



ANNUAL WATER SYSTEM REPORT

2023

Overview of the Community's Domestic and
Agricultural Irrigation Systems

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Introduction

The Town of Osoyoos operates two separate water distribution systems. They include our domestic system, supplied by six groundwater production wells, buffered with four reservoirs, and subdivided into three pressure zones. There is also a separate agricultural irrigation system with two lake intakes and one reservoir. The agricultural irrigation system is located outside the Town of Osoyoos Municipal boundaries and is further sub-divided into two districts (8 and 9).

The municipal system, which is supplied by wells, services all the lands within the municipal boundary and most of the irrigation district. The Municipal System consists of approximately 3,978+ connections, 77.6 km of pipe, 272 hydrants, 815 valves, and two pressure reducing stations. Wells 4,5,6, and produce manganese and iron, which complicate operation of the distribution system by causing discolored water and promoting manganese/iron eating bacteria to accumulate in stagnant lines, which must be flushed regularly to improve water quality and prevent bacteria. The addition of sodium hypochlorite, which must be added to disinfect and prevent water borne illness, further complicates the situation by oxidizing these metals, which make them insoluble in water. All six of our production wells contain organic carbon in substantial amounts as well as ammonia in well 3,4 and 5. These contaminants will produce chlorine byproducts beyond water quality guidelines if the chlorine disinfectant is not carefully dosed and monitored while simultaneously blending the various groundwater sources to dilute the contaminants. This process must be controlled and monitored by skilled and well-trained water

operators. A solution has been presented in the form of a water treatment plant (WTP), which is currently moving forward with a UBC/Reseau Water research pilot plant tasked with finding the most efficient and economical form of treatment for our unique water chemistry.



Agricultural Irrigation Districts 8 and 9 take their water from two lake intakes on the north and south sides of Town boundaries in electoral Area A. Although a chlorine residual is maintained, these sources are perpetually on a boil water as the surface water is otherwise untreated as the chlorine has very little contact time. Many of the residences who historically had received their household water from this source have now been switched to the municipal system with the Rural Area

Twining Project (approximately 80%). Homes not yet on the municipal system continue to remain on boil water advisories due to concerns with the bacteriological potential of the irrigation distribution system.

Large fluctuations in water use define the Osoyoos water distribution systems. In summer 2023 our domestic system (groundwater potable system) consumption fluctuated to an average daily water use of seven times the volume consumed in winter. Although the population of Osoyoos increases drastically in summer due to tourism, we believe this fluctuation is mostly due to residents irrigating their lawns and gardens as similar trends are *not* observed in the flow of returned wastewater. At times in the summer months the demand is higher than the output and the reservoirs start to drop despite all six of our production wells drawing at maximum capacity. This is one of the many operating challenges that Osoyoos faces. Others include approximately 23.7 km of aging asbestos cement water main long past its recommended service life (according to the *BC Government Guide to the Amortization of Tangible Capital Assets. BCGATCA. 2008*). A central bottleneck at the bridge, compounded by all the reservoirs located on the west side, making the task of blending sources and flushing particularly challenging.

Town of Osoyoos Domestic System

Our municipal (potable) system is supplied by six active wells, (wells 1,3,4,5,6, and 8). Each well is enclosed in a small building, which houses the pump and motor (pumphouse). The exception is Well 8 which is a submersible style pump. These wells are located throughout the municipality: three being on the east side of Osoyoos lake (well 3,4, and 5), and three on the west side (well 1,6, and 8). The four reservoirs are all located on the west side of Osoyoos. This system is separate and isolated from the irrigation system which is sourced directly from Osoyoos Lake.



Groundwater well capacities:

Well	Max Litres per Second	Daily Supply in Cubic Metres
Well #1	28	2419.2
Well #3	42	3628.8
Well #4	44	3801.6
Well #5	68	5875.2
Well #6	13	1123.2
Well #8	35	3024
Total	230	19871.5

Reservoir capacities:

Reservoir	Volume in Cubic Metres
340 South	1,350
340 North	2,550
402	1,000
Dividend Ridge	1,100
Total	6,000

The domestic system can be subdivided into three separate pressure zones which are buffered by the different reservoirs:

- *340 Reservoirs* – All areas of Osoyoos east of Highway 97 including East Osoyoos and the twinned sections of the irrigation district.
- *402 Reservoir* – Industrial Park, Osoyoos Secondary, Desert Park, Finch/Swan/Sandpiper/Wren/Killdeer/Curlew Area.
- *Dividend Ridge Reservoir* – Dividend Ridge area including the Osoyoos Golf Course clubhouse.

Emergency Response Plan

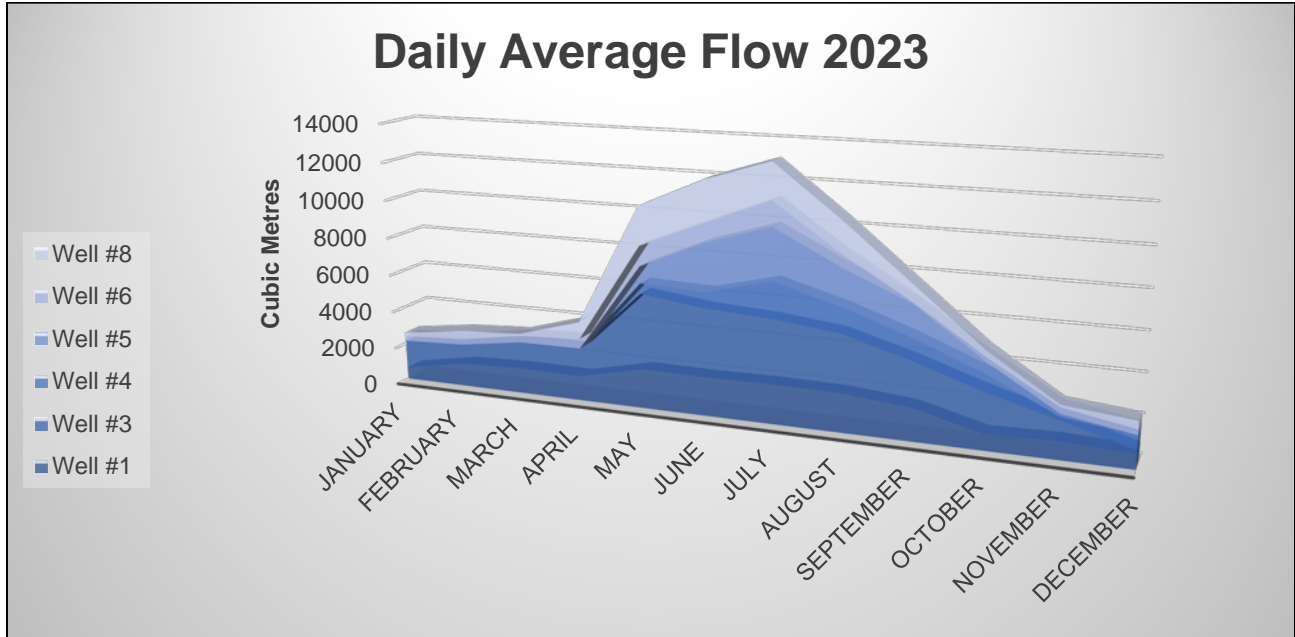
The Town's water utility emergency response plan was updated in 2023 and is currently under review. Many procedures require review after our experience with the Eagle Bluff wildfire and our local Emergency Operations Centre protocol. Current Plan is available on request.

Domestic System Consumption

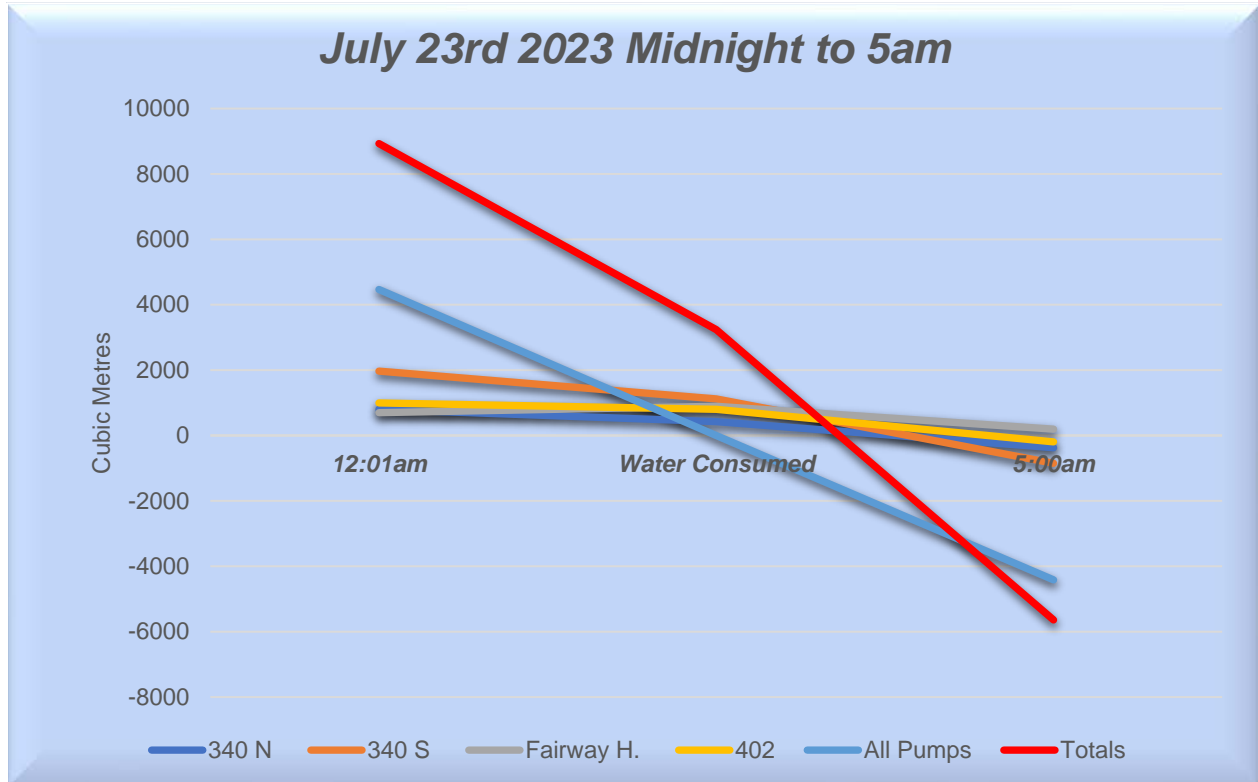
Domestic daily water use was lowest in January and peaked in July. The Town was put under stage two water restrictions as of the 16th of June which lasted until they were rescinded on October 1st. The Town's Bylaws Department did an admirable job of enforcing as best they could.

