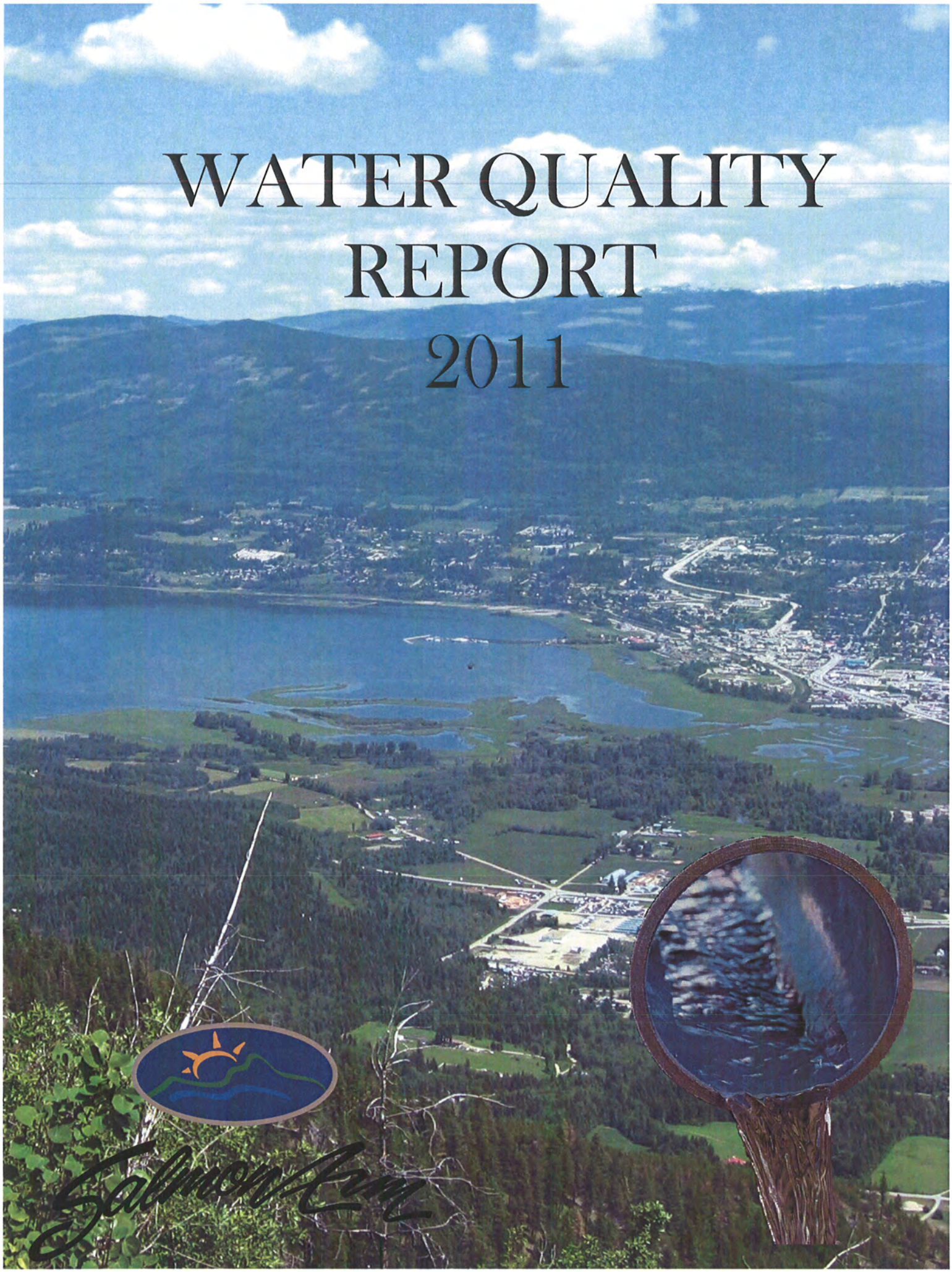
# WATER QUALITY REPORT 2011



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## 1.0 INTRODUCTION

As required by the British Columbia Drinking Water Protection Act, the City of Salmon Arm provides the following annual water quality report. This information has been compiled by the City of Salmon Arm to help you better understand your drinking water.

This report outlines where your water comes from, how it is distributed, and how we ensure it is safe to drink. This information will provide those who want to further inform themselves about their drinking water to do so.

*"Water links us to our neighbour in a way more profound and complex than any other."*

John Thorson

Drinking water can be a complex issue and much of the information provided in the report is technical in nature. Every effort has been made to provide it in a format that is as understandable as possible. Please contact the City of Salmon Arm Engineering & Public Works Department at 803-4000, should you have any questions.

## 2.0 BACKGROUND

The City currently operates and maintains a public water distribution system under the regulations of the Drinking Water Protection Act and Regulations passed May 16, 2003 (http://www.qp.gov.bc.ca/statreg/stat/D/01009_01.htm) by the Province of BC and the Guidelines for Canadian Drinking Water Quality, 2006 edition (http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_e.html).

The Interior Health Authority (IHA) have advised the City that *"Under the legislation, the province has increased the basic expectations around assessing water systems, certifying operators and suppliers, and monitoring and reporting on water quality. The legislation gives provincial drinking water officers (i.e. Interior Health Authority) increased powers to protect water sources from contamination by a drinking-water health hazard. In addition, the drinking-water officers will oversee a source-to-tap assessment of every drinking-water system in the province to address all potential risks to human health."*

The City of Salmon Arm commissioned a new water treatment plant in 2009. The new water Plant was built to insure consistent safe drinking water for the growing population of Salmon Arm and to meet new potable water regulations.

## 3.0 WATER SYSTEM OVERVIEW

The municipal water supply is via three (3) sources, East Canoe Creek at Metford Dam, Shuswap Lake at Canoe Beach and a minor water supply from Rumble Creek for irrigation at the Mt. Ida Cemetery (Figure 1). Water treatment for the system consists of a new water treatment plant for the Shuswap lake intake and chlorine treatment system for the Metford Dam intake. The treatment plant has a design capacity of 40 MLD and this capacity was reached during a warm spell during the 2009 summer. From the Water Plant, water is pumped into 12 reservoirs in different locations throughout the city and also water is supplied to fill the Adams lake Band reservoir. There are 3 booster pump stations and 7 different pressure zones due to elevation changes in the city of Salmon Arm. The distribution system includes approximately 204 km of water main varying in diameter from 100 mm to 1000 mm. It also includes eight (8) different pressure zones, thirteen (13) reservoirs, one dam and six pump stations.

***Did you know ...?***

- *Canada holds 20% of the world's freshwater, but has only 9% of the world's renewable freshwater supply; the rest is "fossil water", a legacy of the melting of large ice sheets that once covered much of Canada.*
- *Canada has more lake area than any other country in the world; Canada'*
- *Every time Beethoven sat down to write music, he poured ice water over his head.*
- *Once you drink water, it leaves your stomach in about 5 minutes!*


**Figure 1 – Water Treatment Plant in Salmon Arm**

The public water system services an area of approximately 7,290 hectares (see Appendix 2) of which 969 hectares includes Band Lands. The City distributes water in pipes made of a variety of materials.

| Pipe Material | Length In Service | Comments |
|---|---|---|
| Cast Iron | 0.5 km | Majority installed prior to 1978 |
| Ductile Iron | 18.9 km | Ductile iron is still used in some applications in Salmon Arm |
| PVC | 90.5 km | Most pipe installed since 1979 has been PVC |
| Asbestos Cement | 93 km | Majority installed prior to 1978 |
| High Density Polyethylene | 0.8 km | Used for specialized applications |

**Figure 2 - Pipe materials in service in Salmon Arm**

## 3.0 WATER SYSTEM OVERVIEW *(continued)*

*"When the well is dry, we learn the worth of water."*

Benjamin Franklin

Shuswap Lake is at a nominal elevation of about 347 m (1135 ft.) Geodetic Survey of Canada (GSC) datum while the Medford Dam intake on East Canoe Creek is at elevation 567 m (1860 ft.) GSC. The Utilities Division attempts to maximize the supply of water from East Canoe Creek so that pumping into the system from Shuswap Lake and the associated costs are minimized. The flow of water from East Canoe Creek into the water system is by gravity.

Periodic problems are experienced with East Canoe Creek, such as:

- turbidity levels that exceed the Interior Health Maximum Allowable Concentration. High turbidity levels are typically associated with higher creek flows during the spring snowmelt and extended high rainfall events in the watershed;
- peak summer water demands that exceed the low natural summer flows in the creek; and
- intermittent high coli form counts, which cause the shutdown of the Metford Dam intake and required the use of Shuswap Lake as the sole water source.

The distribution system is segregated into eight (8) pressure zones. The storage reservoir in the highest pressure zone (Zone 5) is at elevation 615 m (2020 ft.) GSC above sea level. Water has to be pumped over 269 m (885 ft.) in elevation from Shuswap Lake to the storage reservoir at the highest elevation.

***Did you know ...?***

- *About 70% of the earth is covered in water.*
- *3% of the water on earth is freshwater and only 1% is available for human consumption.*
- *Nearly 70% of the earth's fresh water exists in the form of glaciers and permanent snow cover.*
- *Only 0.3% of total global fresh water is stored in lakes and rivers.*

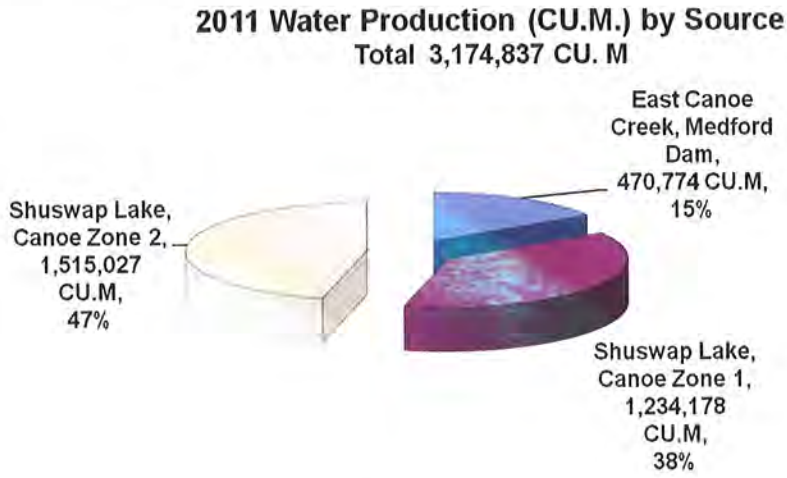



*Figure 3 - Water Source Distribution*

## 3.0 WATER SYSTEM OVERVIEW *(continued)*

### Water treatment Plant

The New Water Plant was put on line May 12th, 2009 and the water quality has improved dramatically for the city residents. Process involves coagulation, filtration, UV treatment and disinfection with added disinfection contact time in the new onsite reservoir. Intake piping changes have taken place to draw water from the new water plant instead of directly from the lake. The current structure remains the same although plans are in place to add extra high lift pumps to improve pumping capacity and flow consistency.

### Water Pumping Stations

The municipal water system includes 14 water storage facilities and six pumping stations. Normally, if there is a major pumping station or storage facility failure, water service to a large area of the community could be discontinued or adversely affected until repair work is completed. With our gravity feed supply source at Metford Dam, water can be cascaded down through all the zones, with the exception of Zone 5.

