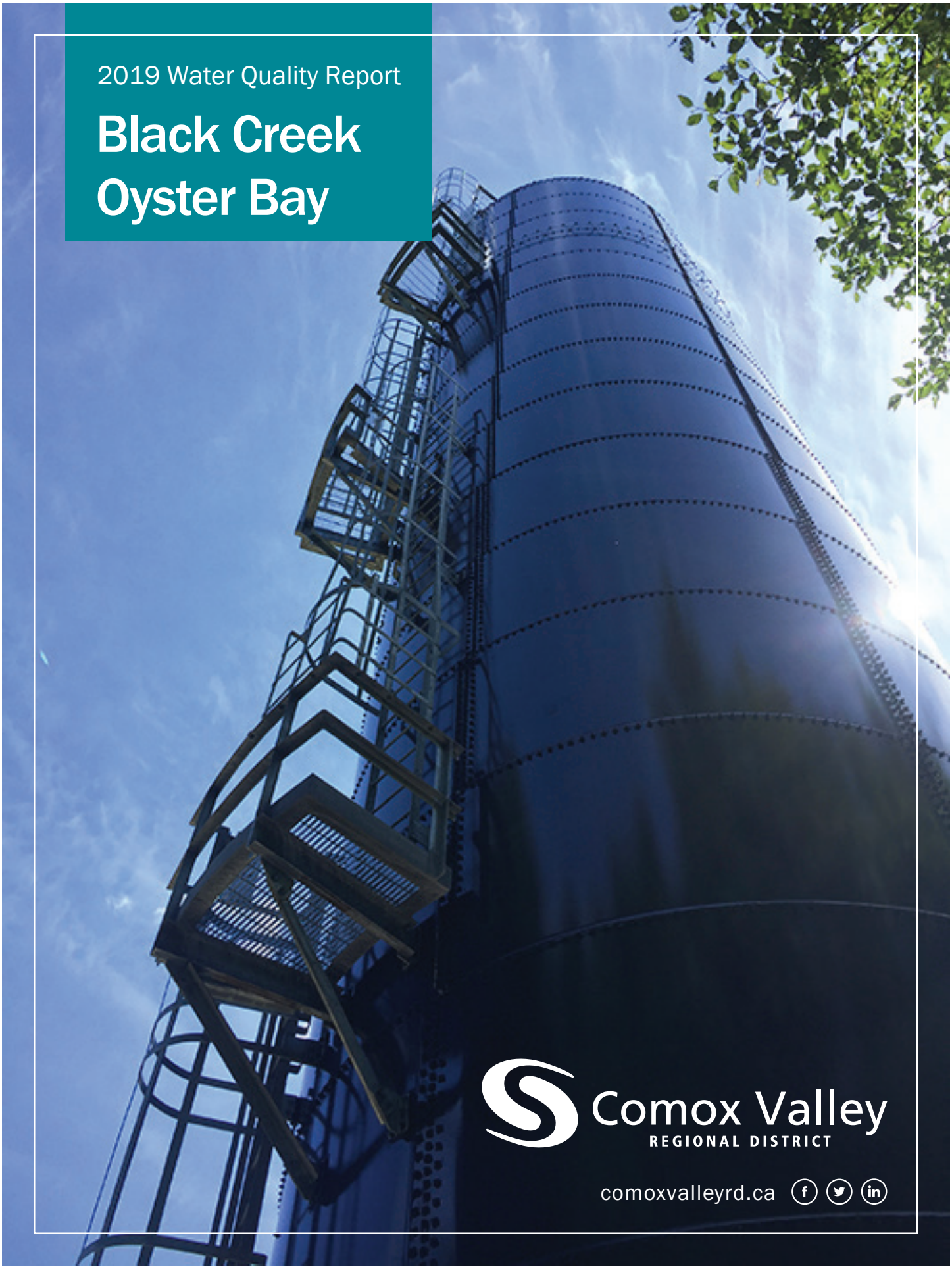
2019 Water Quality Report

Black Creek Oyster Bay



Comox Valley
REGIONAL DISTRICT

comoxvalleyrd.ca

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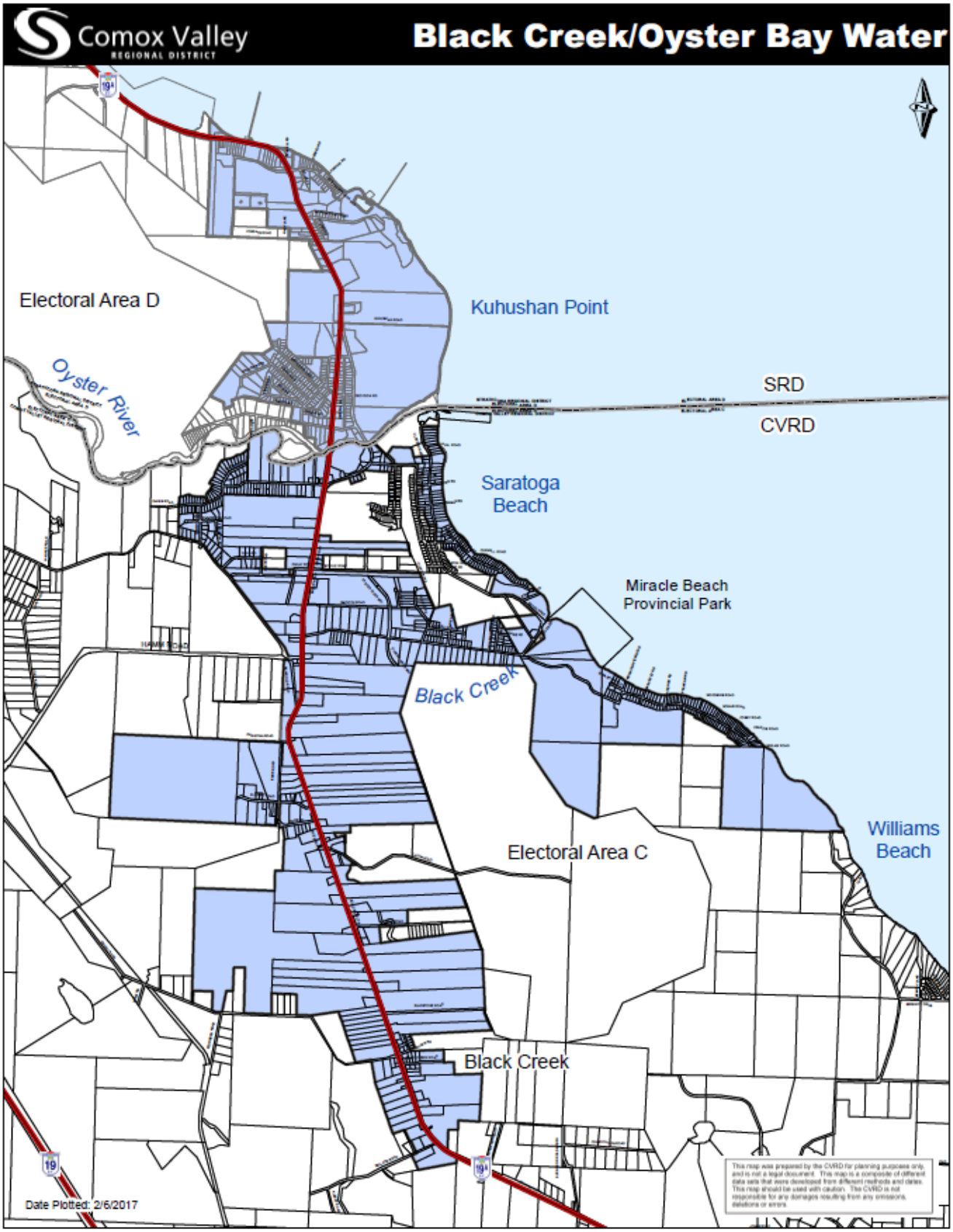
Map of Service Area



