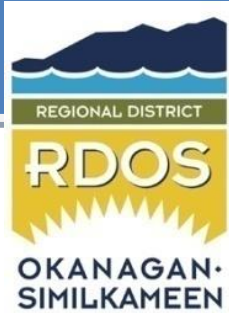


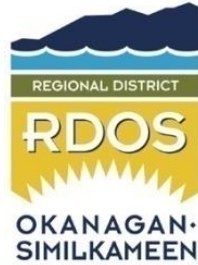
2022

ANNUAL WATER QUALITY MONITORING REPORT

SAGE MESA WATER SYSTEM



Sage Mesa Lake Pump Station



**2022 ANNUAL WATER QUALITY MONITORING REPORT
SAGE MESA WATER SYSTEM
PENTICTON, B.C.**

Copy prepared for:

INTERIOR HEALTH AUTHORITY (IHA)

Interior Health Drink Water Program

1340 Ellis St.

Kelowna, B.C.

V1Y 9N1

Attention: Judi Ekkert, B.Tech, CPHI(C)
Specialist – Environmental Health Officer
Drinking Water Program

Prepared by:

Regional District of Okanagan-Similkameen

101 Martin St.

Penticton, B.C.

V2A 5J9

Author: Rob Palmer, A.Sc.T.

Environmental Supervisor

Table of Contents

1. Introduction.....	3
2. System Description.....	3
3. System Classification and Operator Certifications.....	4
3.1. System Classification.....	4
3.2. Operator Certification.....	4
4. Annual Water Usage.....	5
4.1. Consumption Records.....	5
4.2. Water Conservation Program.....	6
5. Distribution System Water Quality.....	7
5.1. Distribution System Bacteriological Results.....	7
5.2. Distribution System Free Chlorine Residuals.....	8
5.3. Distribution System Water Quality Field Parameter Testing.....	9
5.4. Water Quality Complaints.....	9
6. Source Water Quality.....	10
6.2. Source Water Weekly/Bi-Weekly Monitoring.....	12
6.3. Source Water Potable Water Testing.....	14
6.3.1. Source Water General Potability Parameters 2020 to 2022.....	15
6.3.2. Guideline Notes for General Potability Parameters.....	16
6.3.3. Source Water Total Metals 2020 to 2022.....	17
6.3.4. Guideline Notes for Total Metals Potability.....	18
7. Water System Notifications.....	19
7.1. Water Quality Advisory (WQA).....	19
7.2. Boil Water Notices (BWN).....	19
7.3. Do Not Consume (DNC).....	19
7.4. Do Not Use (DNU).....	20
8. Program Updates and Status.....	20
8.1. Capital Works.....	20
8.2. Emergency Response Plan.....	20
8.3. Water Quality Monitoring Program.....	20
8.4. Future System Upgrades.....	20
8.5. System Maintenance/Upgrades.....	20
9. Summary.....	21

TABLES

Table 1: RDOS Operator Certifications for 2022.....	4
Table 2: Annual Water Usage for 2022.....	5
Table 3: Annual Distribution Water Bacteriological Testing Summary for 2022.....	8

Table 4: Annual Distribution Free Chlorine Residual Summary for 2022	8
Table 5: Annual Field Water Quality Parameter Testing Summary for 2022.....	9
Table 6: Weekly/Bi-Weekly Source Water Parameter Summary 2022.....	12
Table 7: Okanagan Lake General Parameters 2020 to 2022.....	15
Table 8: Okanagan Lake Total Metals 2020 to 2022.....	17

FIGURES

Figure 1: Annual Water Consumption 2010 to 2022	5
Figure 2: Monthly Water Consumption 2020 to 2022.....	6
Figure 3: Okanagan Lake Average Monthly Turbidity 2022.....	11
Figure 4: Okanagan Lake Online Average Turbidity 2020 to 2022	11
Figure 5: Okanagan Lake Monthly <i>E.coli</i> and Total Coliform 2020 to 2022.....	13

1. Introduction

The Regional District of Okanagan-Similkameen is the Operations contractor for the Sage Mesa water system and therefore is responsible for the following Annual Report summarizing the results from the 2022 *Water Quality Monitoring Program*. The report is a conditional requirement of the *Permit to Operate* issued by the Interior Health Authority (IHA) and the *BC Drinking Water Protection Act and Regulation*.

2. System Description

The Sage Mesa water system is located within Electoral Area F, just to the northwest of Penticton. The Sage Mesa system is a privately owned water system which is currently under the management of the British Columbia *Ministry Water Land and Natural Stewardship*. The RDOS provides Operations and Maintenance under a contract agreement with the *Ministry Water Land and Natural Stewardship*.

The Sage Mesa water system is supplied by Okanagan Lake. The system supplies treated water to approximately 242 domestic connections and irrigation water to two golf courses. Water is pumped from the Lake Pump Station into the distribution system and to an elevated storage reservoir (Lower Reservoir). The only treatment of the raw lake water is chlorination through the addition of sodium hypochlorite at the Lake Pump Station. A Booster Station is located at the Lower Reservoir and provides for re-chlorination of the treated water as it is boosted to the Upper Reservoir at a higher elevation. The Upper Reservoir supplies the Sandstone, Westwood and Husula-Highlands areas.

