2016

City of Kamloops Drinking Water Annual Report

Utility Services Division

City of Kamloops

September 9, 2017

Contents

Introduction

This report was prepared in compliance with the requirements under BC's *Drinking Water Protection Act* (DWPA) and the City's Operating Permit. This report has been provided to Interior Health and posted on the City's website.

Kamloops Water System

In 2016, the City's drinking water system consisted of a single treatment plant that feeds an extensive distribution system that supplies water throughout most areas of the City. The only large community within city limits that is not fed from the central treatment system is Rayleigh, which has its own system that is supplied from the North Thompson River. The City's treatment plant, Kamloops Centre for Water Quality (KCWQ), is an ultrafiltration membrane treatment facility that chlorinates the finished water to ensure continued quality of the water throughout the distribution system. Both the water treatment and the distribution systems are designated as Classification Level IV systems and require highly qualified and certified operational staff.

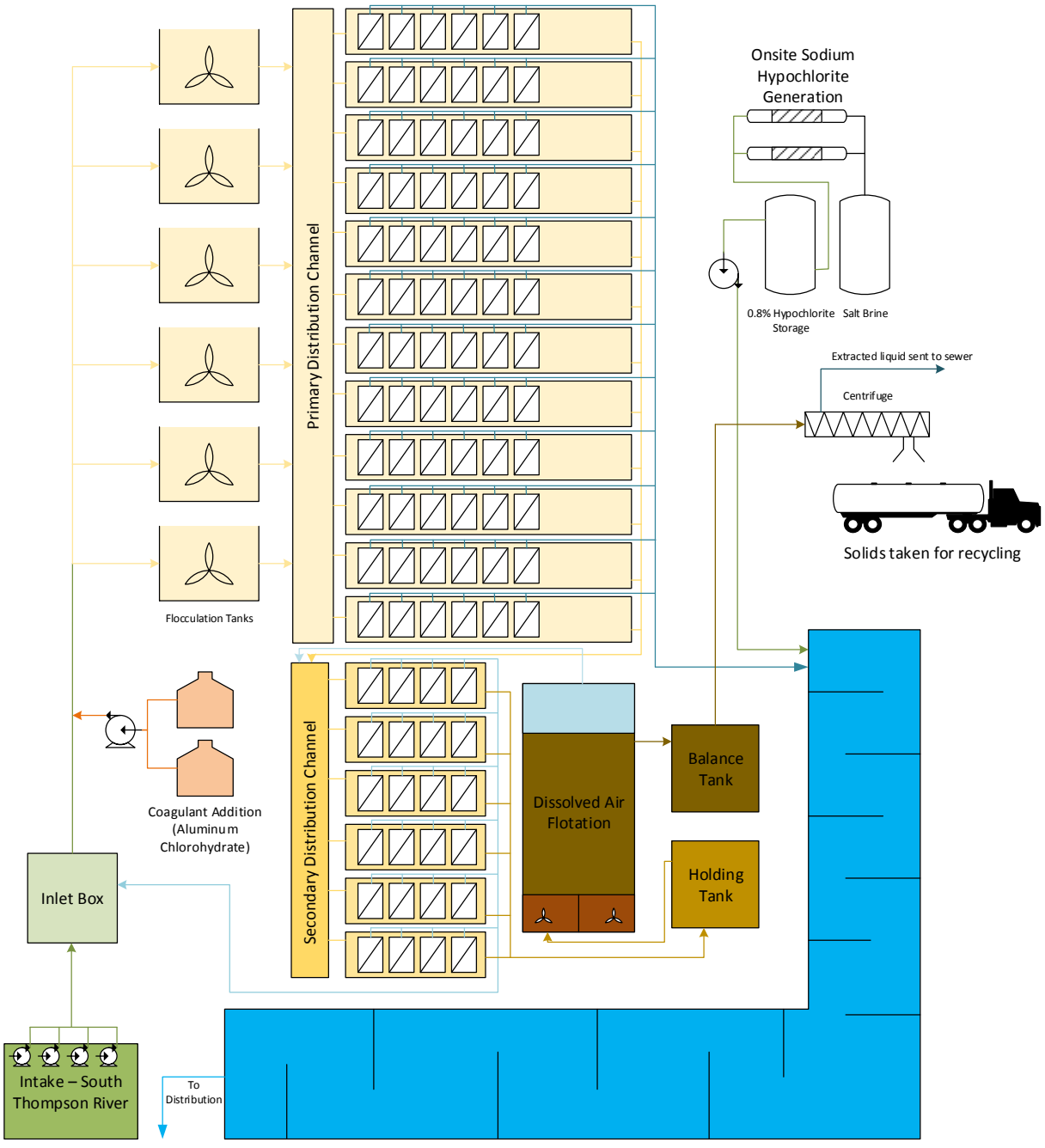
Kamloops Centre for Water Quality

KCWQ treats water from the South Thompson River and supplies most of the city's population. KCWQ is a GE ZeeWeed 500D series ultrafiltration membrane water treatment facility that is capable of producing 160 MLD (million litres per day). The building is certified by Leaders in Environmental and Energy Design (LEED) as a gold standard green building, which is reflected by the processes within. Of the water taken into the facility, 99.99% is used to produce drinking water.

For most of 2016, the solids removed through the treatment process were taken by LafargeHolcim for use in its fly ash process until its Kamloops plant was shut down. The solids were then taken to the City's Owl Road Resource Recovery Centre and are being used as clean cover.

A description of KCWQ and the accompanying process can be seen in Figure 1.

Figure 1: The Kamloops Centre for Water Quality Plant Processes



Kamloops Centre for Water Quality Production Totals

There has been a decrease in water consumption over the past 10 years, which can be directly linked to public education and the phasing in of water meters within the city. Figure 2 shows the monthly total water consumption over the past 10 years, which is down approximately 2 billion litres from the 10-year average.