Introduction

The Comox Valley Regional District (CVRD) strives to provide high quality drinking water to the Black Creek/Oyster Bay (BCOB) Service Area, through responsible operation, monitoring and management of the water system. The CVRD is regulated by Island Health as part of the Ministry of Health for its activities as a potable water supplier. Under the *Drinking Water Protection Act* (DWP Act), the CVRD is required to report annually on water quality for the BCOB Drinking Water System. This report covers the period from January 1 to December 31, 2019 and includes information on water quality, consumption, maintenance and capital projects.

The BCOB Water Service provides domestic water to approximately 2,100 residents and 30 local businesses located in both the CVRD Puntledge – Black Creek (Electoral Area C) and the Strathcona Regional District Electoral Area D. The service is owned and operated by the CVRD for the benefit of both regional districts and is funded through a combination of frontage tax and user rates.

The service consists of two groundwater supply wells and one surface water infiltration gallery adjacent to the Oyster River. The water treatment facility utilizes chlorination, pH control systems, a chlorine gas scrubber, ultraviolet light (UV) disinfection and emergency backup power. The system also includes one pump station and two reservoirs located on Macaulay and Kelland Road.

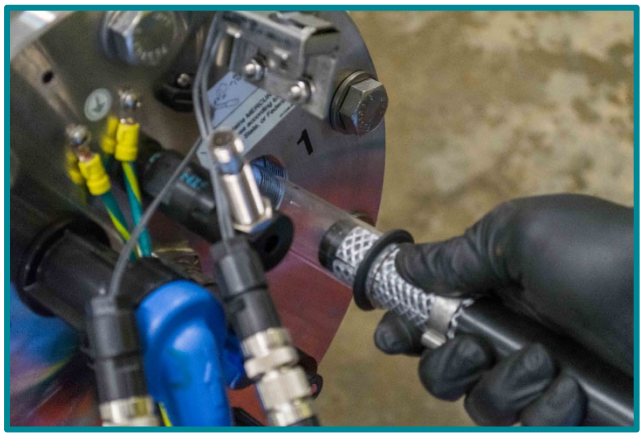


Figure No.1: Cleaning the UV Bulb Sleeves Inside the BCOB Water Treatment Facility.

Operations

Goals

To provide high quality drinking water to all customers through efficient and effective disinfection and distribution operations.

Water Quality Summary

Parameter[1]	2018	2019	Target
Source Water			
Source Water Turbidity (average nephelometric turbidity unit (NTU))	0.03	0.03	<1.0
Source Water Temperature (Celsius)	12.1	10.0	<15
Source Water pH Level	6.75	7.17	7.0-8.5
Water Treatment			
Chlorine Dose (mg/L)	1.13	1.15	<2.0
Distribution Water pH Level (after adjustment)	7.38	7.3	7.0-8.5
Distribution System			
Chlorine Residual-Distribution System (mg/L)	0.88	0.91	>0.20
Total Coliforms (positive samples)	0	0	0
E.Coli (positive samples)	0	0	0
Total Trihalomethanes (mg/L)	0.006	0.014	<0.1

[1]More information for each parameter is available later on in the report.

The Ministry of Health regulates municipal drinking water quality through the DWP Act and the *Drinking Water Protection Regulation* (the Regulation). The DWP Act and Regulation are administered by regional health authorities, and for the CVRD, the administering authority is Island Health. Both the DWP Act and Regulation set out certain requirements for drinking water operators and suppliers to ensure the provision of safe drinking water to their customers.

In the BCOB Water System, raw water enters the Oyster River treatment facility which utilizes UV and chlorine gas for the disinfection process. When water is drawn from the groundwater wells, caustic soda is used for pH adjustment. Once the raw water is treated it proceeds into the distribution system, which consists of two reservoirs and one booster pump station. The CVRD takes weekly water quality samples of the source water and treated water at four fixed locations within the distribution system to ensure that water is meeting provincial objectives. Quarterly testing for distribution by-products is taken from the Macaulay Road reservoir along with a water chemistry report being completed. A summary of water quality and a description of sampling results can be found below. For detailed water quality results refer to Appendix A.

Disinfection

All water supply systems governed by Island Health that are using surface water are required to adhere to provincial 4-3-2-1-0 surface water treatment objectives to ensure that the water treatment process is effectively killing disease causing viruses, bacteria and parasites. The 4-3-2-1-0 specifications are as follows:

- 4-log (99.99 per cent) removal/inactivation of viruses;
- 3-log (99.9 per cent) removal/inactivation of giardia cysts and cryptosporidium oocysts;
- 2 treatment processes, usually filtration and disinfection;
- 1 NTU turbidity (maximum) in finished water;
- No detectable E.Coli, fecal coliforms and total coliforms in treated water.

Figure No.2: Closing Valve within BCOB Treatment Facility

The system is fully compliant with Island Health's surface water treatment objectives and has obtained a filtration deferral permit for use of the Oyster River infiltration gallery. Water drawn from the river utilizes a two-step disinfection process for surface water, UV disinfection followed by chlorination. When water is being drawn out of groundwater wells caustic is also used to help raise the pH of the water.

By dosing the water with chlorine at the treatment plant a free chlorine residual is established throughout the distribution network to help prevent water from bacteriological regrowth. The free chlorine residual is an indicator of the effectiveness of disinfection within the distribution system. The CVRD strives to maintain a free chlorine residual above 0.2mg/L at the end of the system. The CVRD regularly monitors the chlorine residual throughout the distribution network at four fixed locations. Figure No.3 below provides the average chlorine residual at the four new sampling kiosks.