The Interior Health Authority has identified an insufficient chlorine contact time for users in the Lower Zone of the Sage Mesa Water system. Chlorine contact times are required to allow for proper disinfection of surface water sources that may contain pathogens such as viruses, bacteria and protozoa. In order to meet the required contact time, infrastructure improvements will be required following the provincial *Drinking Water Treatment Objectives for Surface Water*.

3. System Classification and Operator Certifications

3.1. System Classification

The *British Columbia Environmental Operators Certification Program (BC EOCP)* is responsible for classifying potable water systems in BC.

The Sage Mesa Lake Pump Station remained classified as *Water Treatment II* in 2022.

The Sage Mesa distribution system remained classified as *Water Distribution II* in 2022.

3.2. Operator Certification

The *British Columbia Environmental Operators Certification Program (BC EOCP)* is also responsible for certification of all water system operators. Operators may hold certification(s) in the disciplines of Water Distribution and/or Water Treatment with four levels (I-IV) of certification achievable within each discipline. RDOS Operators annually attend courses, seminars and complete online training required to maintain their levels of certification. In addition, all operators annually continue to work on augmenting and furthering their levels of certification. All RDOS Operators are certified through the BC EOCP as indicated in the Table 1 below.

OPERATOR EOCP CERTIFICATION No.	WATER DISTRIBUTION CERTIFICATION LEVELS				WATER TREATMENT CERTIFICATION LEVELS			
	IV	III	II	I	IV	III	II	I
1162	X						X	
4194			X					
4840			X				X	
4839		X						X
6926			X					X
8761			X					X
9322		X						X

Table 1: RDOS Operator Certifications for 2022

4. Annual Water Usage

The source water for the Sage Mesa water system is Okanagan Lake. In 2022, a total of 235,672 m³ was pumped from Okanagan Lake, down from 259,080 m³ in 2021.

4.1. Consumption Records

	Cubic Meters (m ³)	US Gallons	Date
Annual Total Usage	235,672	62,257,956	
Minimum Daily Flow	60		Nov 26, 2022
Maximum Daily Flow	2585		Aug 26, 2022

