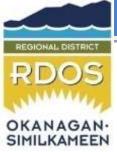
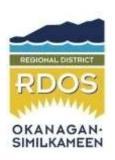
### 2022

# ANNUAL WATER QUALITY MONITORING REPORT MISSEZULA WATER SYSTEM





Regional District of Okanagan-Similkameen
February, 2024



## 2022 ANNUAL WATER QUALITY MONITORING REPORT MISSEZULA WATER SYSTEM MISSEZULA, B.C.

Copy prepared for:

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#### **Table of Contents**

1.	Intro	oduction	1
2.	Syst	em Description	1
3.	Svst	em Classification and Operator Certifications	1
	3.1.	System Classification	
	3.2.	Operator Certification	
		•	
4.		ual Water Usage	
	4.1.	Consumption Records	
	4.2.	Water Conservation	4
5.	Soui	rce Water Quality	4
	5.1.	Source Water Bi-Weekly Monitoring	4
	5.2.	Source Water Potable Water Testing	6
	5.2.	1. Source Water General Potability Parameters 2022	7
	5.2.2	2. Guideline Notes for General Potability Parameters	8
	5.2.3		
	5.2.4	4. Guideline Notes for Total Metals Potability	10
6.	Dist	ribution System Water Quality	12
	6.1.	Distribution System Bacteriological Results	12
	6.2.	Distribution System Free Chlorine Residuals	14
	6.3.	Distribution System Water Quality Field Parameters	14
	6.4.	Water Quality Complaints	14
7.	Wat	er System Notifications	15
	7.1.	Water Quality Advisory (WQA)	15
	7.2.	Boil Water Notice (BWN)	
	7.3.	Do Not Consume (DNC)	
	7.4.	Do Not Use (DNU)	15
8.	Prog	gram Updates and Status	15
	8.1.	Cross Connection Control Program	15
	8.2.	Capital Works / System Additions	
	8.3.	Emergency Response Plan	
	8.4.	Future System Upgrades	
	8.5.	Supervisory Control and Data Acquisition (SCADA System) Ugrades	16
	8.6.	System Maintenance/Upgrades	16
	8.7.	Water Quality Monitoring Program	16

9.	<b>Summary</b>
<b>T</b> A D	
TAB	LES
Tabl	e 1: RDOS Operator Certifications 20222
Tabl	e 2: Missezula Annual Water Consumption 20222
Tabl	e 3: Missezula Lake Bi-Weekly Monitoring 2022 Summary5
Tabl	e 4: Missezula Lake General Potability Parameters 2020 to 20227
Tabl	e 5: Missezula Lake Total Metals Potability 2020 to 20229
Tabl	e 6: Distribution Water Bacteriological Testing 2022 Summary13
Tabl	e 7: Distribution System Free Chlorine Residuals 2022 Summary14
Tabl	e 8: Distribution System Field Measured Parameters 2022 Summary14
FIGU	JRES
Figu	re 1: Annual Water Consumption 2007 to 20223
Figu	re 2: Monthly Water Consumption 2020 to 20223

#### 1. Introduction

As the owner and operator of the Missezula Lake water system, the Regional District Okanagan-Similkameen 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 Missezula Lake water system ownership was transferred from the Missezula Lake Improvement District to the RDOS in the fall of 2019. The Missezula Lake community is a remote community that is located within Electoral Area H approximately 50 kilometers north of Princeton. The Missezula Lake system draws water from Missezula Lake to supply domestic water to approximately 190 connections consisting of both permanent residents and seasonal use homes. The water from Missezula Lake is chlorinated prior to entering the distribution system.

Interior Health Authority has mandated requirements for the Missezula Lake water system to meet the Provincial 4-3-2-1-0 Treatment Standards. Upgrades to the system will be required to fulfill this requirement.

#### 3. System Classification and Operator Certifications

#### 3.1. System Classification

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

The Missezula Lake system remained classified as a Small Water System (SWS) 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 (4) levels 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			WATER TREATMENT CERTIFICATION LEVELS					
No.	IV	III	II	I	IV	III	II	I
1162	Χ						Х	
4194			Χ					
4840			Х				Х	
4839		Х						Х
6926		Х						Х
8761		Х						Х
9322		Х						Х

**Table 1:** RDOS Operator Certifications 2022

#### 4. Annual Water Usage

The annual pumping volumes extracted from the Missezula Lake from 2007 to 2022 is presented below in Figure 1. In 2022, a total of 114,885  $\rm m^3$  of water was pumped from the Missezula Lake up from 144,027  $\rm m^3$  in 2021.