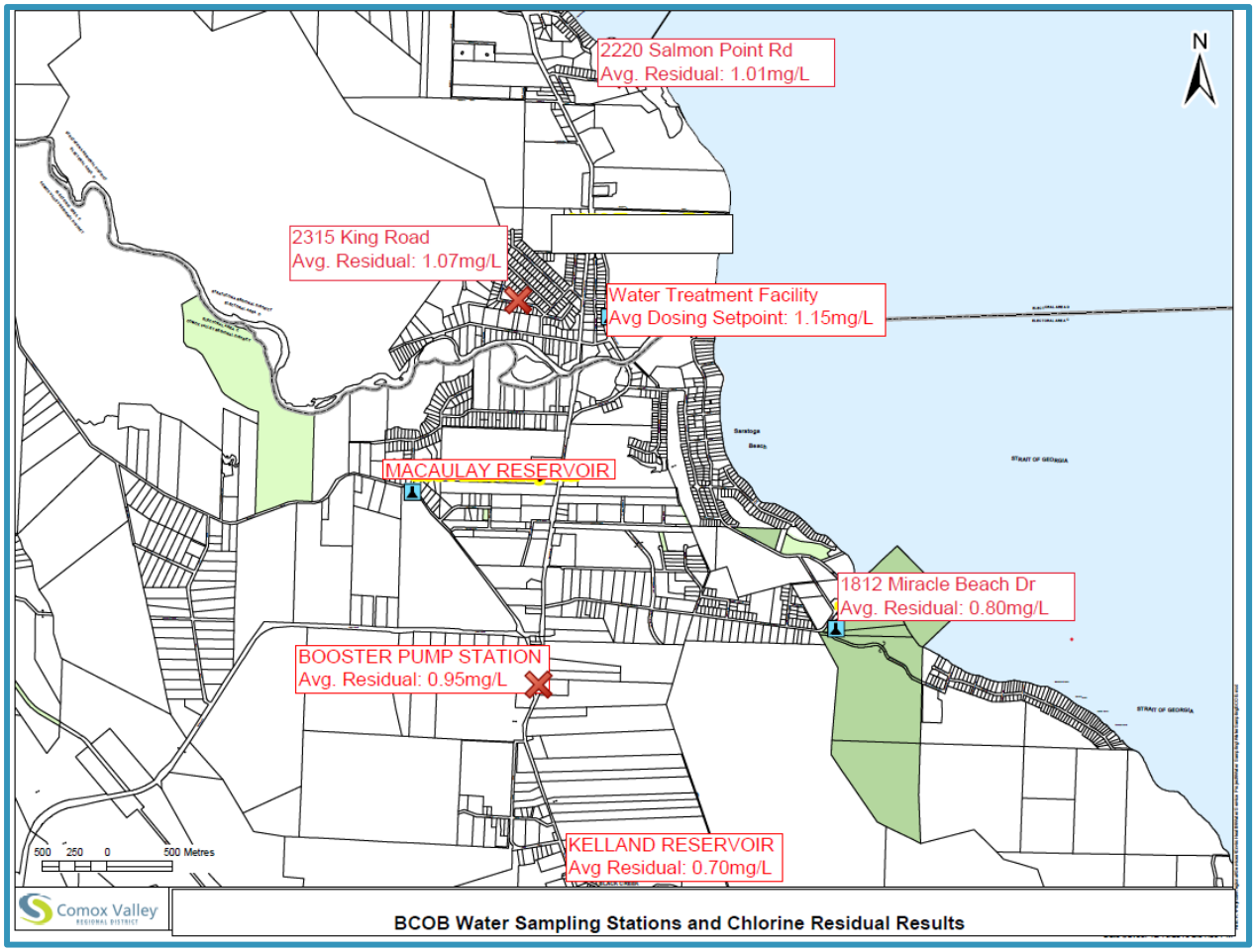


Figure No.3: Average Chlorine Residual at the BCOB Sampling Locations

A by-product of chlorination can be trihalomethanes (THM). There are four types of THM's that contribute to total THM's. Chloroform is the most common THM and is formed when natural organic matter reacts with chlorine and/or bromine in disinfected water. The guidelines require that the total THM's for drinking water must be less than 0.1mg/L. Samples for THM's are taken annually at the Macaulay Road reservoir Table No.1 below shows the average THM's at the Macaulay reservoir.

Table No.1: Total THM Concentration at the Macaulay Road Reservoir

Trihalomethanes	Macaulay Reservoir
Chloroform	0.012
Bromodichloromethane	0.002
Chlorodibromomethane	<0.001
Bromoform	<0.001
Average Total THMs (mg/L)	**0.014**

Bacteria

E.Coli and total coliform bacteria are microorganisms that if present in water samples indicate possible contamination with sewage or animal waste. Chlorination helps to remove harmful pathogens within the water supply network. Table No.2 below, shows that within the BCOB water distribution system for 2019, there were zero positive results found for E.Coli and total coliforms.

Table No.2: Bacteriological Standards and Sampling Results

Results	E.Coli		Total Coliform Bacteria	
	Exceedances[1]	# of Samples	Exceedances[2]	# of Samples
January	0	6	0	6
February	0	7	0	7
March	0	8	0	8
April	0	11	0	11
May	0	9	0	9
June	0	4	0	4
July	0	8	0	8
August	0	8	0	8
September	0	7	0	7
October	0	8	0	8
November	0	2	0	2
December	0	6	0	6
Totals	**0 exceedances per 84 samples**		**0 exceedances per 84 samples**	

[1]Standard-No detectable E.Coli per 100mL

[2]Standard-At least 90 per cent of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml

Canadian Drinking Water Guidelines

Health Canada develops the *Canadian Drinking Water Guidelines*. These are guidelines for limits on microbial, chemical, physical and radiological substances in drinking water. In the guidelines, there are health-based limits on a substance maximum allowable concentration. The guidelines also assign aesthetic objectives to substances that do not cause risk to human health, but will influence consumer acceptance of the water based on factors such as taste, odour and colour. Samples are taken tri-annually at the Macaulay Road reservoir, Table No.3 shows the average concentration for multiple parameters compared to the guideline concentrations. In 2019, the system was below all maximum allowable concentrations as illustrated in the Table No.3.

More information on the parameters listed below, including common sources and health considerations, can be found on the Health Canada website.

Table No.3: Chemical and Physical Parameters at Macaulay Reservoir Compared to Guideline Concentrations

Parameter	Macaulay Reservoir (mg/L)	Guideline Concentration (mg/L)
Aluminum	0.0032	≤0.1
Arsenic	<0.0001	≤0.01
Barium	<0.001	≤1.0
Boron	<0.05	≤5.0
Chloride	4.9	250
Chromium	<0.001	≤0.05
Colour	<5 (TCU)	<15(TCU)
Copper	0.00112	1
Fluoride	<0.050	≤1.5
Iron	<0.005	≤0.30
Lead	<0.0002	≤0.01
Manganese	<0.001	≤0.05
Nitrite (as N)	<0.0050	10
Selenium	<0.0001	≤0.05
Sodium	28.4	≤200
Zinc	<0.005	≤5

Turbidity

The *Canadian Drinking Water Guidelines* also require the turbidity to be below 1 NTU. Turbidity is the measure of relative clarity of a liquid. Clarity is important when producing drinking water for human consumption. The average source water turbidity was 0.03 NTU.