*"If there is magic on this planet, it is contained in water."*

Loran Eisley (Anthropologist), The Immense Journey, 1957

The pump stations house a combined total of 21 pumps with a service life of approximately 40 to 50 years for each pump.

**Figure 4 - Zone 1 Pumping Station Canoe**

## 3.0 WATER SYSTEM OVERVIEW *(continued)*

### System Control – "SCADA" (Supervisory Control And Data Acquisition software)

Maintaining reservoir water levels, operating pumps, monitoring quality control equipment and maintaining a historical data file of the water systems operations is made easier by a comprehensive software program employed by the Utilities Department. Connected by wireless links, the SCADA software is able to monitor sensors at all the reservoirs and pump stations. Interpreting the data received, it then automatically turns pumps on and off to keep the system flowing smoothly. When trouble is detected within the system the software issues alarms and the Utilities Division staff is notified.

***The following illustrates how many gallons of water it takes to make some everyday items.***

| | |
|---|---|
| *Apple* | *16* |
| *Orange* | *22* |
| *Egg* | *85* |
| *Loaf of Bread* | *150* |
| *Pound of Steel* | *270* |
| *Sunday Paper* | *280* |
| *Pound of Aluminum* | *1000* |
| *Pound of cotton* | *1300* |
| *Pound of Beef* | *3000* |

**Laura McDonald, Freshwater Society**

### Pressure-Reducing Valve Stations

The maximum design water pressure for piping within the majority of the municipal water system is 1034 kPa (150 psi). We have two Pressure reducing valve stations containing one Pressure-reducing valve (PRV) each. Pressure reducing valves are used to control the pressure in the water system by creating head losses that prevent pressures from exceeding the design maximum. The failure of a PRV could disrupt flows and mainline pressures to large areas within the community.

The Utilities Division currently overhauls the PRV stations as required, in an effort to extend their service life. Most individual premises also have secondary PRV's as fluctuating pressures can place excessive stress on internal plumbing systems and fixtures.

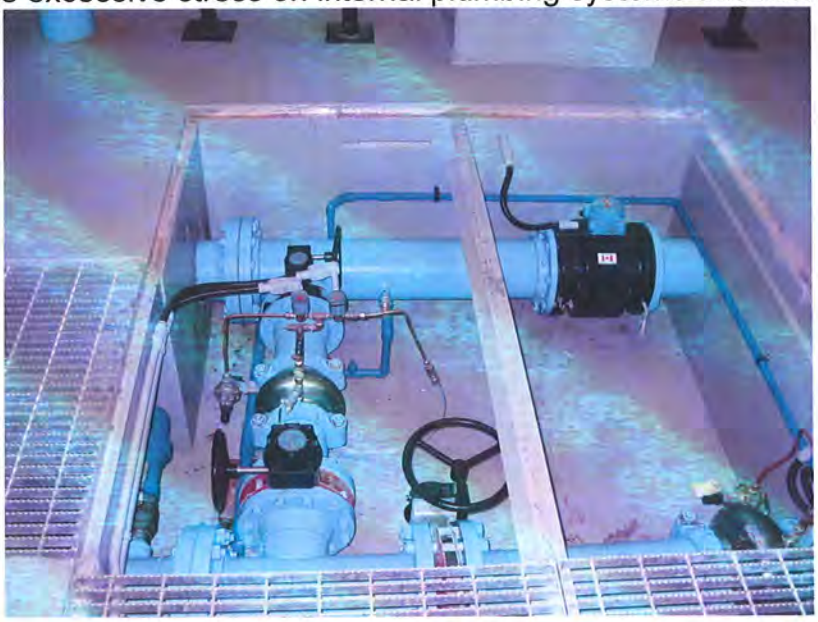


**Figure 5 – Zone 4 Pump/Pressure Reducing Station on 30th Street NE**

*"Throughout the history of literature, the guy who poisons the well has been the worst of all villains..."*

Author unknown

## 3.1 Water System Value

The total value of our primary water distribution system, as detailed in Figure 6 below, is approximately $80,660,000. We budgeted $3,100,000 in 2011 or approximately 3.8%, on water infrastructure replacement. The replacement program is designed to address some of these previously discussed replacement components and other general deficiencies within the system on a priority basis. However; a thorough and comprehensive maintenance program also helps to extend the life expectancy of a majority of these water infrastructure elements.

| System Components | Quantity in Use in Salmon Arm | Approximate Replacement Cost |
|---|---|---|
| Water mains | 204 km | $ 50,500,000 |
| Treatment Plant | 1 | $ 16,000,000 |
| Reservoirs/Tanks | 13 Reservoirs/ 1 Dam | $ 8,700,000 |
| Pumping Stations | 6 | $ 6,000,000 |
| System Control | 1 | $ 460,000 |
| **Total** | | **$ 80,660,000** |

***Figure 6 - Infrastructure replacement value***

***Did you know ...?***

- *In Canada, there is more water underground than on the surface.*
- *Canadians are among the biggest water users in the world.*
- *Annually, Canada's rivers discharge 7% of the world's renewable water supply.*
- *40% of Canada's boundary with the United States is composed of water.*

## *4.0 STAFFING*

The City of Salmon Arm Engineering and Public Works Department is responsible for this municipal function. The Utilities Division is responsible for the operation and maintenance of the water supply and distribution system.

**Staff Overview:**

| Engineering and Public Works |
|---|
| **Dale Mc Taggart, P. Eng.,** Director of Engineering and Public Works |
| **Robert Niewenhuizen, A.Sc.T.,** City Engineer |
| **Gerry Rasmuson, B.Sc.,** Manager of Utilities |

## 4.0 STAFFING *(continued)*

| Utilities Division | |
|---|---|
| **Roger Parks**<br>***Utilities Supervisor***<br>• Level I - Wastewater Collection<br>• Level II - Water Distribution | **John Kalinczuk**<br>***Chief Operator/Manager***<br>• Level II - Water Treatment<br>• Level II – Wastewater Treatment<br>• Level III - Water Distibution |
| **Ray Muller**<br>• Level I – Water Distribution<br>• Level I - Wastewater Collection | **Marcus Miller**<br>• Level I - Water Treatment |
| **Larry Kipp**<br>• Level I - Wastewater Collection<br>• Level II – Water Distribution | **Rick Webb**<br>• Level II - Wastewater Collection<br>• Level II – Water Distribution<br>• Level I - Water Treatment |
| **Mike Stremel**<br>• Level I – Water Distribution<br>• Level I - Wastewater Collection | |
| **Merv Arvay**<br>• Level II – Water Distribution<br>• Level I - Wastewater Collection | |

*Figure 7 - Staff Overview*

*Between 1972 and 1991, Canada's withdrawal of freshwater resources increased from 24 billion cubic meters/year to over 45 cubic meters/year – a rise of 80%: in the same period, the population increased only 3%.*

watercan.com

## 5.0 MONITORING PROGRAM

Drinking water quality is a function of source water quality, water treatment, and water quality changes after treatment. As a result the monitoring of drinking water quality consists of three components: source (raw) water monitoring, monitoring after treatment, and monitoring in the distribution system.

## 5.1 TESTING PARAMETERS

Testing of our water systems is undertaken at both the water treatment plant and throughout our distribution system.

At the water treatment plant, the water plant employees document over 94 daily plant checks, lab testing of 24 different parameters and samples are also sent out to an independent lab for additional bacteria, mineral, UV transmittance and THM. Also plant personnel document monthly, bi-monthly and yearly checks to insure plant is sustained in good functioning order.

***Did you know ...?***

- *Up to 60% of the human body is water.*
- *The brain is composed of 70% water.*
- *Blood is 82% water.*
- *The lungs are nearly 90% water.*

Throughout the distribution system, the City of Salmon Arm, as a purveyor of drinking water to a service population of approximately 15,000, is required to test at least 14 samples per month as outlined in the *Guidelines for Canadian Drinking Water Quality, Sixth Edition*. Our water distribution network is approximately 204 kilometres in length.

At the time of sampling, the Water Utility Operator also checks the water temperature and chlorine residual to ensure the water continuously has disinfection capability. As it is not economically feasible to test for all pathogens in drinking water, the microbiological guidelines are based on these indicator tests.

A Maximum Acceptable Concentration (MAC) level has been established by Health Canada for microbiological criteria. Each MAC has been designed to safeguard human health, assuming a lifelong consumption of drinking water containing the substances at the maximum concentration level.

Aesthetic Objectives (AO's) apply to characteristics of drinking water that can affect its acceptance by consumers. These would include items such as taste, odour, and appearance. However, there are constituents that could pose a health risk in some individuals (i.e. compromised immunity, etc.) if the allowable AO's are exceeded.

For more information regarding testing parameters and MAC levels, please visit Health Canada's website at www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/sum_guide-res_recom/summary-sommaire-eng.pdf

## 5.1 TESTING PARAMETERS *(continued)*

### Turbidity

Turbidity measurements relate to the optical properties of water. Poor turbidity is caused by suspended matter such as clay, silt, finely divided organic and inorganic matter, soluble coloured organic compounds, plankton, and other microscopic organisms.

Excessive turbidity not only detracts from the appearance and taste of water, it can also serve as a source of nutrients for waterborne bacteria. As our supply source is surficial, and therefore subject to changes in quality due to weather changes, the water is sometimes discoloured and may taste different when it rains heavily after a long dry spell. Excessively high turbidity can also have a negative effect on disinfection techniques. The unit of measurement is the nephelometric turbidity unit (NTU). Turbidity, at the point of consumption, shall be less than or equal to 0.3 NTU in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 1.0 NTU at any time. The Metford Dam intake is automatically shut off when the turbidity level reaches one (1) NTU. The system is monitored and flushed, when unacceptably high turbidity test results are recorded. Turbidity is continuously measured at both water supply sources.

*"Anyone who can solve the problems of water will be worthy of two Nobel prizes - one for peace and one for science."*

John F. Kennedy

### Chemical Analysis

The Utilities Division takes samples on a bi-annual basis from both sources for a chemical analysis of common minerals and other chemical parameters (such as hardness). Results are checked against the *Guidelines for Canadian Drinking Water Quality* (see Appendix 1).

## *5.2 TESTING PROGRAM*

Water at the nine sampling sites is tested and sampled every second week (see Appendix 3) by our Water Utility Operator, see Appendix 4. Samples are tested on-site for temperature and chlorine residual, and the results are recorded. Samples are taken in accordance with the *20th Edition of Standard Methods for the Examination of Water and Wastewater*, placed in a sterile bottle, sealed, identified by location with time of day noted, placed in a cooler, and delivered to a certified laboratory for testing (Caro Environmental Services in Kelowna). The water is tested for total coliform, and E. Coli counts. All results are returned to Interior Health. If there is a positive test result, the local Health Office contacts the Director of Engineering & Public Works. Depending on the location and type of positive test result, the City will institute one or more of the following:

## 5.1 *TESTING PARAMETERS (continued)*

***Did you know...?***

- *You can refill an 8-oz glass of water approximately 15,000 times for the same cost as a six pack of soda.*
- *If all the world's water were fit into a gallon jug, the fresh water available for us to use would equal only about one tablespoon.*
- *There is the same amount of water on Earth as there was when the Earth was formed. The water from your faucet could contain molecules that dinosaurs drank.*

a) further testing to confirm the previous test results;
b) main flushing to remove stagnant water;
c) disinfection, if it appears to have contamination from an outside source; and
d) Boil Water Advisory, if there is a health risk to users.