#### **4.1. Consumption Records**

	Cubic Meters (m³)	US Gallons	
Annual Total Usage	114,885	30,349,405	Date
Minimum Daily Flow	n/a	n/a	n/a
Maximum Daily Flow	n/a	n/a	n/a

**Note:** As of July 26, 2022, daily flow was not available due to technical issues with flow meter.

 Table 2: Missezula Annual Water Consumption 2022

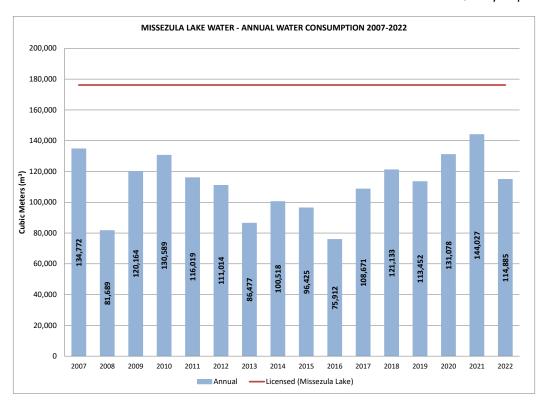


Figure 1: Annual Water Consumption 2007 to 2022

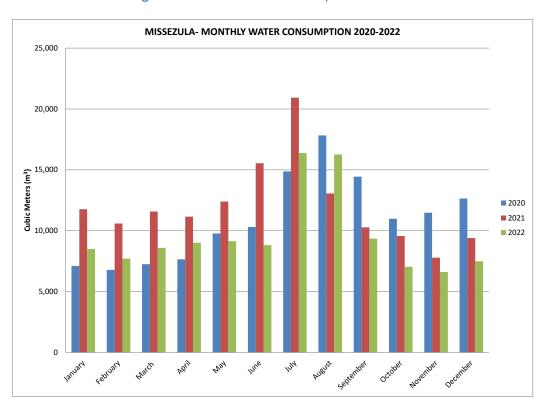


Figure 2: Monthly Water Consumption 2020 to 2022

#### 4.2. Water Conservation

The Missezula Lake water system remained under Stage "Normal" water restrictions in 2022.

#### 5. Source Water Quality

All untreated source water quality parameters are compared to the *British Columbia Drinking Water Protection Act and Regulation (DWPA)* and the *Guidelines for Canadian Drinking Water Quality (GCDWQ)* unless otherwise noted, which could be indicated as an Operational Guideline (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Acceptable Concentrations (MAC).

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

#### 5.1. Source Water Bi-Weekly Monitoring

Bi-weekly monitoring of the Missezula Lake includes grab samples for bacteriological testing and general water potability parameters and field measured parameters using field kits. Samples from Missezula Lake were analyzed for Total Coliforms and *Escherichia coli* (*E.coli*), Alkalinity, Total Organic Carbon, Colour, Hardness, Total Suspended Solids and UV Transmittance at 254 nm. The table below summaries the laboratory results and the field measured parameters from the Missezula Lake.

Analyte	Unit	Avg	Min	Max	Number of Results	Number of Results with Exceedances
Field Results						
Conductivity	μS/cm	340	321	412	19	0
рН		7.84	6.94	8.18	19	0
Total dissolved solids	mg/L	243	228	294	19	0
Temperature	°C	6.4	3.7	8.7	19	0
Turbidity	NTU	0.69	0.28	1.07	17	0
General						
Alkalinity (total, as CaCO3)	mg/L	157	137	175	19	0
Total organic carbon	mg/L	5.09	4.28	5.62	19	0
Colour	CU	7.2	<5.0	13.0	19	0
Hardness (as CaCO3), from total Ca/Mg	mg/L	148	135	156	19	0
Total suspended solids	mg/L	1.2	2.0	2.0	18	0
UV transmittance at 254 nm - filtered	%	80.5	79.5	86.4	19	0
UV transmittance at 254 nm - unfiltered	%	80.1	79.1	84.9	18	0
Total Metals						
Calcium (total)	mg/L	40.9	37.2	43.9	19	0
Magnesium (total)	mg/L	11	10.2	11.8	19	0
Microbiological						
E. coli (MPN)	MPN/100 mL	<1	<1	<1	19	0
Total coliforms (MPN)	MPN/100 mL	1	<1	7	19	0

 Table 3: Missezula Lake Bi-Weekly Monitoring 2022 Summary

#### **5.2. Source Water Potable Water Testing**

Annually, the RDOS submits a sample of the untreated well water 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 Allowable Concentration (MAC), Interim Maximum Acceptable Concentrations (IMAC) and Aesthetic Objectives (AO) for parameters if applicable.

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 from Missezula Lake met the applicable guidelines in 2022 with no notable increasing or decreasing trends.