Figure 2: Monthly Total Production for the Past 10 Years

Month	Total Production (m^3)										Year to Year Comparison		
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average	Minimum	Maximum
January	1,095,540	1,068,079	1,102,050	1,041,252	1,028,342	1,004,683	997,845	998,516	998,859	999,352	1,004,599	997,845	1,102,050
February	986,597	1,055,727	965,800	882,146	920,659	912,473	870,821	903,897	875,057	876,222	893,188	870,821	1,055,727
March	1,087,778	1,129,479	1,079,800	1,111,459	1,112,117	1,000,423	1,013,585	1,001,555	1,001,061	991,862	1,020,101	991,862	1,129,479
April	1,565,289	1,418,228	1,484,942	1,537,427	1,254,472	1,338,717	1,256,169	1,155,441	1,377,097	1,519,266	1,316,860	1,155,441	1,565,289
May	2,855,690	2,411,831	2,418,702	2,126,552	1,970,344	2,338,361	2,228,929	1,736,305	2,405,924	2,089,764	2,128,271	1,736,305	2,855,690
June	2,592,920	2,905,390	3,342,126	2,232,802	2,446,945	2,008,220	2,128,609	2,435,774	2,633,979	2,317,143	2,328,445	2,008,220	3,342,126
July	3,520,260	3,803,433	3,742,487	3,408,915	2,902,192	2,895,880	3,424,556	3,187,312	2,922,031	2,421,451	2,958,903	2,421,451	3,803,433
August	3,082,544	3,240,125	3,596,436	3,007,564	3,430,008	3,257,773	3,133,474	2,746,427	2,659,919	2,740,741	2,994,724	2,659,919	3,596,436
September	2,065,431	2,456,995	2,404,774	1,700,291	2,629,657	2,366,983	2,036,171	1,836,736	1,737,829	1,618,868	2,037,707	1,618,868	2,629,657
October	1,287,900	1,357,211	1,320,321	1,281,721	1,301,444	1,383,194	1,254,593	1,237,151	1,147,270	1,096,279	1,236,655	1,096,279	1,383,194
November	1,033,554	1,107,158	1,056,127	1,031,241	991,751	999,703	1,114,296	996,238	976,284	958,048	1,006,054	958,048	1,114,296
December	1,074,300	502,407	1,049,221	1,037,506	1,003,279	1,011,471	1,005,151	1,006,889	989,458	978,535	999,130	502,407	1,074,300
Total	22,247,803	22,456,063	23,562,785	20,398,876	20,991,210	20,517,881	20,464,199	19,242,241	19,724,769	18,607,531	20,821,336	18,607,531	23,562,785
Daily Peak	144,626	140,499	143,509	132,697	127,032	117,905	124,608	121,608	106,999	99,564	125,905	99,564	144,626
Peak Date	13-Jul	30-Jun	30-Jul	29-Jul	06-Jul	08-Aug	25-Jul	16-Jul	28-Jun	19-Aug	26-Aug	28-Jun	19-Aug
Daily Low	29,768	28,682	20,180	20,379	29,180	29,794	29,094	28,771	28,603	29,330	27,378	20,180	29,794

These monthly numbers can be graphically seen in Figure 3. Overall, the total consumption for 2016 and the peak daily flow were the lowest on record.

Figure 3: Graphical Representation of the KCWQ 10-Year Monthly Water Consumption

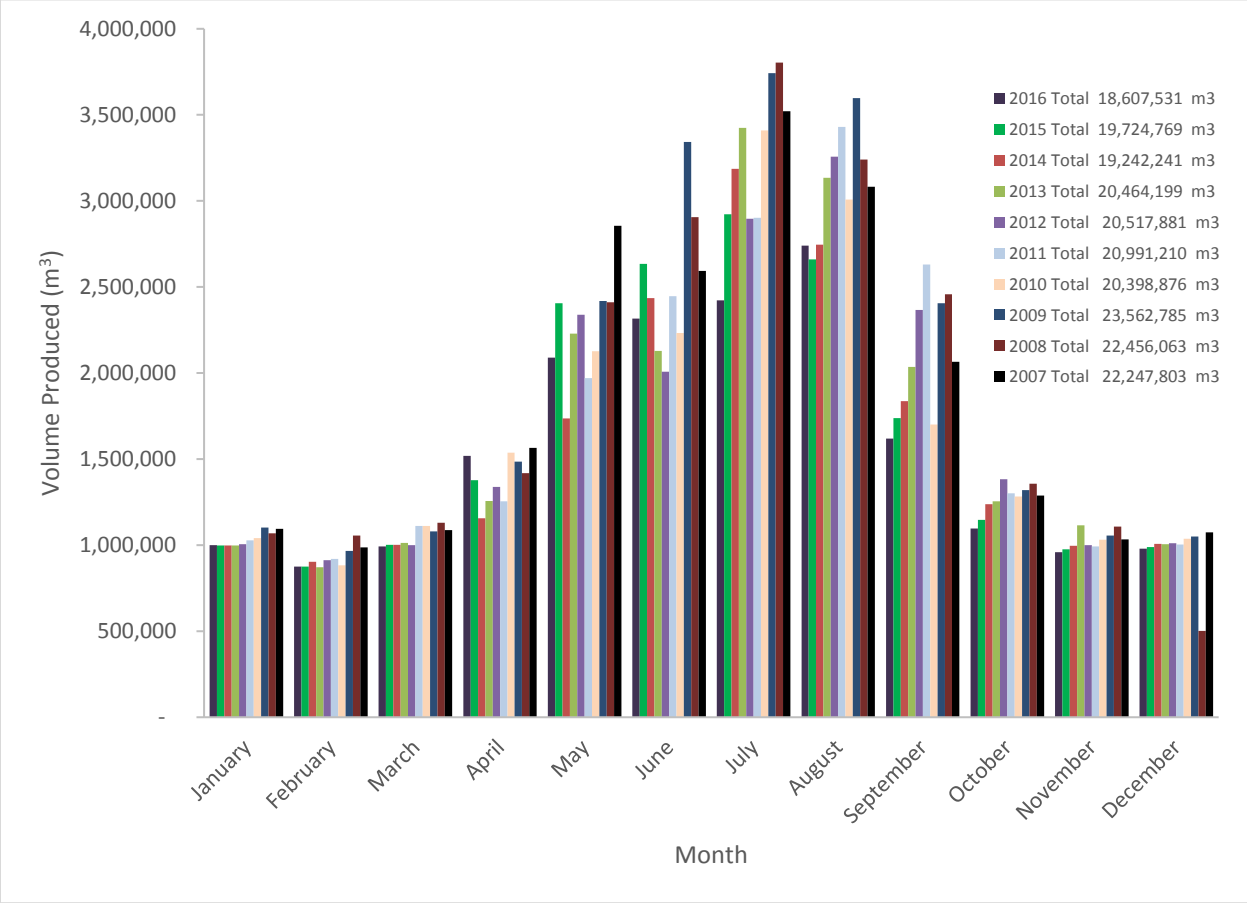
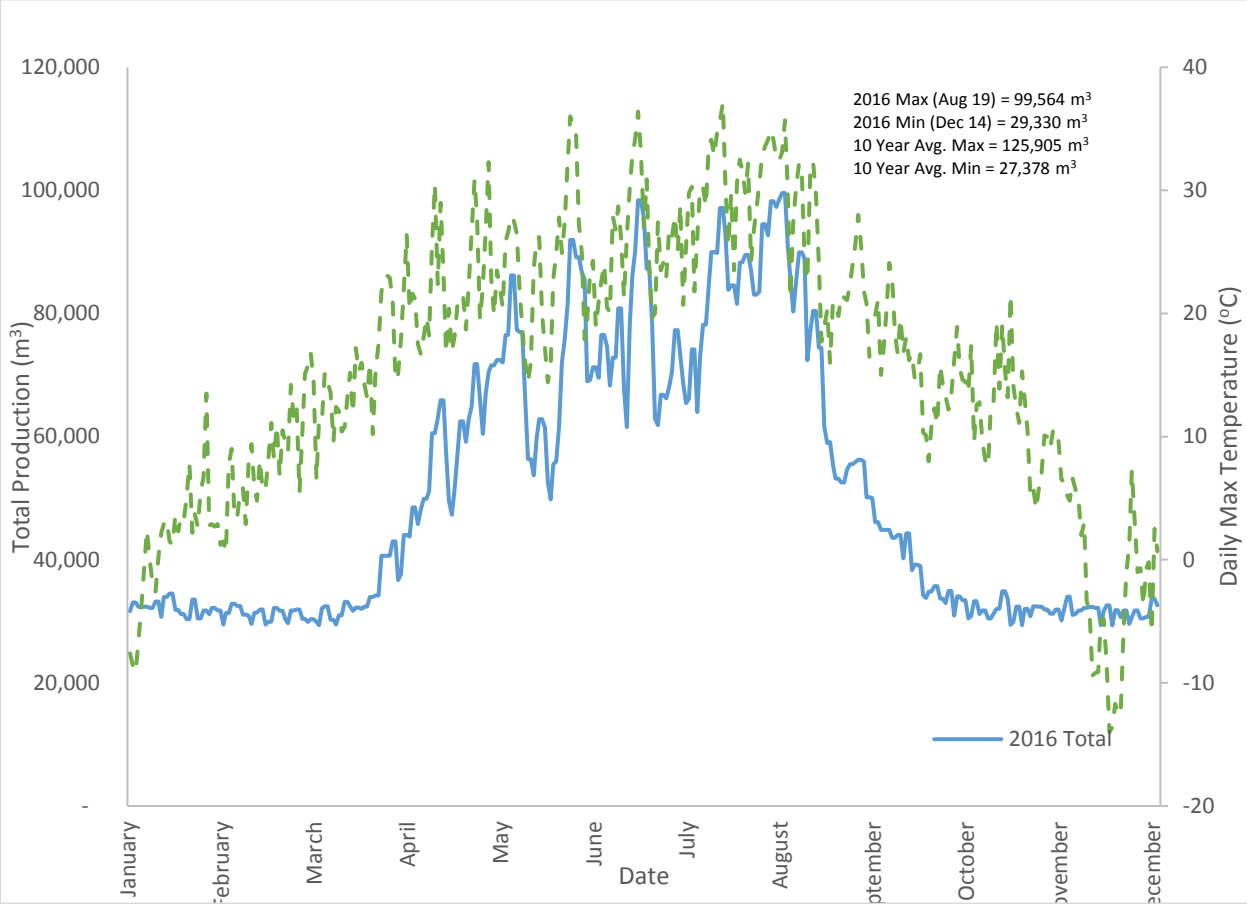