Table 2: Annual Water Usage for 2022

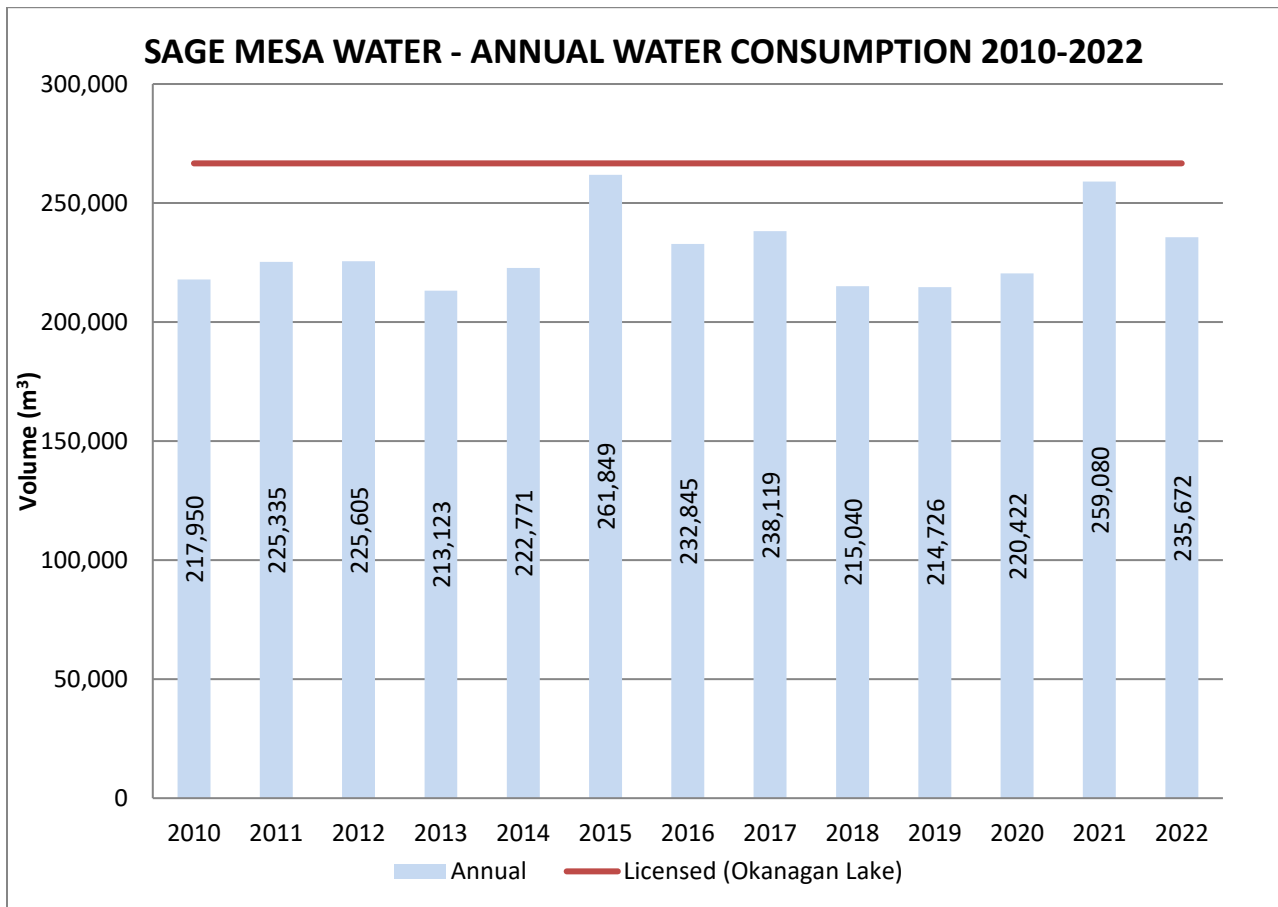


Figure 1: Annual Water Consumption 2010 to 2022

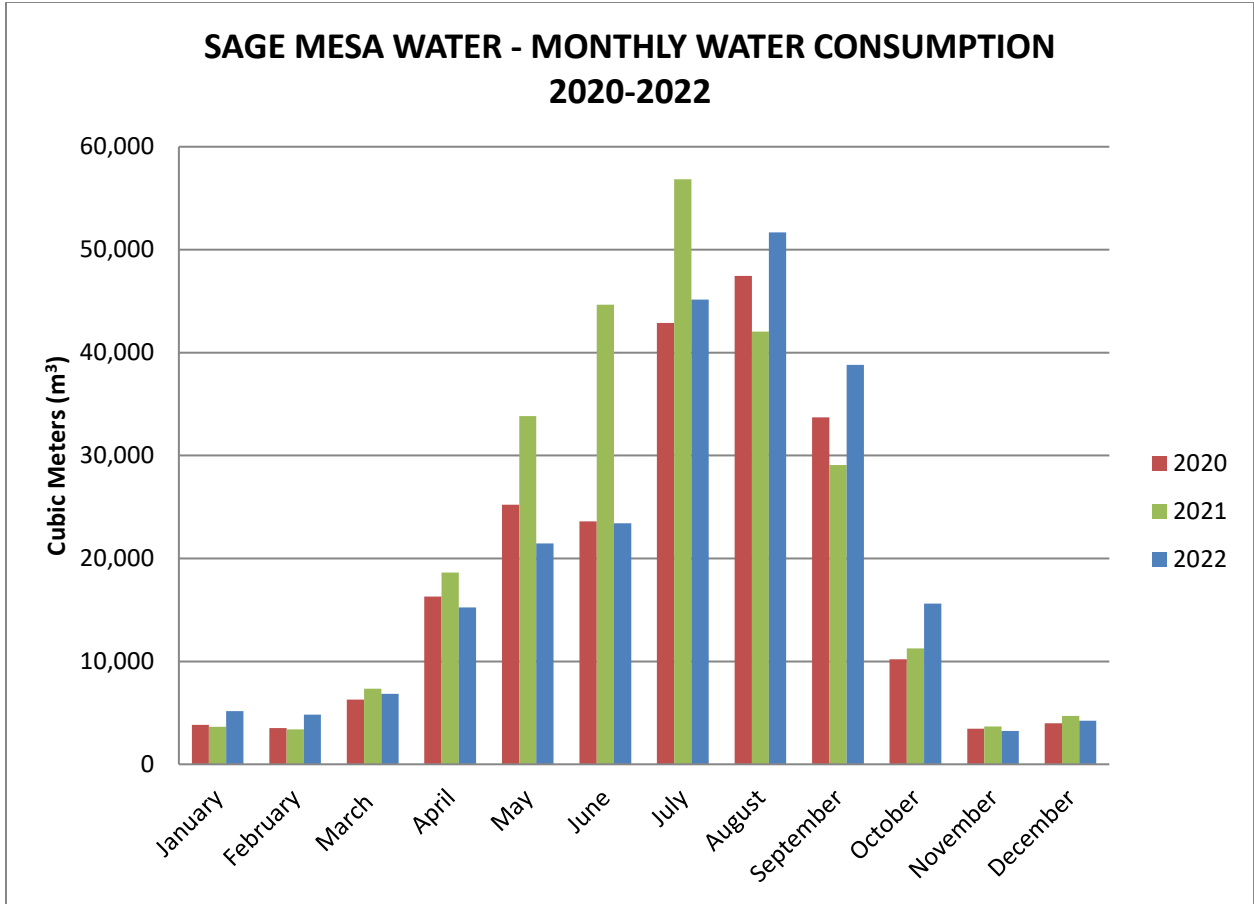


Figure 2: Monthly Water Consumption 2020 to 2022

4.2. Water Conservation Program

The Sage Mesa water system remained under Stage “Normal” water restrictions in 2022. In Stage “Normal” watering is allowed three times per week with even and odd properties being assigned alternate days of the week. No watering of lawns, shrubs or flowers allowed on Mondays.

5. Distribution System Water Quality

All treated distribution water quality parameters are compared to the applicable criteria set out in the *British Columbia Drinking Water Protection Act and Regulation (DWPA)*, the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*, Interior Health Authority programs and Operational Guidelines (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Allowable Concentrations (MAC).

All 2022 accredited laboratory tests were performed by Caro Analytical Services (Kelowna, B.C.).

5.1. Distribution System Bacteriological Results

The following is a summary of the bacteriological testing results from the treated water distribution system. There are two regular sampling sites (dedicated sample stations) throughout the distribution system that are alternated between weekly.

Schedule A of the *B C Drinking Water Protection Regulation* provides bacteriological testing criteria as given below.

