DRINKING WATER ANNUAL REPORT 2017

July 15, 2018

(revised April 8, 2019)

Contents

Executive Summary

The City of Enderby operates and maintains a community drinking water system in accordance with the Drinking Water Protection Act and the Guidelines for Canadian Drinking Water Quality. In 2017, the total water distributed from the City of Enderby Water Treatment Plant was 554,558 m^3. The maximum one-day demand was on August 24, 2017 at 3,209 m^3.

In 2017, the City of Enderby spent $889,895 to operate and maintain the community drinking water system, whereas in 2016 the City spent $982,160. Capital investment represents 47% of the total expended by the City of Enderby in 2017.

The total replacement value for the water distribution system (such as pipes and pumps) is $18,651,177. As of December 31, 2017, the total depreciation is $8,464,704. The remaining value is $10,186,473. The total replacement value for the City of Enderby water treatment system (such as buildings, clarifier, chlorinators, and ultraviolet bank) is $3,591,265. As of December 31, 2017, the total depreciation is $1,364,257. The remaining value is $2,227,008. In 2017, $204,612 was contributed to the City of Enderby water reserve fund and $171,122 was withdrawn. The balance of the water reserve fund as of December 31, 2017 is $539,171.

The major project undertaken in 2017 was renewal of water distribution infrastructure on Salmon Arm Drive. On April 12, 2017, the water main crossing of the Shuswap River failed, which triggered an emergency response, including the issuance of a boil water notice and a mandatory water conservation order; a temporary line has been installed on the Bawtree Bridge until such time as the permanent repairs may proceed. Other projects included a replacement pump motor for the Shuswap Well and replacement of the sand media and nozzles in the Water Treatment Plant clarifier.

The City continues its monitoring program and nothing of concern was discovered in the drinking water system in 2017. The City's Public Works staff are working towards obtaining certifications which match the classification of the treatment and distribution systems. The City intends to revive its Cross Connection Control program in 2018 and will use a risk-based approach to addressing hazards.

The City has completed its Source Protection Plan for both sources and has taken action to implement its short-term recommendations. The City also completed its annual update to its Drinking Water Emergency Response Plan.

Introduction

The City of Enderby operates and maintains a community drinking water system in accordance with the Drinking Water Protection Act and associated Regulations, as well as the Guidelines for Canadian Drinking Water Quality. Pursuant to Section 15(b) of the British Columbia Drinking Water Protection Act and Section 11 of the British Columbia Drinking Water Protection Regulation, the City of Enderby provides the following Annual Drinking Water Report for 2017.

The goal of the City of Enderby is to provide clean, safe, and reliable drinking water. This means that the drinking water quality meets the standards specified in the Canadian Drinking Water Guidelines and the operation of the drinking water system is consistent with the BC Drinking Water Protection Act and Drinking Water Protection Regulation.

High quality drinking water must meet requirements with respect to the following:

- Maximum acceptable concentrations of microbiological contaminants such as bacteria, protozoa, and viruses such as *Giardia*, *Cryptosporidium*, and *Escherichia coli*;
- Maximum acceptable levels of turbidity;
- Maximum acceptable chemical and physical parameters; and
- Aesthetic objectives related to taste, colour, and odour.

The City accomplishes these requirements through a multi-barrier approach to treatment. A multi-barrier approach is required as "the limitations or failure of one or more barriers may be compensated for by the effective operation of the remaining barriers. This compensation minimizes the likelihood of contaminants passing through the entire system and being present in sufficient amounts to cause illness to consumers."[1]

There are a variety of potential hazards to drinking water. These threats involve chemical and microbiological contaminants that may be introduced at the source or intake, during treatment, or during distribution. These hazards are an ever-present threat to the City's drinking water supply which must be controlled. The City observes a robust water quality monitoring regime and uses multi-barrier treatment to manage these threats and protect the public. The City also has an up-to-date Drinking Water Emergency Response Plan and completed source protection planning.

Water System Overview

The Enderby water system consists of two sources:

1. Shuswap Well (ground water; suspected of being under the direct influence of surface water); and
2. Shuswap River (surface water).

[1] Federal-Provincial-Territorial Committee on Drinking Water and the CCME Water Quality Task Group, "From Source to Tap: Guidance on the Multi-Barrier Approach to Safe Drinking Water" (Ottawa, Ontario: 2004), 17.

The total amount of pipe in the distribution system is 30,962 meters. This consists of 10,656 meters of PVC pipe, 19,893 meters of concrete pipe, 355 meters of steel pipe, and 58 meters of copper pipe. (Note: these are 2016 figures; to be revised following completion of Salmon Arm Drive works later in the year.)

