2024 Water System Annual Report

Rev. 1

Town of Osoyoos

November 2025

Project No. 302-1108-003

ENGINEERING ■ PLANNING ■ URBAN DESIGN ■ LAND SURVEYING

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Revision #	Revised by	Date	Issue / Revision Description
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Report Submission

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List of Acronyms

AO	Aesthetic Objective
GCDWQ	Guidelines for Canadian Drinking Water Quality
IHA	Interior Health Authority
MAC	Maximum Allowable Concentration
MOE	Ministry of Environment and Climate Change Strategy
TRUE	TRUE Consulting
Town	Town of Osoyoos

Units of Measure

ft	feet
Igpm	Imperial gallons per minute
km	kilometre
L/d	Litres per day
L/m	Litres per minute
L/s	Litres per second
lpcd	Litres per capita per day
m	metre
mg/L	milligrams per Litre
mm	millimetre
NTU	Nephelometric Turbidity Units
psi	pounds per square inch
USgpm	US gallons per minute

Referenced Reports

Town of Osoyoos. (2024). *Annual Water System Report.*

TRUE Consulting. (2010). *Town of Osoyoos Water Conservation Plan.*

Western Water Associates Ltd. (2012). *Assessment of Groundwater Under the Direct Influence of Surface Water (GWUDI): Town of Osoyoos B.C. Municipal Water Supply.*

1.0 Introduction to the Town Water Systems

The Town of Osoyoos (the Town) operates water systems within its municipal boundary and within Electoral Area A. These include the domestic water system and irrigation Systems 8 and 9 on the west side of Osoyoos Lake, north and south of the Town's municipal boundary. The service areas for both systems are illustrated on Figure 1-1 and Figure 1-2.

The municipal system provides services to the majority of residential, commercial and industrial lands within the municipal boundary. It consists of six (6) active wells, and four storage reservoirs. The municipal system serves approximately 3,978 connections, with high volume consumers being monitored with water meters. In 2024, installation of water meters on all services began and will be completed in 2025.

Historically, Systems 8 and 9 were used primarily for irrigation purposes. As more potable water demand has been put on Systems 8 and 9, the Town has expanded the municipal water system to service these areas. This is commonly referred to as the Rural Area Twinning project and has consisted of multiple phases. Since 2017, the Town has been undergoing this project, allowing the domestic and irrigation water systems to operate independently. To date, approximately 60% of System 8 and 100% of System 9 have been twinned.

Systems 8 and 9 are supplied by lake water intakes during the irrigation season (April to October). The surface water source is not treated, as such areas of Systems 8 and 9 that are not serviced by the domestic system are put on an annual boil water advisory. This advisory is removed for these areas during the remainder of the year because the domestic system is used for supply.