Schedule A
Water Quality Standards for Potable Water
(sections 2 and 9)

Parameter:	Standard:
Fecal coliform bacteria	No detectable fecal coliform bacteria per 100 ml
<i>Escherichia coli</i>	No detectable <i>Escherichia coli</i> per 100 ml
Total coliform bacteria	
(a) 1 sample in a 30 day period	No detectable total coliform bacteria per 100 ml
(b) more than 1 sample in a 30 day period	At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml

In 2022, all distribution samples reported no detections for Total Coliforms and *E.coli*. The following is a summary of the laboratory bacteriological results from the treated water distribution system.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
Lab Results						
Microbiological						
E. coli (counts)	CFU/100 mL	<1	<1	<1	52	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	52	0

Table 3: Annual Distribution Water Bacteriological Testing Summary for 2022

5.2. Distribution System Free Chlorine Residuals

The following is a summary of the field free chlorine residual measurements from the distribution system. Free chlorine residuals are required to be maintained between 0.2 mg/L and 2.0 mg/L.

Typically, one to two monitoring sites were monitored on a weekly basis.

Flushing of water mains occurred at all locations when measured residual levels were below the MAC.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results
Field Results						
Chlorine (free)	Booster Station	mg/L	1.27	0.72	1.79	26
	Sandstone Dr.	mg/L	0.86	0.51	1.15	26

Table 4: Annual Distribution Free Chlorine Residual Summary for 2022

5.3. Distribution System Water Quality Field Parameter Testing

The following is a summary of the field parameters that are measured routinely in the distribution system. There are two regular sampling sites throughout the distribution system. Typically, one site was monitored on a weekly basis in conjunction with the bacteriological sampling.

Analyte	Unit	Average	Minimum	Maximum	Number of Results
Field Results					
Conductivity	µS/cm	309	287	332	49
pH		8.36	7.96	8.67	52
Total dissolved solids	mg/L	219	198	235	49
Temperature	°C	12.0	4.0	23.5	52
Turbidity	NTU	0.59	0.23	2.15	52

Table 5: Annual Field Water Quality Parameter Testing Summary for 2022

5.4. Water Quality Complaints

One water quality complaint was received August 8th of water surging/pressure issues at a residence on Forsyth Drive. Investigation found no cause.

6. Source Water Quality

All untreated source water quality parameters are compared to the applicable criteria set out in the *British Columbia Drinking Water Protection Act and Regulation (DWPA)*, the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*, Interior Health Authority programs and Operational Guidelines (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Acceptable Concentrations (MAC).

All 2022 accredited laboratory tests were performed by Caro Analytical Services (Kelowna, B.C.).

6.1. Source Water Turbidity Monitoring

Turbidity is a measure of the relative clarity or cloudiness of water measured in Nephelometric Turbidity Units (NTU). Turbidity is measured by passing light through a sample and measuring how light reflects off of the suspended particles within the sample.

The Interior Health Authority requires source water turbidity values to be evaluated against the following criteria. Exceedances of the criteria, typically compared to the average 24 hour turbidity value, will require a level of public notification as described below.

Source Water Quality	Turbidity Range	Public Notification Required
Good	NTU < 1	None
Fair	1 < NTU < 5	Water Quality Advisory (WQA)
Poor	5 ≤ NTU	Boil Water Notice (BWN)

Online continuous turbidity monitoring and trending of the Okanagan Lake source water is part of the SCADA (Supervisory Control and Data Acquisition) system. In addition to the online monitoring, grab samples are drawn on a weekly basis and measured using portable field test kits to verify the operation of the online instrumentation.