Supplementary to the Interior Health requirement for the bi-weekly testing of water within the distribution system, the City has instituted an additional testing program. Random sites are periodically tested for temperature and chlorine residual. These sites are located in key locations on the extremities of the system known to have low flow or stagnant water conditions. This ensures that no biological re-growth is occurring within the system. Where either of these parameters reaches the set limits, flushing to refresh the water supply is instituted.

The health of our water system and public trust in it are issues the City takes seriously. Our Utilities Division staff work closely with Interior Health so that a program is in place that ensures our citizens are provided with safe and healthy drinking water.

**New Water mains**
Disinfection of a new water main is completed in accordance with AWWA C651, Continuous Feed Method. If the samples are not clean, the whole process is repeated.

## 6.0 *WATERMAIN BREAKS*

*Many Canadians lose more water from leaky taps than they need for cooking and drinking.*

watercan.com

Most water utilities frequently experience minor disruptions. Pipes break, valves stick, hydrants leak and power outages occur. Although these are not anticipated, the problems experienced can usually be corrected with minimal disruption, and regular service can be quickly restored.

In 2011, our staff responded to and repaired 3 water main breaks. (Note: service connection or hydrant lead breaks are not included in this total).

In cases of water main breaks, the City adheres to the procedures set out in the American Water Works Association (AWWA) Standard C651-92 regarding water main chlorination prior to re-commissioning of the main.

## 7.0 NOTIFICATION PROTOCOL

*"We forget that the water cycle and the life cycle are one"*

Jacques Cousteau

Normally, breaks or disruption to water service are caused by conditions that can be repaired and reinstated quickly, directly by City forces without risk to the public health. Sometimes however, situations arise that require extra care to guarantee that the integrity of our water infrastructure has not been compromised. The Utilities Department endeavours to keep the Medical Health Officer apprised of any extraordinary situations that may adversely impact the City's water system.

## 8.0 Capital Works Projects

### Water main Upgrading

In addition to repairing water mains that break, aging water mains must be replaced. An ongoing replacement/preventative measures program is in place, targeting areas with older piping materials in susceptible condition and areas identified with inadequate fire flow. Future development is also factored into the overall plan.

*"Man - despite his artistic pretensions, his sophistication, and his many accomplishments - owes his existence to a six inch layer of topsoil and the fact that it rains."*

Unknown author

### Water Supply and Distribution System Upgrading

| Capital Projects completed in 2011 |
|---|
| • Numerous water main replacements throughout the City. Replacements are typically added to the Capital plan because of age, material, break history, or fire flow requirements. |
| • Continuation of the Cities water meter program |
| • Design and construction of the twinning of Homely Reservoir |
| • Hydrant infill program |
| • Mainline valve installation program |

*Figure 10 – Capital Projects*

## 9.0 WATER CONSUMPTION

***Did you know ...?***

- *The value of the in-ground assets of Canadian municipal water supply and wastewater systems totals over $100 billion.*
- *About 82% of Canadians (1994 data) are served by wastewater treatment plants, compared with 75% Americans, 86.5% Germans, and 99% Swedes.*
- *Less than 3% of the water produced at a large municipal water treatment plant is used for drinking purposes; during the summer, about half of all treated water is sprayed onto lawns and gardens.*

Our community has an above average per capita water use when compared to other Canadian municipalities. Some possible causes of this excessively high per capita consumption may include undetected system leaks, illegal connections, high residential summer irrigation demand, and inaccurate metering. In 2003 the Water Use Efficiency Committee brought forward a Water Conservation policy which Council adopted (see Appendix 8).

The City of Salmon Arm had a Water Audit conducted in 2007 by Hetek Solutions. The objective of the study was to identify sources of water loss from the municipal system. The results of the report will be key in planning future water works and upgrades.

It is evident that leakage within the system combined with actual consumption (as well as unauthorized use) creates somewhat skewed municipal water consumption data. Regardless of potential losses in the system, production data can be used to illustrate consumption trends and is therefore useful in identifying areas where conservation measures can be implemented.
See Appendix 5 and 6 for further total consumption data.

***The following illustrates how many gallons of water it takes to do some everyday Things.***

| | |
|---|---|
| *Brush Teeth* | *2* |
| *Flush Toilet* | *2 to 7* |
| *Run Dishwasher* | *9 to 12* |
| *Wash Dishes by Hand* | *20* |
| *Clothes Washer* | *50* |
| *10 Min Shower* | *25 to 50* |
| *Bath* | *25 to 50* |

## 10.0 TEST RESULTS

*The Guidelines for Canadian Drinking Water Quality, Sixth Edition* and the *British Columbia Safe Drinking Water Regulation* have established the following microbiological criteria:

- No sample should contain more than one total coliform organisms per 100 ml, none of which should be E. Coli;
- No two consecutive samples from the same site should show the presence of coliform organisms; and
- At least 90% of the samples must have zero total coliforms per 100 m.

## 11.0 2011 CHALLENGES TO DRINKING WATER QUALITY

There were no periods in 2011, where the source water on East Canoe Creek was showing high turbidity (above 1NTU). No Public Water Quality Advisory Notices were required during 2011 operating season.

## 12.0 CONCLUSION

***Can I make a difference?***

***Yes, you can...***

- *Wait till you have a full load before running the dishwasher or doing laundry.*
- *When brushing your teeth, turn the water off while brushing rather than leaving it running.*
- *Place a jug of water or a plastic insert (available at hardware stores) into the water tank of your toilet. This can save 45,000L in a household of 4 per year.*
- *Keep your lawn healthy and maintain at a height of 6.5cm. Taller grass holds water better, and a healthy lawn will choke out weeds.*
- *Clean sidewalks and driveways with a broom, not a hose.*
- *Avoid the use of pesticides and hazardous materials in your garden and yard.*

The City of Salmon Arm has made a lot of progress in the implementation of BC's Drinking Water Protection Act and Regulations. While there is always ongoing work to do, City staff continues to work hard to maximize the safety and reliability of the water we deliver to our customers.

The City of Salmon Arm is pleased to present the 2011 Annual Water Quality Report, detailing the health and direction of our water system. If you have any questions about this report or want more information about water consumption and production, please contact the Engineering & Public Works Department at 803-4000.


# APPENDIX 1

# CITY OF SALMON ARM
# SOURCE WATER CHEMICAL ANALYSIS
# TEST RESULTS

# Shuswap Lake Source
# Raw Water Quality

**CDWG : Canadian Drinking Water Quality Guidelines**

CDWG*1 Maximum acceptable concentration
CDWG*2 Aesthetic concentration

*Note-Beginning July of 2011, testing is completed on treated water from the Water Treatment Plant

| | CDWG*1 | CDWG*2 | RDL Units | 30-Mar-06 | 19-Jun-06 | 22-Jun-07 | 21-Aug-07 | 29-Jan-08 | 26-Aug-08 | 01-Jun-09 | 12-Jan-10 | 06-Jul-10 | 11-Jan-11 | 26-Jul-11 | 10-Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity (Total as CaCO3) mg/L | | | 1 | | | | | 43 | 42 | 48.9 | 46.9 | 49.6 | 44.9 | 46.4 | 45.2 |
| pH (units) | | 6.5-8.5 | 0.1 | 7.3 | 7.0 | 6.9 | 6.9 | 7.2 | 6.8 | 7.87 | 7.75 | 8.06 | 7.74 | 7.52 | 7.77 |
| Conductivity at 25 deg C (umhos/cm | - | | 5 | 128 | 118 | 118 | 110 | 113 | 110 | 113 | 107 | 113 | 105 | 117 | 100 |
| Dissolved Solids (Total) mg/L | | <500 | 5 | 73 | 72 | 68 | 74 | 68 | 61 | 84 | 59 | 79 | 70 | 67 | 57 |
| Turbidity (NTU) | | | 0.1 | | | 1.3 | 15 | 1.6 | 11 | 0.9 | 0.5 | 1.9 | 0.4 | 0.1 | 0.3 |
| Hardness (Total) mg/L as CaCO3 | | <500 | 2.07 | 51 | 50 | 41 | 58.5 | 51.4 | 44.7 | 54.5 | 48.4 | 54.3 | 49.6 | 49.2 | 51.4 |
| Clour, True | | | 5 | | | <5 | <5 | 11 | <5 | <5 | <5 | 12 | 6 | <5 | <5 |
| Nitrate mg/L as N | <10 | | 0.01 | 0.07 | 0.12 | 0.096 | 0.083 | 0.066 | 0.1 | 0.07 | 0.09 | <.01 | 0.09 | 0.101 | 0.088 |
| Nitrite mg/L as N | <1 | | 0.01 | <0.01 | <0.01 | <0.010 | <0.010 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 |
| Fluoride mg/L | <1.5 | | 0.1 | 0.15 | 0.1 | <0.10 | <0.10 | <.1 | <.1 | <.1 | <.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Total Coliform (Colonies/100mL) | ** | | 1 | 0 | 17 | 6 | 1 | 1 | 11 | 1 | 2 | 13 | 3 | <1 | 2 |
| E. Coli | <1 | | 1 | | | | | <1 | <1 | <1 | 1 | 1 | <1 | <1 | <1 |
| Aluminum (Total) mg/l | | | 0.05 | 0.04 | 0.07 | 0.12 | 0.75 | 0.42 | 0.657 | <.05 | <.05 | 0.075 | <.05 | <.05 | <.05 |
| Antimony (Total) mg/l | | | 0.003 | <0.0005 | <0.0005 | <0.006 | <0.0006 | <.003 | <.003 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| Arsenic (Total) mg/L | <.01 | | 0.005 | <0.001 | <0.001 | <0.010 | <0.001 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| Barium (Total) mg/L | 1.0 | | 0.005 | <0.02 | <0.02 | 0.012 | 0.018 | 0.019 | 0.019 | 0.0122 | 0.0099 | <.005 | <.05 | <.05 | <.05 |
| Beryllium | | | 0.002 | | | | | <.002 | <.002 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| Boron (Total) mg/L | 5.0 | | 0.02 | <0.1 | <0.1 | <0.02 | <0.002 | <.02 | <0.02 | <0.02 | <0.02 | <.04 | <.04 | <.04 | <.04 |
| Cadmium (Total) mg/L | 0.005 | | 0.0001 | <0.0002 | <0.0002 | <0.00010 | 0.00001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
| Calcium (Total) mg/L | - | | 0.5 | 16 | 16 | 17.1 | 18.3 | 16.3 | 13.9 | 16.9 | 15 | 16.8 | 15.5 | 15.7 | 16.3 |
| Chloride mg/L | | <250 | 0.1 | 1.20 | 1.15 | 0.91 | | 0.69 | 0.89 | 1.07 | 1.09 | 0.85 | 0.92 | 4.3 | 0.97 |
| Chromium (Total) mg/L | 0.05 | | 0.015 | <0.002 | <0.002 | <0.030 | 0.003 | <.015 | <.015 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| Cobalt (Total) mg/L | | | 0.0005 | | | | | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 |
| Copper (Total) mg/L | | <1.0 | 0.003 | <0.01 | <0.01 | <0.010 | 0.004 | 0.0065 | 0.0087 | <.001 | 0.0011 | 0.226 | <.002 | 0.0123 | <.002 |
| Cyanide (total) | | | 0.01 | | | <0.01 | | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 |
| Iron (Total) mg/L | 0.3 | | 0.2 | 0.08 | 0.14 | <0.30 | 1.00 | 0.50 | 0.87 | <.1 | <.1 | 0.15 | <.1 | <.1 | <.1 |
| Lead (Total) mg/L | 0.01 | | 0.001 | <0.001 | <0.001 | <0.0020 | 0.0006 | <.001 | <.001 | <.001 | <.001 | 0.0097 | <.001 | <.001 | <.001 |
| Magnesium (Total) mg/L | - | | 0.2 | 2.7 | 2.4 | 3.02 | 3.13 | 2.61 | 2.44 | 3 | 2.63 | 3.01 | 2.65 | 2.44 | 2.59 |
| Manganese (Total) mg/L | | 0.05 | 0.005 | 0.017 | 0.026 | 0.018 | 0.092 | 0.057 | 0.0858 | 0.004 | 0.0025 | 0.0039 | 0.0049 | 0.0032 | 0.0025 |
| Mercury (Total) mg/L | 0.001 | | 0.0003 | <0.0002 | <0.0002 | <0.00050 | <0.00005 | <.0003 | <.0003 | <.0005 | <.0005 | <.0005 | 0.00025 | <.0002 | <.0002 |
| Molybdenum (Total) mg/l | | | 0.001 | <0.03 | <0.03 | <0.0050 | 0.0007 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| Nickel (Total) mg/L | | | 0.005 | | | | | <.005 | <.005 | <.002 | <.002 | <.002 | <.002 | <.002 | <.002 |
| Phosphorus (Total) mg/L | | | 0.2 | | | | | <.2 | <.2 | <.2 | <.2 | <.2 | <.2 | <.2 | <.2 |
| Potassium (Total) mg/l | | | 0.2 | 1.1 | 1.0 | 1.02 | 1.36 | 1.12 | 0.98 | 0.99 | 1.09 | 1.17 | 1 | 1.06 | 0.94 |
| Selenium (Total) mg/L | 0.01 | | 0.005 | <0.001 | <0.001 | <0.010 | <0.001 | <.005 | <.005 | <.003 | <.003 | <.003 | <.005 | <.005 | <.005 |
| Silicon | | | 1 | | | 3.9 | 6.4 | 5.6 | 5.6 | 3.7 | 7.8 | 17.2 | <5 | <5 | <5 |
| Silver (Total) mg/L | | | 0.0004 | | | | | <.0004 | <.0004 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 |
| Sodium (Total) mg/L | | <200 | 0.2 | 3 | <2 | 2.3 | 2.38 | 2.11 | 1.87 | 2.46 | 2.19 | 2.52 | 2.17 | 4.32 | 2.28 |
| Sulphate mg/L | | <500 | 1 | 9.1 | 7.6 | 8 | | 7.3 | 7.4 | 8 | 8.2 | 6.8 | 7.6 | 6.7 | 7.2 |
| Uranium (Total) mg/l | <0.02 | | 0.0005 | 0.0005 | 0.0004 | <0.0010 | 0.0005 | <.0005 | 0.0007 | 0.0004 | 0.00037 | 0.00039 | 0.0003 | <.0002 | 0.00033 |
| Zinc (Total) mg/L | | <0.05 | 0.03 | <0.05 | <0.05 | 0.054 | 0.006 | <.03 | <.01 | <.01 | <.01 | 1.32 | <.04 | N/A | <.04 |