Although this had some effect, generally between 2am and 6am our well output was not keeping up with the demand, resulting in many mornings in the summer months where the reservoirs were depleting faster than our maximum output. This timing, along with our wastewater trends, point to the irrigation of lawns and gardens being the primary cause. * See below

*Comparison of daily average flows of domestic water and wastewater:



Consumption has been increasing steadily as our population and number of services grow. During peak demand in the early summer mornings our total well output is less than the demand on a regular basis as illustrated in the following chart:



During this particularly demanding five-hour period on July 23rd, The Town's consumption on the domestic system was 5641 m³ (313 liters per second). Our maximum pump flow during this time was 4416 m³ (245 liters per second) with all wells running. This resulted in a deficit of 1225 m³ which was absorbed by our reservoirs as the graph shows. The trend is worrisome as there is no margin for mechanical failure or firefighting. If the timing of the Eagle Bluff wildfire was different, and residents did not change their watering habits, the outcome of the fire may have been different.

Well Output in 2023 amounted to 2,430,397 cubic metres, *an increase of 7.4 % over 2022*, a substantial increase for one year. Our overall daily average use was 6659 m³, (assuming eight thousand domestic users), which amounts to a yearly average of 826 litres a day per person. In the warmer months (May – August) we average 1500 litres per person per day. To put these numbers in perspective, the Canadian national average is roughly **329 litres** per person per day.

Although Osoyoos' Waster Restrictions Bylaw states municipal parks are exempt, Public Works cut park irrigation drastically to assist with lowering consumption. Irrigation timers were changed to off peak; days were decreased, duration was cut dramatically, and the parks survived.

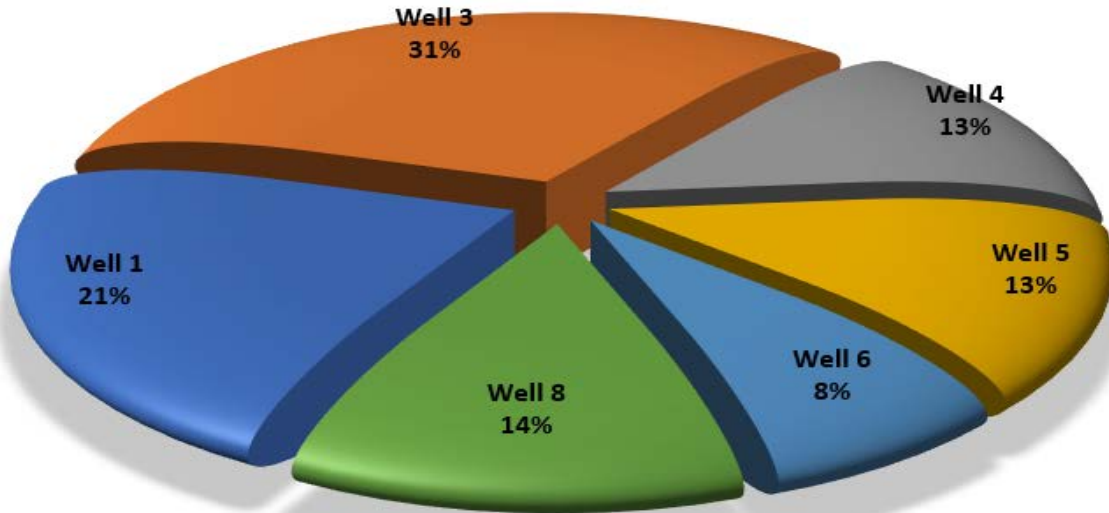
Osoyoos' water consumption by well:

2023 Water Consumption *all figures in cubic meters													
m3	January	February	March	April	May	June	July	August	September	October	November	December	Total 2023 m3
Well #1 Total	19659	34929	41674	39553	64221	61214	64422	62830	51766	26040	27584	24318	518210
Average daily demand	634.1612903	1247.464286	1344.322581	1318.433333	2071.645161	2040.466667	2078.12903	2026.77419	1725.533333	840	919.466667	784.4516129	1419.753425
Well #3 Total	43266	29316	44174	44391	109895	106919	109912	92821	69240	63994	30739	4797	749464
Average daily demand	1545.214286	1047	1424.967742	1479.7	3545	3563.96667	3545.54839	2994.22581	2308	2064.322581	1024.633333	154.7419355	2053.326027
Well #4 Total	0	0	0	31972	39513	57684	56191	40503	33442	27008	5117	27196	318626
Average daily demand	0	0	0	1065.733333	1274.612903	1922.8	1812.6129	1306.54839	1114.733333	871.2258065	170.566667	877.2903226	872.9479452
Well #5 Total	0	0	0	0	22668	74317	80953	59911	49578	18522	4427	0	310376
Average daily demand	0	0	0	0	731.2258065	2477.233333	2611.3871	1932.6129	1652.6	597.483871	147.566667	0	850.3452055
Well #6 Total	7812	8424	10812	15382	32250	28981	39345	21969	2087	7058	9315	9102	192537
Average daily demand	252	300.8571429	348.7741935	512.7333333	1040.322581	966.0333333	1269.19355	708.677419	69.5666667	227.6774194	310.5	293.6129032	527.4986301
Well #8 Total	6173	12508	3815	26891	62441	64595	59145	50685	25760	9662	3721	15788	341184
Average daily demand	199.1290323	446.7142857	123.0645161	896.366667	2014.225806	2153.16667	1907.90323	1635	858.666667	311.6774194	124.0333333	509.2903226	934.7506849
Totals	76910	85177	100475	158189	330988	393710	409968	328719	231873	152284	80903	81201	2430397
Average daily demand	2480.967742	3042.035714	3241.129032	5272.9667	10677.0323	13123.6667	13224.7742	10603.8387	7729.1	4912.387097	2696.76667	2619.387097	6658.621918
Station #8 Total	0	0	0	40153	436092	581278	591707	608813	327346.2	27869	6030	6243.4	2625531.6
Average daily demand	0	0	0	1338.433333	15574.71429	19375.9333	21132.3929	21743.3214	10911.54	995.3214286	201	222.9785714	7193.23726
Station #9 Total	0	0	0	26591	358755	389708	486218	392325	303132	122243	0	0	2078972
Average daily demand	0	0	0	886.366667	12812.67857	12990.2667	17364.9286	14011.6071	10104.4	4365.821429	0	0	5695.813699
Totals	0	0	0	66744	794847	970986	1077925	1001138	630478.2	150112	6030	6243.4	4704503.6
Average daily demand	0	0	0	2224.8	28387.3929	32366.2	38497.3214	35754.9286	21015.94	5361.142857	201	222.9785714	12889.05096

Well production as a percentage of total output:

Chart Area

Well Production 2023



During 2023 The Town's Water Distribution System and Water Treatment Classifications were re-submitted to the Environmental Operator's Certification Program (EOCP). They increased from a class two to a class three distribution system and a class three treatment, up from a class one treatment. This was due to additions to the system, new contaminant findings, and new rules regarding classification by the EOCP. A push by our staff for training and certification regarding treatment will commence immediately in anticipation of the new treatment plant.

Current EOCP levels and applicable Red Seal trades of Operators:

Name:	Position:	WD Certification Level:	Applicable Trades:
S. Kelly McDonald	Utilities Superintendent	3	Journeyman Millwright
David Stene	Operator	2	
Karl Fichter	Operator	2	
David Gordin	Operator		Journeyman Plumber
Gabriel Wood	Operator in Training	OIT	
Manuel Mora	Water/WW Equipment Operator		

Cross Connection Program

The Town of Osoyoos engages in a rigorous backflow prevention program. Town utilities staff are trained and certified to be able to identify and prevent issues in the system, as well as monitor the Town's own backflow devices which are certified annually. The Town has contracted MTS inc. from Vernon to administer the program and conduct assessments. Reports are available upon request.

Domestic System Capital Projects in 2023

In the Spring, due to ever increasing demand, exploratory drilling was conducted and two new well sites were explored. Options were limited as to the placement of potential sites, due to urban build up and the location of the aquifers. Although these two new well sites show promise for output capacity, they too show the same contaminants, (manganese, iron, Total Organic Carbon (TOC), and ammonia), in similar quantities as Osoyoos' current wells.