All water is chlorinated prior to distribution. The Shuswap River surface water is filtered through a two-stage rapid filtration system which reduces turbidity and minimizes the threat of giardia and cryptosporidium. The Shuswap Well is normally piped to the Water Treatment Plant clearwell, where it receives ultraviolet treatment in addition to the chlorination received on-site.

Under normal operation, water from the Shuswap River is filtered and chlorinated, then pumped from the clearwell through the UV disinfection system and into the distribution system to a water reservoir. Water from the Shuswap Well is chlorinated on-site and pumped to the clearwell, then through the UV disinfection system and to the reservoirs. There is a total of 3,782 m^3 of reservoir capacity. Depending on demand, both systems can operate in conjunction. Each system can be isolated and run to the reservoirs alone.

It should be noted that, when the Shuswap Well is supplying water, a number of customers east of the Enderby Bridge may receive water that is only disinfected with chlorine, meaning that it does not receive the two forms of treatment required for surface water (the Shuswap Well is suspected of being under the influence of surface water). However, when the supply of water is from the Water Treatment Plant, all customers receive fully treated water.

Under current operating parameters, the combined source capacity of the Shuswap River and the Shuswap Well is 4,753 m^3 per day. The maximum production capacity of the Water Treatment Plant is 3,150 m^3 per day under normal operating conditions at peak demand, although the rate of production is affected by source water turbidity, which increases backwashing frequency. The ultimate source capacity, with infrastructure changes and assuming the capability to operate the Shuswap Well for twenty-four hours per day, is 6,135 m^3.

Annual Consumption Data

Note: the below figures only describe the Water Treatment Plant flow meter; this does not reflect the full quantity of water sent from the Shuswap Well, some of which is distributed to residents east of the Bawtree Bridge without being captured by the flow meter.

In 2017, the total water distributed from the City of Enderby Water Treatment Plant was 554,558 m^3. The maximum one-day demand was on August 24, 2017 at 3,209 m^3. By contrast, in 2016, the total water distributed from the Water Treatment Plant was 500,896 m^3 and the maximum one-day demand was on May 16 at 3,261 m^3.

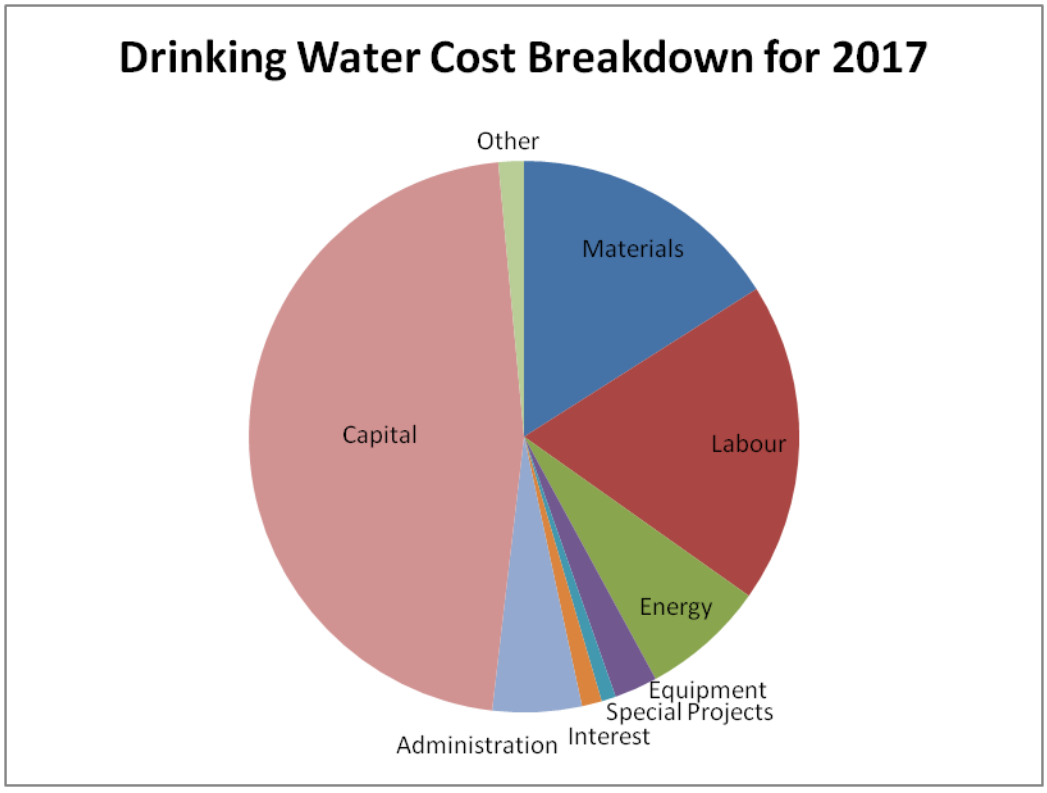
The following chart shows maximum and average daily demands from the Water Treatment Plant by month for 2016 and 2017. Variations in demand tend to be influenced by a variety of factors such as population growth and consumption habits, with weather playing a particularly significant role.