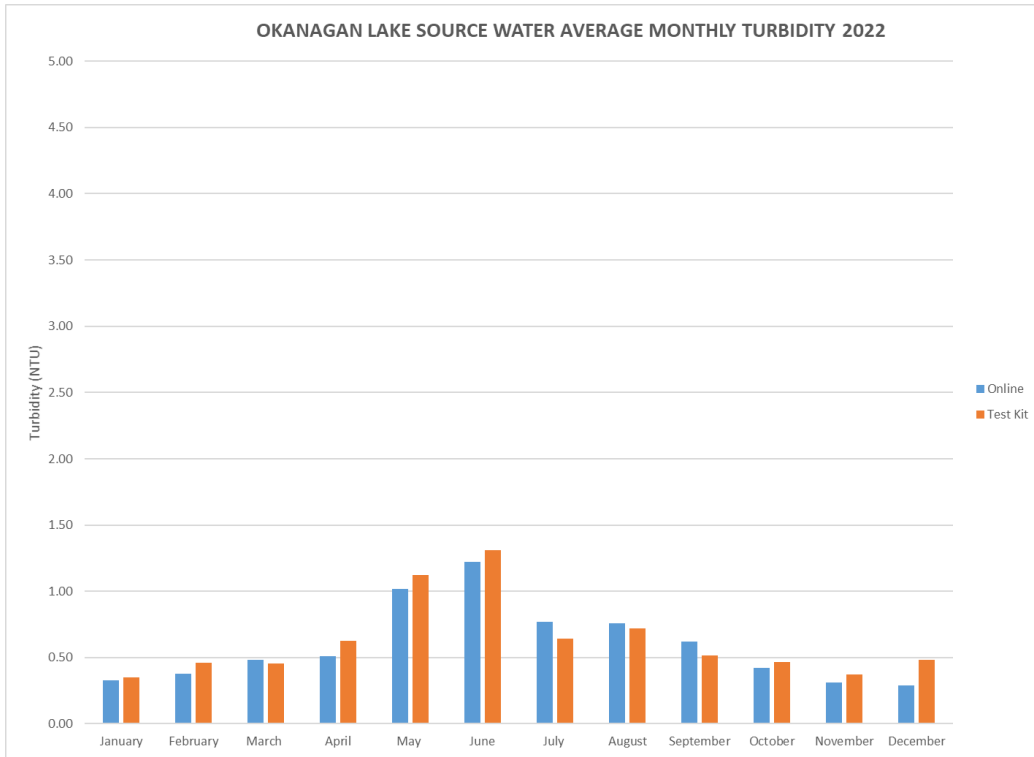


Figure 3: Okanagan Lake Average Monthly Turbidity 2022

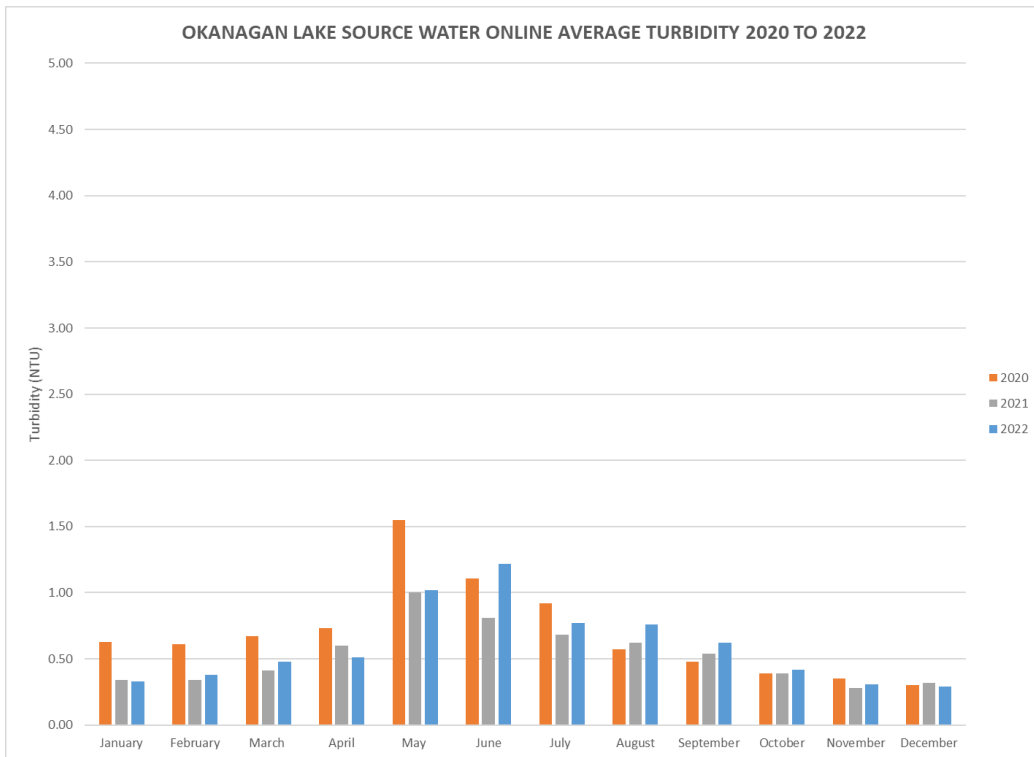


Figure 4: Okanagan Lake Online Average Turbidity 2020 to 2022

6.2. Source Water Weekly/Bi-Weekly Monitoring

Various parameters are monitored weekly and bi-weekly on the source water. These parameters provide support for operational decisions. These parameters are monitored by both field kits and grab samples that are sent to the laboratory for analysis.

Analyte	Unit	Average	Minimum	Maximum	Number of Results
Field Results					
Reading Type: Test Kit					
Conductivity	µS/cm	301	282	354	49
pH		8.27	7.32	8.65	52
Total dissolved solids	mg/L	214	201	249	49
Temperature	°C	11.1	3.4	24.2	52
Turbidity	NTU	0.63	0.29	2.3	51
Reading Type: Online Instrument					
Turbidity	NTU	0.63	0.23	2.03	47
Lab Results					
General					
Alkalinity (total, as CaCO ₃)	mg/L	117.5	97.3	136	27
Total organic carbon	mg/L	4.28	3.74	5.12	27
Colour	CU	4.9	<5.0	21	52
Hardness (as CaCO ₃), from total Ca/Mg	mg/L	119	112	133	27
UV transmittance at 254 nm - unfiltered	%	84.8	79.8	88.6	51
Microbiological					
E. coli (MPN)	MPN/100 mL	<1	<1	19	51
E. coli (counts)	CFU/100 mL	<1	<1	<1	1
Total coliforms (MPN)	MPN/100 mL	10	1	86	51
Total coliforms (counts)	CFU/100 mL	7	7	7	1
Total Metals					
Calcium (total)	mg/L	32.4	30.1	36.4	27
Magnesium (total)	mg/L	9.36	8.17	10.5	27

Table 6: Weekly/Bi-Weekly Source Water Parameter Summary 2022

The following graph shows the three year trend for Total Coliforms and *E.coli* from the Okanagan Lake intake. Note, the laboratory changed analytical methods for the raw water bacteriological testing from Membrane Filtration (MF CFU/100ml) to Most Probable Number (MPN) in late 2019. Only the MPN data was graphed.