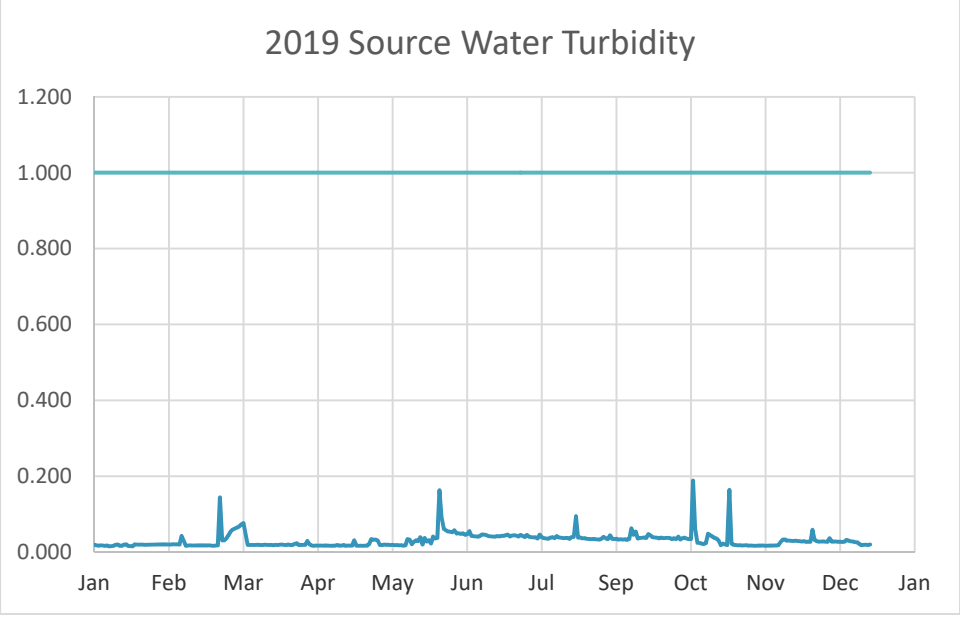


Figure No.4: Source Water Turbidity

Temperature
Temperature is described as an aesthetic objective (a parameter that may impair the taste, smell or colour of water) and physical characteristic of water. Gradual variations in water temperature occur throughout the seasons, however signifcant changes in water temperature can upset chlorination and chemical water treatment processess. The guidelines recommend water temperature to be less than 15°Celsius. The average temperature for the incoming source water was 10.0º Celsius and within the distribution was 13.6º Celsius.

pH
The pH of water is a measure of water acidity. pH has minimal impact for water consumers and varies greatly depending on the water source. However, pH is very important for many operational water quality parameters. The *Canadian Drinking Water Guidelines* recommend the pH ranging between 7 to 10.5. In 2019, the average pH of the source water was 7.17 and the average pH within the distribution system was 7.3.

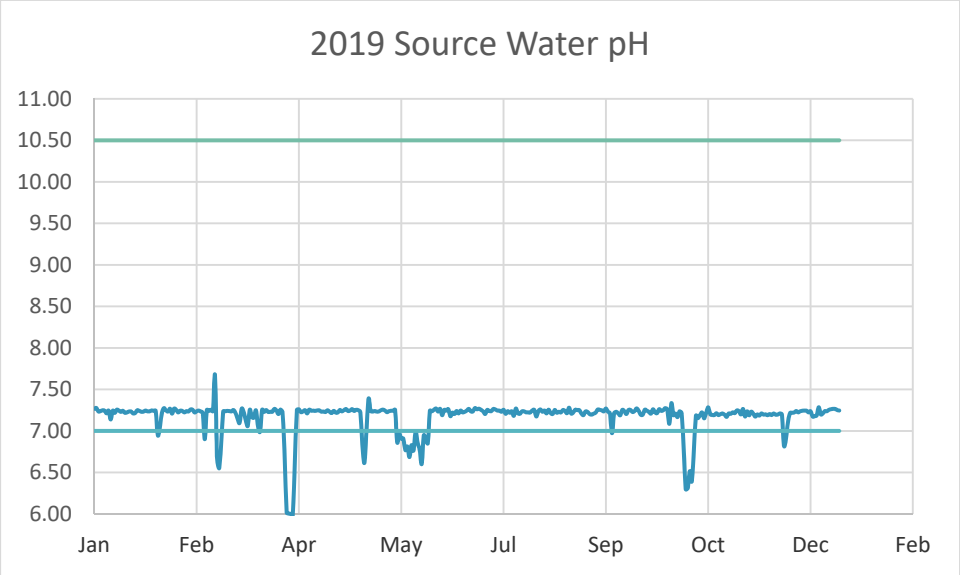


Figure No.5: Source Water pH

Planning

Goals
To ensure effective long-term planning and management programs are in place to meet the needs of all users groups while minimizing operation and infrastructure costs.

Consumption
In 2019, the CVRD treated a total of 356,258m^3 of water. The average daily water consumption for the system is 976m^3/day. For the BCOB Water System, surface water and groundwater sources are typically rotated seasonally depending on turbidity and system demand. A water conservation bylaw was adopted for the BCOB Water System in April 2018. The purpose of the bylaw is to help reduce water use in the summer months when water consumption increases and water availability decreases, since adoption of the bylaw in 2018 a seven per cent reduction in the max day demand occurred. There are a number of factors that contribute to system demands and further review of future years will be required to determine the effectiveness of watering restrictions. The maximum day demand was 1,872m^3 and occurred on August 31, 2019. Stage 1 water restrictions take effect yearly on

May 1st and Stage 2 restrictions take effect yearly on July 1st. However it can be seen that during the summer months water consumption is increasing approximately two fold from the average day demand, as shown in the Figure No.6 below.

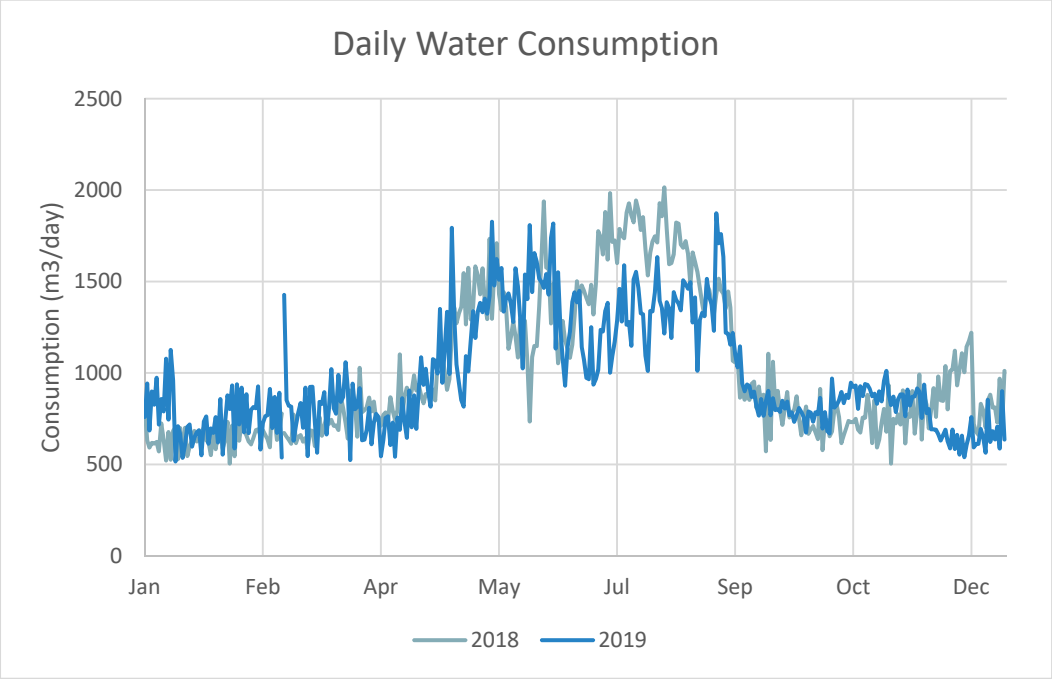


Figure No.6: Daily Water Consumption in BCOB for 2018 and 2019

Maintenance

The BCOB Water System is owned and operated by the CVRD. The water services staff consists of eight operators with varying ranges of certification. Each operator is registered with the Environmental Operator's Certification Program within BC and is required to remain in good standing by taking yearly continuing education courses.