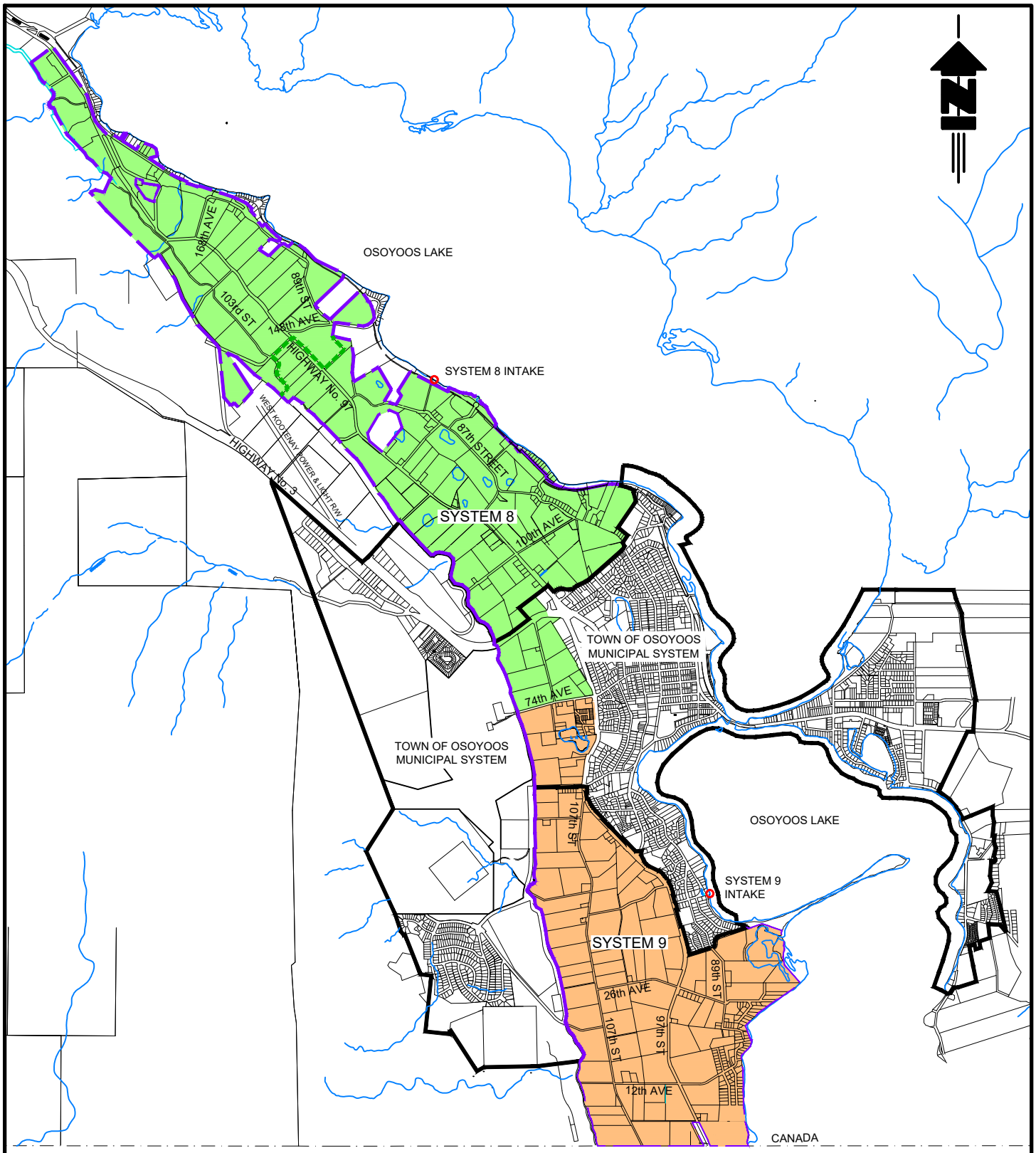

Figure 1-1: Town of Osoyoos Water System Service Areas

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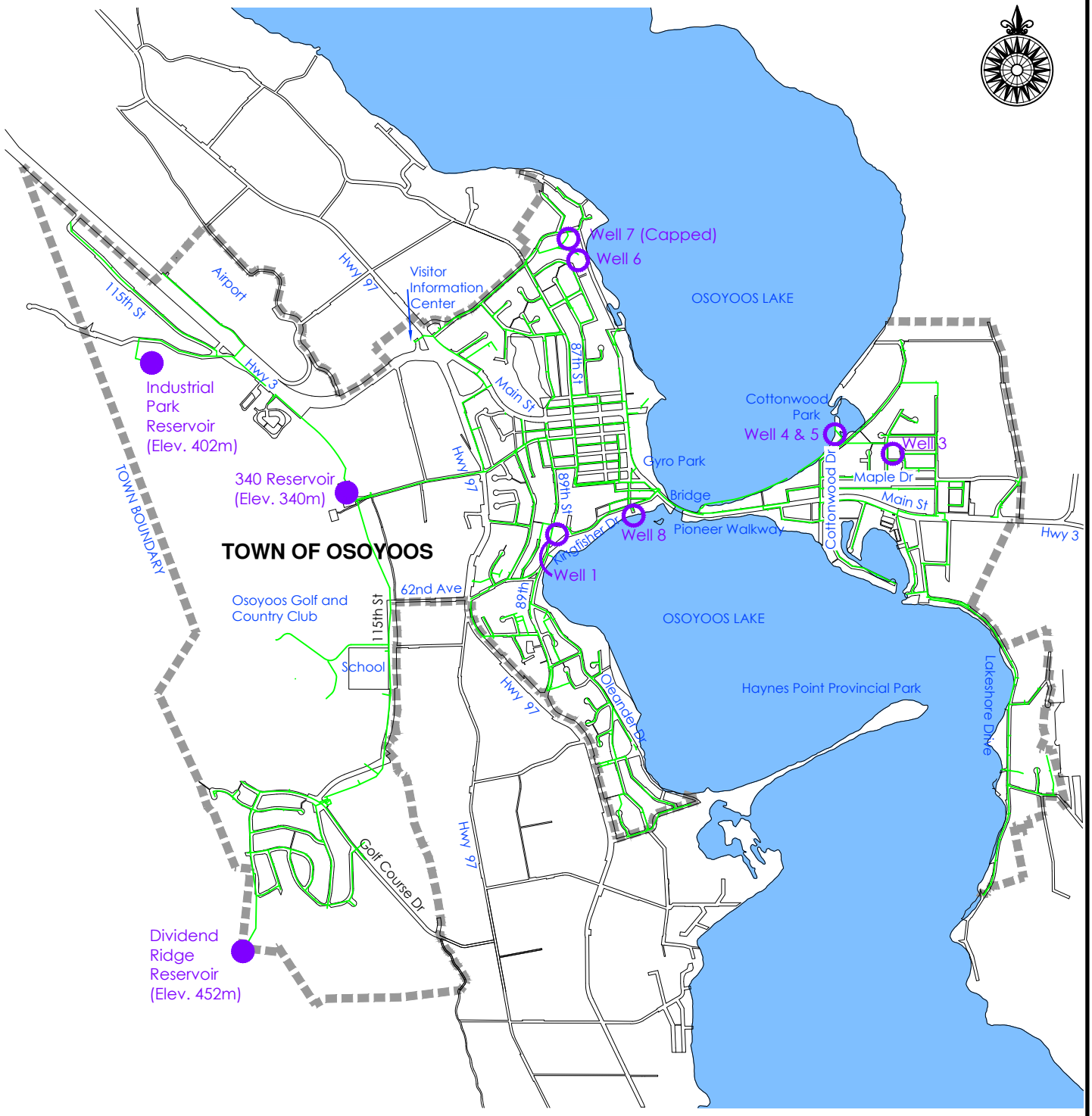

Figure 1-2: Town of Osoyoos Municipal Water System

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2.0 Municipal Water System

2.1 Water Supply Wells

2.1.1 System Overview

The Town's domestic water system is sourced from groundwater wells located throughout the municipality. There are currently six operational wells (#1, #3, #4, #5, #6, #8) and one additional groundwater source (Well #7) which has recently been identified by the Interior Health Authority (IHA) as not viable due to proximity to sewer systems and manganese concentrations. The IHA review letter is provided in Appendix A. Well locations can be seen in Figure 2-1. Each operational well is located in a pumphouse which houses a well pump and a hypochlorite injection system.

FIGURE 2-1: GROUNDWATER WELL LOCATIONS

2.1.2 System Capacity