Figure 4 shows the daily water consumption for 2016 with an overlay of the maximum daily temperature. The daily peak for 2016 was 99.6 million litres, which happened on August 19. This was the lowest summer maximum peak since the plant was built.

Figure 4: KCWQ Daily Water Flows for 2015 With Daily Maximum Temperature Overlay



Distribution System Overview

The distribution system consists of over 623 km of water mains, 45 booster stations, 46 reservoirs, 2,350 fire hydrants and a total of 24,462 connections. In the following pages of this report, we will give an outline of the distribution system along with summaries of projects and events within the 2016 calendar year.

Booster Stations and Reservoirs

In 2016, Utility Services Division staff coordinated a rehabilitation project on the Brock Reservoir. Contractors were used to repair the internal lining of the reservoir. While the reservoir was out of commission, staff took the opportunity to perform an extensive cleaning of the reservoir to ensure continued water quality in years to come. The Brock Reservoir was put back into service on May 24, 2016.

Contractors were also used to conduct cleaning on the Valleyview reservoir on June 10, 2016.

Electrical upgrades to both the 418 and the 509 water booster stations were completed in 2016.

An underwater remotely operated vehicle inspection of the 1786 Arrowstone Drive water reservoir was completed on December 13, 2016, in preparation for cleaning in 2017.

Distribution System

The distribution system is very extensive, with the main material transporting the water being quite varied as can be seen in Figure 5. The maintenance of this distribution system consists of actively replacing lines that have reached the end of their functional life, need upgrading due to inadequate sizing for development, or are in poor condition and cause issues.

Figure 5: Water Main Material Summary

Material	Length (km)	% of Total Pipe	% Change from Last Year
AC - Asbestos Cement	179.555	28.83	-0.50
CI - Cast Iron	36.996	5.94	-0.15
CU - Copper	0.925	0.15	-1.73
DI - Ductile Iron	102.502	16.46	-0.28
GI - Galvanized Iron	0.276	0.04	0.00
HYP - High Pressure Concrete	17.492	2.81	0.00
PLY - Polyethylene	1.537	0.25	0.00
PVC - Polyvinyl Chloride	272.804	43.80	1.25
STL - Steel	10.75	1.73	-0.17
Total	622.837	100	

Water Conservation

The 2016 calendar year marked the completion of the universal water metering project, and now all residences supplied by City of Kamloops potable water are on water meters. This past calendar year was also the lowest water use ever recorded within Kamloops. The total usage was 2 billion litres below the 10-year average. The peak daily use also dropped below 100 million litres for the first time since advanced water treatment began in Kamloops. Education and metering has brought Kamloops water use down by over 20% of the total peak yearly usage and has resulted in a 30% reduction of peak daily usage.

Cross Connection Control Program

The City's Cross Connection Control Plan (CCCP) has focused on premise isolation for industrial, commercial, and institutional (ICI) properties. A review of the programs in similarly sized communities indicates that they have also focused on premise isolation for the same group of customers to begin the program.

To date, the City's CCCP has mainly been focused on new ICI installations when new development and buildings are added to the system. If cross connection control is required, it is made a condition of the Building Permit or Development Permit. A backflow prevention assembly testing report submitted to the Public Works and Utilities Department indicating that the cross connection control device works satisfactorily is required before occupancy of the property is granted.

Monitoring requirements include annual testing by a certified cross connection control device tester. Should the test fail, repairs and recertification or replacement will be required to maintain the safety of the City's water distribution system. The City currently monitors an inventory of roughly 1,300 cross connection control devices (premise isolation and internal protection). City staff continue to assess ICI properties for cross connection control risks and if a control devices are required.

2016 Water Utility Projects

Pacific Way Water Main Upgrade

A major water main replacement on Pacific Way was completed in 2016 to replace an aging section of ductile iron pipe from Howe Road to Greystone Crescent. The approximately $1.5 million project is another example of proactive asset management within the distribution system.

The North Thompson Emergency Intake

In 2016, an RFQ was posted and awarded to Acres Construction for the $9.5 million construction of the Emergency North Thompson River Intake. The North Thompson Emergency Intake will ensure residents are supplied with crucial fire protection and non-potable water in the event of a major contamination of the South Thompson River impacting KCWQ. Completion of the emergency intake is expected in early 2018.

Requests for Service

A total of 1,678 requests for service related to water distribution and treatment were filed with the Public Works and Utilities Department in the 2016 calendar year. This is an 11% reduction from the previous year. Figure 6 is a breakdown of the categories to which each of the requests is related.