**Well #9 and #10 sampling results on next page.*

New wells #9 and #10 sampling results:

Parameter	Units	Test Well 1 WPID 28644 (May 26, 2023)	Test Well 2 WPID 28646 (May 31, 2023)	GCDWQ
General Parameters				
pH	pH units	7.85	7.84	AO = 7-10.5
Conductivity	µs/cm	476	487	--
Turbidity	NTU	0.11	0.22	varies
General Parameters and Nutrients				
Total Dissolved Solids	mg/L	274	293	AO < 500
Total Organic Carbon	mg/L	3.18	3.13	--
Total Hardness (as CaCO ₃)	mg/L	201	212	--
Fluoride	mg/L	0.34	0.68	MAC = 1.5
Nitrate, N	mg/L	<0.010	<0.010	MAC = 10
Nitrite, N	mg/L	<0.010	<0.010	MAC = 1
Ammonia, N	mg/L	0.467	0.338	--
Chloride	mg/L	13.5	15.6	AO < 250
Sulfate	mg/L	35.4	40.5	AO < 500
Total Cyanide	mg/L	<0.0020	<0.0020	MAC = 0.2
Selected Ions and Metals (Total)				
Aluminum	mg/L	<0.0050	<0.0050	MAC = 2.9
Antimony	mg/L	<0.00020	0.00029	MAC = 0.006
Arsenic	mg/L	0.00061	0.00084	MAC = 0.01
Barium	mg/L	0.0950	0.0846	MAC = 2
Boron	mg/L	<0.0500	<0.0500	MAC = 5
Cadmium	mg/L	0.000017	0.000029	MAC = 0.007
Chromium	mg/L	<0.00050	<0.00050	MAC = 0.05
Copper	mg/L	0.00281	0.0503	MAC = 2 AO ≤ 1
Iron	mg/L	<0.010	0.014	AO ≤ 0.3
Lead	mg/L	0.00071	0.00386	MAC = 0.005
Manganese	mg/L	0.101	0.0443	MAC = 0.12 AO ≤ 0.02
Mercury	mg/L	<0.000010	<0.000010	MAC = 0.001
Selenium	mg/L	0.00196	<0.00050	MAC = 0.05
Sodium	mg/L	26.9	29.2	AO < 200
Strontium	mg/L	0.450	0.791	MAC = 7
Uranium	mg/L	0.00497	0.00751	MAC = 0.02
Zinc	mg/L	0.0235	0.0235	AO ≤ 5
Microbiological Parameters				
Total Coliforms	CFU/100mL	<1	<1	MAC < 1
E. Coli	CFU/100mL	<1	<1	MAC < 1
Disinfection By-product Formation Potential				
Chlorine Demand	mg/L	8.4	8.2	--
Total HAAs	mg/L	0.0932	0.0990	MAC = 0.08
Total THMs	mg/L	0.112	0.113	MAC = 0.1

Notes: GCDWQ = Guidelines for Canadian Drinking Water Quality; MAC = Maximum Acceptable Concentration (flagged as orange); AO = Aesthetic Objective (flagged as green); HAA = Haloacetic Acids; THM = Trihalomethanes.

*Western Water Associates LTD Groundwater Exploration Program Report / *GCDWQ=Guidelines for Canadian Drinking Water Quality / *WPID=Well Plate Identification Number

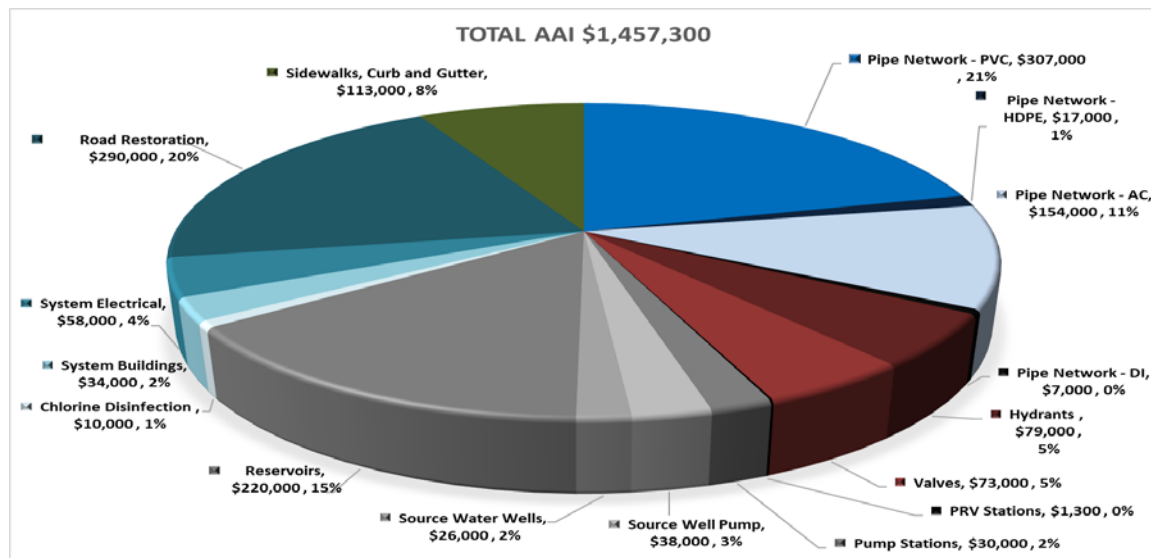
A domestic water system infrastructure master plan was completed in 2023 by TRUE engineering to evaluate the domestic water network performance under existing and future conditions and provide a guide for staged system improvements and expansions.

The plan included:

- An analysis on the Town's water demand profile.
- A review of the Town's treated water storage reservoirs.
- Design criteria utilized for water modelling purposes.
- A review of the performance of the existing water system.
- Proposed water system upgrades to address system deficiencies.
- A system composite model with GIS software to create asset inventories based on:
 - Review of record drawings and survey data, and
 - Review of Official Community Plan (OCP) for future land use.
- A domestic water system model using Water CAD Software.
- A reserve balance model considering average annual investment and monthly service fee (MSF).
- A 20-year horizon work plan for capital and replacement projects.
- The analysis and recommendations for replacement, rehabilitation, improvement, and implementation of infrastructure.

With the recent changes in Land Use designations by the Province of British Columbia, the Water Master Plan will need to be updated to reflect the Provincial mandate to allow for high density development in all land use zones within the community. This update will not only need to look at the domestic consumption requirements, but the need to provide fire protection for this higher density construction.

Recommended Average Annual Investment (AAI) developed with a risk-based approach is shown in the following graph:



**Full document can be accessed at Osoyoos.ca*

During 2023 work on upgrading our remote monitoring and control system (SCADA - Supervisory Command and Data Acquisition) continued. Our current system is long outdated and unreliable. Exceed Electrical Engineering is converting our *ifix* monitoring system to *VTSCADA* programming as well as upgrading our PLCs (Programmable Logic Controllers) and HMIs (Human Machine Interface) in our stations. The system is now on a server in a secure off-site location. The importance of this was emphasized as the Eagle Bluff wildfire raged nearby the Operational Services Department building. Our telemetry was converted all to cellular as well in 2023.



Notable Events Affecting our Domestic System in 2023

During the Summer the Eagle Bluff wildfire occurred on the west side of Osoyoos pushing our domestic distribution system to its limits once again. All the groundwater pumps were run at maximum capacity and were not keeping up. As the reservoirs started to deplete rapidly the fire department completed use of the pumper trucks and the demand subsided. Although we had the option of diverting irrigation water at our disposal this was



not needed, thankfully, as a thorough flush of the system would have to be conducted with a boil water advisory in place.



Four major water main breaks occurred at Pinehurst Place, 74th Avenue, 83rd Street, and Golf Course Drive. Numerous minor breaks occurred as well at various locations which needed to be repaired. Golf Course drive had a two-meter longitudinal break, most likely caused by stress on the system from the Eagle Bluff wildfire firefighting activities. Pressure was unable to be maintained and a boil water advisory was issued for the area until sampling was completed.



Well 3 pump was pulled in December for maintenance. A small amount of the residue removed from the wall of the pipe in the header directly downstream of the pump is pictured below (manganese and iron). Well 3 is one of Osoyoos' best water quality wells and runs 24 hours a day during the summer.



Anticipated 2024 Capital Projects

Next year should be a busy year for utilities. Many projects are being planned and implemented.

- In 2024 we are planning to rebuild our 340 Booster Station. This station is long past its life expectancy and has multiple leaks that are very difficult to repair due to the design of the chamber. (When originally built, the valve chamber was not constructed with the entrance large enough to remove the valve so it can be replaced, among other confined space design issues.)
- The Town's water metering program will begin in 2024, as this capital project is currently out to tender. This should alleviate some of the water consumption issues.
- Our SCADA (Supervisory Control and Data Acquisition Computer System) system upgrades will continue as the installations of the components carry on into 2024.
- We are planning to hire two new operators in our goal to switch completely from reactionary to preventative maintenance.
- Other items we are looking at upgrading are: standby power, flood mitigation of the well sites and rehabilitation of the water infrastructure at Magnolia Place.
- In conjunction with the studies being done on treatment options, a study is being commissioned to plan a reservoir on the east side of the lake.

Future Treatment Plant

With the discovery of both ammonia and organic carbon in our wells as complicating factors for potential treatment options, steps needed to be taken. Operations began talks with RESEAU Water and UBC to ask for their assistance in determining the most economical form of treatment for Osoyoos before any plans were finalized regarding the water treatment plant. In November, a pilot trailer was tooled with various treatment options to test. It arrived on site and was set up at Well 4/5 located in Cottonwood Park. This advanced pilot plant will be in operation till early 2024 as this research takes place.