Well pump capacity is analyzed using an 'n-1' approach. The 'n-1' approach illustrates the supply capacity of the system if any one well is not operational due to maintenance or repairs. It is assumed that the well with the highest capacity is excluded, allowing for a conservative analysis and system redundancy. Based on the maximum supply flows summarized in Table 2-1, the 'n-1' well capacity is approximately 160.9 L/s (13.9 ML/d). The Towns' current maximum day demand is approximately equivalent to the n-1 supply capacity. To account for this issue, the Town is actively planning for increasing source water capacity.

TABLE 2-1: GROUNDWATER WELL PUMP CAPACITY OVERVIEW

WELL	MAX SUPPLY (US GPM)	MAX SUPPLY (L/S)	MAX SUPPLY (ML/D)
Well #1	440	27.8	2.4
Well #3	660	41.7	3.6
Well #4	700	44.0	3.8
Well #5	1080	68.3	5.9
Well #6	200	12.7	1.1
Well #8	550	34.7	3.0
Total	**3630**	**229.2**	**19.8**
'n-1' System Capacity	2550	160.9	13.9

2.2 Water Distribution System

The Town's domestic water system consists of approximately 78.7 km of water main ranging in size from 50 mm to 400 mm. The system includes 272 hydrants, 815 valves, two pressure reducing valve (PRV) stations, two pump stations, six active source water wells and pump houses, and four reservoirs.