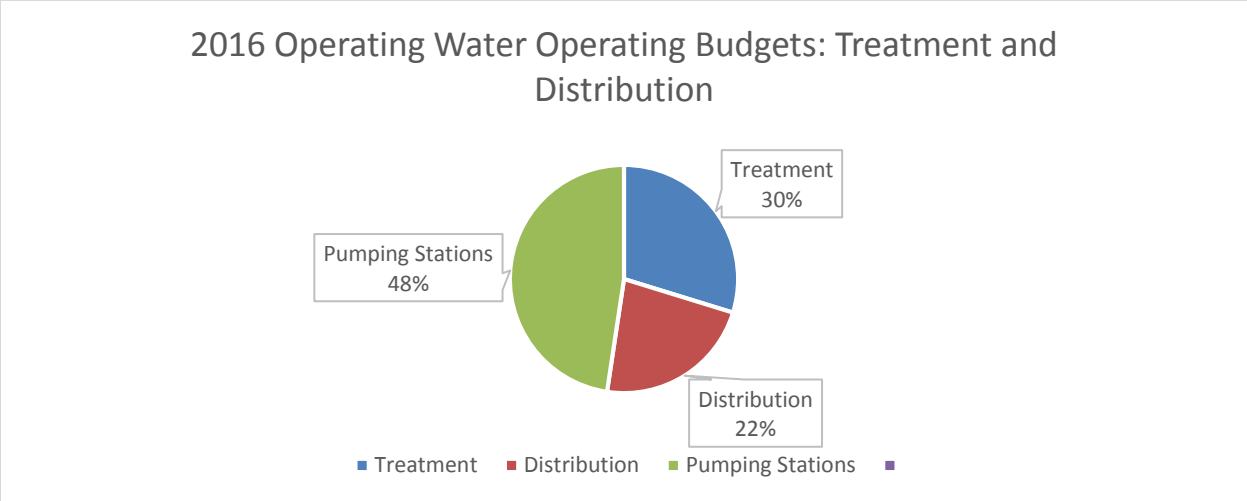
Figure 6: Service Requests in Water Treatment and Distribution

Request Categories Related to Utilities/ Water	Number of Requests 2016	2015
Booster Stations	17	36
Cross Connection Control	19	15
Frozen Services	4	0
General	87	111
Hydrants	72	81
Irrigation On/Off	33	35
No Water	77	70
Reservoirs	3	8
Service Boxes	102	94
Service Location	138	178
Turn Service On/Off	592	673
Water Filling Station	61	60
Water Leak	321	350
Water Pressure	83	79
Water Quality	66	90
Water Restrictions	3	3
Totals	1,678	1,883

Annual Operating Budget for Water Treatment and Distribution

The water utility operating budget in 2016 was nearly $9 million and was split between treatment, distribution, pumping, and administration. The operating budget included $2.5 million for treatment, $1.9 million for distribution, and $4 million for pumping, as shown in Figure 7.

Figure 7: Operating Budget for Treatment and Distribution



Water Quality Sampling and Analysis

The water quality from our source water, at the KCWQ, and within the distribution system is analyzed extensively. Samples are collected nightly and analyzed at the KCWQ from the raw water, from treated water at the plant, and from within the distribution system. Bacteriological samples are also analyzed throughout the distribution system on a weekly basis. Samples of our source water and one from within the distribution system are also taken quarterly and sent off to an accredited lab for extensive analysis.

KCWQ Water Quality Testing

There are a variety of parameters measured, which are listed in the following paragraphs, that are monitored at the plant in order to check the treatment process. Figures 8, 9, and 10 also summarize the results of the nightly analysis for the KCWQ. These analyses are done in-house by the certified operators at the KCWQ.

True and Apparent Colour

Colour in water can be imparted in two ways: through dissolved material or suspended material. The suspended material could be clays, silts, algae, or any other material that can be remain undissolved in water. The dissolved materials are typically organics such as tannins that are leached from plants, trees, or roots and impart a yellowish/brown colour. They may also be from dissolved metals like iron. Suspended material in water is much easier to treat through filtration; dissolved material may be more difficult to treat. Apparent colour is a measure of all colour in water, including suspended material, and true colour measures only the dissolved colour. Colour in itself is not a health issue, but it is unwanted as aesthetically it does not make for good drinking water.

pH

pH is a measure of the activity of the hydrogen ion in water. It represents the acidity or basicity of water. The pH scale goes from 0 to 14, with anything smaller than 7 being acidic, anything greater than 7 being basic, and 7 being neutral. Drinking water is regulated to fall between a pH of 6.5 to 8.5. In Kamloops, we would want to be a little on the higher side of that range in order to protect our pipes against corrosion.

Hardness

Hardness is primarily made up of dissolved calcium and magnesium in water. These compounds are not at all harmful to health, and people actually need them in their diet. However, when they are at high levels, they may cause "soap scum" when reacting with soaps, require more soap or detergent when cleaning things, and clog pipes and hot water tanks. Hardness is broken down into the following general categories: 0 to 60 mg/L as $CaCO_3$ is considered soft, 61 to 120 mg/L is considered moderate, 121 to 180 mg/L is considered hard, and anything over 180 mg/L is considered very hard.

Alkalinity

Alkalinity is a measure of the buffering capacity of water. The alkalinity will keep the pH stable if something acidic or basic is introduced to the water. The higher the alkalinity, the more stable your pH will remain. In general, this parameter has no health implications, and it is strictly used as a guideline in treatment processes.

Conductivity and Total Dissolved Solids

Conductivity and total dissolved solids (TDS) go hand in hand as the probe that measures conductivity in water will give an estimate of the TDS. Conductivity is a measure of how well a water sample conducts electricity. Water is actually an insulator, and in order to conduct electricity, water needs dissolved ions. So, water's ability to conduct electricity is directly related to the amount of dissolved solids within the water. In water treatment, this measurement is used to monitor any changes in water quality, as it is a fairly quick test.

Total Suspended Solids

Total suspended solids (TSS) is a measure of all the colloidal material in water. Measuring this in our raw water gives an indication of the amount of solids that will be removed in our process. The higher the TSS, the "dirtier" the water is. There is no guideline limit on this as there is another related test called turbidity, which is a quicker test in which a guideline is applied.

Turbidity

Turbidity is a measure of the clarity of the water. It is also directly related to the colloidal material in the water. This is measured by passing a beam of light through the sample and measuring the amount of water that is refracted at a 90° angle. The units applied are called nephelometric turbidity units (NTU). *The Guidelines for Canadian Drinking Water Quality* (GCDWQ) state that drinking water should have a turbidity of less than 1 NTU. Our membrane water treatment plant should not have a turbidity of greater than 0.1 NTU leaving the plant.

Aluminum

Aluminum in our water is of interest as we use an aluminum-based coagulant to help in the treatment process. By monitoring the amount of aluminum in our raw and treated water, we ensure that our coagulant is not being overdosed and is not entering our drinking water at elevated levels. The GCDWQ sets the operational guideline for water treatment plants at 0.1 mg/L.

Free and Total Chlorine (Cl_2)

Chlorine levels are important in water treatment to ensure that water is safe all the way through the distribution system to each home. The primary form of chlorine used in our treatment system is sodium hypochlorite. Free chlorine measures the amount of hypochlorite in our water, while total chlorine measures the free chlorine plus any combined chlorine disinfectants such as chloramines. In our system, we strive to maintain a residual free chlorine level of greater than 0.2 mg/L at the end of the distribution system.