TOC (Total Organic Carbon), while not currently regulated, will likely be regulated in the future. One of the main issues of TOC, and naturally occurring ammonia, is it creates byproducts when mixed with sodium hypochlorite and other forms of chlorine. This has been proven to cause cancer with long term exposure. TOC along with ammonia also increases the chlorine absorption (demand) of the water before a stable residual is formed (breakpoint chlorination). Because of this, breakpoint chlorination is not attempted in our domestic system (in order to keep the chlorine byproducts within regulations (**byproduct potential testing results below*)). This adds a further burden for our Operators as a residual must be maintained throughout the system. Careful monitoring and dosing is done manually at different points in the system which further complicates its operation, especially in the low flow times during the winter when the water age increases dramatically.

Final details of the future plant are unknown pending the results of these tests. Until the treatment process is decided, the footprint needed for the plant is unknown and the raw water lines and plant location/configuration cannot be finalized.

Sampling and Contaminants

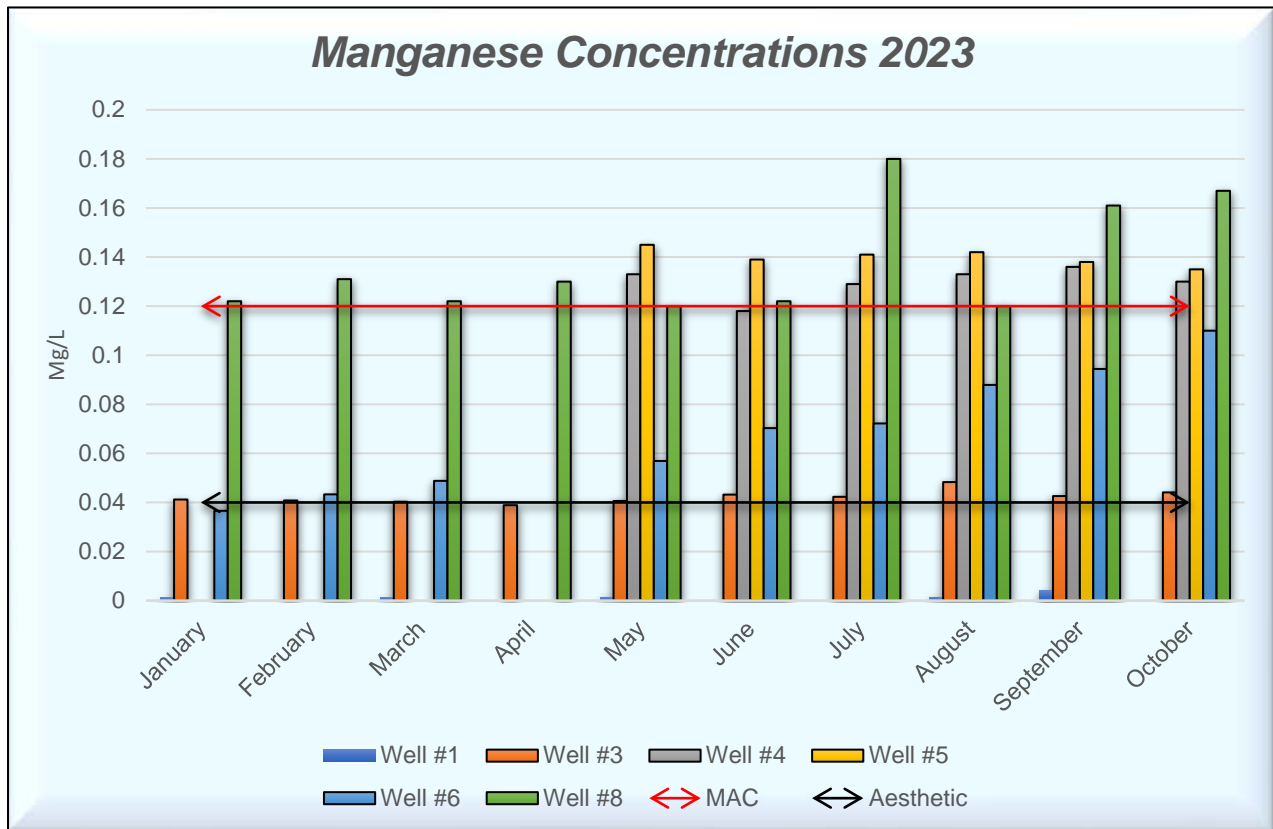
Over 350 scheduled domestic system bacteriological tests are conducted annually as well as full comprehensive testing in order to keep our drinking water as safe as possible and keep track of

changes in water quality. We perform many more tests than mandatory requirements in order to help us blend our well supplies properly to keep parameters below regulated limits. In addition, daily spot tests are done for chlorine residual and turbidity at various points of the system. **scheduled samples located in appendix*

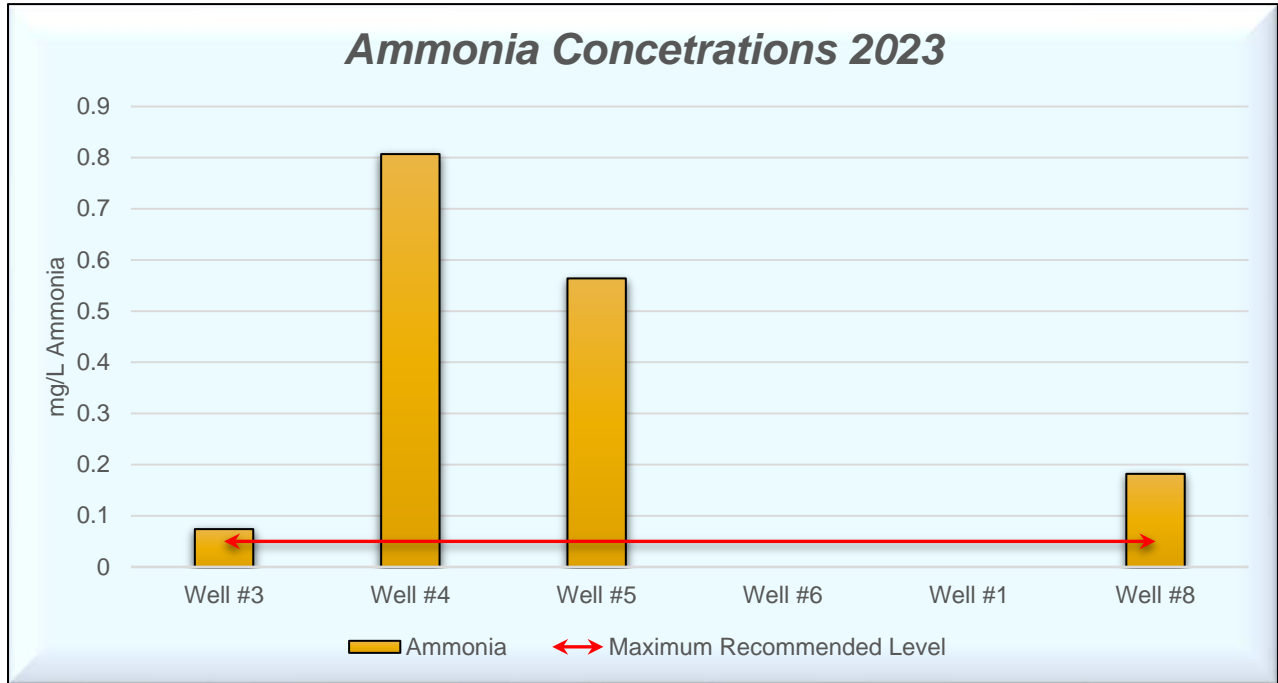
- Bacteriological Samples test for E-coli and Coliforms. We had zero positive tests in the domestic system during 2023.
- Comprehensive Samples include tests for bacteriological contaminants as well as minerals and other parameters. # Results below

Other tests that have been conducted on our raw well water include ammonia and organic carbon in addition to chlorine byproduct potential. On the Distribution system we also test for chlorine byproducts as well as regularly check chlorine residuals and turbidity. Town Water Operators conduct hundreds of samples annually to monitor our system.

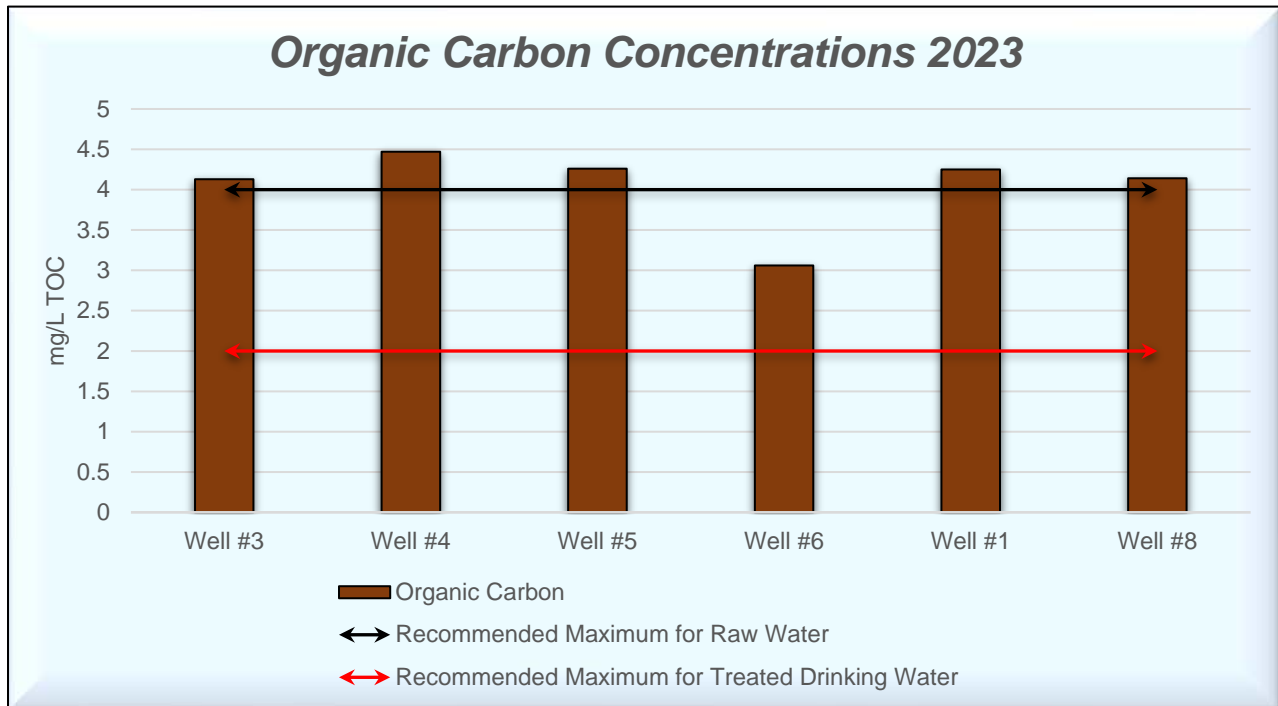
Manganese concentration per well (M.A.C. = maximum acceptable concentration level):