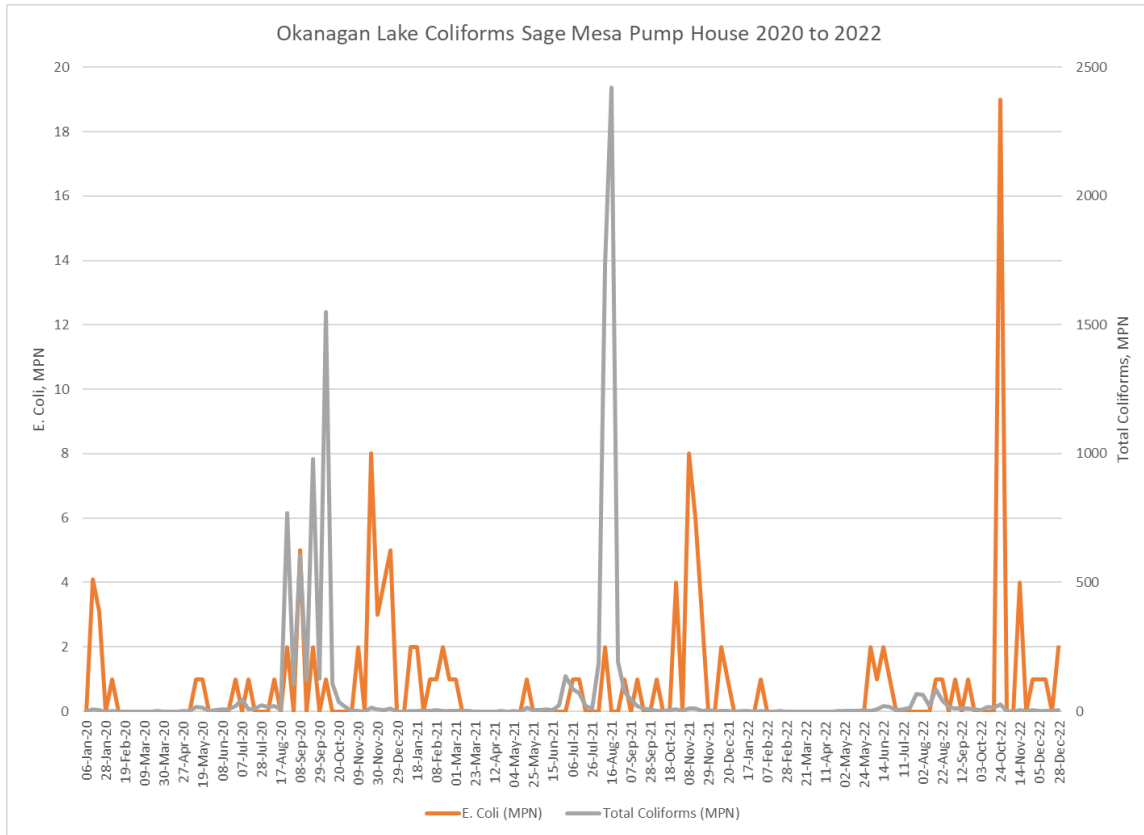


Figure 5: Okanagan Lake Monthly *E.coli* and Total Coliform 2020 to 2022

6.3. Source Water Potable Water Testing

Annually, the RDOS submits a sample of the untreated water from the Okanagan Lake intake to an accredited lab for comprehensive potable water testing. The results of these test are compared against the *Guidelines for Canadian Drinking Water Quality*. The *GCDWQ* establishes Maximum Acceptable Concentrations (MAC), Interim Maximum Acceptable Concentrations (IMAC) and Aesthetic Objectives (AO) for parameters if applicable. In 2022, there were no exceedances of the guidelines in the Sage Mesa source water sample.

This comprehensive test includes physical parameters (e.g. color, turbidity, temperature, ultraviolet transmittance), chemical parameters (e.g. hardness, total metals and nutrients). Changes in these parameters may result in the need for water notifications for customers (i.e. Boil Water Notice or Water Quality Advisory) or the requirement for treatment processes to be implemented. The following tables display the results for the respective comprehensive potable water tests.

All tested source water parameters met the applicable guidelines in 2022. Chloride showed an increasing trend, from 2020 to 2022, while potassium showed a decreasing trend for the same time frame. No other increasing or decreasing trends were noted.