Figure 8: KCWQ Average Monthly Raw Water Analysis

Month	True Colour (PtCo Units)	Apparent Colour (PtCo Units	pH	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	TDS (mg/L)	Conductivity (µs/cm)	TSS (mg/L)	Turbidity (NTU)	Aluminium (mg/L)	Temp (^oC)
January	3.0	13.1	7.69	40.0	39.5	40.6	99.6	3.0	2.2	ND	3.7
February	2.7	13.0	7.72	40.7	40.2	40.7	77.3	3.6	2.4	ND	5.0
March	3.2	15.4	7.82	41.3	40.8	43.7	83.0	3.9	2.5	ND	7.5
April	5.6	22.7	7.9	42.0	41.4	43.4	80.0	6.1	3.4	ND	10.5
May	4.2	17.8	7.8	38.2	37.6	39.5	74.9	4.1	2.9	0.0	11.8
June	4.3	14.3	7.8	37.7	37.2	38.9	74.3	2.7	2.4	0.0	15.7
July	4.2	12.6	7.9	36.5	36.2	38.7	71.3	2.5	1.8	0.0	19.4
August	4.8	15.1	7.9	36.1	35.9	39.0	76.0	4.8	2.0	0.0	21.3
September	1.9	9.7	7.9	37.2	36.3	40.5	76.8	2.6	1.6	0.0	18.0
October	0.0	9.6	7.8	37.8	37.1	39.8	75.6	1.9	1.8	0.0	13.2
November	0.0	8.5	7.8	37.3	36.5	37.9	72.2	2.0	1.7	0.0	10.4
December	0.5	8.3	7.8	37.7	37.5	38.8	73.9	2.5	1.8	0.0	4.0
Min	0	8	7.69	36	36	37.9	71.3	1.9	1.61	0.0	3.7
Max	6	23	7.93	42	41	43.7	99.6	6.1	3.36	0.0	21.3
Average	3	13	7.82	39	38	40.1	77.9	3.3	2.20	0.0	11.7

Figure 9: KCWQ Average Monthly Treated Water Analysis

Month	True Colour (PtCo Units)	Apparent Colour (PtCo Units	pH	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	TDS (mg/L)	Conductivity (µs/cm)	Turbidity (NTU)	Aluminium (mg/L)	Temp (^oC)	Free Cl (mg/L)	Total Cl (mg/L)
January	0	0	7.82	40.2	39.8	46.9	89.0	0.013	ND	6.3	1.21	1.30
February	0	0	7.83	41.1	40.9	47.8	90.7	0.013	ND	7.8	1.22	1.30
March	0	0	7.89	41.3	41.1	50.0	93.6	0.013	ND	9.7	1.20	1.26
April	0	0	7.92	41.6	41.4	49.6	94.1	0.019	ND	12.0	1.25	1.33
May	0	0	7.87	38.3	38.2	45.8	86.9	0.014	0.000	13.4	1.34	1.42
June	0	0	7.97	37.8	38.0	47.1	85.8	0.017	0.002	17.0	1.36	1.43
July	0	0	8.01	36.5	36.5	44.1	83.7	0.012	0.001	20.4	1.27	1.36
August	0	0	8.08	36.5	36.5	45.7	86.6	0.012	0.001	22.0	1.47	1.56
September	0	0	8.08	37.0	37.0	46.6	88.5	0.011	0.000	18.6	1.63	1.73
October	0	0	7.97	38.1	37.9	46.3	87.8	0.011	0.000	14.3	1.59	1.70
November	0	0	7.93	37.3	37.5	45.6	86.8	0.016	0.000	12.6	1.64	1.74
December	0	0	7.88	38.1	37.9	45.6	86.2	0.012	0.000	6.9	1.45	1.52
Min	0	0	7.82	36.5	36.5	44.1	83.7	0.011	0.000	6.3	1.20	1.26
Max	0	0	8.08	41.6	41.4	50.0	94.1	0.019	0.002	22.0	1.64	1.74
Average	0	0	7.94	38.7	38.6	46.7	88.3	0.014	0.000	13.4	1.39	1.47

*ND refers to Non-detectable Limit

Figure 10: KCWQ Average Monthly Distribution Water Analysis

Month	True Colour (PtCo Units)	Apparent Colour (PtCo Units	pH	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	TDS (mg/L)	Conductivity (µs/cm)	Turbidity (NTU)	Free Cl2 (mg/L)	Total Cl2 (mg/L)	Temp (°C)
January	0	0	7.9	40.4	40.1	48.3	91.6	0.10	0.91	0.99	7.9
February	0	0	7.9	41.2	41.0	49.3	93.2	0.11	0.88	0.97	8.6
March	0	0	8.0	41.6	41.3	49.6	93.8	0.10	0.85	0.93	9.7
April	0	0	8.0	42.0	41.7	50.2	95.2	0.12	0.76	0.85	11.1
May	0	0	7.9	38.6	38.6	46.1	87.6	0.10	0.78	0.86	12.6
June	0	0	8.0	38.4	38.1	44.4	84.2	0.08	0.77	0.85	15.9
July	0	0	8.0	37.4	36.9	42.3	80.5	0.09	0.66	0.72	16.6
August	0	0	8.1	36.8	36.7	44.1	84.1	0.08	0.76	0.84	19.5
September	0	0	8.1	37.7	37.3	45.2	85.9	0.11	0.79	0.88	16.8
October	0	0	8.1	38.4	38.3	47.8	87.6	0.08	0.79	0.87	14.7
November	0	1	8.0	38.1	37.9	45.6	85.9	0.37	0.89	0.97	12.0
December	0	0	8.0	38.5	38.4	47.1	89.3	0.10	0.92	1.01	7.9
Min	0	0	7.87	37	37	42.3	80.5	0.08	0.66	0.72	7.9
Max	0	1	8.10	42	42	50.2	95.2	0.37	0.92	1.01	19.5
Average	0	0	7.99	39	39	46.7	88.2	0.12	0.81	0.89	12.8

Distribution Sampling

The City is committed to providing safe drinking water to each and every connection within its service area. To this end, the distribution system is sampled at over 23 different locations weekly, and by the end of 2016, 24 locations were sampled due to the inclusion of the Tournament Capital Ranch. These samples are analyzed for background bacterial counts, total coliforms, and E. coli.

Background Bacterial Monitoring

Background bacteria monitoring is done through what is called a heterotrophic plate count (HPC). Heterotrophic bacteria are a group of bacteria that use carbon as a food source and can be found in a variety of water sources. Most bacteria found in water are actually heterotrophic. In general, these bacteria are not pathogenic, and the HPC test in itself will not tell you whether the water is bad to drink. Because of this, there is no maximum acceptable concentration (MAC), as stated in the GCDWQ. What this test tells us is whether there are conditions within the system that bacteria can regrow or thrive in.

The City uses this test to monitor integrity and overall "health" of the distribution system. If a sample is positive for background bacteria greater than 200 counts, the system is flushed and resampled. Any positive counts of any size for background bacteria are also resampled, which is above and beyond any legislative requirements.

Coliform Bacterial Monitoring

Coliform bacteria is a group of bacteria that is a little more of a narrow focus from the HPC test. These bacteria again represent a large group of bacteria found in water and soil, on vegetation, and in the feces of mammals. Most of these bacteria are not harmful to humans, but because of the ease of testing of this bacteria, it makes for a great indicator of contamination.

In water treatment systems, there is a zero threshold allowance for coliforms within water samples. If a sample shows up positive for coliforms, the site is immediately resampled and, if coliforms are found again, a boil water advisory is put in place. The distribution area is then pulled offline and cleaned before being put back into action and resampled.

E. Coli Bacterial Monitoring

E. coli bacteria are a subsection of coliform bacteria. These bacteria may not be harmful to human health, but specific strains can cause serious health issues and even death in some instances. These bacteria are also found almost exclusively in the feces of mammals; therefore, they are a definite sign of contamination. Any positive counts for coliforms or E. coli result in an immediate boil water advisory, resampling, and cleaning of the affected area. The results for the 2016 distribution system can be seen in Figure 11.