All domestic connections provided by the Town of Osoyoos are sourced from ground water wells that lie within the Town's municipal boundaries. Ground water is treated with hypochlorite at the each well pumphouse and conveyed to the reservoirs and throughout the distribution system.

The water distribution system is owned and operated by the Town. Records indicate the earliest pipe installation was completed in 1959. In general, asbestos cement (AC) pipe was predominantly installed prior to 1979, followed by polyvinyl chloride (PVC) pipe from 1979 onwards. Other pipes within the distribution system include ductile iron (DI) and high-density polyethylene (HDPE).

The existing water distribution network generally consists of the following pipe materials and lengths:

- Approx. 53.2 km of PVC watermain (sizes including 50 mm - 400 mm)
- Approx. 24.3 km of AC watermain (sizes including 100 mm – 300 mm)
- Approx. 763 m of HDPE watermain (sizes including 50 mm, 350 mm, and 450 mm)
- Approx. 434 m of DI watermain (sizes include 250 mm and 300 mm)

A summary of the existing watermain by size and material is presented in Figure 2-2.

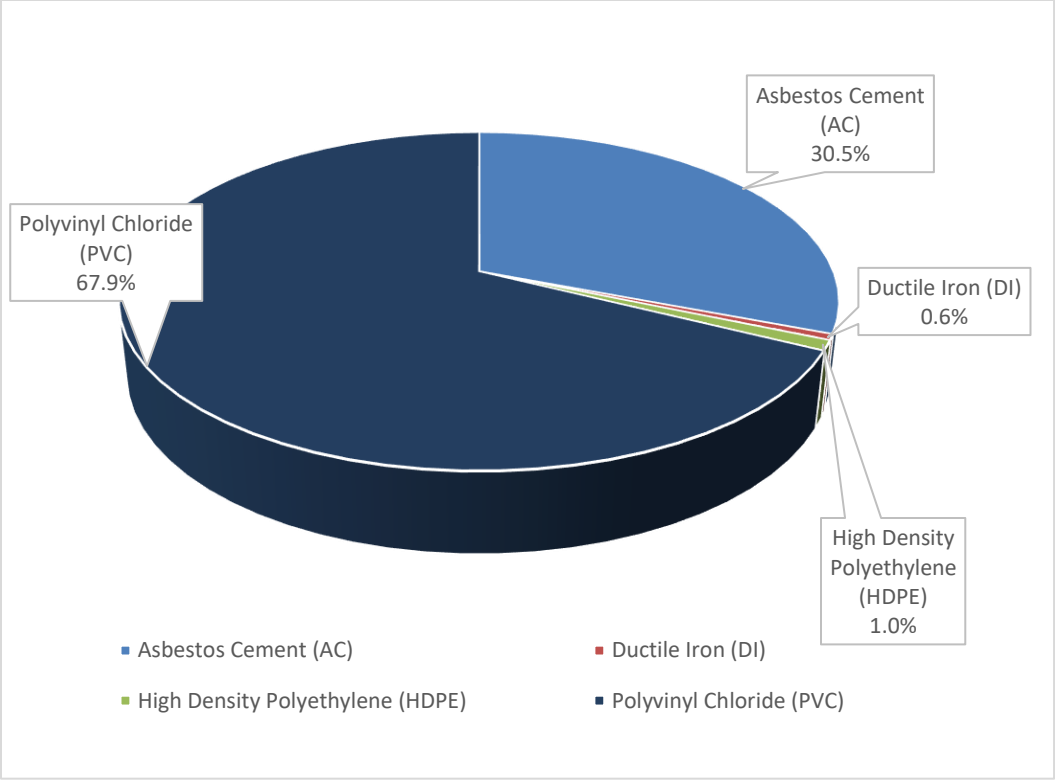

FIGURE 2-2: WATER DISTRIBUTION SYSTEM - PIPE MATERIAL SUMMARY

2.3 Reservoirs and Pressure Zones

The domestic water system comprises a total of three pressure zones. Each zone is serviced by one reservoir with the exception of the 340 Zone which has two reservoirs. These reservoirs are summarized in Table 2-2. Each reservoir is located on the west bench in Osoyoos at different elevations.