Notes:

Hardness: 80-100 as CaCO3
>200 as CaCO3
>500 as CaCO3

Aluminum - No health guideline "operational guidance values" are 0.10 or 0.20 mg/l depending on treatment type.

** Microbiological Characteristics:
For total coliform the maximum acceptable concentration is 0 colonies/100mL. However, due to uneven distribution in water:
1) No sample should contain more than 10 total coliform organisms per 100 mL none of which should be fecal coliforms.
2) No consecutive samples from the same site should show any coliforms
3) If any coliforms are detected, or if there are more than 200 background colonies on a toal coliform membrane filter per 100 mL, the site should be resampled, and if results confirmed, cause should be determined and remediation undertaken.

# Medford Dam Source
# Raw Water Quality

**CDWG : Canadian Drinking Water Quality Guidelines**
**CDWG*1** Maximum acceptable concentration
**CDWG*2** Aesthetic concentration

| Test | CDWG*1 | CDWG*2 | RDL Units | 30-Mar-06 | 19-Jun-06 | 22-Jun-07 | 21-Aug-07 | 29-Jan-08 | 25-Aug-08 | 01-Jun-09 | 12-Jan-10 | 06-Jul-10 | 15-Feb-11 | 26-Jul-11 | 10-Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity (Total as CaCO3) mg/L | | | 1 | | | | | 197 | 177 | 161 | 210 | 169 | 185 | 196 | 188 |
| pH (units) | | 6.5-8.5 | 0.1 | 8.0 | 7.9 | 7.6 | 7.8 | 7.9 | 7.6 | 8.31 | 8.12 | 8.26 | 8.32 | 8.26 | 8.28 |
| Conductivity at 25 deg C (umhos/cm) | - | | 5 | 393 | 349 | 342 | 346 | 411 | 370 | 309 | 422 | 324 | 381 | 365 | 398 |
| Dissolved Solids (Total) mg/L | | <500 | 5 | 247 | 215 | 209 | 229 | 258 | 234 | 199 | 238 | 205 | 217 | 222 | 226 |
| Turbidity (NTU) | | | 0.1 | | | 0.6 | 0.5 | 0.2 | 0.6 | 0.7 | 0.2 | 0.4 | 0.2 | 0.5 | 0.2 |
| Hardness (Total) mg/L as CaCO3 | | <500 | 2.07 | 196 | 177 | 158 | 168 | 222 | 164 | 177 | 219 | 181 | 189 | 199 | 223 |
| Colour, true (colour units) | | <15 | 5 | | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 5 | <5 |
| Nitrate mg/L as N | <10 | | 0.01 | <0.01 | 0.02 | <0.010 | <0.010 | 0.014 | <.01 | <.01 | <.01 | 0.08 | 0.06 | <.01 | <.01 |
| Nitrite mg/L as N | <1 | | 0.01 | <0.01 | <0.01 | <0.010 | <0.010 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 |
| Fluoride mg/L | 1.5 | | 0.1 | 0.15 | 0.20 | <0.10 | 0.11 | 0.11 | <.1 | <.1 | 0.13 | <.1 | 0.25 | <.1 | 0.14 |
| Total Coliform (Colonies/100mL) | ** | | 1 | 0 | 26* | 23 | 59 | 2 | 74 | 19 | 5 | 41 | 5 | 110 | 4 |
| E. Coli | <1 | | 1 | | | | | <1 | 7 | 1 | <1 | <1 | <1 | 5 | <1 |
| Aluminum (Total) mg/L | 0.1 | | 0.05 | <0.01 | <0.01 | 0.01 | <0.01 | <.05 | <.05 | <.05 | <.05 | <.05 | <.05 | <.05 | <.05 |
| Antimony (Total) mg/L | 0.006 | | 0.003 | <0.0005 | <0.0005 | <0.0006 | <0.0006 | <.003 | <.003 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| Arsenic (Total) mg/L | 0.01 | | 0.005 | <0.001 | <0.001 | <0.001 | <0.001 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| Barium (Total) mg/L | 1.0 | | 0.005 | 0.03 | 0.03 | 0.027 | 0.032 | 0.033 | 0.031 | 0.0235 | 0.0324 | <.005 | <.05 | <.05 | <.05 |
| Beryllium (Total) mg/L | | | 0.002 | | | | | <.002 | <.002 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| Boron (Total) mg/L | 5.0 | | 0.02 | <0.1 | <0.1 | <0.002 | 0.003 | <.02 | <.02 | <.02 | <.02 | <.04 | <.04 | <.04 | <.04 |
| Cadmium (Total) mg/L | 0.005 | | 0.0001 | <0.0002 | <0.0002 | <0.00001 | <0.00001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
| Calcium (Total) mg/L | - | | 0.5 | 65 | 62 | 67.3 | 64.2 | 73 | 54.1 | 61.3 | 68.1 | 61.7 | 59.4 | 68.4 | 71.8 |
| Chloride (Total) mg/L | | <250 | 0.1 | 0.50 | 0.50 | 0.26 | 0.28 | 0.28 | 0.27 | 0.24 | 0.51 | 0.12 | 0.7 | 0.25 | 0.37 |
| Chromium (Total) mg/L | 0.05 | | 0.015 | <0.002 | <0.002 | <0.003 | 0.003 | <.015 | <.015 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| Cobalt (Total) mg/L | | | 0.0005 | | | | | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 |
| Copper (Total) mg/L | | <1.0 | 0.003 | <0.01 | <0.01 | <0.001 | <0.001 | <.003 | <.003 | <.001 | <.001 | 0.004 | <.002 | <.002 | <.002 |
| Cyanide (total) mg/L | | | 0.01 | | | <0.01 | <0.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 |
| Iron (Total) mg/L | 0.3 | | 0.2 | <0.03 | <0.03 | 0.15 | 0.3 | <.2 | <.2 | <.1 | <.1 | <.1 | <.1 | <.1 | <.1 |
| Lead (Total) mg/L | 0.01 | | 0.001 | <0.001 | <0.001 | <0.0002 | <0.0002 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| Magnesium (Total) mg/L | - | | 0.2 | 8.1 | 5.4 | 6.2 | 10.2 | 9.69 | 7.04 | 5.8 | 11.8 | 6.53 | 9.75 | 6.84 | 10.7 |
| Manganese (Total) mg/L | | 0.05 | 0.005 | <0.002 | <0.002 | 0.001 | 0.006 | <.005 | 0.0144 | <.002 | 0.0042 | <.002 | 0.0024 | 0.0024 | 0.0043 |
| Mercury (Total) mg/L | 0.001 | | 0.0003 | <0.0002 | <0.0002 | 0.00005 | <0.00005 | <.0003 | <.0003 | <.0005 | <.0005 | <.0005 | <.0002 | <.0002 | <.0002 |
| Molybdenum (Total) mg/L | | | 0.001 | <0.03 | <0.03 | 0.0011 | 0.0011 | 0.0012 | <.001 | <.001 | 0.0013 | 0.001 | 0.0012 | <.001 | 0.0016 |
| Nickel (Total) mg/L | | | 0.005 | | | | | <.005 | <.005 | <.002 | <.002 | <.002 | <.002 | <.002 | <.002 |
| Phosphorus (Total) mg/L | | | 0.2 | | | | | <.2 | <.2 | <.2 | <.2 | <.2 | <.2 | <.2 | <.2 |
| Potassium (Total) mg/L | | | 0.2 | 1.5 | 1.3 | 1.43 | 1.98 | 1.51 | 1.31 | 1.13 | 1.77 | 1.4 | 1.44 | 1.45 | 1.47 |
| Selenium (Total) mg/L | 0.01 | | 0.005 | <0.001 | <0.001 | <0.001 | <0.001 | <.005 | <.005 | <.003 | <.003 | <.003 | <.005 | <.005 | <.005 |
| Silicon (Total) mg/L | | | 1 | | | 7.4 | 8.1 | 6 | 5.6 | 6.8 | 11.8 | 28.8 | 6.6 | 5.8 | 7.7 |
| Silver (Total) mg/L | | | 0.0004 | | | | | <.0004 | <.0004 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 | <.0005 |
| Sodium (Total) mg/L | | <200 | 0.2 | 3 | <2 | 1.84 | 2.78 | 2.81 | 1.87 | 1.52 | 3.13 | 1.91 | 2.55 | 1.97 | 2.95 |
| Sulphate (Total) mg/L | | <500 | 1 | 25 | 13 | 13.7 | 19.9 | 23.1 | | 11.8 | 31.1 | 15.1 | 24.9 | 13 | 25.6 |
| Uranium (Total) mg/L | 0.02 | | 0.0005 | 0.00090 | 0.00060 | 0.0007 | 0.0008 | 0.001 | 0.0007 | 0.00052 | 0.00103 | 0.00063 | 0.00082 | 0.00063 | 0.00093 |
| Vanadium (Total) mg/L | | | 0.01 | | | | | <.01 | | | <.01 | <.01 | <.01 | <.01 | <.01 |
| Zinc (Total) mg/L | | <.05 | 0.03 | <0.05 | <0.05 | 0.007 | 0.014 | <.03 | <.01 | <.01 | <.01 | <.01 | <.04 | <.04 | <.04 |