6.3.1. Source Water General Potability Parameters 2020 to 2022

				Sampling Location	Lake Pump Station	Lake Pump Station	Lake Pump Station
				Date Sampled	08-Sep-20	28-Sep-21	27-Jun-22
Analyte	Unit	Guideline					
		GCDWQ MAC	GCDWQ AO				
Lab Results							
General							
Alkalinity (total, as CaCO ₃)	mg/L	NG	NG	108	121	113	
Total organic carbon	mg/L	NG	NG	8.46	3.94	4.13	
Chloride	mg/L	NG	250	4.89	5.42	5.56	
Colour	CU	NG	15	6.0	<5.0	6.2	
Conductivity	µS/cm	NG	NG	268	270	250	
Total cyanide	mg/L	0.2 ^{1.1}	NG	<0.0050	<0.0020	<0.0020	
Fluoride	mg/L	1.5	NG	0.17	0.19	<0.10	
Hardness (as CaCO ₃), from total Ca/Mg	mg/L	NG	NG	124	120	122	
Langelier Index		NG	NG	0.3	0.3	0.2	
pH		NG	7.0 - 10.5 _{2.1}	8.18	8.16	8.04	
Total dissolved solids (computed)	mg/L	NG	500	157	166	161	
Sulphate	mg/L	NG	500 ^{2.2}	28.6	30.2	29.7	
Sulphide (total, as S)	mg/L	NG	0.047 ^{2.3}	<0.020	<0.020	<0.020	
Turbidity	NTU	N ^{1.2}	NG	0.97	0.37	0.68	
UV transmittance at 254 nm - filtered	%	NG	NG	83.5	85.2	81.8	
UV transmittance at 254 nm - unfiltered	%	NG	NG	82.5			
Nutrients							
Ammonia (total, as N)	mg/L	NG	NG	0.062	<0.050	0.069	
Nitrate (as N)	mg/L	10	NG	<0.010	0.036	<0.010	
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010	<0.010	
Potassium (total)	mg/L	NG	NG	2.67	2.42	2.28	

See Guideline Notes in Section 5.3.2

Table 7: Okanagan Lake General Parameters 2020 to 2022

6.3.2. Guideline Notes for General Potability Parameters

1. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)

Note 1.1 for Total cyanide:

The MAC for free cyanide is 0.2 mg/L. A maximum of 0.2 mg/L was used, in this report, to identify exceedances for total cyanide as a means for determining the potential for exceeding the free cyanide guideline.

Note 1.2 for Turbidity:

"Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters should meet the requirements described in GCDWQ.

For systems that use groundwater that is not under the direct influence of surface water, which are considered less vulnerable to faecal contamination, turbidity should generally be below 1.0 NTU.

For effective operation of the distribution system, it is good practice to ensure that water entering the distribution system has turbidity levels below 1.0 NTU."

2. Notes for Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives (GCDWQ AO)

Note 2.1 for pH:

The operational guideline for pH is a range of 7.0 to 10.5 in finished drinking water.

Note 2.2 for Sulphate:

There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L. Health authorities should be notified of drinking water sources containing above 500 mg/L.

Note 2.3 for Sulphide (total, as S):

The aesthetic objective for sulphide (as H₂S) is 0.05 mg/L. This is equivalent to 0.047 mg/L sulphide (as S).

6.3.3. Source Water Total Metals 2020 to 2022

Analyte	Unit	Guideline		Lake Pump Station 08-Sep-20	Lake Pump Station 28-Sep-21	Lake Pump Station 27-Jun-22
		Date Sampled				
		GCDWQ MAC	GCDWQ AO			
Lab Results						
Total Metals						
Aluminum (total)	mg/L	2.9 ^{1.1}	0.100 ^{2.1}	0.0411	0.0140	0.0214
Antimony (total)	mg/L	0.006	NG	<0.00020	<0.00020	<0.00020
Arsenic (total)	mg/L	0.010 ^{1.2}	NG	0.00071	<0.00050	<0.00050
Barium (total)	mg/L	2.0 ^{1.3}	NG	0.0245	0.0219	0.0212
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 ^{1.4}	NG	0.000011	<0.000010	<0.000010
Calcium (total)	mg/L	NG	NG	34.0	32.4	34.3
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 ^{1.5}	1	0.00178	0.00149	0.00514
Iron (total)	mg/L	NG	0.3	0.036	0.015	0.017
Lead (total)	mg/L	0.005 ^{1.6}	NG	<0.00020	<0.00020	<0.00020
Magnesium (total)	mg/L	NG	NG	9.56	9.52	8.76
Manganese (total)	mg/L	0.12 ^{1.7}	0.02 ^{2.2}	0.00191	0.00162	0.00187
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00374	0.00365	0.00323
Nickel (total)	mg/L	NG	NG	0.00136	0.0007	0.00046
Selenium (total)	mg/L	0.05	NG	0.00056	<0.00050	<0.00050
Sodium (total)	mg/L	NG	200	11.5	11.8	11.1
Strontium (total)	mg/L	7.0 ^{1.8}	NG	0.298	0.264	0.254
Uranium (total)	mg/L	0.02	NG	0.00247	0.00259	0.00233
Zinc (total)	mg/L	NG	5.0	<0.0040	<0.0040	<0.0040

See Guideline Notes in Section 5.3.4

Table 8: Okanagan Lake Total Metals 2020 to 2022

6.3.4. Guideline Notes for Total Metals Potability

1. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)

Note 1.1 for Aluminum (total): The maximum acceptable concentration (MAC) for total aluminum in drinking water is 2.9 mg/L (2 900 µg/L) based on a locational running annual average of a minimum of quarterly samples taken in the distribution system. (Update March 5, 2021)

Note 1.2 for Arsenic (total): Every effort should be made to maintain arsenic levels in drinking water as low as reasonably achievable.

Note 1.3 for Barium (total): Update January 24, 2020. The MAC was revised from 1.0 mg/L to 2.0 mg/L.

Note 1.4 for Cadmium (total): A maximum acceptable concentration (MAC) of 0.007 mg/L (7 µg/L) is established for total cadmium in drinking water, based on a sample of water taken at the tap. (Update July 14, 2020).

Note 1.5 for Copper (total): A maximum acceptable concentration (MAC) of 2 mg/L is established for total copper in drinking water, based on a sample of water taken at the tap. Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on Copper, June 2019.