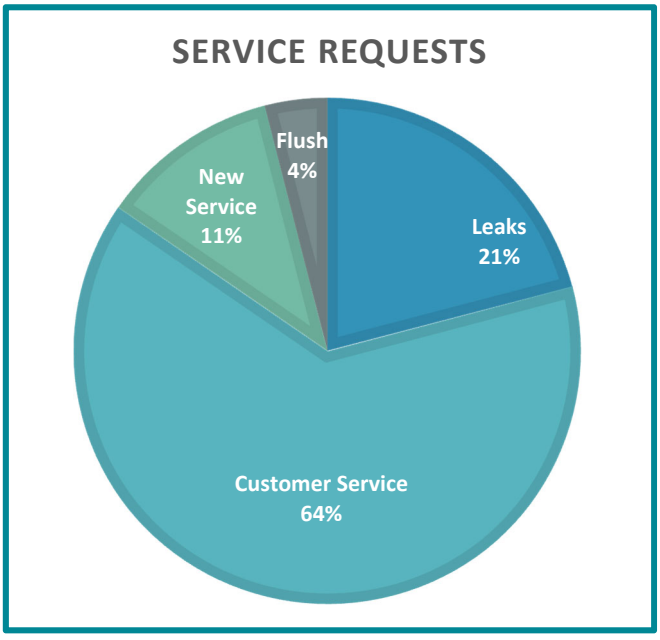


Figure No.7: Service Requests by Category

The CVRD carries out regular and routine maintenance of the entire BCOB Water System, to ensure continued operation and supply of safe and clean water to all users. The treatment facility, wells, distribution lines and reservoirs are regularly inspected and maintained.

201 service requests within the system were investigated by CVRD Waterworks Operations Staff. Figure No.7 identifies the various types of service requests received by waterworks staff.

Financial

An application to the Clean Water and Wastewater Fund (CWWF) was submitted in 2016 for grant funding for the installation of a new water supply well for the system. The CVRD was informed in spring 2017 that the application was successful. The project is 83 per cent funded by the CWWF and the CVRD will be proceeding with the drilling, engineering and construction of a new production well. The new well will help to alleviate capacity concerns for the system in the dry summer months. Funding for the project expires in March 31, 2021.

In 2018 and 2019, the CVRD continued to work with the Strathcona Regional District to secure their approval for installation of the new production well in the Oyster River Nature Park, and study ground water availability within the Oyster River Nature Park was continued. An assessment of the river infiltration gallery was also completed in 2019, and took a comprehensive look at the capacity of the gallery and anticipated effects of climate change.

Discussions on conversion of Watutco Water System to a CVRD service was continued in 2019, including approval by the BCOB Services Committee for completion of a petition process for electoral assent. Further discussions with the owner of the system and development of cost per connection information was complete in 2019. An information session for residents and completion of the petition process is planned for 2020.

A detailed asset management plan for the service was complete in 2019 and includes a comprehensive asset inventory, review of the condition of current infrastructure, required levels of service and long term asset replacement requirements. A five per cent increase in water rates was approved in 2019 based on the outcomes of the asset management work, a comprehensive rate review will be completed in 2020 to develop a long term rate schedule for the service.

2019 Accomplishments

- ✓ Completed an assessment of the Oyster River infiltration gallery, including anticipated effects of climate change on the system.
- ✓ Farm status rebate program continued for an additional two years.
- ✓ Completion of the detailed asset management plan for the service.
- ✓ Finalization of the Watutco Water System feasibility study and approval by the BCOB Services Committee to proceed with negotiations with Pacific Playgrounds and assent process by way of petition.
- ✓ Install new meters along highway to improve meter-reading efficiency and operator safety.

2020 Objectives

- Pending development in the area, replace a watermain along Oyster River Way and Paulson Road.
- Complete the design and construction of the new production well project (2020 & 2021).
- Proceed with assent process for conversion of Watutco Water System to a CVRD service.
- Comprehensive rate review for the service based on results of asset management plan.