TABLE 2-2: RESERVOIR CAPACITY SUMMARY

RESERVOIR	VOLUME (M^3)
340 Zone	1,350
340 Zone	2,550
402 Zone Industrial Park	1,000
Dividend Ridge	1,100
Total	**6,000**

The pressure zones and associated reservoirs are summarized as follows:

- 340 Zone – 2 Reservoirs with a combined capacity of 3,910 m^3. The service area includes all areas of the Town east of Highway 97 including East Osoyoos and parts of the twinned sections of Systems 8 and 9.
- 402 Zone - Industrial Park Reservoir has a capacity of 1,000 m^3. The service area includes the Industrial Park, Osoyoos Secondary School, Desert Park and parts of the twinned sections of Systems 8 and 9.
- Dividend Ridge Reservoir has a capacity of 1,140 m^3. The service area includes the Dividend Ridge neighborhood and the golf course club house.

3.0 Osoyoos Irrigation District

Until 1990, the South Okanagan Lands Irrigation District (SOLID) owned and operated Systems 8 and 9 and provided its users with irrigation water sourced from lake intakes. In 1990, SOLID was dissolved, and the ownership/operation of Systems 8 and 9 was transferred to the Town of Osoyoos. Systems 8 and 9 provide irrigation water to 610 hectares of agricultural land. Prior to the System 8 and 9 twinning projects, it also provided domestic water to 500 users.

3.1 Osoyoos Lake Intakes

During irrigation season (mid-April to mid-October), irrigation Systems 8 and 9 are supplied from separate intakes in Osoyoos Lake. The System 8 (North Basin) intake is located North of 120 Avenue (south of the former BC Tree Fruits Packinghouse) and the System 9 (Central Basin) intake is located on Acadia Court. Intake locations are presented in Figure 3-1. At both intakes, water disinfection is provided by chlorination.

FIGURE 3-1: IRRIGATION SOURCE WATER INTAKES

Outside of the irrigation season, the lake intakes are not operated except for emergency conditions. During this period, water to domestic connections in the service areas of Systems 8 and 9 are supplied by groundwater from the Town's municipal system.

FIGURE 3-2: IRRIGATION SYSTEM PUMPHOUSES, INTAKE #9 (LEFT) AND INTAKE #8 (RIGHT)

3.2 Surface Water Supply Systems 8 and 9

The System 8 and 9 water distribution systems were constructed in the 1960's when irrigation supplied from the irrigation canal was replaced with a pressurized system. Starting in September of 2016 the Town of Osoyoos began expanding its municipal water distribution system into Systems 8 and 9 as part of the rural area twinning project. The approximate total length of domestic water supplied by the municipal system is summarized as follows:

- System 8:
  - 5.6 km of 250mm diameter PVC
  - 0.49 km of 200mm diameter PVC
  - 3.1 km of 150mm diameter PVC
- System 9:
  - 2.5 km of 250mm diameter PVC
  - 2.6 km of 200mm diameter PVC
  - 3.1 km of 150mm diameter PVC

The irrigation water distribution systems for Systems 8 and 9 are summarized in Table 3-1.

TABLE 3-1: IRRIGATION DISTRIBUTION SYSTEM SUMMARY

	SYSTEM 8 (M)	SYSTEM 9 (M)	TOTAL (M)
Small dia. PVC installed 1960's	3,875	1,953	5,828
Asbestos Cement	12,130	12,197	24,327
Ductile Iron and Concrete Cylinder	280	321	601
PVC installed since 1991	9,822	1,769	11,591
Total	**26,107**	**16,240**	**42,347**

The total distribution main length is 42.3 km of which 24.3 km (or 57%) is asbestos cement pipe.