Note 1.6 for Lead (total): The maximum acceptable concentration (MAC) for total lead in drinking water is 0.005 mg/L (5 µg/L), based on a sample of water taken at the tap and using the appropriate protocol for the type of building being sampled. Every effort should be made to maintain lead levels in drinking water as low as reasonably achievable (or ALARA). (GCDWQ: Guideline Technical Document; March, 2019)

Note 1.7 for Manganese (total): Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on manganese, May 2019.

Note 1.8 for Strontium (total): Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on strontium, May 2019.

7. Water System Notifications

The Interior Health Authority's team of drinking water officers are responsible for providing the oversight to ensure compliance and drinking water safety. The IHA is responsible for issuing *Permits to Operate* to drinking water systems. The Interior Health Authority has four types of water notifications to inform users of negative impacts to water quality.

7.1. Water Quality Advisory (WQA)

There is some level of risk associated with consuming the drinking water but a Boil Water Notice is not needed. The risk is elevated for people with weakened immune systems, the elderly and infants and young children.

On May 5, 2022 a *Water Quality Advisory* for Okanagan Lake intake turbidity greater than 1 NTU (a "FAIR" rating) was issued for the Upper Zone of Sage Mesa (the Lower Zone remained on the permanent Boil Water Notice, see next section). The WQA was rescinded July 6th when Lake turbidity levels were consistently below 1 NTU (a "GOOD" rating).

7.2. Boil Water Notices (BWN)

There are organisms in the water that can make you sick. To safely consume (swallow) the water, you must bring it to a rolling boil for at least 60 seconds, or use a safe alternate source of water.

A permanent Boil Water Notice (BWN) was issued in 2019 for the Lower Zone of the Sage Mesa system which remained in effect for 2022. This BWN is in response to insufficient contact time between the added chlorine and the source water from Okanagan Lake before the water reaches the first customers in the Lower portion of the system. With insufficient contact time there is the potential for inadequate pathogen reduction in the water supplied to the properties in the Lower Zone year round. This BWN will remain in effect until the appropriate engineered upgrades are in place to meet the provincial *Drinking Water Treatment Objectives for Surface Water*. Permanent metal *Boil Water Notice* signs with high visibility post covers are in place year round at the entrances to the Lower Zone.

7.3. Do Not Consume (DNC)

There are harmful chemicals or other bad things in the water that can make you sick. You cannot make the water safe by boiling. The water can make you sick if you consume (swallow) it. You cannot use the water for drinking, brushing teeth, washing/preparing/cooking food or pet's drinking water. You can bath, shower and water plants and gardens with the water.

No DNCs issued in 2022.

7.4. Do Not Use (DNU)

There are known microbial, chemical or radiological contaminants in the water and that any contact with the water with the skin, lungs or eyes can be dangerous. Do not turn on your tap for any reason and do not use your water. You CANNOT make the water safe by boiling it.

No DNUs issued in 2022.

8. Program Updates and Status

8.1. Capital Works

No capital works were completed in 2022.

8.2. Emergency Response Plan

The *Emergency Response Plan* is scheduled to be updated in 2024.

8.3. Water Quality Monitoring Program

The *Water Quality Monitoring Program* is scheduled to be updated in 2024.

8.4. Future System Upgrades

In 2020 both the Upper and Lower water storage reservoirs were cleaned, disinfected and inspected by a structural engineer. Both reservoirs are showing signs of deteriorating structural integrity however, the Upper Reservoir is more pronounced. As a result the roof of the Upper Reservoir has been cordoned off to any access. The RDOS continued work in 2022 with the Province and engineering consultants to determine the best plan for addressing the concerns identified in the structural engineer's report.

In addition, work continued between the Province, the water system owner and the RDOS on planning for upgrading the Sage Mesa water system to meet the provincial *Drinking Water Treatment Objectives for Surface Water*.

8.5. System Maintenance/Upgrades

The failure of an electrical transformer on December 27, 2021 prevented automated control of the system and require the system to be operated manually. A request was issued to residents to conserve water until the necessary repairs were completed. On January 7, 2022, a new transformer was installed to replace the transformer which had failed.

On January 14, 2022 a new vertical turbine was installed on Pump #1 at the Lake Pump Station.

On March 2, 2022 residents were notified of the water supply to the majority of Lower Sage Mesa being shut off while a leaking water service on Sage Mesa Drive was repaired.

A new support chain was installed by a diving contractor on the Okanagan Lake intake screen on June 16, 2022.

A sink hole that was discovered along the pumping main below 4675 Sage Mesa Dr. was filled with concrete on June 27, 2022.

On October 5, 2022 a leak was repaired on the 2 inch PVC watermain along Ladera Place. A domestic water service renewed at the same time.

A break on the 2 inch PVC lateral watermain was repaired on Sage Mesa Drive on December 16, 2022.

9. Summary

All tested source water parameters from the Okanagan Lake supplying the Sage Mesa water system met the applicable criteria with the exception of turbidity which resulted in a *Water Quality Advisory* being issued for the Upper Zone. The Lower Zone remained on a permanent *Boil Water Notice* due to insufficient chlorine contact time. The RDOS continues to work with the *Ministry of Water, Land and Resource Stewardship* on reviewing and upgrading the various programs that support facilitating the highest quality of water possible.