#### 5.2.1. Source Water General Potability Parameters 2022

	Raw Water 04-Jun- 20	Raw Water 28-Sep- 22			
			Guideline		
Analyte	Unit	GCDWQ MAC	GCDWQ AO		
Lab Results					
General					
Alkalinity (total, as CaCO3)	mg/L	NG	NG	162	175
Total organic carbon	mg/L	NG	NG	5.58	4.28
Chloride	mg/L	NG	250	8.53	9.20
Colour	CU	NG	15	6.5	7.1
Conductivity	μS/cm	NG	NG	317	310
Total cyanide	mg/L	0.2 1.1	NG	<0.0020	<0.0020
Fluoride	mg/L	1.5	NG	0.11	<0.10
Hardness (as CaCO3), from total Ca/Mg	mg/L	NG	NG	155	145
Langelier Index		NG	NG	0.3	0.3
рН		NG	7.0 - 10.5 <sup>2.1</sup>	7.87	7.96
Total suspended solids	mg/L	NG	NG	<2.0	
Sulphate	mg/L	NG	500 <sup>2.2</sup>	10.8	11.4
Sulphide (total, as S)	mg/L	NG	0.047 2.3		<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.74	0.56
UV transmittance at 254 nm - filtered	%	NG	NG		79.9
UV transmittance at 254 nm - unfiltered	%	NG	NG	79.6	
Nutrients					
Ammonia (total, as N)	mg/L	NG	NG	<0.050	0.061
Nitrate (as N)	mg/L	10	NG	0.012	<0.010
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010
Total kjeldahl nitrogen	mg/L	NG	NG	0.225	
Total organic nitrogen	mg/L	NG	NG	0.225	
Phosphorus (total, APHA 4500-P)	mg/L	NG	NG	0.0304	
Potassium (total)	mg/L	NG	NG	1.59	1.32

See Guideline Notes in Section 5.2.2

 Table 4: Missezula Lake General Potability Parameters 2020 to 2022

#### 5.2.2. 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 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).

#### 5.2.3. Source Water Total Metals 2022

			Sampling Location	Raw Water	Raw Water
			Date Sampled	04-Jun-20	28-Sep-22
		Gu	ideline		
Analyte	Unit	GCDWQ MAC	GCDWQ AO		
Lab Results					
Total Metals					
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	<0.0050	<0.0050
Antimony (total)	mg/L	0.006	NG	<0.00020	<0.00020
Arsenic (total)	mg/L	0.010 1.2	NG	0.00066	0.00066
Barium (total)	mg/L	2.0 <sup>1.3</sup>	NG	0.0383	0.0386
Boron (total)	mg/L	5	NG	0.0229	<0.0500
Cadmium (total)	mg/L	0.007 1.4	NG	<0.000010	<0.000010
Calcium (total)	mg/L	NG	NG	42.6	41.2
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.00242	0.00194
Iron (total)	mg/L	NG	0.3	<0.010	<0.010
Lead (total)	mg/L	0.005 1.6	NG	0.00077	<0.00020
Magnesium (total)	mg/L	NG	NG	11.8	10.3
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 2.2	0.00345	0.00446
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00076	0.00076
Nickel (total)	mg/L	NG	NG	<0.00040	<0.00040
Selenium (total)	mg/L	0.05	NG	<0.00050	<0.00050
Sodium (total)	mg/L	NG	200	9.11	8.61
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.210	0.200
Uranium (total)	mg/L	0.02	NG	0.000208	0.000229
Zinc (total)	mg/L	NG	5.0	<0.0040	<0.0040

See Guideline Notes in Section 5.2.4

**Table 5:** Missezula Lake Total Metals Potability 2020 to 2022

#### 5.2.4. 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  $\mu$ g/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  $\mu$ g/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  $\mu$ g/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.

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

Note 2.1 for Aluminum (total): The operational guidance (OG) value for total aluminum in drinking water is 0.100 mg/L (100 µg/L) to optimize water treatment and distribution system operations. This value is based on a locational running annual average. The sampling frequency required to calculate the locational running annual average will vary based on the type of treatment facility and the sampling location. (Update March 5, 2021)

**Note 2.2 for Manganese (total):** Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on manganese, May 2019.

#### 6. Distribution System Water Quality

All treated distribution system water quality parameters are compared to the *British Columbia Drinking Water Protection Act and Regulation (DWPA)* and the *Guidelines for Canadian Drinking Water Quality (GCDWQ)* unless otherwise noted, which could be indicated as an operational guideline (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Acceptable Concentrations (MAC).