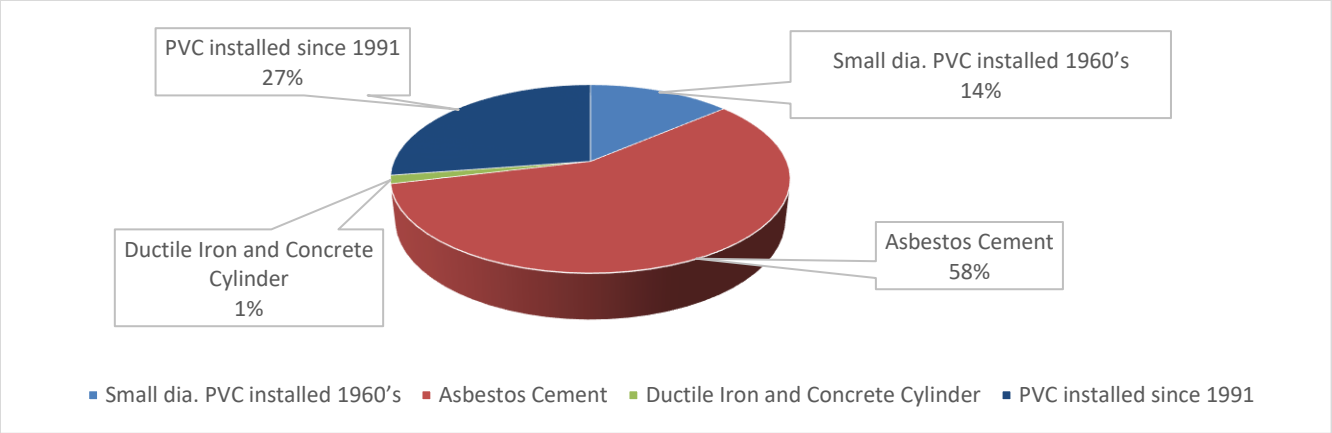

FIGURE 3-3: SYSTEM 8 AND 9 IRRIGATION DISTRIBUTION SYSTEM SUMMARY

3.3 Winter Storage Reservoir

During the irrigation season, Systems 8 and 9 are operated/controlled by system pressure. Pressure monitors in each pumphouse start and stop supply pumps as required to maintain a set supply pressure. Outside of the irrigation season, a reservoir located on the Osoyoos West Bench Southwest of the Municipal 340 reservoirs is put into service. This reservoir has an operating capacity of 482,000 L (130,000 USgal). This reservoir is supplied by Well No. 6 which is controlled by reservoir level.

4.0 Water Consumption

4.1 Municipal System

The municipal water system consumption in 2024 totaled 2,211 ML. Water supplied by each well is summarized in Table 4-1 and shown on a percentage basis in Figure 4-1. In 2024 there was a decrease of 9% in annual demand when compared to the 2023 annual demand of 2,430 ML.

TABLE 4-1: MUNICIPAL WATER SYSTEM -TOTAL ANNUAL CONSUMPTION

	Total Consumption (ML)
Well No. 1	548
Well No. 3	612
Well No. 4	221
Well No. 5	332
Well No. 6	180
Well No. 8	318
Total	**2,211**