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
01-Jan	759		0.02	7.27	1.18													
02-Jan	942	7.0	0.02	7.28	1.17	0.78		0.9	1.23		<1	<1			<1	<1		
03-Jan	685		0.02	7.23	1.17													
04-Jan	898	7.7	0.02	7.24	1.18													
05-Jan	827		0.02	7.25	1.16													
06-Jan	974		0.02	7.24	1.16													
07-Jan	718	6.7	0.02	7.21	1.16	0.72												
08-Jan	857	6.7	0.02	7.24	1.15	0.78	1.05			1.3			<1	<1			<1	<1
09-Jan	790	6.4	0.02	7.14	1.18	0.78												
10-Jan	1077		0.02	7.24	1.15													
11-Jan	745	7.5	0.02	7.22	1.18	0.78												
12-Jan	1126		0.02	7.26	1.17													
13-Jan	959		0.02	7.25	1.17													
14-Jan	515	6.7	0.02	7.23	1.17	0.73		1.21	0.81		<1	<1			<1	<1		
15-Jan	709	6.6	0.02	7.24	1.15													
16-Jan	665	6.8	0.02	7.22	1.20	0.76												
17-Jan	536		0.02	7.22	1.15													
18-Jan	607	6.9	0.02	7.23	1.17	0.78												
19-Jan	706		0.02	7.23	1.14													
20-Jan	718		0.02	7.21	1.16													
21-Jan	597	6.3	0.02	7.22	1.18	0.79	1.01			1.22								
22-Jan	647	6.4	0.02	7.25	1.14	0.78												
23-Jan	675	6.8	0.02	7.24	1.17	0.78												
24-Jan	686	6.9	0.02	7.23	1.17	0.78												
25-Jan	550		0.02	7.23	1.12													
26-Jan	733		0.02	7.25	1.12													
27-Jan	762		0.02	7.24	1.15													
28-Jan	613	7.6	0.02	7.24	1.15	0.76												
29-Jan	696		0.02	7.25	1.13													
30-Jan	673	6.5	0.02	7.24	1.14	0.90												
31-Jan	758		0.02	7.24	1.15													
01-Feb	620	6.7	0.02	6.95	1.17	0.80												
02-Feb	857		0.02	7.03	1.14													
03-Feb	553		0.02	7.21	1.15													
04-Feb	729	6.6	0.02	7.27	1.17			0.9	1.2		<1	<1			<1			
05-Feb	877		0.02	7.25	1.17													
06-Feb	803	6.6	0.02	7.23	1.15	0.78												
07-Feb	931	7.0	0.02	7.27	1.15													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
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08-Feb	588	7.5	0.02	7.21	1.14	0.78												
09-Feb	937		0.02	7.27	1.14													
10-Feb	719		0.02	7.25	1.11													
11-Feb	919	6.3	0.04	7.22	1.15	0.79	1.23						<1/<1/<1				<1/<1/<1	
12-Feb	676	7.0	0.03	7.24	1.13	0.80												
13-Feb	883	7.1	0.02	7.24	1.16	0.79												
14-Feb	671		0.02	7.22	1.17													
15-Feb	797	7.4	0.02	7.24	1.14													
16-Feb	813		0.02	7.23	1.12													
17-Feb	807		0.02	7.26	1.17													
18-Feb	926		0.02	7.26	1.19													
19-Feb	581	7.3	0.02	7.22	1.17	0.78		0.36			<1				<1			
20-Feb	725	7.0	0.02	7.24	1.16													
21-Feb	764		0.02	7.25	1.18													
22-Feb	769	7.7	0.02	7.23	1.15	0.86												
23-Feb	912		0.02	7.22	1.15													
24-Feb	698		0.02	6.90	1.12													
25-Feb	868	7.3	0.02	7.25	1.16	0.85							<1				<1	
26-Feb	673		0.02	7.24	1.15													
27-Feb	891	7.3	0.02	7.25	1.16													
28-Feb	538		0.02	7.24	1.15													
01-Mar	1427	6.3	0.14	7.67	1.09	0.84												
02-Mar	851		0.03	6.66	1.11													
03-Mar	820		0.03	6.55	1.11													
04-Mar	816	7.0	0.04	6.84	1.13	0.83					<1	<1			<1	<1		
05-Mar	630		0.04	7.23	1.18													
06-Mar	715		0.05	7.24	1.17													
07-Mar	781	7.0	0.06	7.24	1.19													
08-Mar	835	7.4	0.06	7.24	1.19													
09-Mar	700		0.06	7.24	1.12													
10-Mar	919		0.07	7.25	1.18													
11-Mar	546	7.8	0.07	7.22	1.15	0.81	1.3			1.29			<1	<1			<1	<1
12-Mar	923		0.08	7.15	1.15													
13-Mar	924	8.0	0.05	7.10	1.18	0.81												
14-Mar	728		0.02	7.27	1.17													
15-Mar	564	8.6	0.02	7.23	1.21	0.81												
16-Mar	841		0.02	7.13	1.16													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
17-Mar	831		0.02	7.06	1.20													
18-Mar	895	8.3	0.02	7.26	1.18	0.81		1.01	1.22		<1	<1			<1	<1		
19-Mar	664	8.4	0.02	7.17	1.19													
20-Mar	805	8.8	0.02	7.16	1.18	0.81												
21-Mar	1021		0.02	7.25	1.20													
22-Mar	806	9.3	0.02	7.05	1.16	0.80												
23-Mar	777		0.02	6.99	1.16													
24-Mar	989		0.02	7.25	1.16													
25-Mar	842	8.7	0.02	7.23	1.14		0.99			1.13			<1	<1			<1	<1
26-Mar	869	9.1	0.02	7.25	1.13	0.79												
27-Mar	1059		0.02	7.23	1.18													
28-Mar	910	9.0	0.02	7.23	1.18													
29-Mar	524	8.9	0.02	7.23	1.21													
30-Mar	941		0.02	7.27	1.14													
31-Mar	802		0.02	7.25	1.20													
01-Apr	815	7.2	0.02	7.20	1.19			0.76	1.23		<1	<1			<1	<1		
02-Apr	916		0.02	7.26	1.21													
03-Apr	632	9.6	0.02	7.22	1.19	0.78												
04-Apr	635		0.02	6.70	1.18													
05-Apr	689	8.3	0.02	6.02	1.17	0.79												
06-Apr	809		0.02	6.01	1.19													
07-Apr	610		0.02	6.00	1.19													
08-Apr	729	8.6	0.02	5.99	1.20		1.03			1.03			<1	<1			<1	<1
09-Apr	776		0.02	6.62	1.19													
10-Apr	759	9.2	0.02	7.25	1.13	0.77												
11-Apr	545	8.8	0.03	7.26	1.14	0.76												
12-Apr	634	8.1	0.02	7.23	1.18	0.76												
13-Apr	754		0.02	7.24	1.13													
14-Apr	763		0.02	7.25	1.16													
15-Apr	606	9.4	0.02	7.21	1.17			0.73	1.01		<1	<1			<1	<1		
16-Apr	728		0.02	7.26	1.12													
17-Apr	542	9.6	0.02	7.24	1.18													
18-Apr	755	9.2	0.02	7.24	1.11													
19-Apr	689		0.02	7.24	1.16													
20-Apr	861		0.02	7.25	1.13													
21-Apr	728		0.02	7.25	1.12													
22-Apr	645		0.02	7.23	1.17													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
23-Apr	904	9.2	0.02	7.23	1.16	0.72	0.74			1.03			<1	<1			<1	<1
24-Apr	703	9.7	0.02	7.23	1.18	0.71												
25-Apr	877		0.02	7.25	1.21													
26-Apr	694	9.8	0.02	7.23	1.15	0.69												
27-Apr	905		0.02	7.22	1.18													
28-Apr	1086		0.02	7.24	1.19													
29-Apr	935	10.0	0.02	7.22	1.16	0.64	0.93			1.04	<1		<1	<1	<1		<1	<1
30-Apr	1022		0.02	7.22	1.18													
01-May	899	10.0	0.02	7.25	1.18													
02-May	816		0.02	7.24	1.16													
03-May	1075	10.3	0.03	7.25	1.16	0.66												
04-May	1066		0.02	7.26	1.16													
05-May	997		0.02	7.24	1.18													
06-May	1349	10.4	0.02	7.25	1.14	0.80		1	1.04		<1	<1			<1	<1		
07-May	947		0.02	7.26	1.18													
08-May	1121	10.1	0.02	7.24	1.12													
09-May	1334		0.02	7.26	1.20													
10-May	994	10.0	0.02	7.25	1.10													
11-May	1793		0.03	7.23	1.14													
12-May	1313		0.03	6.83	1.08													
13-May	1047	11.1	0.03	6.62	1.04	0.99							<1	<1			<1	<1
14-May	947		0.03	7.00	1.16													
15-May	851		0.02	7.39	1.11													
16-May	816	10.7	0.02	7.24	1.14	1.17												
17-May	1092	10.5	0.02	7.23	1.17													
18-May	1008		0.02	7.24	1.17													
19-May	1175		0.02	7.23	1.18													
20-May	1337		0.02	7.23	1.21													
21-May	1192	10.3	0.02	7.25	1.18	0.98		0.62	1.02		<1	<1			<1	<1		
22-May	1334		0.02	7.26	1.19													
23-May	1383	10.8	0.02	7.25	1.22	0.93												
24-May	1332	11.1	0.02	7.23	1.21													
25-May	1406		0.02	7.24	1.20													
26-May	1324		0.02	7.24	1.20	0.85												
27-May	1423	11.6	0.02	7.24	1.20		1.15			1.17	<1		<1	<1	<1		<1	<1
28-May	1827		0.03	7.25	1.18													
29-May	1478		0.03	6.87	1.19													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
30-May	1623		0.02	6.97	1.15													
31-May	1510		0.03	6.91	1.13													
01-Jun	1574		0.03	6.91	1.17													
02-Jun	1336		0.03	6.77	1.16													
03-Jun	1410	10.9	0.04	6.81	1.17			1.1	1.08		<1	<1			<1	<1		
04-Jun	1434		0.02	6.69	1.18													
05-Jun	1381	11.1	0.04	6.83	1.18													
06-Jun	1279		0.03	6.76	1.15													
07-Jun	1571	11.0	0.03	6.99	1.17													
08-Jun	1474		0.02	6.86	1.13													
09-Jun	1288		0.04	6.77	1.13													
10-Jun	1025	11.0	0.04	6.60	1.13		1.06			1.16								
11-Jun	1538		0.04	6.95	1.19													
12-Jun	1404	11.9	0.16	6.89	1.20													
13-Jun	1808		0.09	6.85	1.14													
14-Jun	1442	13.3	0.06	7.24	1.10													
15-Jun	1655		0.06	7.24	1.13													
16-Jun	1609		0.05	7.26	1.14													
17-Jun	1516	14.4	0.05	7.27	1.10			0.21	0.53									
18-Jun	1497	13.8	0.05	7.23	1.16													
19-Jun	1465	13.8	0.06	7.27	1.29													
20-Jun	1540		0.05	7.19	1.29													
21-Jun	1429	14.1	0.05	7.25	1.34	0.41												
22-Jun	1740		0.05	7.25	1.33													
23-Jun	1817		0.05	7.26	1.40													
24-Jun	1133	14.2	0.05	7.18	1.28	0.44	0.68			0.64			<1	<1			<1	<1
25-Jun	1550		0.05	7.22	1.32													
26-Jun	1237	14.5	0.06	7.20	1.27													
27-Jun	1075		0.04	7.24	1.22													
28-Jun	930	13.8	0.04	7.21	1.17	0.34												
29-Jun	1140		0.04	7.25	1.21													
30-Jun	1224		0.04	7.22	1.33													
01-Jul	1388		0.04	7.23	1.26													
02-Jul	1441	15.3	0.05	7.25	1.30	0.29		0.66	1.17		<1	<1			<1	<1		
03-Jul	1387		0.05	7.27	1.26													
04-Jul	1449		0.04	7.24	1.35													
05-Jul	1142	14.9	0.04	7.24	1.21	0.29												