Notes:

Hardness: 80-100 as CaCO3
>200 as CaCO3
>500 as CaCO3

Aluminum - No health guideline "operatic
are 0.10 or 0.20 mg/l dependi

** Microbiological Characteristics:
For total coliform the maximum acceptable concentration is 0 colonies/100mL. However, due to uneven distribution in water:
1) No sample should contain more than 10 total coliform organisms per 100 mL none of which should be fecal coliforms.
2) No consecutive samples from the same site should show any coliforms
3) If any coliforms are detected, or if there are more than 200 background colonies on a toal coliform membrane filter per 100 100 mL, the site should be resampled, and if results confirmed, cause should be determined and remediation undertaken.

* 19 June 06 - Total Coliform - 26 colonies/100 mL with unidentified bacterial background greater than 200 colonies/100 mL

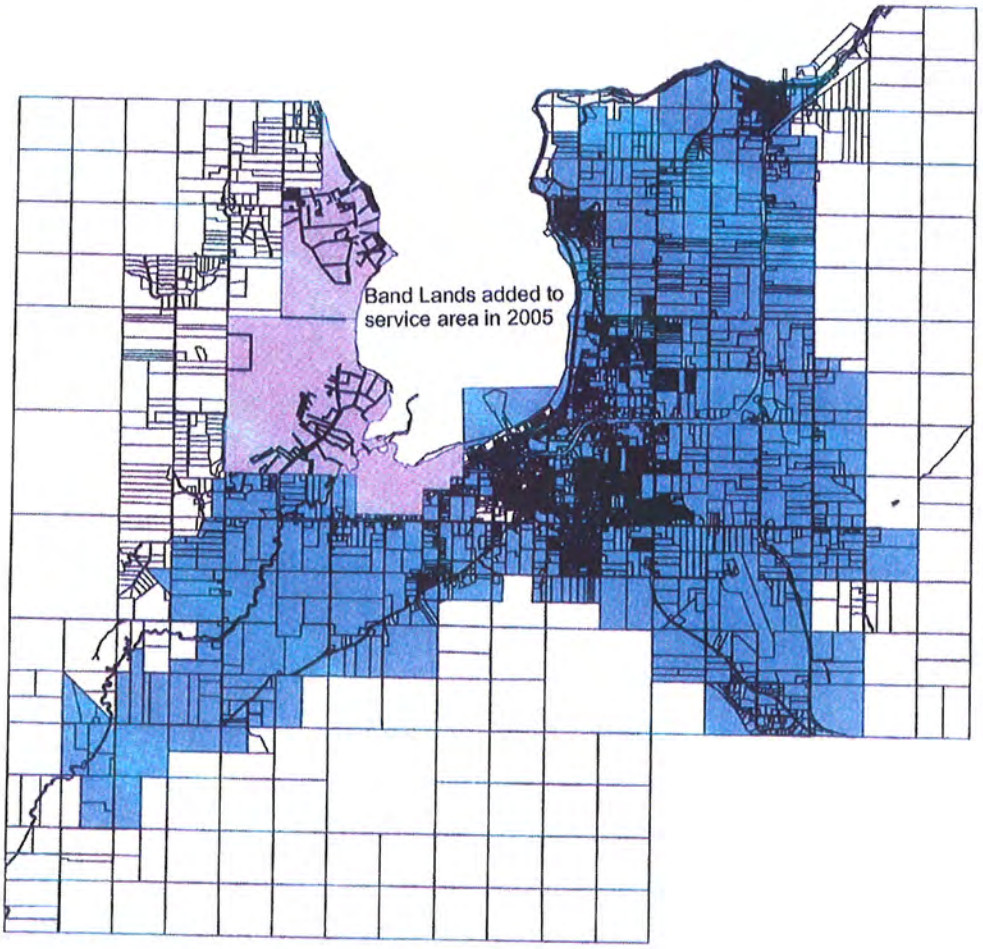
Salmon Arm

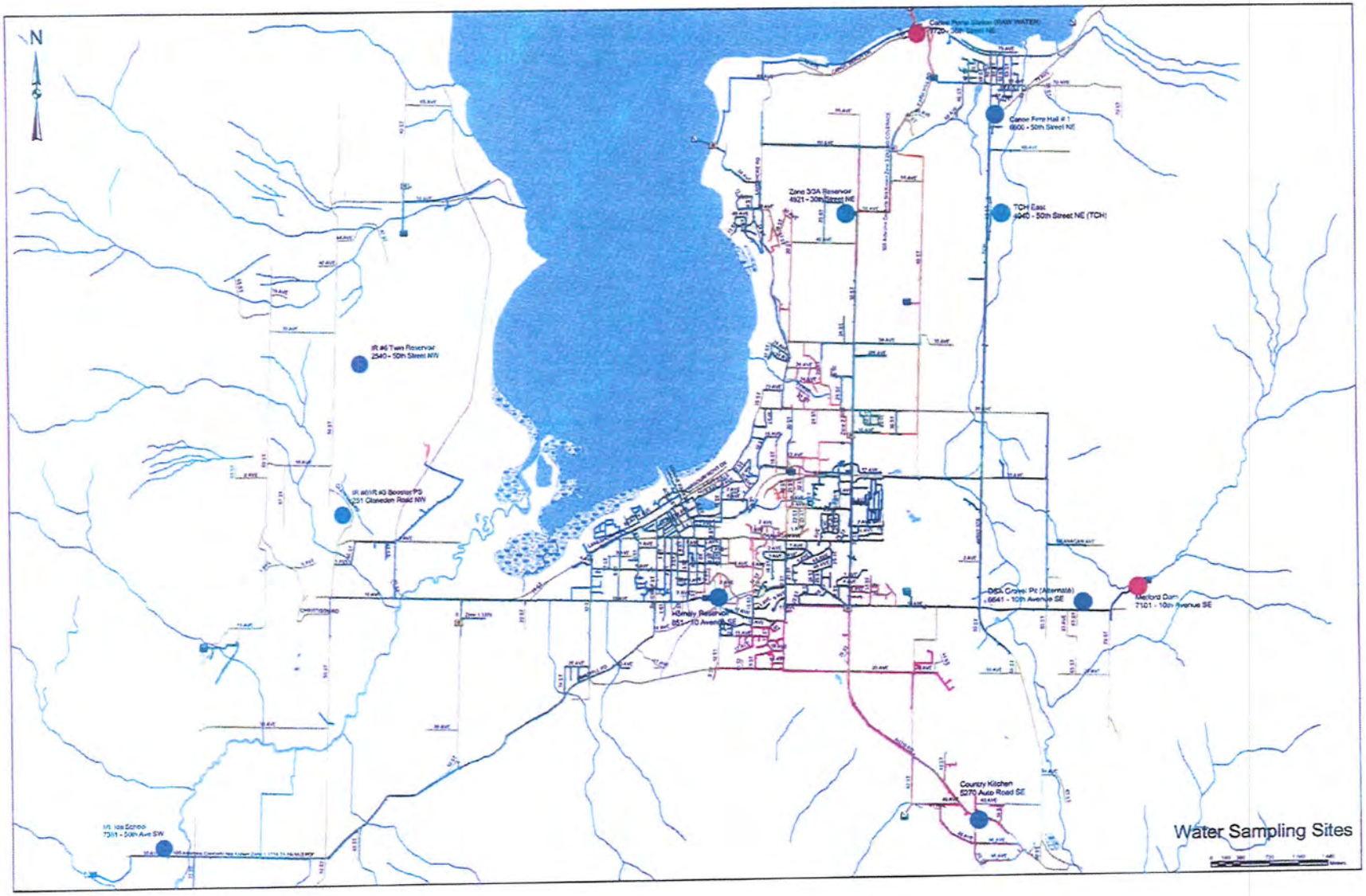
# APPENDIX 2

# CITY OF SALMON ARM
# WATER SERVICE AREA

N

# CITY OF SALMON ARM
# WATER SERVICE AREA




N
Canoe Ferry Hall # 1
6600 - 50th Street NE
Zone 3/3A Reservoir
4921 - 30th Street NE
TCH East
4040 - 50th Street NE (TCH)
IR #6 Twin Reservoir
2540 - 50th Street NW
IR #6/IR #3 Booster PS
251 Otineden Road NW
Romaly Reservoir
853 - 10 Avenue SE
Ditch Gravel Pit (Alternate)
6641 - 10th Avenue SE
Medford Dam
7101 - 10th Avenue SE
Country Kitchen
5270 Auto Road SE
IR. Ida Scroo
7301 - 50th Ave SW
Water Sampling Sites


APPENDIX 3

# INTERIOR HEALTH AUTHORITY
# CITY OF SALMON ARM
# WATER SAMPLE SCHEDULE

# DISTRICT OF SALMON ARM
# OPERATIONS DEPARTMENT
# WATER UTILITY
# WATER SAMPLE SITES & LOCATIONS

| | Water Sample Site Name | Street Location |
|---|---|---|
| 1. | Canoe Fire Hall | 6600 – 50 Street NE |
| 2. | Mt Ida School | 7381 – 50 Avenue SW |
| 3. | Homely Reservoir | 851 – 10 Avenue SE |
| 4. | Zone 3 Reservoir | 4921 – 30 Street NE |
| 5. | Country Kitchen | 5270 Auto Road SE |
| 6. | TCH East | 4940 - 50 Street NE [TCH] |
| 7. | IR #3 Reservoir | 251 Gleneden Road NW |
| 8. | IR #6 Reservoir | 2540 – 50 Street NW |
| 9. | DSA Gravel Pit* [alternate] | 6641 – 10 Avenue SE |

## WATER SAMPLE SCHEDULE

| | |
|---|---|
| **Week 1 & 3** | Canoe Fire Hall<br>Country Kitchen<br>Mt Ida School<br>IR #6 Reservoir |
| | |
| **Week 2 & 4** | Homely Reservoir<br>IR #3 Reservoir<br>Zone 3 Reservoir<br>TCH East<br>DSA Gravel Pit* [alternate] |

*DSA Gravel Pit is an alternate site for water samples when Metford Dam is not in use.