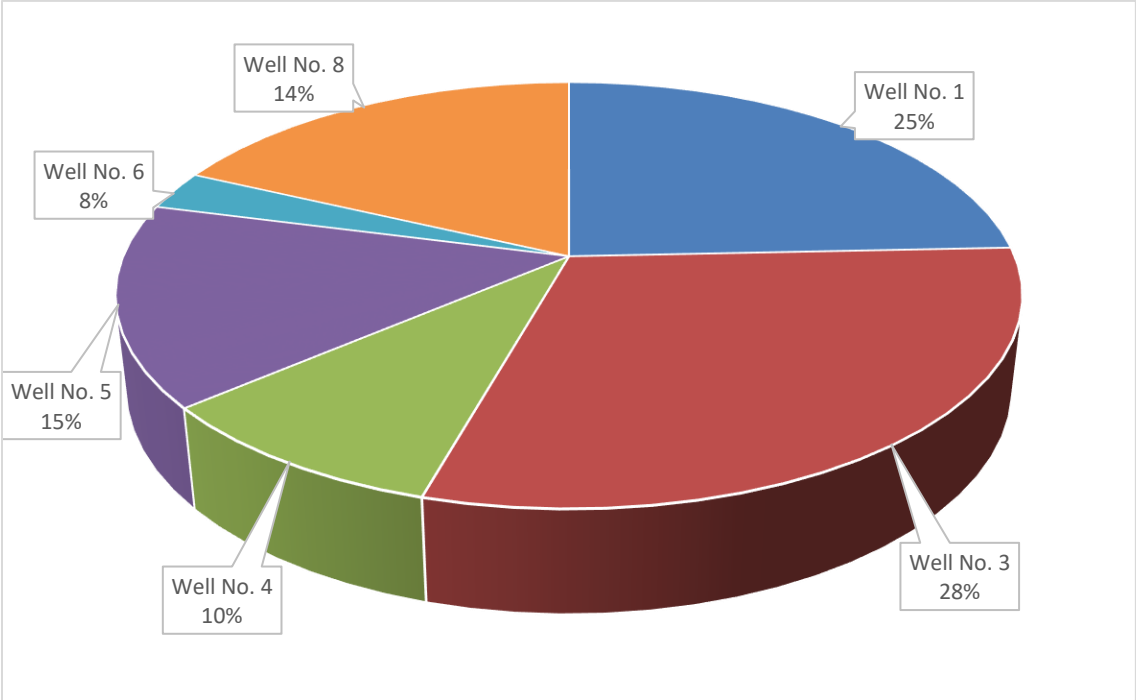

FIGURE 4-1: PERCENT TOTAL CONSUMPTION SUMMARY

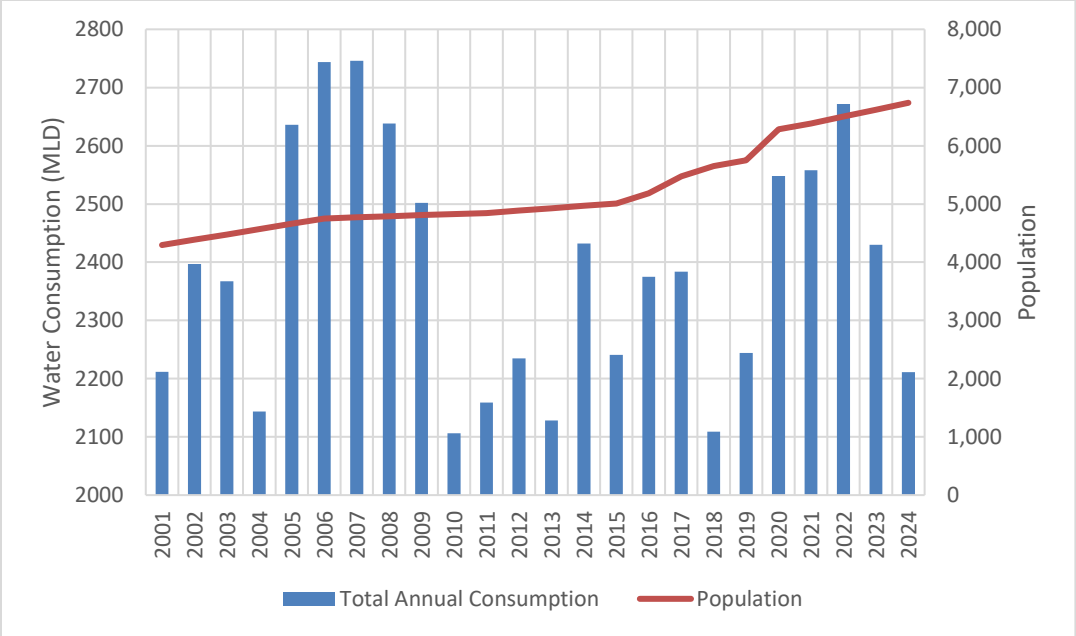

FIGURE 4-2: TOTAL ANNUAL WATER CONSUMPTION - MUNICIPAL SYSTEM

As shown in Figure 4-2, water consumption within the municipal system has decreased since 2022. This is attributed to water conservation by reducing annual consumption to normal levels from high consumption in 2022 caused by extremely hot weather. It is noted that per capita consumption is decreasing given that population is increasing while annual consumption is in line with historic values.

Figure 4-3 summarizes maximum day demand (MDD) and average day demand (ADD) from 2001 to 2024, well capacities, and the system capacity (which is limited by pump capacity). As observed in Figure 4-3, the well capacity currently exceeds that of the system capacity. System observations are summarized as follows:

- In 2024, the ADD was 6.0 MLD. This is a decrease of 10% compared to 2023.
- The MDD in 2024 was 13.8 MLD. This value is 6% greater than 2023 MDD.
- Both 2023 and 2024 MDD are below the n-1 system capacity.