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
06-Jul	1072		0.04	7.28	1.19													
07-Jul	973		0.04	7.26	1.15													
08-Jul	966	14.5	0.04	7.27	1.18		0.67			1			<1	<1			<1	<1
09-Jul	1250		0.04	7.25	1.20													
10-Jul	937	15.1	0.04	7.24	1.10	0.29												
11-Jul	966		0.04	7.20	1.13													
12-Jul	1018	14.9	0.04	7.25	1.12	0.43												
13-Jul	1235		0.04	7.24	1.20													
14-Jul	1227		0.05	7.24	1.24													
15-Jul	1340	15.3	0.04	7.26	1.30			0.81	1.13		<1	<1			<1	<1		
16-Jul	1383		0.04	7.26	1.28													
17-Jul	1001	15.5	0.04	7.25	1.12													
18-Jul	1093		0.04	7.24	1.17													
19-Jul	1171	14.3	0.04	7.23	1.18													
20-Jul	1286		0.04	7.25	1.26													
21-Jul	1459		0.04	7.21	1.30													
22-Jul	1281	15.2	0.04	7.24	1.25		0.79			0.97			<1	<1			<1	<1
23-Jul	1588		0.05	7.22	1.35													
24-Jul	1263		0.04	7.24	1.26													
25-Jul	1279	16.2	0.04	7.18	1.19													
26-Jul	1148		0.04	7.27	1.24	1.04												
27-Jul	1513		0.04	7.21	1.34													
28-Jul	1553		0.04	7.21	1.29													
29-Jul	1464	16.5	0.05	7.24	1.29	0.97												
30-Jul	1326		0.04	7.24	1.28													
31-Jul	1321	16.1	0.04	7.22	1.27	0.86												
01-Aug	1094		0.04	7.22	1.19													
02-Aug	1011	15.6	0.04	7.22	1.16	0.76												
03-Aug	1338		0.04	7.25	1.35													
04-Aug	1337		0.04	7.25	1.31													
05-Aug	1441		0.04	7.17	1.28													
06-Aug	1633	16.9	0.04	7.24	1.31	0.62		0.85	0.98		<1	<1			<1	<1		
07-Aug	1394		0.04	7.26	1.33													
08-Aug	1355		0.04	7.23	1.25	0.54												
09-Aug	1216		0.04	7.25	1.26	0.51												
10-Aug	1386		0.04	7.21	1.30													
11-Aug	1355		0.04	7.26	1.31													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
12-Aug	1191	15.9	0.03	7.22	1.27	0.45	0.77			1.12			<1	<1			<1	<1
13-Aug	1442	16.1	0.04	7.20	1.29													
14-Aug	1400		0.04	7.25	1.32													
15-Aug	1378	16.5	0.09	7.22	1.29	0.40												
16-Aug	1343	16.5	0.04	7.23	1.22	0.39												
17-Aug	1506		0.04	7.22	1.38													
18-Aug	1486		0.04	7.25	1.31													
19-Aug	1461	16.9	0.04	7.24	1.28	0.37		0.87	1.28		<1	<1			<1	<1		
20-Aug	1495		0.04	7.21	1.35	0.38												
21-Aug	1277		0.03	7.28	1.32													
22-Aug	1413	15.5	0.03	7.21	1.33													
23-Aug	1012	15.7	0.03	7.22	1.19	0.37												
24-Aug	1289		0.03	7.25	1.30													
25-Aug	1328		0.03	7.25	1.27													
26-Aug	1311	15.6	0.03	7.25	1.34		0.95			1.04			<1	<1			<1	<1
27-Aug	1514	15.7	0.04	7.21	1.32													
28-Aug	1413		0.04	7.19	1.31													
29-Aug	1377		0.04	7.23	1.31													
30-Aug	1230		0.03	7.23	1.28	0.28												
31-Aug	1872		0.04	7.20	1.35													
01-Sep	1709		0.04	7.20	1.36													
02-Sep	1759		0.03	7.21	1.34													
03-Sep	1635		0.04	7.22	1.34													
04-Sep	1220	16.0	0.03	7.26	1.25	0.21		0.97	1.11		<1	<1			<1	<1		
05-Sep	1214		0.03	7.25	1.30													
06-Sep	1154	15.6	0.03	7.25	1.21	0.19												
07-Sep	1218		0.03	7.24	1.25													
08-Sep	1101		0.03	7.27	1.21													
09-Sep	1031	15.3	0.03	7.23	1.20	0.17	1.02			1.08			<1/<1	<1			<1/<1	<1
10-Sep	1145		0.06	7.21	1.15													
11-Sep	942		0.05	6.97	1.17													
12-Sep	900	14.3	0.05	7.21	1.02													
13-Sep	937		0.04	7.23	1.10	0.18												
14-Sep	928		0.04	7.21	1.08													
15-Sep	869		0.04	7.19	1.09													
16-Sep	897		0.04	7.25	1.08			0.49	0.58		<1	<1			<1	<1		
17-Sep	817	12.3	0.04	7.24	1.06	0.16												