**OTHER BACTERIOLOGICAL SAMPLING/TESTING:**

| | Raw Water Sample Sites | Street Location | Sample Schedule |
|---|---|---|---|
| 1. | Canoe Pump Stn [Raw] | 7720 – 36 Street NE | Week 1 & 3 |
| 2. | Metford Dam [Raw] | 7101 – 10 Avenue SE | Week 2 & 4 |

Canoe Beach [Swimming]

- May and September [Twice a month from the three alternating sites as listed below]
- June, July & August [Once a week 2 samples from the three alternating sights between Canoe Beach Wharf, Canoe Beach in front of the Pump Stn and Canoe Beach East].


APPENDIX 4

# INTERIOR HEALTH AUTHORITY
# CITY OF SALMON ARM WATER SYSTEM
# BIOLOGICAL MONITORING REPORTS

CARO ENVIRONMENTAL SERVICES

E.COLI AND COLIFORM TESTING - PART 1

| Date | Fire Hall #1 | | | Zone 5 Sample Stn | | | Mt Ida Sample Stn | | | Zone 2A Reservoir | | | Water Treatment Plant (raw) | | | Sample Retests | | | Additional Samples | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background |
| 04-Jan | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **2** | < 1 | | | | | | | |
| 18-Jan | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **3** | < 1 | | | | | | | |
| 01-Feb | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **1** | < 1 | | | | | | | |
| 15-Feb | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **1** | < 1 | | 7 | < 1 | | | | |
| 01-Mar | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **1** | < 1 | | | | | | | |
| 15-Mar | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | | | | | | |
| 05-Apr | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | | | | | | |
| 19-Apr | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | | | | | | |
| 03-May | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **2** | <1 | | | | | | | |
| 17-May | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **1** | <1 | | | | | | | |
| 07-Jun | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | | | | | | |
| 21-Jun | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **6** | <1 | | 20 | <1 | | <1 | <1 | |
| 05-Jul | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **1** | <1 | | | | | | | |
| 19-Jul | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | >3 | <1 | | | | | | | |
| 09-Aug | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | >1 | <1 | **>200** | | | | | | |
| 23-Aug | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **1** | <1 | | | | | | | |
| 06-Sep | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **3** | <1 | | | | | | | |
| 20-Sep | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | 2 | <1 | | | | | <1 | <1 | |
| 04-Oct | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | **>200** | | | | | | |
| 18-Oct | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **1** | <1 | | | | | **≥17** | **2** | **>200** |
| 15-Nov | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **2** | <1 | | | | | | | |
| 29-Nov | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | **1** | **1** | | | | | | | |
| 13-Dec | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

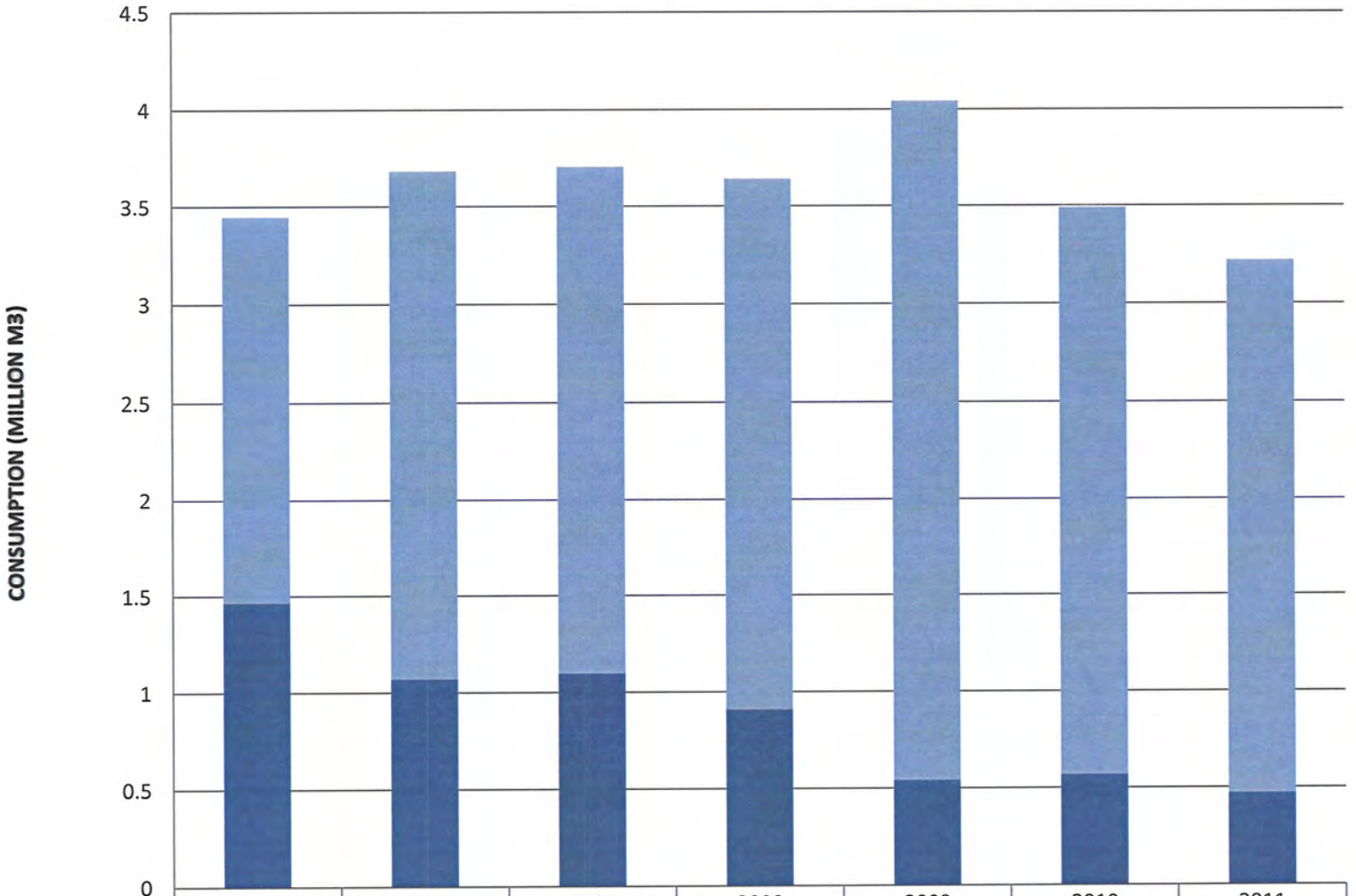
| Date | Zone # 3 Reservoir | | | TCH East | | | CSA Gravel Pit | | | Metford Dam (raw) | | | Homely Reservoir | | | IR #3 Reservoir | | | Sample Retests | | | Additional Samples | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background | Total | E.Coli | Background |
| 11-Jan | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **8** | < 1 | | < 1 | < 1 | | < 1 | **< 1** | | | | | | | |
| 25-Jan | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **9** | < 1 | | < 1 | < 1 | | < 1 | **< 1** | | | | | | | |
| 08-Feb | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **7** | | | | | | < 1 | < 1 | | | | | | | |
| 22-Feb | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **5** | < 1 | | | | | < 1 | < 1 | | | | | | | |
| 08-Mar | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **6** | < 1 | | | | | < 1 | < 1 | | | | | < 1 | < 1 | |
| 22-Mar | < 1 | < 1 | | < 1 | < 1 | | < 1 | < 1 | | **5** | < 1 | | < 1 | < 1 | | < 1 | < 1 | | | | | < 1 | < 1 | |
| 12-Apr | <1 | <1 | | <1 | <1 | | <1 | <1 | | **6** | <1 | | <1 | <1 | | <1 | **<1** | | | | | | | |
| 26-Apr | <1 | <1 | | <1 | <1 | | <1 | <1 | | **6** | <1 | | <1 | <1 | | <1 | **<1** | | | | | <1 | <1 | |
| 10-May | <1 | <1 | | <1 | <1 | | <1 | <1 | | **off** | **off** | | <1 | <1 | | <1 | <1 | | | | | | | |
| 24-May | <1 | <1 | | <1 | <1 | | <1 | <1 | | **off** | **off** | | <1 | <1 | | <1 | <1 | | | | | | | |
| 14-Jun | <1 | <1 | | <1 | <1 | | <1 | <1 | | **50** | **9** | **>200** | <1 | <1 | | <1 | **<1** | | | | | | | |
| 28-Jun | <1 | <1 | | <1 | <1 | | <1 | <1 | | **60** | **1** | **>200** | <1 | <1 | | <1 | **<1** | | | | | <1 | <1 | |
| 12-Jul | <1 | <1 | | <1 | <1 | | <1 | <1 | | **16** | **5** | | **3** | <1 | | <1 | <1 | | <1 | <1 | | | | |
| 26-Jul | <1 | <1 | | <1 | <1 | | <1 | <1 | | **55** | **4** | **>200** | <1 | <1 | | <1 | <1 | | | | | | | |
| 16-Aug | <1 | <1 | | <1 | <1 | | <1 | <1 | | **23** | **2** | **>200** | <1 | <1 | | <1 | **<1** | | | | | | | |
| 30-Aug | <1 | <1 | | <1 | <1 | | <1 | <1 | | **62** | <1 | **>200** | <1 | <1 | | <1 | **<1** | | | | | | | |
| 13-Sep | <1 | <1 | | <1 | <1 | | <1 | <1 | | **48** | **2** | **>200** | <1 | <1 | | <1 | **<1** | | | | | | | |
| 27-Sep | <1 | <1 | | <1 | <1 | | <1 | <1 | | **>190** | <1 | **>200** | <1 | <1 | | <1 | <1 | | | | | | | |
| 11-Oct | <1 | <1 | | <1 | <1 | | <1 | <1 | | **170** | <1 | **>200** | <1 | <1 | | <1 | **<1** | | | | | | | |
| 25-Oct | <1 | <1 | | <1 | <1 | | <1 | <1 | | **28** | <1 | **>200** | <1 | <1 | | <1 | <1 | | | | | | | |
| 08-Nov | <1 | <1 | | <1 | <1 | | <1 | <1 | | **19** | <1 | **>200** | <1 | <1 | | <1 | <1 | | | | | | | |
| 22-Nov | <1 | <1 | | <1 | <1 | | <1 | <1 | | **7** | <1 | | <1 | <1 | | <1 | <1 | | | | | | | |
| 06-Dec | <1 | <1 | | <1 | <1 | | <1 | <1 | | **11** | <1 | | <1 | <1 | | <1 | <1 | | | | | | | |
| 20-Dec | <1 | <1 | | <1 | <1 | | <1 | <1 | | **18** | **3** | | <1 | <1 | **>200** | <1 | <1 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