Ammonia concentration per well:

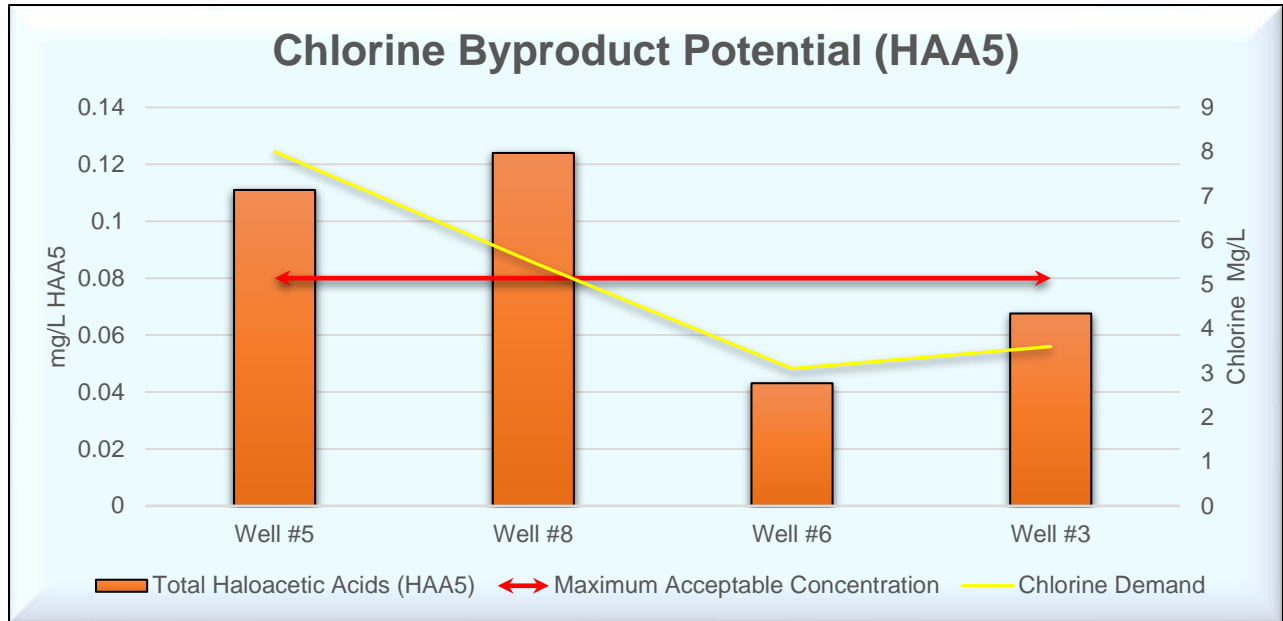


TOC concentration per well:

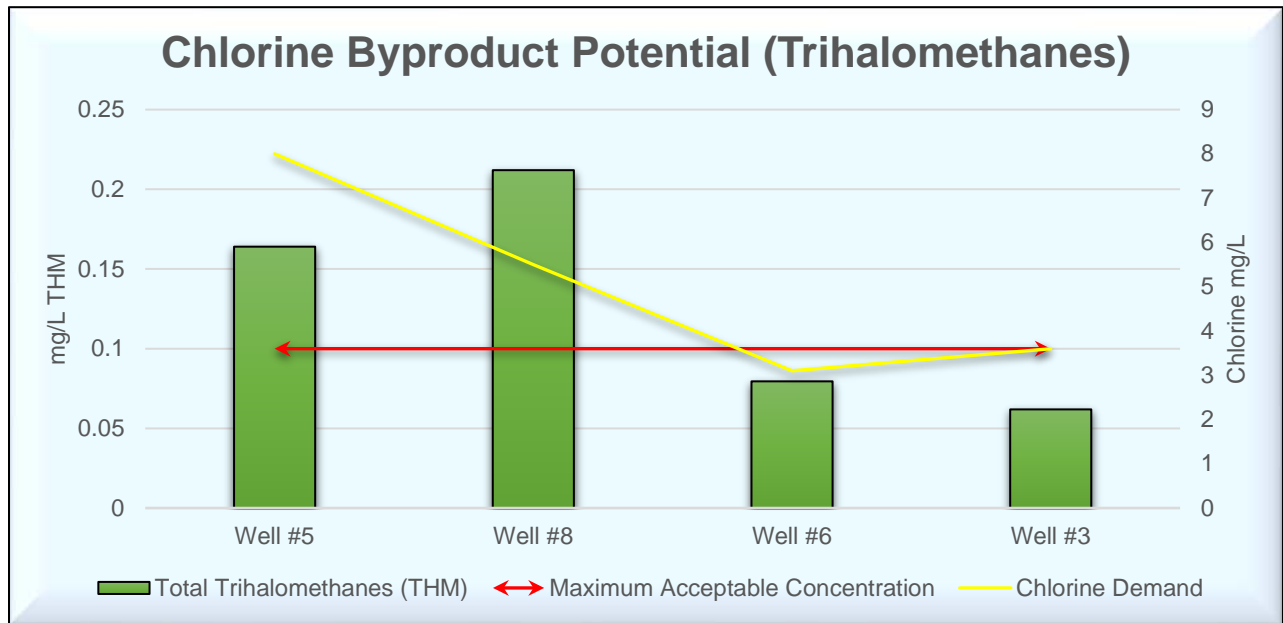


The following charts illustrate the byproduct formation potential of each well if chlorine breakpoint was reached. The wells not listed were not tested as the ammonia and manganese concentrations were lower. (Well #4 was not tested due to its similarity with #5):

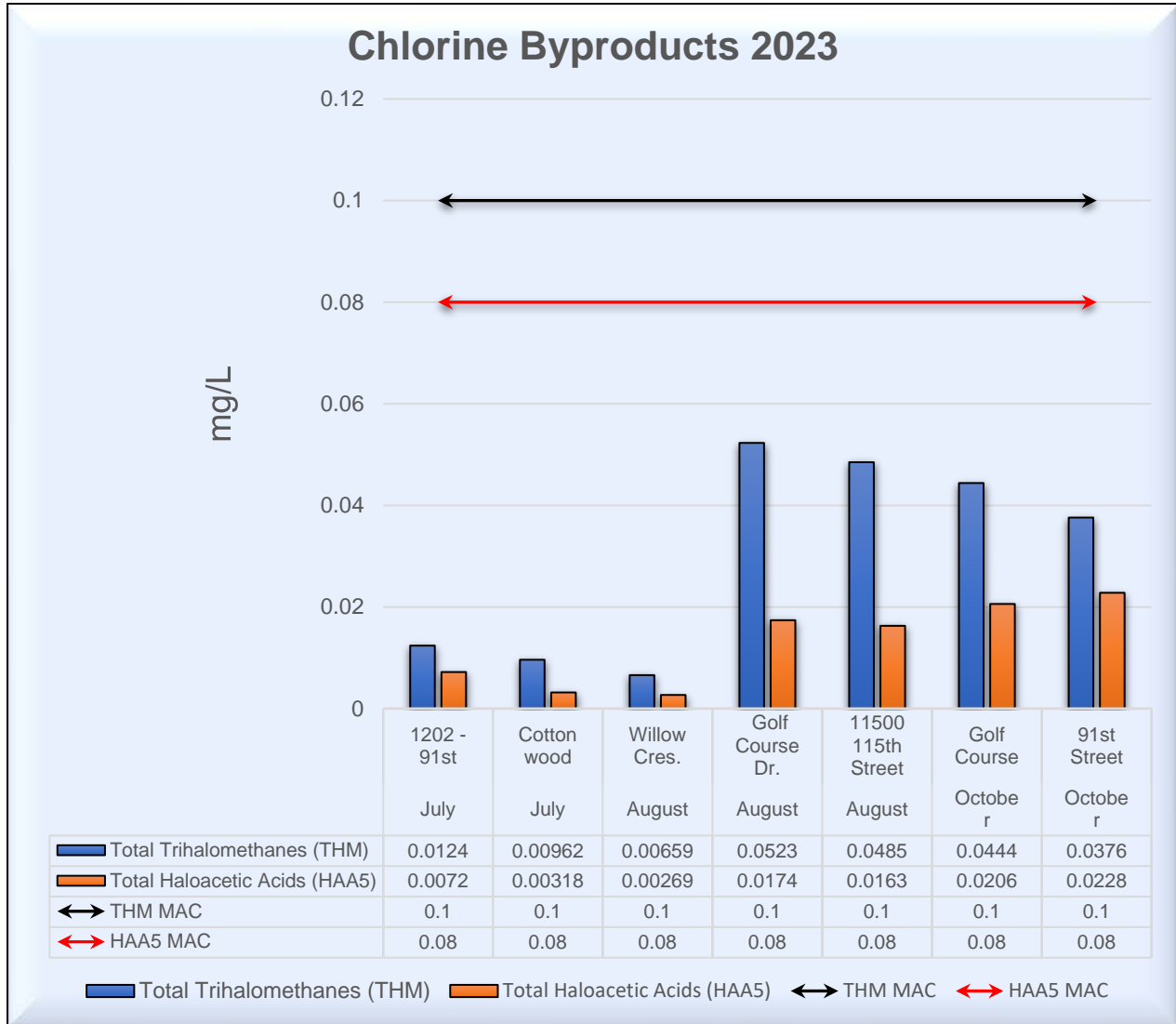
Chlorine By-product Potential results (Halo acetic Acids):