Unusually low demand values in April and May 2017 were largely owing to the boil water notice and mandatory water conservation order issued in connection with the failure of the Shuswap River main crossing.

Month	2016 Max. Daily Demand (m^3)	2016 Avg. Daily Demand (m^3)	2017 Max. Daily Demand (m^3)	2017 Avg. Daily Demand (m^3)
January	1519	1192	1944	1452
February	1641	1123	2314	1803
March	1784	1167	1731	1413
April	1936	1286	1445	1137
May	3261	1715	1638	1070
June	2860	1851	2304	1616
July	2852	1826	3131	2478
August	2694	2022	3209	2535
September	2249	1379	2836	1970
October	1480	1012	1554	1045
November	1217	930	1023	844
December	1155	934	1075	879

Drinking Water Cost Breakdown

In 2017, the City of Enderby spent $889,895 to operate and maintain the community drinking water system, whereas in 2016 the City spent $982,160. Capital investment represents 47% of the total expended by the City of Enderby in 2017. The costs by expense category are:



The following chart describes the dollar value associated with each expense category and compares these values to 2016:

Category	2016 Value	2017 Value
Materials	128,145	142,397
Labour	156,469	167,193
Energy	59,058	64,783
Equipment	30,084	22,534
Special Projects	66,408	7,538
Interest	29,594	10,446
Administration	45,162	46,582
Capital	455,929	415,068
Other	11,307	13,354
Total	**982,160**	**889,895**

Some operating costs increased primarily as a result of expenses associated with the Shuswap River main crossing failure and emergency response. As well, interest expenses have declined as the City continues to pay down its debt.

Water System Assessment and Infrastructure Deficit

The total replacement value for the water distribution system (such as pipes and pumps) is $18,651,177. As of December 31, 2017, the total depreciation is $8,464,704. The remaining value is $10,186,473.

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In 2017, $204,612 was contributed to the City of Enderby water reserve fund and $171,122 was withdrawn. The balance of the water reserve fund as of December 31, 2017 is $539,171.

The City invested $415,068 into capital assets during 2017.

In order to address its infrastructure deficit, the City has committed to an incremental tax increase of 1% per year to the water utility. This amount is dedicated to asset management.

Completed Major Projects and Forthcoming Major Projects

There were a number of major water projects started or completed in 2017:

1. Salmon Arm Drive water distribution system upgrades (in progress).
2. Shuswap River water main crossing renewal (in progress).

3. Source Protection Plan (completed).
4. Shuswap Well pump motor replacement (completed).
5. Water Treatment Plant clarifier media and nozzle replacement (completed).
6. Groundwater license application for the Shuswap Well (completed; conditional water license no. 500146 issued on May 23, 2018).

Major Events

The City responded to a variety of challenges in 2017, including the failure of the Shuswap River water main crossing on or about April 12, 2017 that resulted in a declaration of state of local emergency, a boil water notice, and a mandatory water conservation order. The Water Treatment Plant was also turned off following a potential leak of vehicle fuel into the Shuswap River upstream on May 16, 2017.

Water Quality Monitoring

Daily samples are collected at the Shuswap Well and Riverbank sites and tested for pH, temperature, and turbidity. Daily samples are also collected at the Water Treatment Plant and tested for pH, temperature, turbidity, and colour. The clearwell is tested on a daily basis for pH, temperature, turbidity, colour, and free and total chlorine.

Weekly system checks and distribution samples are tested for chlorine residuals to ensure a minimum of 0.20 mg/L of free chlorine is found at the furthest points in the distribution system. Residuals were above the minimum threshold for all sample locations and dates, except for a period during the emergency response associated with the Shuswap River main crossing failure, when higher levels of turbidity in the distribution system increased the chlorine demand. As a result, during this period, chlorine residuals at most of the City's sampling points was below 0.20 mg/L. However, system-wide testing near the end of the boil water notice did not indicate the presence of any bacteria.