Salmon Arm

# APPENDIX 5

# ANNUAL WATER CONSUMPTION 2005 TO 2011

# ANNUAL WATER CONSUMPTION

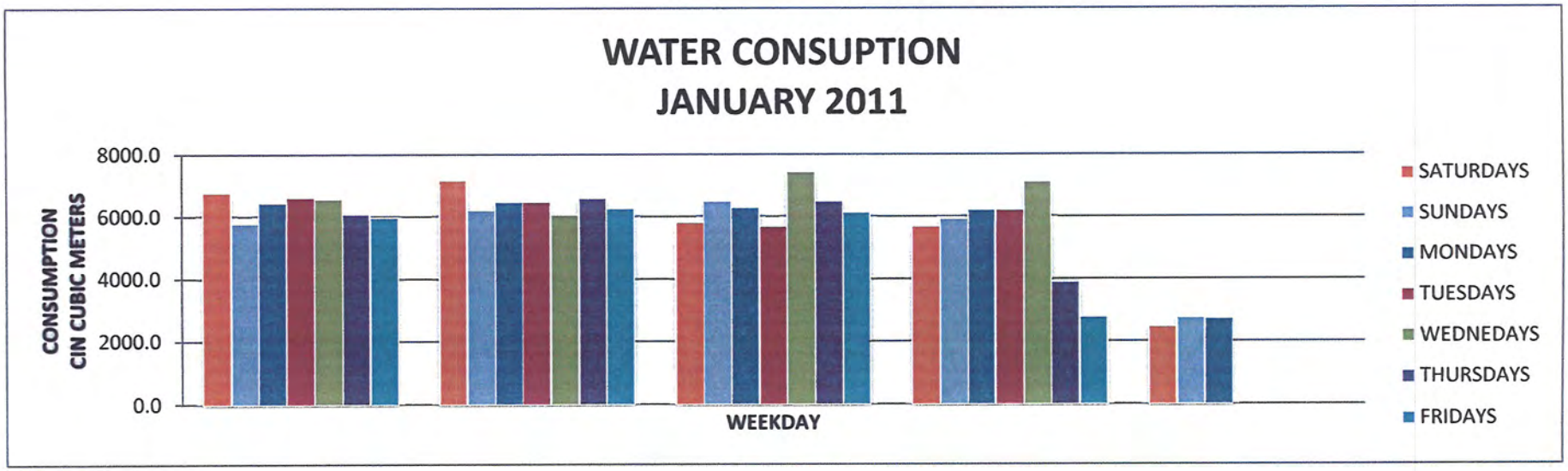


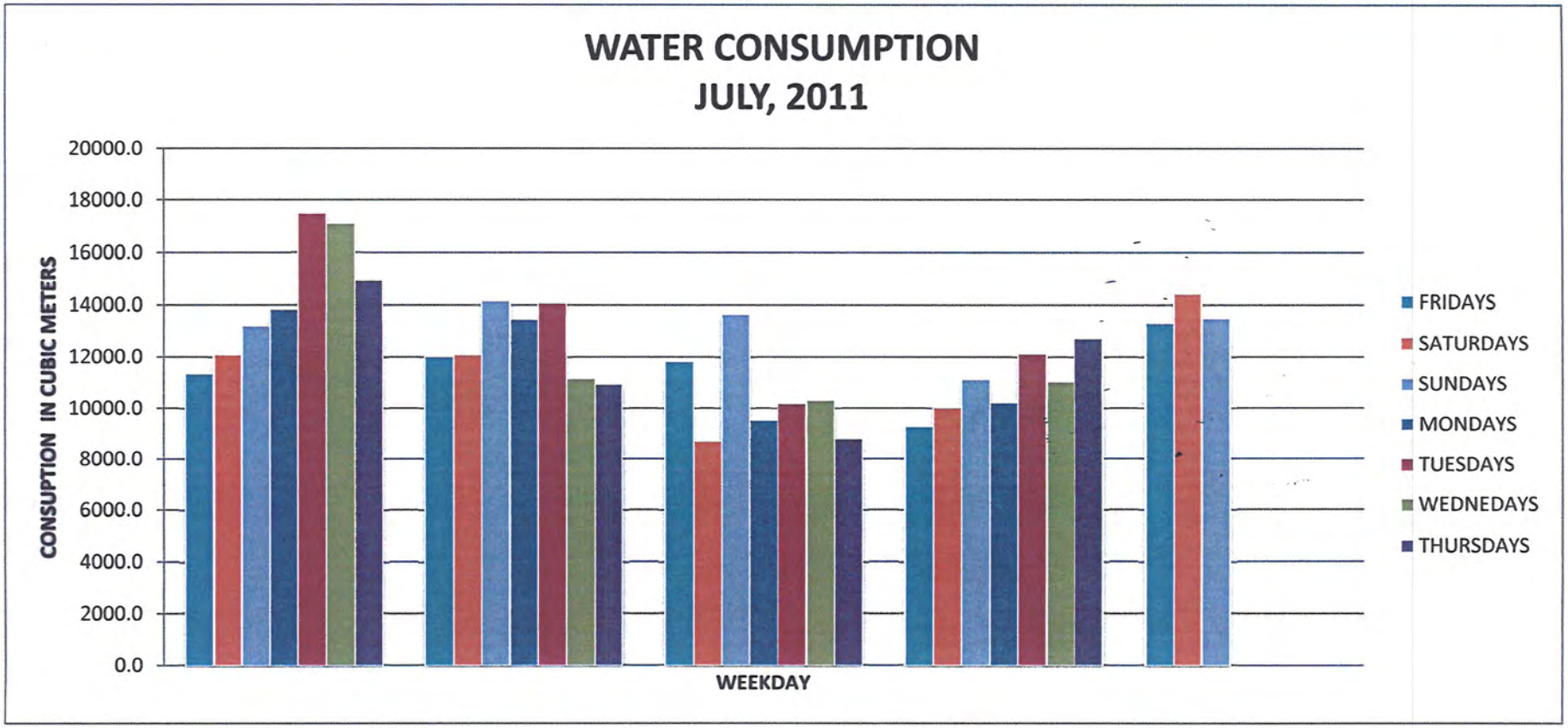

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| SHUSWAP LAKE | 1,983,574 | 2,616,306 | 2,610,868 | 2,735,017 | 3,501,051 | 2,923,013 | 2,749,205 |
| MEDFORD | 1,464,579 | 1,068,088 | 1,094,967 | 906,987 | 541,369 | 566,523 | 470,774 |

Salmon Arm

# APPENDIX 6

# JANUARY AND JULY WATER CONSUMPTION COMPARISON


WATER CONSUPTION
JANUARY 2011
CONSUMPTION
CIN CUBIC METERS
8000.0
6000.0
4000.0
2000.0
0.0
WEEKDAY
SATURDAYS
SUNDAYS
MONDAYS
TUESDAYS
WEDNEDAYS
THURSDAYS
FRIDAYS


WATER CONSUMPTION
JULY, 2011
CONSUPTION IN CUBIC METERS
20000.0
18000.0
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
WEEKDAY
FRIDAYS
SATURDAYS
SUNDAYS
MONDAYS
TUESDAYS
WEDNEDAYS
THURSDAYS


# APPENDIX 7

# MAINTENANCE PROGRAM

## SYSTEM MAINTENANCE

Regular inspections, maintenance and water quality testing is performed by certified operators to ensure optimal operation of the City's water system.

To assist the operators of our water system, the City purchased a new, state of the art, maintenance management program in 2009.

Maintenance of the Salmon Arm water system involves five key programs:

1) Air Valves – servicing and upgrading.
2) Water mains – flushing, scouring for taste and odour control.
3) Hydrants – servicing, painting and upgrading.
4) Reservoirs – inspection and cleaning.
5) Clearing of trees and brush along City rights of ways

As replacement of the entire distribution grid is not financially viable, system maintenance becomes a critical component in the management of the water infrastructure.

### *ANNUAL MAINTENANCE PROGRAM*

#### Air Valves

Turbulence created in the water as it flows through the system causes some of the dissolved air in the water to collect as bubbles in the pipes. These air bubbles collect at the high points in the system and restrict water flow. We have approximately 109 air valves installed in below-ground chambers that automatically
Bleed air from the pressurized piping system. If an air valve failed, negative pressures could allow groundwater to infiltrate and contaminate the water system. Air valves receive regular maintenance as required and are replaced at the end of their service life, which is approximately 20 years.

#### Water mains

Water main maintenance involves both the upgrading of aging water mains and ensuring that existing water mains are operating effectively.

#### Water main Flushing

As water travels from the watersheds, it collects organic particles
and transports them to the water system. As these particles travel
to areas of the water system with lower flow velocities they settle out.
Accumulated debris and stagnant water inhibit flow through mains, cause dirty water and potentially create a favourable environment for bacterial growth. In response to these concerns, the Utilities Department initiated a water main flushing program for identified problem areas. Each main is flushed annually during

daytime hours. When flushing, a hydrant is opened and the water stream is used to expel the contents of the main. There are approximately 47 locations throughout the municipality referred to as "high maintenance areas" where water demand is low or where water mains terminate in a dead end. These areas are flushed as required, sometimes as often as every month during the summer.

**Figure 1 – Utilities Department operator flushing water main as part of regular maintenance**

## Hydrant Maintenance

To ensure proper fire protection, Salmon Arm implemented a fire hydrant maintenance program. The program requires staff to check the pressure on each hydrant before it is serviced and dismantles each hydrant, renewing worn parts as necessary. The
hydrant is then lubricated and reassembled. All hydrants get an overhaul biannually.

## Reservoir Maintenance

Debris can accumulate in reservoirs and bacteria and algae can grow on the walls. Each year, the Utilities Department staff cleans and services two different reservoirs. The program involves decommissioning the reservoir, draining it, removing any sediment, repairing leaks, and disinfection. The reservoir is then refilled, chlorinated and tested for water quality. This program requires approximately two days to complete before the reservoir can be brought back into service.


# APPENDIX 8

# WATER CONSERVATION POLICY

**CITY OF SALMON ARM** **POLICY NO. 5.16**

**TOPIC:** To establish City water reduction goals and a water use efficiency program

**PURPOSE:**

1. to effectively defer the need for water & sewage system capacity improvements and the resultant other associated infrastructure costs;
2. to reduce operating / maintenance (o & m) costs;
3. to establish a more fair and equitable water rates structure;
4. to contribute directly or indirectly to the reduction of impact on the environment;
5. to have in place a City water conservation strategy so as to qualify for senior government funding programs.

**POLICY (GOALS)** Goals: Years 2003, 2004, 2005, 2006 and 2007

1. Develop and deliver a public awareness & education program for VOLUNTARY water use efficiencies to achieve
   a. a reduction of PEAK daily use by 20% (Factor of 1:5)
   b. a reduction of AVERAGE daily use by 14% (Factor of 1:7)

   There shall be a report back to Council in 2006 / 2007.

**POLICY (IMPLEMENTATION)** Implementation Strategy – Goals

1. Formalize the rationale in support of deferral of infrastructure and related costs in relation to peak daily demand.
2. Formalize the rationale in support of reduction in average daily demand.
3. Approach the goals on three fronts:
   a. Public use (leakage & public land sprinkling).
   b. Business use: water audits and/or inventory of use.
   c. Residential use: conservation by education.
4. Review the water user fee rates (i.e. metered vs non-metered).
5. Review commercial, industrial, institutional and multi-family metered accounts to ensure consistency.
6. Adopt a Bylaw requiring "ultra-low" flush toilets.
7. Develop a Water Efficiency Program using internal resources (staff) and external resources (consultant or others), funded through the Water Management budget; such program to include, at minimum, the following elements:

a. Water efficiency theme, logo, or slogan for purposes of branding and imaging of objectives.
b. Education materials for multi-media communication purposes, such materials to clearly present the goals, rationale and strategies being pursued in the interests of conservation.
c. Establish media partnerships, as appropriate, with newspaper, radio, television and internet services for short and long-term use of multi-media communication with water users.
d. Establish business partnerships, as appropriate, with suppliers, service businesses and others to facilitate and encourage more efficient water management in and around the home and business.
e. As appropriate from year to year, engage the resources of third party agencies to supplement the primary efforts of the City in public education.