Chlorine By-product Potential results (Trihalomethanes):

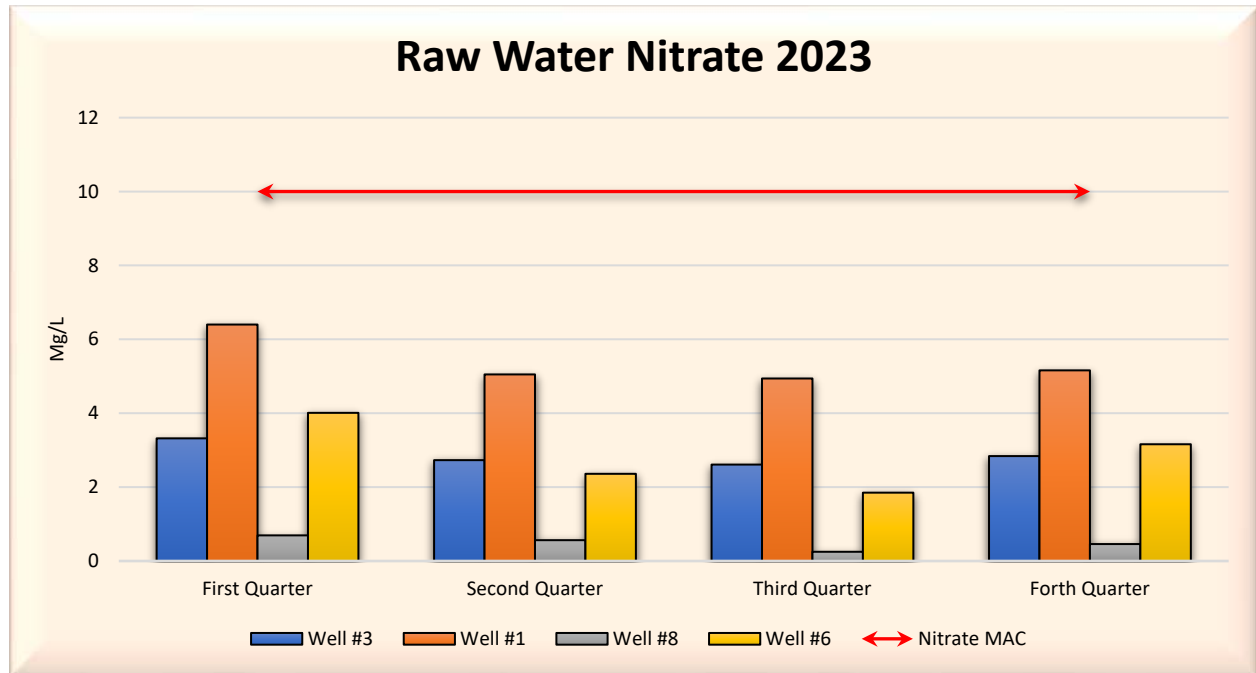


Due to Operators blending the various well sources and flushing dead ends our testing on the distribution system has indicated that chlorine byproducts do not exceed the regulated maximum allowable concentration (MAC) as shown below:



The Town of Osoyoos also monitors nitrate levels in every well's raw water, focusing on Well #6 and #8 which have historically had the highest levels. In 2023 nitrate monitoring showed no change and was below the regulated Maximum Allowable Concentration (MAC). It is important to monitor nitrate levels in our area as agricultural infiltration and runoff from fertilizer can affect our relatively shallow aquifers.

Nitrate Sampling Results (Our other well results were negligible):



Municipal weekly scheduled sampling locations of the Domestic System include:

Tamarack Drive, 89th Street/Hwy 97, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8, 340 Reservoir, 402 Reservoir, Dividend Ridge Reservoir, Cottonwood Drive, Lobelia Drive, Dividend Ridge Booster, and Hummingbird Lane. *2023 sampling schedule in appendix

Maintenance

Hydrants

The Operational Services Department has successfully completed a full maintenance process on 50% of the Fire Hydrants on the distribution system. The full maintenance process was completed by a third-party contractor with the remaining 50% visually inspected by Operational Services operators.

Flushing

A uni-directional flushing program was not initiated this year, instead spot flushing occurred. This change was due to two reasons. Upon inspection of the 340 Reservoir by *Aquavision* ROV, three to five inches of residue were discovered. This was despite the reservoirs being cleaned in the Fall of 2022. This fact, along with the discovery of a thick manganese/iron sludge layer on the header of Pump #3, led us to believe that we could not reach the velocities needed to remove our build-up from the pipe sidewalls properly. Well #3 produces 41 liters per second, which equates to 1.5 metres per second in a 200mm pipe, (Header size). This far exceeds minimum scouring velocity. It is our belief that, from experience, uni-directional flushing would only increase the manganese levels in the drinking water without scouring the residue meaningfully.

Valve Exercising

Unfortunately, limited valve exercising occurred in 2023 due to staffing issues. This will be improved upon going forward with the addition of more Operators.

Irrigation System (Districts #8, #9)

Introduction

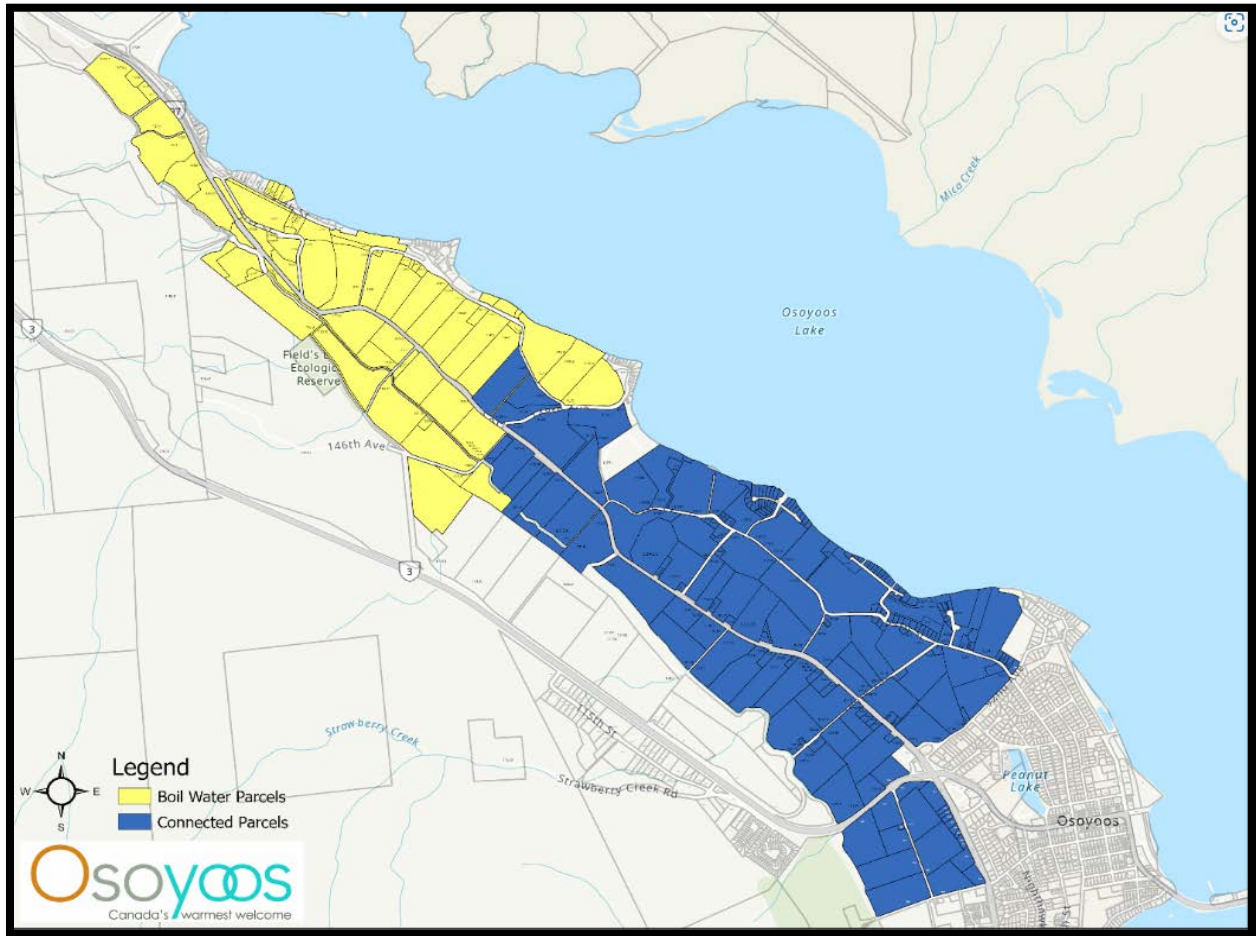
The Town of Osoyoos also operates an irrigation system outside of municipal boundaries which is kept isolated from the Town's Domestic System. Ownership of this system was transferred to the Town in 1990 when the *South Okanagan Lands Irrigation District* was dissolved. Before 2023 the district's supply was changed to Domestic System water when the irrigation season ended in October. This is no longer the case due to the risk of contamination to the municipal system. District 9 is now isolated and decommissioned for the off season as no more residential services are connected to it. District 8 is kept charged by one pump at Station 8 lake intake and buffered with Reservoir #9. A boil water advisory is maintained throughout the year. Historically the advisory was lifted on the homes in the irrigation district during the off season. This will no longer occur as the safety of the system cannot be verified, even with municipal water. *See map next page.