Figure 11: 2016 Distribution System Biological Sampling

Date	Number of Samples Taken	Samples Positive for Background Bacteria	Samples Positive for Coliforms	Samples Positive for E. Coli	Notes/ Measures Taken
04/01/2016	23				
11/01/2016	23				
18/01/2016	23				
25/01/2016	23	1			Background count of 13
01/02/2016	24				Resample taken of previous weeks background count
09/02/2016	23				
15/02/2016	23				
22/02/2016	23				
29/02/2016	23				
07/03/2016	23				
14/03/2016	24				Extra Sample in Juniper
16/03/2016	1				TCR Sample
17/03/2016	1				TCR Sample
21/03/2016	25				Extra Sample in Juniper + Weekly TCR started
24/03/2016	4				
29/03/2016	25				
04/04/2016	24				
11/04/2016	24				
18/04/2016	24				
25/04/2016	24				
02/05/2016	24				
09/05/2016	24				
16/05/2016	24				
22/05/2016	24				
29/05/2016	24				
06/06/2016	24				
13/06/2016	24				
20/06/2016	24				
27/06/2016	24				
04/07/2016	24				
11/07/2016	24				
18/07/2016	24				
25/07/2016	24				
02/08/2016	23	1			Background count of 2
08/08/2016	25				Resample of Background count
12/08/2016	0		1		Coliform count of 1
15/08/2016	24	1			Resample of coliform found background of 1
22/08/2016	25				Re-sampled again, nothing detected
29/08/2016	23	1			Background of 13
06/09/2016	25				Re-sample of background counts
12/09/2016	24				
19/09/2016	24				
26/09/2016	24	1			Background of 1
03/10/2016	25				Re-sample of background
11/10/2016	24				
17/10/2016	23				
24/10/2016	23				
31/10/2016	22	1			Background of 1, resample of background
07/11/2016	23				
14/11/2016	23				
21/11/2016	23				
28/11/2016	23				
05/12/2016	23	1			Background of 11
12/12/2016	24	1			Re-sample of background result of 6
19/12/2016	24				Re-sample came back negative
28/12/2016	23				
Totals	1239	8	1	0	

There were a total of eight positive results for background bacteria and one positive for coliforms in 2016. After resampling the background bacteria positive samples, all samples came back negative. The positive coliform sample was resampled immediately, and the results showed no coliforms; however, a single background count was found. Once again, the sample was retaken and came back negative. There were no positive results for E. coli within the system. Overall, all guidelines were met, and there was no need for any water quality advisories.

Quarterly Raw and Distribution Sampling

The following are extensive water quality analysis results as completed by a provincially accredited lab from the source water and within the distribution system. In 2016, there were a total of three sampling periods. The samples were taken by City staff and sent off to CARO Analytical services in Kelowna. The results of these extensive analysis can be seen in Tables 12 through 19. As seen in the tables, all of the treated water quality parameters are within the GCDWQ.

Figure 2: CARO Anions Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Bromide	mg/L	0.1	N/A	<0.10	0	<0.10	0	<0.10	0
Chloride	mg/L	0.1	AO<=250	0.71	4.37	0.56	3.86	0.46	4.02
Fluoride	mg/L	0.1	MAC=1.5	0	<0.10	0	<0.10	0	<0.10
Nitrate as N	mg/L	0.01	MAC=10	0.066	0.069	0.028	0.027	0.035	0.032
Nitrite as N	mg/L	0.01	MAC=1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphate, Ortho as P	mg/L	0.01	N/A	0	<0.01	0	<0.01	0	<0.01
Sulfate	mg/L	1	AO<=500	6.9	7.2	5.5	5.6	5.3	5.3
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						

Figure 13: CARO General Parameters Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Colour, True	CU	5	AO<=15	<5	<5	6	<5	<5	<5
Alkalinity, Total as CaCO3	mg/L	1	N/A	41	41	36	35	37	36
Alkalinity, Phenolphthalein (as CaCO3)	mg/L	1	N/A	0	0	<1	<1	<1	<1
Alkalinity, Bicarbonate (as CaCO3)	mg/L	1	N/A	41	41	36	35	37	36
Alkalinity, Carbonate (as CaCO3)	mg/L	1	N/A	0	0	<1	<1	<1	<1
Alkalinity, Hydroxide (as CaCO3)	mg/L	1	N/A	0	0	<1	<1	<1	<1
BOD, 5-day	mg/L	2	N/A	<10	0	<6	0	<6	0
Carbon, Total Organic	mg/L	0.5	N/A	1.8	1.3	1.8	1.4	2.6	2.1
Carbon, Dissolved Organic	mg/L	0.5	N/A	1.7	0	1.7	0	2.5	0
Cyanide, Total	mg/L	0.01	MAC=0.2	0	<0.010	0	<0.0020	0	<0.0020
Ammonia as N, Total	mg/L	0.02	N/A	0.031	0	0.041	0	<0.020	0
Nitrogen, Total Kjeldahl	mg/L	0.05	N/A	0.34	0.11	0.11	0.06	0.06	<0.05
Oil & Grease, Total	mg/L	2	N/A	0	<4	0	3	0	<2
Phenolics, Total	mg/L	0.002	N/A	0	<0.002	0	<0.002	0	<0.002
Solids, Total Dissolved	mg/L	10	AO<=500	56	66	58	65	49	66
Sulfide, total	mg/L	0.05	AO<=0.05	0	<0.05	0	<0.05	0	<0.05
Turbidity	NTU	0.1	OG<0.1	1.6	0.1	1.12	<0.10	6.04	<0.10
Conductivity (EC)	uS/cm	2	N/A	97	112	83	94	85	99
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						

Figure 14: CARO Calculated Parameters

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Hardness, Total (Total as CaCO3)	mg/L	0.5	N/A	38.9	41	35.4	35.7	38.1	38
Hardness, Total (Diss. as CaCO3)	mg/L	0.5	N/A	52.1	50.9				
Nitrate+Nitrite as N	mg/L	0.02	N/A	0.066	0.069	0.028	0.027	0.035	0.032
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						