8. Amend Bylaw No. 1274 to effectively convert permissible outdoor sprinkling from the current "alternate odd/even days" which results in potential 50% peak daily demand to a "three-day cycle" which results in a potential 33% peak daily demand.
9. Develop and implement an evaluation process to monitor the success of the Water Efficiency Program, the results of which shall be made public at intervals as part of the public education process.
10. Assess, identify and develop maintenance practices to reduce / eliminate water distribution system leakage.
11. Develop and implement a "cross-connection" control program.
12. Residential Lawn – Profiling – continue with program (limited version).
13. Automated underground irrigation systems – documentation, audit and public education.

| | |
|---|---|
| Prepared by: Director of Operations | Date: March 15, 2003 |
| | |
| Approved by Council | Date: March 24, 2003 |
| | |
| Amended: | Date: December 11, 2006 |


# APPENDIX 9

# WATER EMERGENCY RESPONSE PLAN

# City of Salmon Arm

## EMERGENCY RESPONSE PLAN

# Emergency Response Plan

# *PREFACE*

The purpose of an Emergency Response Plan (ERP) is to provide a reference guide for the City of Salmon Arm to use in the event of an emergency. Emergencies may be an incident which presents a threat to the health of people drawing water from the system or a disruption to the City's normal fire protection capabilities.

The ERP is divided into three sections:

Part I - Action Plans

The following possible emergency scenarios are listed with recommended responses and procedures provided:

1. Contamination of Source
2. Loss of Source
3. Chlorinator Failure
4. Backflow Contamination
5. Broken Watermain
6. Pressure Reducing Valve (PRV) Failure
7. Pump failure

Part II – Contact List

A contact list is provided which identifies key personnel and agencies that may need to be notified.

Part III – System Inventory

Description of the major components of the water system is provided along with mapping to assist the City in identifying the location of the problem in relation to the overall system.

Appendix I

Water user notification templates notices that describe the situation and the effect of the emergency.

Appendix II

Water systems maps

- Section maps of the City water infrastructure which can help locate applicable infrastructure throughout the City limits

# *PART I - ACTION PLANS*

## *1. CONTAMINATION OF SOURCE*

**ACTIONS REQUIRED:**

1) Shut down source

2) Assess nature and cause of problem

3) Contact Local Health Officer

4) Notify users of water contamination. In case of bacteriological contamination, issue a boil water order. In case of chemical or toxic substance, advise accordingly.

   - **Issue a mail out to all City of Salmon Arm homes immediately (see notification templates)**
   - **In particular ensure at risk users i.e. hospitals, nursing homes are contacted directly**

5) Make direct calls and notification to users and alert local media requesting public service announcements

6) Post notice on all public water taps and fountains (shut off if possible)

7) Contact government agencies and emergency personnel:
   - Ministry of Environment
   - Fire Department
   - Provincial Emergency Preparedness Program

8) Arrange for alternate drinking water source if necessary

9) Once problem is rectified, initiate water flushing and disinfection program in distribution system to remove contaminate

10) Retest source, report to Health Inspector

11) When safe to do so and permission in writing has been received from the Ministry of Health turn water source back on

12) Cancel all boil water notices, advertise water is safe again

13) When appropriate determine if contamination can be prevented in the future. If so include capital works or operational changes required in annual budget for consideration

**CONTACTS**

- City Staff (Utility personnel, Managers)
- Local Health Authority
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- Applicable operational procedures
- Water notices
- Contact list

## 2. *LOSS OF SOURCE*

**ACTIONS REQUIRED:**

1. Identify lost source
2. Assess nature and cause of problem
3. Notify users of water shortage and the need for conservation (if deemed necessary)
4. Notify Health Unit & Health office if possible contamination has occurred (see contamination of source response)
5. Arrange for alternate drinking water source if necessary
6. Correct loss of source problem
7. Put back into service
8. Inform effected users operations back to normal

**CONTACTS**

- City Engineer
- City Staff (Utility personnel, Managers)
- Local Health Authority
- Fire Department
- Provincial Emergency Preparedness Program
- Ministry of Environment
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- Applicable operational procedures
- Water notices
- Contact list

## *3. CHLORINATOR FAILURE*

**ACTIONS REQUIRED:**

1. Assess nature and cause of problem

2. Contact Local Health Officer

3. Arrange for other disinfection procedures (shut off source and use alternate source only) if possible

4. Notify users of water disinfection failure. Issue a boil water order.

    - **Produce and issue a mail out to all City of Salmon Arm homes immediately (see notification templates)**
    - **In particular ensure at risk users i.e. hospitals, nursing homes are contacted directly**

5. Make direct calls and notification to users and alert local media requesting public service announcements

6. Post notice on all public water taps and fountains (shut off if possible)

7. Arrange for alternate drinking water source if necessary

8. Arrange for chlorine failure repairs

9. Contact chlorinator manufacturer for advice on repairs to chlorinator if required

10. Once problem is rectified, initiate water flushing and disinfection program in distribution system to remove contaminate if required

11. Test source, report to Health Inspector

12. When safe to do so and permission in writing has been received from the Ministry of Health turn water source back on

**CONTACTS**

- City Engineer
- City Staff (Utility personnel, Managers)
- Local Health Authority
- Fire Department
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- Chlorinators manufacture's specifications
- Applicable operational procedures
- Water notices
- Contact list

## *4. BACKFLOW CONTAMINATION*

**ACTIONS REQUIRED:**

1. Assess nature and cause of backflow contamination problem
2. Contact Local Health Officer
3. Isolate area if possible
4. Arrange for alternate drinking water source if necessary
5. Notify users of potential water contamination. In case of bacteriological contamination, issue a boil water order. In case of chemical or toxic substance, advise accordingly.
6. Make direct calls and notification to users and alert local media requesting public service announcements
7. Make corrections to fix or eliminate the problem
8. Once problem is rectified, initiate water flushing and disinfection program in distribution system to remove contaminate if required
9. When safe to do so and permission in writing has been received from the Ministry of Health turn water source back on

**CONTACTS**

- City Engineer
- City Staff (Utility personnel, Managers)
- Local Health Authority
- Fire Department
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- Applicable operational procedures
- Water notices
- Contact list

## *5. BROKEN WATERMAIN*

**ACTIONS REQUIRED:**

1. Isolate break at nearest valves

2. Repair break as quickly as possible

3. Determine zone of influence
   (a) If break is limited to a specific area, inform affected users of temporary loss of service or pressure reductions while repairs are being completed
   (b) If break causes disruption to overall system, inform all users to reduce consumption

4. Try to maintain positive pressure throughout the distribution system

5. Contact government agencies and emergency personnel if break deemed serious enough to cause a health hazard:
   - Local Health Officer
   - Fire Department
   - City Engineer

6. Arrange for alternate drinking water source if necessary

7. Once repair is completed, initiate water flushing and disinfection program in affected mains if positive pressure was not maintained during repair

8. Reinstate main operation and contact effected users

**CONTACTS**

- City Staff (Utility personnel, Managers)
- Local Health Authority
- Fire Department
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- Applicable operational procedures
- Water notices
- Contact list

## *6. PRESSURE REDUCING VALVE (PRV) FAILURE*

**ACTIONS REQUIRED:**

1. Assess nature and cause of problem

2. Contact PRV supplier and City Engineer for assistance

3. Determine zone of influence. With a large PRV failure, the small PRV may become the primary source of water supply to some users and pressure reductions may occur at peak demand conditions. Notify affected users to reduce water consumption.

4. Contact the Fire Department to let them know fire flows have been reduced

5. If large PRV needs to be removed for servicing, install a spool piece for manual operation during fire flow conditions

6. Once corrected contact affected users and the Fire Department to let them know the PRV is back in service

**CONTACTS**

- City Engineer
- City Staff (Utility personnel, Managers)
- Fire Department
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- PRV manufacture's specifications
- Applicable operational procedures
- Water notices
- Contact list

## *7. PUMP FAILURE*

**ACTIONS REQUIRED:**

1. Turn on Metford Dam source (if Canoe source pumps fail) if not already on

2. Assess nature and cause of pump problem (if pump located at reservoir re-route water if possible). If unable to correct contact appropriate supplier/consultant for assistance.

3. Contact BC Hydro if power failure is cause of pump failure

4. Notify users of water shortage and the need for conservation (if demand is higher than Metford can supply). In addition contact the Fire Department that fire flows may be reduced

5. Once pump failure is corrected put back into service

6. Contact all effected users and inform them pump is back on line

**CONTACTS**

- City Engineer
- City Staff (Utility personnel, Managers)
- Fire Department
- Local Health Authority (if deemed necessary)
- Refer to contact list as necessary

**USEFUL RESOURCES**

- City maps
- PRV manufacture's specifications
- Applicable operational procedures
- Water notices
- Contact list

# *PART III – SYSTEM INVENTORY*

## Water Source

The City water system consists of two (2) main raw water sources, treatment systems for the source waters and an extensive water pumping, distribution, and storage system. Our water supply is via two (2) sources, East Canoe Creek at Metford Dam and Shuswap Lake at Canoe Beach. Water treatment of the source waters is by primary disinfection with chlorine.

Shuswap Lake is at a nominal elevation of about 346 m (1135 ft.) while the Metford Dam intake on East Canoe Creek is at elevation 567 m (1860 ft.). The Utilities Department attempts to maximize the supply of water from East Canoe Creek so that pumping into the system from Shuswap Lake and the associated costs are minimized. The flow of water from East Canoe Creek into the water system is by gravity.

## Distribution System

The public water system services an area of approximately 6,322 hectares (see Appendix 2). The City distributes water in pipes made of a variety of materials. The first watermains were made of wood. These wooden mains have since been replaced with cast iron, ductile iron, PVC, polyethylene, steel, asbestos cement, spun concrete and some copper piping. The oldest mains still operating in the Salmon Arm water system inventory are cast iron pipes.

The distribution system includes approximately 196 km of watermain varying in diameter from 100mm to 600mm. It also includes six different pressure zones, ten reservoirs, one dam and four pump stations. There was a major expansion in the northwest sector of the City to service the Adams Lake Band Reserve, Neskonlith Band Reserve and some lands in the Gleneden area. This extension adds three (3) reservoirs, one (1) pump station and 5600 meters of 300mm diameter watermain to the water system.

## Pressure Zones

The distribution system is segregated into six (6) pressure zones. The storage reservoir in the highest pressure zone is at elevation 615 m (2020 ft.). Water has to be pumped over 269 m (885 ft.) in elevation from Shuswap Lake to the storage reservoir at the highest elevation.

*Telephone & name updates done May 2007

## Acknowledgements

This report was assembled and edited by the Operations Department, City of Salmon Arm.

Sample Data and Source Information provided by Gerry Rasmuson, Utilities Foreman, City of Salmon Arm.

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