At least once per month, samples are collected at 10 monitoring stations within the distribution system for microbiological testing. Monthly samples are also collected at the Shuswap Well and the Water Treatment Plant effluent point. No Coliforms or E. Coli – which are measured in Colony-Forming Units (CFU) - were detected at any of the sample points within the distribution system, with the exception of two results at the Valcairn monitoring station that is suspected to be due to an error in how the sample was taken.

The filter backwash is sampled on a bi-monthly schedule for pH, conductivity, turbidity, total suspended solids, aluminum, and microbiology.

On a quarterly basis, trihalomethane (THM) samples are collected from the Brash PRV, Booster #1, and Valcairn stations. THMs are by-products caused by the chemical reaction between chlorine and organic matter naturally present in water. High levels of THMs can have adverse health effects and, as a result, the *Guidelines for Canadian Drinking Water Quality* set a maximum acceptable concentration of 0.1 mg/L. All THM tests from the above sample stations reported below the maximum acceptable concentration, with concentrations ranging from 0.071 to 0.0462 mg/L.

The Shuswap Well is tested monthly for nitrogen levels (including nitrates and nitrites) and microbiology. The Shuswap River is sampled monthly for microbiology. Both sources are sampled quarterly for total organic carbon.

The Shuswap River is sampled annually for comprehensive testing. The Shuswap Well is sampled every three years for comprehensive testing. Comprehensive tests were performed on both sources in 2017, on August 8:

Test	River	Well
Chloride	0.36	1.66
Fluoride	<0.10	<0.10
Nitrate (as N)	0.01	0.179
Nitrite (as N)	<0.010	<0.010
Sulfate	5.8	5.5
Temperature, at pH	23	22
Colour, True	5.5	<5.0
Alkalinity, Total (as CaCO3)	40.4	55.1
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0
Alkalinity, Bicarbonate (as CaCO3)	40.4	55.1
Alkalinity, Carbonate (as CaCO3)	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	<1.0	<1.0
Cyanide, Total	<0.0020	<0.0020
Turbidity	0.68	0.11
pH	7.74	7.51
Conductivity (EC)	93.1	124
Langelier Index	-0.9	-1
Hardness, Total (as CaCO3)	42.7	54.5
Solids, Total Dissolved (calc)	48.9	66.1
Aluminum, total	0.0666	0.008
Antimony, total	<0.00010	<0.00010
Arsenic, total	<0.00050	<0.00050
Barium, total	0.0093	0.0111
Boron, total	0.007	0.0082
Cadmium, total	<0.000010	<0.000010
Calcium, total	14	16.5
Chromium, total	<0.00050	<0.00050
Cobalt, total	<0.00010	<0.00010
Copper, total	0.0073	0.0048

Iron, total	0.091	<0.010
Lead, total	0.0004	0.0013
Magnesium, total	1.88	3.24
Manganese, total	0.0047	<0.00020
Mercury, total	<0.000010	<0.000010
Molybdenum, total	0.0006	0.0013
Nickel, total	0.0004	0.0003
Potassium, total	0.88	1.16
Selenium, total	<0.00050	<0.00050
Sodium, total	1.31	3.67
Uranium, total	0.0003	0.0003
Zinc, total	0.0052	0.0062
Coliforms, Total	170	<1
Background Colonies	> 200	
E. coli	20	<1
EPHw10-19	<250	<250
EPHw19-32	<250	<250
LEPHw	<250	<250
HEPHw	<250	<250
Acenaphthene	<0.050	<0.050
Acenaphthylene	<0.200	<0.200
Acridine	<0.050	<0.050
Anthracene	<0.010	<0.010
Benz(a)anthracene	0.01	<0.010
Benzo(a)pyrene	<0.010	<0.010
Benzo(b)fluoranthene	<0.050	<0.050
Benzo(b+j)fluoranthene	<0.050	<0.050
Benzo(g,h,i)perylene	<0.050	<0.050
Benzo(k)fluoranthene	<0.050	<0.050
Chrysene	<0.050	<0.050
Dibenz(a,h)anthracene	<0.050	<0.050
Fluoranthene	<0.030	<0.030
Fluorene	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	<0.050	<0.050
Naphthalene	<0.200	<0.200
Phenanthrene	<0.100	<0.100
Pyrene	<0.020	<0.020
Quinoline	<0.050	<0.050
Benzene	<0.5	<0.5
Bromodichloromethane	<1.0	<1.0