Figure 15: CARO Dissolved Metals Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Aluminum, dissolved	mg/L	0.005	N/A	<0.005	0.005	0.009	0.01	0.007	0.008
Antimony, dissolved	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic, dissolved	mg/L	0.0005	N/A	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Barium, dissolved	mg/L	0.005	N/A	0.008	0.008	0.008	0.008	0.01	0.009
Beryllium, dissolved	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth, dissolved	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron, dissolved	mg/L	0.004	N/A	0.005	<0.004	<0.004	<0.004	0.007	0.005
Cadmium, dissolved	mg/L	0.00001	N/A	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium, dissolved	mg/L	0.2	N/A	12	13.1	11.4	11.6	12	12.1
Chromium, dissolved	mg/L	0.0005	N/A	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt, dissolved	mg/L	0.00005	N/A	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Copper, dissolved	mg/L	0.0002	N/A	0.0013	0.0034	0.0018	0.0049	0.0011	0.0027
Iron, dissolved	mg/L	0.01	N/A	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead, dissolved	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Lithium, dissolved	mg/L	0.0001	N/A	0.0007	0.0007	0.0006	0.0006	0.0007	0.0006
Magnesium, dissolved	mg/L	0.01	N/A	2.14	1.99	1.65	1.62	1.96	1.9
Manganese, dissolved	mg/L	0.0002	N/A	0.0014	0.0004	0.0006	0.0002	0.0011	0.0008
Molybdenum, dissolved	mg/L	0.0001	N/A	<0.00002	<0.00002	0.0005	0.0005	<0.00002	<0.00002
Nickel, dissolved	mg/L	0.0002	N/A	0.0007	0.0007	0.0002	0.0003	0.0006	0.0006
Phosphorus, dissolved	mg/L	0.02	N/A	0.0003	<0.0002	<0.02	<0.02	0.0003	<0.0002
Potassium, dissolved	mg/L	0.02	N/A	<0.02	<0.02	0.77	0.76	<0.02	<0.02
Selenium, dissolved	mg/L	0.0005	N/A	0.81	0.85	<0.0005	<0.0005	0.85	0.85
Silicon, dissolved	mg/L	0.5	N/A	<0.0005	<0.0005	1	1	<0.0005	<0.0005
Silver, dissolved	mg/L	0.00005	N/A	2.8	2.8	<0.00005	<0.00005	3.1	3.1
Sodium, dissolved	mg/L	0.02	N/A	<0.00005	<0.00005	1.41	3.56	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.001	N/A	1.75	4.68	0.064	0.065	1.5	4.28
Sulfur, dissolved	mg/L	1	N/A	0.075	0.074	2	2	0.073	0.073
Tellurium, dissolved	mg/L	0.0002	N/A	<1	<1	<0.0002	<0.0002	1	1
Thallium, dissolved	mg/L	0.00002	N/A	<0.0002	<0.0002	<0.00002	<0.00002	<0.0002	<0.0002
Thorium, dissolved	mg/L	0.0001	N/A	<0.00002	<0.00002	<0.0001	<0.0001	<0.00002	<0.00002
Tin, dissolved	mg/L	0.0002	N/A	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001
Titanium, dissolved	mg/L	0.005	N/A	<0.0002	<0.0002	<0.005	<0.005	<0.0002	<0.0002
Uranium, dissolved	mg/L	0.00002	N/A	<0.005	<0.005	0.00024	0.00006	<0.005	<0.005
Vanadium, dissolved	mg/L	0.001	N/A	0.00033	0.00005	<0.001	<0.001	0.00028	0.00007
Zinc, dissolved	mg/L	0.004	N/A	<0.001	<0.001	<0.004	<0.004	<0.001	<0.001
Zirconium, dissolved	mg/L	0.0001	N/A	<0.004	0.008	<0.0001	<0.0001	<0.004	0.009
Mercury, dissolved	ug/L	0.005	N/A	<0.0001	<0.0001	0	0	<0.0001	<0.0001
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						

Figure 16: CARO Total Recoverable Metals Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Aluminum, total	mg/L	0.005	OG<0.1	0.054	0.007	0.035	0.013	0.072	0.298
Antimony, total	mg/L	0.0001	MAC=0.006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic, total	mg/L	0.0005	MAC=0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Barium, total	mg/L	0.005	MAC=1	0.012	0.009	0.009	0.009	0.01	0.009
Beryllium, total	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth, total	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron, total	mg/L	0.004	MAC=5	0.01	0.007	<0.004	<0.004	0.007	0.007
Cadmium, total	mg/L	0.00001	MAC=0.005	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	0.00003
Calcium, total	mg/L	0.2	N/A	16.3	16.5	12.6	12.4	12.5	12.1
Chromium, total	mg/L	0.0005	MAC=0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
Cobalt, total	mg/L	0.00005	N/A	0.00008	<0.00005	<0.00005	<0.00005	0.00008	<0.00005
Copper, total	mg/L	0.0002	AO<=1	0.0018	0.0052	0.0038	0.0056	0.0021	0.0029
Iron, total	mg/L	0.01	AO<=0.3	0.11	0.02	0.05	<0.01	0.12	<0.01
Lead, total	mg/L	0.0001	MAC=0.01	0.0002	0.0002	<0.0001	0.0003	0.0001	0.0002
Lithium, total	mg/L	0.0001	N/A	0.0009	0.0008	0.0005	0.0005	0.0007	0.0006
Magnesium, total	mg/L	0.01	N/A	2.76	2.35	1.7	1.64	2	1.91
Manganese, total	mg/L	0.0002	AO<=0.05	0.0058	0.0007	0.0024	0.0006	0.0054	0.001
Mercury, total	mg/L	0.00002	MAC=0.001	<0.00002	<0.00002	0	<0.00002	0	<0.00002
Molybdenum, total	mg/L	0.0001	N/A	0.0008	0.0008	0.0006	0.0006	0.0006	0.0006
Nickel, total	mg/L	0.0002	N/A	0.0005	0.0002	0.0007	0.0002	0.0005	0.0003
Phosphorus, total	mg/L	0.02	N/A	<0.02	<0.02	<0.02	<0.02	0.03	<0.02
Potassium, total	mg/L	0.02	N/A	0.99	0.95	0.68	0.76	0.85	0.81
Selenium, total	mg/L	0.0005	MAC=0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silicon, total	mg/L	0.5	N/A	3.6	3.4	2.9	2.7	3.2	3.2
Silver, total	mg/L	0.00005	N/A	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium, total	mg/L	0.02	AO<=200	2.24	5.52	1.45	3.53	1.5	4.2
Strontium, total	mg/L	0.001	N/A	0.088	0.082	0.067	0.066	0.074	0.071
Sulfur, total	mg/L	1	N/A	<1	2	<1	<1	2	1
Tellurium, total	mg/L	0.0002	N/A	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thallium, total	mg/L	0.00002	N/A	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Thorium, total	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin, total	mg/L	0.0002	N/A	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium, total	mg/L	0.005	N/A	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium, total	mg/L	0.00002	MAC=0.02	0.0004	0.00005	0.00028	0.00007	0.00029	0.00007
Vanadium, total	mg/L	0.001	N/A	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc, total	mg/L	0.004	AO<=5	<0.004	0.014	0.005	0.005	<0.004	0.011
Zirconium, total	mg/L	0.0001	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury, total	ug/L	0.005	MAC=1	0	0	<0.005	0	<0.005	0