The Irrigation System consists of 42.3 km of pipe: of which 58% is asbestos cement pipe installed in the 1960's. The two lake intakes (Station #8 and Station #9) keep the system charged by way of pressure monitoring sensors controlling the pumps. Six pumps in #9 and five pumps in #8 are activated or deactivated in sequence as demand fluctuates. In the winter, the #9 reservoir level is used to activate the pump(s) in Station 8 to compensate for demand. This is a more efficient modulation rather than using pressure during this time of lower consumption. The system also includes a booster station located on 103rd street off highway 97, which helps to maintain usable pressure at the extremities of the system.



*Picture courtesy of Destination Osoyoos.

Boil Water Advisory Location:



Yellow Parcels are on continuous boil water advisory.

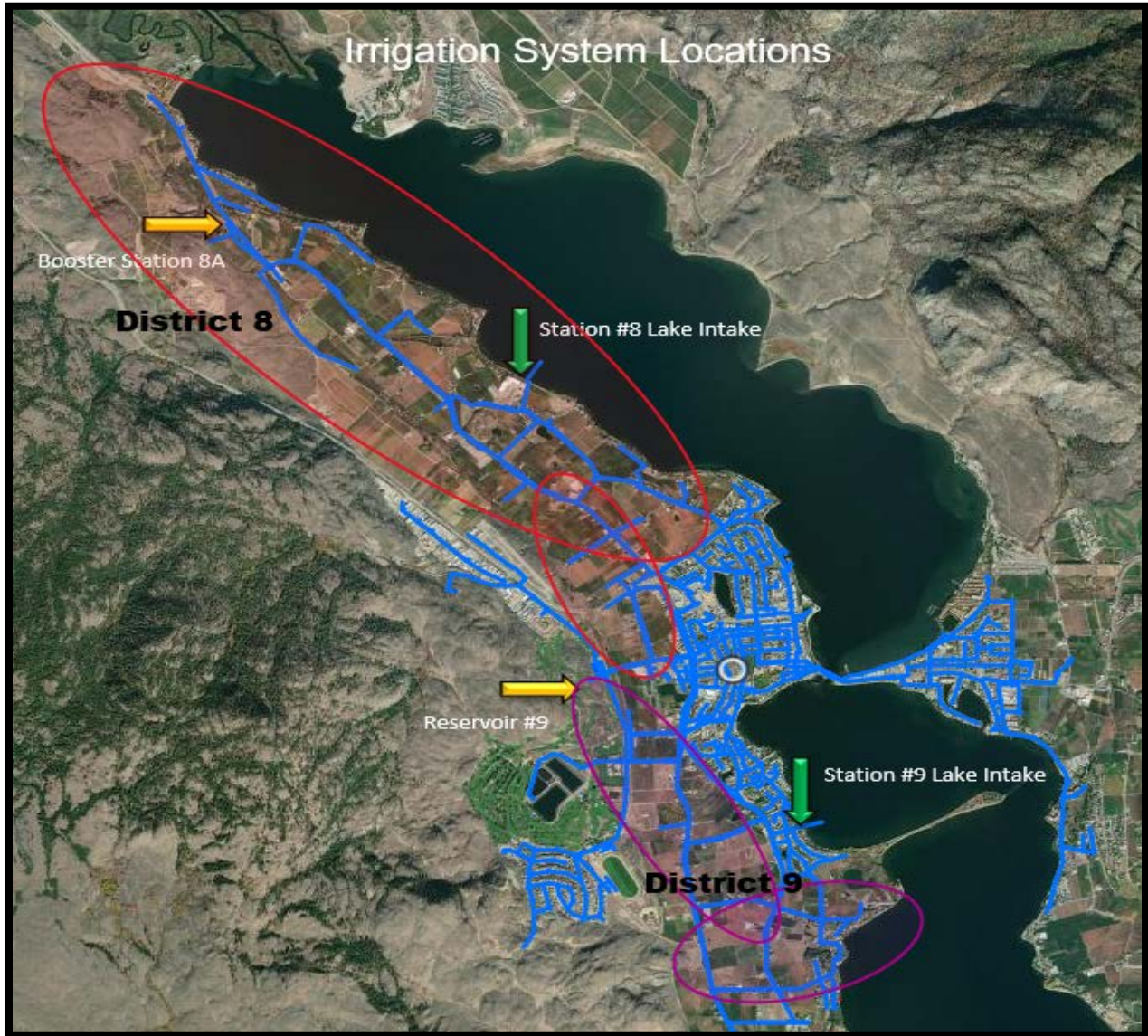
Separate System

On December 19th, 2023, the Agricultural Irrigation System was divided from the Municipal Domestic System with the Environmental Operator's Certification Program. It is now registered as a distinct entity with a classification of Water Distribution Level Two. Going forward, the two systems will be reported on separately. The primary reason for this is to clarify boil water restrictions.



1*Picture of Station #8 lake intake.

One of the key reviews still needed to ensure that the Agricultural Irrigation System is effectively managed now and in the future is an Asset Management Plan. An Asset Management Plan will allow for effective and accurate rate structure planning to safeguard the financial stability of the agricultural irrigation system for years to come.



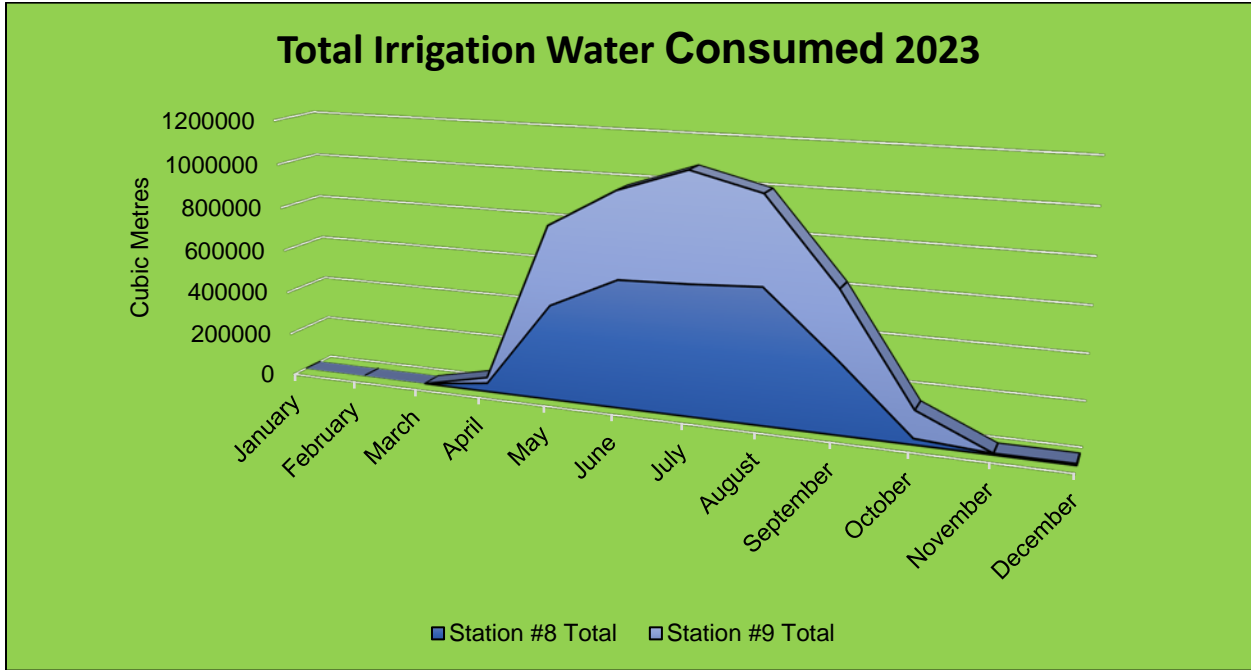
Irrigation System Consumption

Total water pumped to the irrigation system amounted to 4,704,504 cubic metres in 2023 with an average annual daily demand of 12889 cubic metres. During the main irrigation months (May to September) the average day demand was 31204 cubic metres. This is a decline from 2022 at 5,102,097 cubic metres. The consumption of the irrigation system has been steadily declining year on year as orchards are switching to vineyards, which have considerably less water demand.