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
18-Sep	767	12.5	0.05	7.20	1.03	0.17												
19-Sep	857	12.7	0.04	7.25	1.04	0.17												
20-Sep	766		0.04	7.25	1.06													
21-Sep	845		0.04	7.23	1.03													
22-Sep	902		0.04	7.24	1.06													
23-Sep	769	12.4	0.04	7.27	0.99		0.76			0.92							<1	<1
24-Sep	862		0.04	7.24	1.04													
25-Sep	797	12.6	0.04	7.20	1.05													
26-Sep	802		0.04	7.20	1.05													
27-Sep	787	10.9	0.04	7.26	1.03													
28-Sep	847		0.04	7.24	1.09													
29-Sep	805		0.03	7.23	1.08													
30-Sep	843		0.04	7.21	1.03													
01-Oct	769		0.03	7.26	1.06													
02-Oct	784	10.1	0.04	7.22	0.99													
03-Oct	732		0.03	7.21	1.06													
04-Oct	769		0.04	7.26	0.99													
05-Oct	808		0.04	7.24	0.99													
06-Oct	787		0.04	7.25	1.01													
07-Oct	759	10.1	0.03	7.27	1.00	0.43		0.43	0.66		<1	<1			<1	<1		
08-Oct	674		0.03	7.26	0.96													
09-Oct	789	8.7	0.19	7.09	1.03	0.37												
10-Oct	782		0.06	7.33	1.06													
11-Oct	734	8.7	0.02	7.19	1.00	0.40												
12-Oct	785		0.02	7.21	1.01													
13-Oct	774		0.02	7.17	1.05													
14-Oct	863		0.02	7.24	1.06													
15-Oct	696	9.1	0.02	7.21	1.07	0.36							<1	<1/<1/<1			<1	<1/<1/<1
16-Oct	786		0.05	6.80	1.03													
17-Oct	681	9.5	0.04	6.30	1.01													
18-Oct	669	9.1	0.04	6.31	1.01	0.38												
19-Oct	969		0.04	6.51	1.02													
20-Oct	811		0.04	6.39	1.01													
21-Oct	825	9.1	0.03	6.78	1.00	0.39		0.88	0.95		<1	<1			<1	<1		
22-Oct	850		0.02	7.18	0.98													
23-Oct	895	8.8	0.02	7.16	1.03	0.40												
24-Oct	835		0.02	7.19	0.99													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
25-Oct	880	9.1	0.02	7.22	1.00	0.42												
26-Oct	864		0.16	7.15	0.91													
27-Oct	946		0.02	7.22	1.06													
28-Oct	924		0.02	7.28	0.86													
29-Oct	931		0.02	7.20	1.03													
30-Oct	803	7.6	0.02	7.19	1.02													
31-Oct	927	8.1	0.02	7.19	0.98	0.41												
01-Nov	874	8.6	0.02	7.21	1.06	0.50												
02-Nov	940		0.02	7.19	1.05													
03-Nov	935		0.02	7.20	1.07													
04-Nov	913	9.0	0.02	7.21	1.01	0.63		1.01	1.01		<1	<1			<1	<1		
05-Nov	873		0.02	7.20	0.97													
06-Nov	886	9.1	0.02	7.17	1.03	0.78												
07-Nov	832		0.02	7.21	0.99													
08-Nov	899	8.8	0.02	7.21	1.02	0.74												
09-Nov	845		0.02	7.22	1.02													
10-Nov	957		0.02	7.22	1.00													
11-Nov	1011		0.02	7.25	1.02													
12-Nov	884	8.9	0.02	7.24	1.03	0.69												
13-Nov	825	9.0	0.02	7.20	1.01	0.68												
14-Nov	870		0.02	7.26	0.99													
15-Nov	786	9.2	0.02	7.17	1.04	0.66												
16-Nov	855		0.02	7.24	1.07													
17-Nov	883		0.02	7.19	1.02													
18-Nov	883	9.2	0.02	7.23	0.98	0.95												
19-Nov	764	9.1	0.03	7.21	1.03													
20-Nov	909	8.5	0.03	7.17	1.02	1.24												
21-Nov	822		0.03	7.20	1.03													
22-Nov	869	7.5	0.03	7.19	1.02	1.25												
23-Nov	872		0.03	7.21	0.99													
24-Nov	915		0.03	7.20	0.97													
25-Nov	899	7.7	0.03	7.20	1.04	1.16												
26-Nov	754		0.03	7.19	1.03													
27-Nov	936	6.8	0.03	7.20	1.05	1.10												
28-Nov	781	6.5	0.03	7.19	1.03	1.08												
29-Nov	802	6.5	0.03	7.21	1.00	1.05												
30-Nov	692		0.03	7.20	0.99													

Date	SOURCE WATER				DISTRIBUTION SYSTEM													
					Chlorine Residuals (mg/L)						E.Coli				Total Coliforms			
	Total Water Consumption (m3)	Temp (˚C)	Turbidity (NTU)	pH	Calculated Chlorine Dose	Kelland Reservoir	8527 Island Hwy	1812 Miracle Beach	2220 Salmon Pt Rd	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road	1812 Miracle Beach	2220 Salmon Pt Rd	8527 Island Hwy	2315 King Road
01-Dec	692		0.03	7.20	1.01													
02-Dec	689	6.5	0.03	7.21	1.01	1.00		0.99	1.05		<1				<1			
03-Dec	665		0.03	7.20	0.99													
04-Dec	630	7.2	0.06	6.82	0.98	0.97												
05-Dec	659		0.03	6.91	1.08													
06-Dec	689	7.2	0.03	7.11	1.03	1.11												
07-Dec	625		0.03	7.22	1.06													
08-Dec	588		0.03	7.22	1.09													
09-Dec	690	7.6	0.03	7.22	1.07								<1	<1			<1	<1
10-Dec	584		0.03	7.24	1.04													
11-Dec	661	7.8	0.03	7.22	1.01													
12-Dec	553		0.04	7.24	1.07													
13-Dec	657	7.5	0.03	7.24	1.03													
14-Dec	539		0.03	7.25	1.07													
15-Dec	606		0.03	7.24	1.04													
16-Dec	657	6.9	0.03	7.22	1.02	0.98		0.88	1.02		<1				<1			
17-Dec	758		0.03	7.24	1.04													
18-Dec	593	7.4	0.03	7.17	1.01	0.98												
19-Dec	610	7.4	0.03	7.18	1.03	1.08												
20-Dec	612	7.4	0.03	7.19	1.00	1.17												
21-Dec	694		0.03	7.28	1.01													
22-Dec	650		0.03	7.20	1.05													
23-Dec	564	6.2	0.03	7.21	1.08	1.09	0.96			1.04			<1	<1			<1	<1
24-Dec	852	6.8	0.03	7.24	1.07	1.43												
25-Dec	622		0.03	7.24	1.08													
26-Dec	681		0.02	7.25	1.08													
27-Dec	637	7.0	0.02	7.26	1.05													
28-Dec	706		0.02	7.27	1.09													
29-Dec	586		0.02	7.27	1.18													
30-Dec	900	8.3	0.02	7.25	1.10													
31-Dec	636		0.02	7.25	1.16													
Count	**365**	**158**	**365**	**365**	**365**	**108**	**18**	**22**	**21**	**17**	**24**	**19**	**22**	**19**	**24**	**18**	**23**	**20**
AVERAGE	**976**	**10.0**	**0.03**	**7.17**	**1.15**	**0.70**	**0.95**	**0.80**	**1.01**	**1.07**								