MAC = Maximum Acceptable Concentration AO = Aesthetic objective

Figure 17: CARO Pesticides, Herbicides, and Fungicides Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Alachlor	ug/L	0.1	N/A				<0.10		<0.10
Aldrin	ug/L	0.04	N/A				<0.04		<0.04
alpha-BHC	ug/L	0.05	N/A				<0.05		<0.05
alpha-Chlordane	ug/L	0.05	N/A				<0.05		<0.05
Atrazine	ug/L	0.1	MAC=5				<0.10		<0.10
Azinphos-methyl	ug/L	0.2	N/A				<0.20		<0.20
beta-BHC	ug/L	0.05	N/A				<0.05		<0.05
Bromacil	ug/L	0.1	N/A				<0.10		<0.10
Captan	ug/L	0.1	N/A				<0.10		<0.10
Chlorothalonil	ug/L	0.05	N/A				<0.05		<0.05
Chlorpyrifos	ug/L	0.02	MAC=90				<0.20		<0.02
Cyanazine	ug/L	0.2	N/A				<0.20		<0.20
delta-BHC	ug/L	0.05	N/A				<0.05		<0.05
Diazinon	ug/L	0.03	MAC=20				<0.03		<0.03
Dichlorvos	ug/L	0.1	N/A				<0.10		<0.10
Dieldrin	ug/L	0.04	N/A				<0.04		<0.04
Dimethoate	ug/L	0.2	MAC=20				<0.20		<0.20
Disulfoton	ug/L	0.1	N/A				<0.10		<0.10
Endosulfan I	ug/L	0.05	N/A				<0.05		<0.05
Endosulfan II	ug/L	0.05	N/A				<0.05		<0.05
Endosulfan sulfate	ug/L	0.05	N/A				<0.05		<0.05
Endrin	ug/L	0.02	N/A				<0.03		<0.02
Endrin aldehyde	ug/L	0.05	N/A				<0.05		<0.05
Endrin ketone	ug/L	0.05	N/A				<0.05		<0.05
gamma-BHC (Lindane)	ug/L	0.05	N/A				<0.05		<0.05
gamma-Chlordane	ug/L	0.05	N/A				<0.05		<0.05
Heptachlor	ug/L	0.05	N/A				<0.05		<0.05
Heptachlor epoxide	ug/L	0.05	N/A				<0.05		<0.05
Malathion	ug/L	0.1	MAC=190				<0.10		<0.10
Methyl parathion	ug/L	0.1	N/A				<0.10		<0.10
Metolachlor	ug/L	0.1	MAC=50				<0.10		<0.10
Metribuzin	ug/L	0.2	MAC=80				<0.20		<0.20
p,p-DDD	ug/L	0.04	N/A				<0.04		<0.04
p,p-DDE	ug/L	0.04	N/A				<0.04		<0.04
p,p-DDT	ug/L	0.04	N/A				<0.04		<0.04
Parathion	ug/L	0.1	N/A				<0.10		<0.10
Pentachloronitrobenzene	ug/L	0.1	N/A				<0.10		<0.10
Phorate	ug/L	0.1	MAC=2				<0.10		<0.10
Fenchlorphos (Ronnel)	ug/L	0.1	N/A				<0.10		<0.10
Simazine	ug/L	0.2	MAC=10				<0.20		<0.20
Sulfotep	ug/L	0.1	N/A				<0.10		<0.10
Terbufos	ug/L	0.1	MAC=1				<0.10		<0.10
Triallate	ug/L	0.1	N/A				<0.10		<0.10
Trifluralin	ug/L	0.2	MAC=45				<0.20		<0.20
cis-Permethrin	ug/L	0.1	N/A				<0.10		<0.10
trans-Permethrin	ug/L	0.1	N/A				<0.10		<0.10
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						

Figure 18: CARO Polycyclic Aromatic Hydrocarbon (PAH) Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Acenaphthene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Acenaphthylene	ug/L	0.05	N/A		<0.20		<0.20		<0.20
Acridine	ug/L	0.1	N/A		<0.10		<0.10		<0.10
Anthracene	ug/L	0.05	N/A		<0.01		<0.01		<0.01
Benz (a) anthracene	ug/L	0.05	N/A		<0.01		<0.01		<0.01
Benzo (a) pyrene	ug/L	0.01	MAC=0.01		<0.01		<0.01		<0.01
Benzo (b) fluoranthene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Benzo (g,h,i) perylene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Benzo (k) fluoranthene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Chrysene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Dibenz (a,h) anthracene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Fluoranthene	ug/L	0.05	N/A		<0.03		<0.03		<0.03
Fluorene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Indeno (1,2,3-cd) pyrene	ug/L	0.05	N/A		<0.05		<0.05		<0.05
Naphthalene	ug/L	0.3	N/A		<0.20		<0.20		<0.20
Phenanthrene	ug/L	0.1	N/A		<0.10		<0.10		<0.10
Pyrene	ug/L	0.1	N/A		<0.02		<0.02		<0.02
Quinoline	ug/L	0.1	N/A		<0.10		<0.10		<0.05
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						

Figure 19: CARO Volatile Organic Compounds (VOC) Analysis

Analyte	Units	Method detection limit	Drinking Water Guidline Level	Raw (March 16, 2016)	Noble Creek Booster Station (March 16, 2016)	Raw (June 28, 2016)	Memborial Booster Station (June 28, 2016)	Raw (Dec 1, 2016)	Aberdeen Booster Station (Dec 1, 2016)
Benzene	ug/L	0.5	MAC=5		<0.5		<0.5		<0.5
Bromodichloromethane	ug/L	1	N/A		1.1		<1.0		<1.0
Bromoform	ug/L	1	N/A		<1.0		<1.0		<1.0
Carbon tetrachloride	ug/L	1	MAC=2		<1.0		<1.0		<1.0
Chlorobenzene	ug/L	1	AO<=30		<1.0		<1.0		<1.0
Chloroethane	ug/L	2	N/A		<2.0		<2.0		<2.0
Chloroform	ug/L	1	N/A		33		29.2		40.9
Dibromochloromethane	ug/L	1	N/A		<1.0		<1.0		<1.0
1,2-Dibromoethane	ug/L	0.3	N/A		<0.3		<0.3		<0.3
Dibromomethane	ug/L	1	N/A		<1.0		<1.0		<1.0
1,2-Dichlorobenzene	ug/L	0.5	AO<=3		<0.5		<0.5		<0.5
1,3-Dichlorobenzene	ug/L	1	N/A		<1.0		<1.0		<1.0
1,4-Dichlorobenzene	ug/L	1	AO<=1		<1.0		<1.0		<1.0
1,1-Dichloroethane	ug/L	1	N/A		<1.0		<1.0		<1.0
1,2-Dichloroethane	ug/L	1	MAC=5		<1.0		<1.0		<1.0
1,1-Dichloroethene	ug/L	1	MAC=14		<1.0		<1.0		<1.0
1,2-Dichloroethene	ug/L	1	N/A		<1.0		<1.0		<1.0
1,2-Dichloropropane	ug/L	1	N/A		<1.0		<1.0		<1.0
cis-1,3-Dichloropropene	ug/L	1	N/A		<1.0		<1.0		<1.0
trans-1,3-Dichloropropene	ug/L	1	N/A		<1.0		<1.0		<1.0
Ethylbenzene	ug/L	1	AO<=1.6		<1.0		<1.0		<1.0
Methyl tert-butyl ether	ug/L	1	AO<=15		<1.0		<1.0		<1.0
Methylene chloride	ug/L	3	MAC=50		<3.0		<3.0		<3.0
Styrene	ug/L	0	N/A		<1.0		<1.0		<1.0
1,1,2,2-Tetrachloroethane	ug/L	1	N/A		<1.0		<1.0		<1.0
Tetrachloroethene	ug/L	1	MAC=30		<1.0		<1.0		<1.0
Toluene	ug/L	1	AO<=24		<1.0		<1.0		<1.0
1,1,1-Trichloroethane	ug/L	1	N/A		<1.0		<1.0		<1.0
1,1,2-Trichloroethane	ug/L	1	N/A		<1.0		<1.0		<1.0
Trichloroethene	ug/L	1	MAC=5		<1.0		<1.0		<1.0
Trichlorofluoromethane	ug/L	1	N/A		<1.0		<1.0		<1.0
Vinyl chloride	ug/L	2	MAC=2		<2.0		<2.0		<2.0
Xylenes (total)	ug/L	2	AO<=20		<2.0		<2.0		<2.0
MAC = Maximum Acceptable Concentration			AO = Aesthetic objective						