Bromoform	<1.0	<1.0
Carbon tetrachloride	<0.5	<0.5
Chlorobenzene	<1.0	<1.0
Chloroethane	<2.0	<2.0
Chloroform	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0
1,2-Dibromoethane	<0.2	<0.2
Dibromomethane	<1.0	<1.0
1,2-Dichlorobenzene	<0.5	<0.5
1,3-Dichlorobenzene	<1.0	<1.0
1,4-Dichlorobenzene	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
1,1-Dichloroethylene	<1.0	<1.0
cis-1,2-Dichloroethylene	<1.0	<1.0
trans-1,2-Dichloroethylene	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0
1,3-Dichloropropene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Methyl tert-butyl ether	<1.0	<1.0
Dichloromethane	<3.0	<3.0
Styrene	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<0.5	<0.5
Tetrachloroethylene	<1.0	<1.0
Toluene	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0
Trichloroethylene	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0
Vinyl chloride	<1.0	<1.0
Xylenes (total)	<2.0	<2.0

Environmental Operators Certification

City of Enderby operators are progressing in obtaining their EOCP certifications. Interior Health requires that the City has a designated chief operator certified at Level III for Water Treatment and Level III for Water Distribution, but has accepted the existing level of certifications on the understanding that the City is working towards full compliance.

During 2017, City of Enderby employed the following operators:

Name	Title	Water Treatment
Clayton Castle	Lead Hand	Level II
Desiree Vetter	Systems Operator I	Diploma
Jamie Prevost	Utility Worker III	
Ray Brown	Utility Worker III	
Cliff Vetter	Utility Worker II	

Water Conservation Plan

The City of Enderby's Water Conservation Plan establishes strategies to reduce water demand throughout the community. Reducing water demand helps to protect our water resources, mitigate requirements for infrastructure expansion, and reduce operating and maintenance costs.

As of December 31, 2017, the City of Enderby has achieved a number of strategies within its Water Conservation Plan, including:

1. Education
    a. Implementing a Water Conservation Education program.
    b. Continuing compliance patrols and enforcement of sprinkling regulations.

2. Metering and Rates
    a. Adopted a rate structure which balances conservation and equity.
    b. Amended the Building Inspection Bylaw to include requirements for water meters.
    c. Amended policies and agreements for out-of-town service connections to require water meters.
    d. Completed water meter installations on all residential, commercial, industrial and civic properties.

3. Loss Control
    a. Completed a Loss Control Program in 2012, which estimated the total Unaccounted For Water at 6.5% or 12.05 m^3 per hour.
    b. Completed a Leak Detection Audit to identify and repair water leaks within municipal infrastructure.

4. Planning for the Future
    a. Developing infrastructure upgrade plans for both treatment and distribution, in order to pursue grant funding.

Cross Connection Control Program

In 2003, Interior Health required all large water purveyors (City of Enderby included) to implement a cross connection control program as a condition of operating permit. The purpose of the program is to protect public health by ensuring that the drinking water provided by the City of Enderby is not contaminated due to a backflow incident.

The City adopted a Cross Connection Control Program in 2004 and began the program implementation with assessments of a number of commercial, industrial, institutional and agricultural customers in June, 2004. Under Enderby's program, owners were expected to implement the recommendations in a timely manner and were responsible for all costs associated with their backflow prevention systems.

For a number of reasons, including cost and internal capacity limitations, the Cross Connection Control Program has not been fully implemented. The City of Enderby intends to revive the Cross Connection Control program in 2018, and will follow a risk-based approach that focuses on premises isolation.

Source Protection Plan

In February 2017, the City completed its Source Protection Plan for both the surface water intake and the Shuswap Well. The Source Protection Plan characterized the sources, provided an inventory of potential contaminants and threats, characterized risks, and recommended various actions to mitigate risk. As a result of this plan, the City has completed analyses of both sources for herbicides, pesticides, and petroleum in order to characterize the source water better. The City has also reached out to relevant third parties to inform them of the locations of the City's drinking water sources and request that they notify the City in the event of an accident, spill, fire, or natural disaster. The City has also requested that the Regional District of North Okanagan refer development applications within the designated groundwater protection area.

Emergency Response Plan

The City of Enderby Drinking Water Emergency Response Plan was completed in early 2013. The Emergency Response Plan includes provisions for public notification and response procedures for emergency situations, such as backflow incidents, broken water mains, chlorinator failure, source and/or reservoir contamination, and spills or vehicle accidents affecting the distribution system. It also provides an emergency contact directory.

The Emergency Response Plan was updated in June 2017. It was also updated on May 9, 2018.