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

#### 6.1. Distribution System Bacteriological Results

The Missezula Lake Pump House discharge and two distribution system sample stations were sampled bi-weekly. A third distribution sample station was sampled periodically. Samples from the Pump House discharge and distribution system were analyzed for Total Coliforms and *Escherichia coli* (*E.coli*). Schedule A of the BC *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
Escherichia coli	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 had 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	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
Lab Results: I	Microbiologica	l					
	Pump House Discharge	CFU/100 mL	<1	<1	2	25	0
Background bacteria	The Bridge	CFU/100 mL	<1	<1	<1	2	0
bacteria	The Gate	CFU/100 mL	<1	<1	<1	25	0
	Tower	CFU/100 mL	<1	<1	<1	25	0
	Pump House Discharge	CFU/100 mL	<1	<1	<1	26	0
E. coli (counts)	The Bridge	CFU/100 mL	<1	<1	<1	2	0
(counts)	The Gate	CFU/100 mL	<1	<1	<1	26	0
	Tower	CFU/100 mL	<1	<1	<1	26	0
	Pump House Discharge	CFU/100 mL	<1	<1	<1	26	0
Total coliforms	The Bridge	CFU/100 mL	<1	<1	<1	2	0
(counts)	The Gate	CFU/100 mL	<1	<1	<1	26	0
	Tower	CFU/100 mL	<1	<1	<1	26	0

 Table 6: Distribution Water Bacteriological Testing 2022 Summary

#### **6.2.** Distribution System Free Chlorine Residuals

The following is a summary of the free chlorine residual measurements from the pump house discharge and the distribution system. Free chlorine is measured with bacteriological samples. Free chlorine residuals are required to be maintained between 0.2 mg/L and 2.0 mg/L of free chlorine.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results
Field Results						
	Pump House Discharge	mg/L	0.76	0.15	1.15	26
Chlorine	The Bridge	mg/L	0.81	0.66	0.95	2
(free)	The Gate	mg/L	0.59	0.09	0.95	26
	Tower	mg/L	0.28	0.02	0.76	26

**Table 7:** Distribution System Free Chlorine Residuals 2022 Summary

#### **6.3. Distribution System Water Quality Field Parameters**

The following is a summary of the field parameters that are measured routinely at the Pumphouse discharge and in the distribution system.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
Field Results						
Conductivity	μS/cm	349	338	398	65	0
рН		7.87	6.8	8.3	66	0
Total dissolved solids	mg/L	248	240	283	65	0
Temperature	°C	6.5	3.1	12.9	66	0
Turbidity	NTU	0.45	0.16	1.68	78	0

**Table 8:** Distribution System Field Measured Parameters 2022 Summary

#### 6.4. Water Quality Complaints

None to report for 2022.

#### 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.

No WQAs issued in 2022.

#### 7.2. Boil Water Notice (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.

On May 18, 2022 a BWN was issued in response to a loss of system pressure due to a generator failure during a power outage. This BWN was rescinded May 27, 2022.

#### 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 used 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. Cross Connection Control Program

The RDOS continued work in 2022 towards implementing an official Cross Connection Control program and bylaw. The Public Works Department addresses specific cross connection control issues with the current water system bylaw as they arise.

#### 8.2. Capital Works / System Additions

None of note in 2022.

#### 8.3. Emergency Response Plan

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

#### 8.4. Future System Upgrades

As mandated by the Interior Health Authority, the Missezula Lake water system is required to meet the Provincial 4-3-2-1-0 Treatment Standards if it is to continue using Missezula Lake as a water source. The Regional District applied for Federal/Provincial grant funding in 2020 and was notified in late 2021 that the grant application was successful. The RDOS will initiate the source water upgrade project for the Missezula Lake water system in 2022.

In anticipation of the upgrades Larratt Aquatic (Kelowna, B.C.) was contracted in 2020 to begin an assessment of the Missezula Lake Intake. This report was completed in early 2022.

In July, 2022 the RDOS drilled a test groundwater well adjacent to the shoreline of Missezula Lake on the pump station property. Further investigation of this groundwater source was conducted in 2022.

#### 8.5. Supervisory Control and Data Acquisition (SCADA System) Ugrades

None of note in 2022.

#### 8.6. System Maintenance/Upgrades

None of note in 2022.

#### 8.7. Water Quality Monitoring Program

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

#### 9. Summary

All tested water parameters from the Missezula Lake water system met applicable criteria in 2022. A *Boil Water Notice* was issued in May of 2022 in response to a loss of system pressure due to a failure with the backup emergency generator. The operation of the Missezula Lake water system by a team of RDOS *EOCP* certified Operators resulted in the supply of the highest quality water possible to the community of Missezula Lake. The RDOS continues to work on reviewing and upgrading the various programs that support facilitating the highest quality of water possible. In addition, the RDOS will continue work on the Missezula Lake Upgrade Project in 2023 to meet the Provincial 4-3-2-1-0 Treatment Standards.