Station #8 Total	0	0	0	40153	436092	581278	591707	608813	327346.2	27869	6030	6243.4	2625531.6
Average daily demand	0	0	0	1338.43333	15574.71429	19375.9333	21132.3929	21743.3214	10911.54	995.3214286	201	222.9785714	7193.23726
Station #9 Total	0	0	0	26591	358755	389708	486218	392325	303132	122243	0	0	2078972
Average daily demand	0	0	0	886.366667	12812.67857	12990.2667	17364.9286	14011.6071	10104.4	4365.821429	0	0	5695.813699
Totals	0	0	0	66744	794847	970986	1077925	1001138	630478.2	150112	6030	6243.4	4704503.6
Average daily demand	0	0	0	2224.8	28387.3929	32366.2	38497.3214	35754.9286	21015.94	5361.142857	201	222.9785714	12889.05096

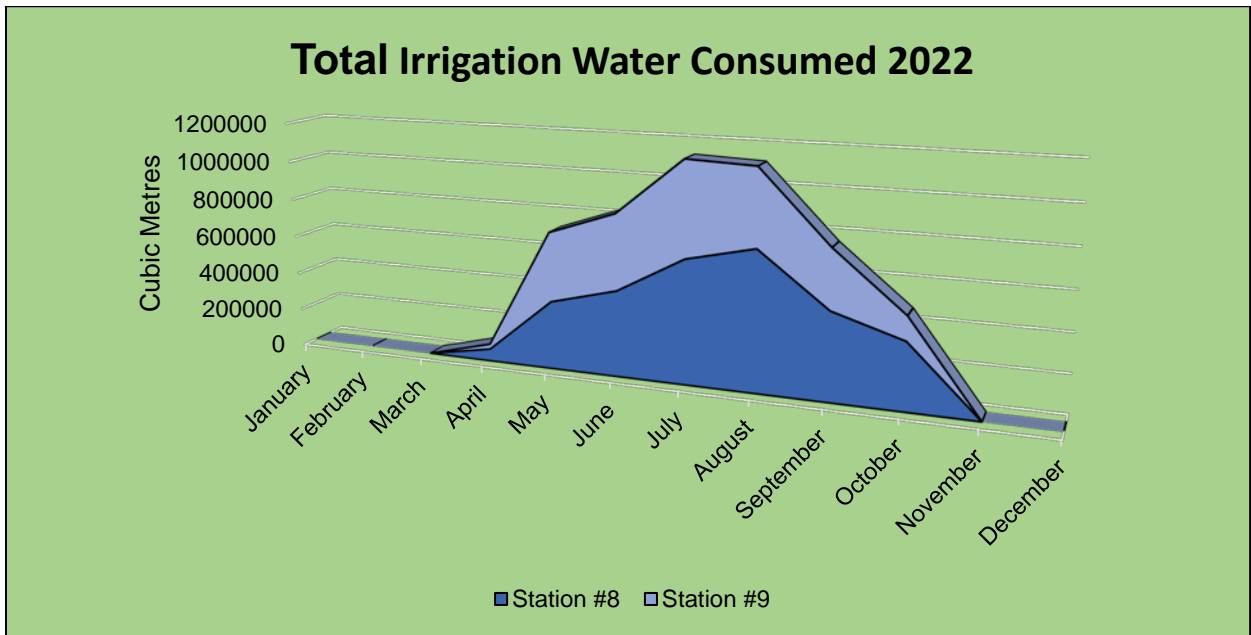
2023 Consumption:

2023 M3	January	February	March	April	May	June	July	August	September	October	November	December	Totals
Station #8	0	0	0	40153	436092	581278	591707	608813	327346.2	27869	6030	6243.4	2625532
Station #9	0	0	0	26591	358755	389708	486218	392325	303132	122243	0	0	2078972
Totals	0	0	0	66744	794847	970986	1077925	1001138	630478.2	150112	6030	6243.4	4704504



2022 Consumption:

2022 M3	January	February	March	April	May	June	July	August	September	October	November	December	Totals
Station #8	0	0	0	64080	355184	446046	639314	720573	453119	344809	0	0	3023125
Station #9	0	0	0	26591	358755	389708	486218	392325	303132	122243	0	0	2078972
Totals	0	0	0	90671	713939	835754	1125532	1112898	756251	467052	0	0	5102097



Sampling

The Irrigation System is regularly sampled for chlorine residual and turbidity by our Operators. A regime of bacteriological sampling and comprehensive sampling is also followed as per Interior Health guidelines.

Lake water comprehensive sample results show no signs of any contaminants over the MAC (Maximum Acceptable Concentration). There are occasional coliform hits in the system due to the untreated water, which is to be expected. Therefore, a Boil Water Advisory is always in place for the homes on the irrigation system. Boiling also removes any chlorine by-products. *All sampling results and lab reports available upon request.

Irrigation Positive Coliform Tests:

Irrigation System Positive Samples 2023												
Week	Sample Date	Sample Time	Sample ID	Civic Address	Lake Level	24 hour Percipitation (mm)	Temp	NTU	Mg/L	Total Coliforms	E. Coli	
Week 19	09-May	10:45am	Agricultural System #8	103rd	911.7	0.8		26	0.29	16	<1	
Week 21	23-May	9:10am	Agricultural System #8	103rd	911.1	11.2	13	6.88	0.41	1	<1	
Week 29	18-Jul	9:00AM	Agricultural System #8	103rd	911	0	18	1.07	0.53	2	<1	
Week 29	18-Jul	9:30AM	Agricultural System #8	System 8 intake	911	0	17	1.36	1.14	3	<1	
Week 29	18-Jul	10:55AM	Agricultural System #9	System 9 intake	911	0	23	1.98	1.2	11	<1	
Week 31	01-Aug	9:10AM	Agricultural System #8	103rd	910.8	0	18	1.76	0.7	5	<1	
Week 32	09-Aug	9:31AM	Agricultural System #8	103rd	910.8	0	19	1.2	0.54	2	<1	
Week 33	15-Aug	11:00AM	Agricultural System #8	103rd	910.7	0		1.77	0.71	7	<1	
Week 35	29-Aug	9:10am	Agricultural System #8	103rd	910.9	13.5	20.5	1.81	0.35	66	<1	
Week 38	19-Sep	8:00AM	Agricultural System #8	103rd	911	0	18	1.13	0.89	4	<1	
Week 41	10-Oct	8:55AM	Agricultural System #8	122nd	910.5	0	18	0.37	0.06	2	<1	

*NTU: Turbidity measurement

*Mg/L: Chlorine residual

Information on coliform bacteria and what they indicate link in appendix.

Conclusion

The challenges facing Osoyoos are many and diverse. Thankfully, Town Operators are up for this challenge. With the vast network of aging pipe to maintain, (rivals cities three times our size) and the poor quality of our aquifers, the system is extremely demanding for our limited staff. Regardless, we strive not to cut corners. With all the new projects in the works, the future looks promising, although the workload is enormous. Operations will focus diligently on efficient use of the Town of Osoyoos' tax dollars as we work to improve our systems.

Appendix.

Information on coliform bacteria and what they indicate can be found at:

<https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-total-coliforms.html#a313>

* All Sampling laboratory results available upon request.

* Laboratory sampling performed by *CARO Analytical Services*.

* Thanks to **Dave Stene, Karl Fichter, Dave Gordin, Manuel Mora, and Gabriel Wood** for sampling and data collection.

2023 Weekly Sampling Schedule:

Legend
Comprehensive Samples (Potability Package)
Nitrate Samples
Manganese Samples
Raw Water Bacteria Samples
Reservoir Bacteria Samples

Week	Domestic System Sample ID's (Bacteria Samples)	Irrigation System Sample ID's	Comprehensive Sample ID's	Nitrate Samples	Manganese Samples
Week one	Cottonwood, Lobelia, 12th Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 2	Cottonwood, 12th Ave, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 3	Cottonwood, Lobelia, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 4	Cottonwood, 12th Ave, Hummingbird, Dividend Ridge, Well #1, Well #3, Well #6	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	Well #1, Well #3, Well #6, Well #8	N/A	N/A
Week 5	Cottonwood, Lobelia, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 6	Cottonwood, 12th Ave, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 7	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 8	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 9	Cottonwood, Hummingbird, Dividend Ridge, 340 Reservoir, 402 Reservoir, Dividend Ridge Reservoir, System #9 Reservoir	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A

Week 10	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 11	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 12	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 13	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 14	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 15	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 16	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #4, Well #5, Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 17	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	System 8 Intake, System 9 Intake	N/A	N/A
Week 18	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 19	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 20	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	N/A	N/A
Week 21	Tamarack, Lobelia, 122nd Ave, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)		N/A	N/A
Week 22	Tamarack, 89th/HWY 97, 122nd Ave, 340 Reservoir, 402 Reservoir, Dividend Ridge Reservoir	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A

Week 23	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 24	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #4, Well #5, Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 25	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 26	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 27	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 28	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #4, Well #5, Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 29	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	System 8 Intake, System 9 Intake	N/A	N/A
Week 30	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 31	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 32	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	N/A	N/A
Week 33	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 34	Tamarack, 89th/HWY 97, 122nd Ave, 340 Reservoir, 402 Reservoir, Dividend Ridge Reservoir	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 35	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A

Week 36	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #4, Well #5, Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 37	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 38	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 39	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	System 8 Intake, System 9 Intake	N/A	N/A
Week 40	Tamarack, 12th Ave, 122nd Ave, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #4, Well #5, Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8
Week 41	Tamarack, 12th Ave, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 42	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 43	Tamarack, 89th Street/Hwy 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 44	Cottonwood, Lobelia, Dividend Ridge, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	Well #1, Well #3, Well #6, Well #8	N/A	N/A
Week 45	Tamarack, 12th Ave, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)		N/A	N/A
Week 46	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 47	Tamarack, 89th/HWY 97, 122nd Ave, 340 Reservoir, 402 Reservoir, Dividend Ridge Reservoir, System #9 Reservoir	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 48	Cottonwood, Lobelia, Dividend Ridge, Well #1, Well #3, Well #4, Well #5, Well #6, Well #8	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	Well #6, Well #8	Well #3, Well #4, Well #5, Well #6, Well #8

Week 49	Tamarack, 12th Ave, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 50	Cottonwood, Hummingbird, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 51	Tamarack, 89th/HWY 97, 122nd Ave	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A
Week 52	Cottonwood, Lobelia, Dividend Ridge	17202 103rd Street (System 8), 7002 Highway 97 (System 9)	N/A	N/A	N/A

**Zero positive bacteriological hits in the Domestic System in 2023*