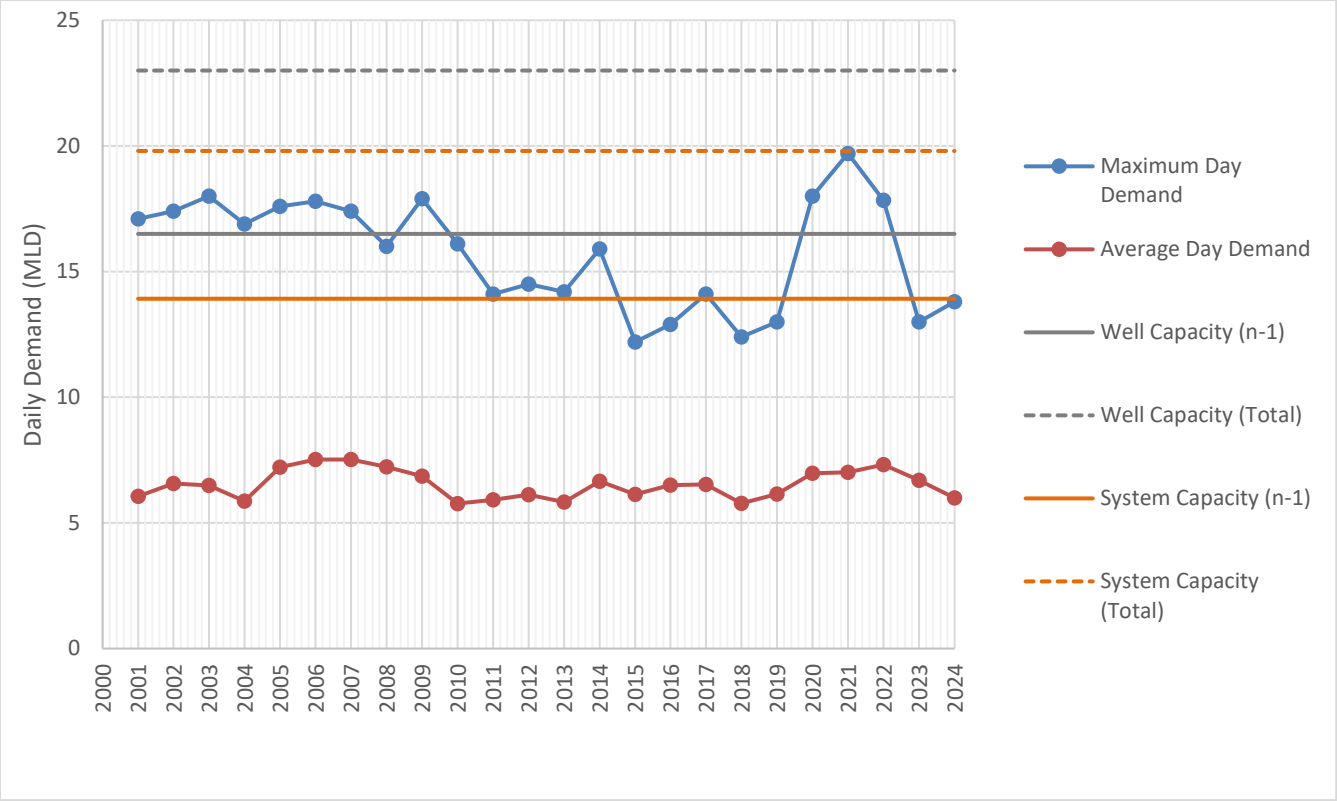

FIGURE 4-3: SYSTEM AND WELL CAPACITY RELATIVE TO DAILY DEMAND

4.2 Systems 8 and 9

Water consumptions in 2024 for Irrigation Systems 8 and 9 are summarized as follows.

TABLE 4-2: SYSTEM 8 AND 9 TOTAL ANNUAL CONSUMPTION

	TOTAL CONSUMPTION (ML)
System 8	2,603
System 9	2,457
Total	**5,070**

The total annual consumption of 5,070 ML during the irrigation season equates to an average application rate of 754 L/m^2 based on 672 ha of irrigation in the service area. Figure 4-4 illustrates total consumption in Irrigation Systems 8 and 9 in the period 2010 to 2024. As compared to 2023, the 2024 irrigation system consumption increased by 365 ML (8%). This increase may be the result of warmer weather in 2024 compared to 2023.

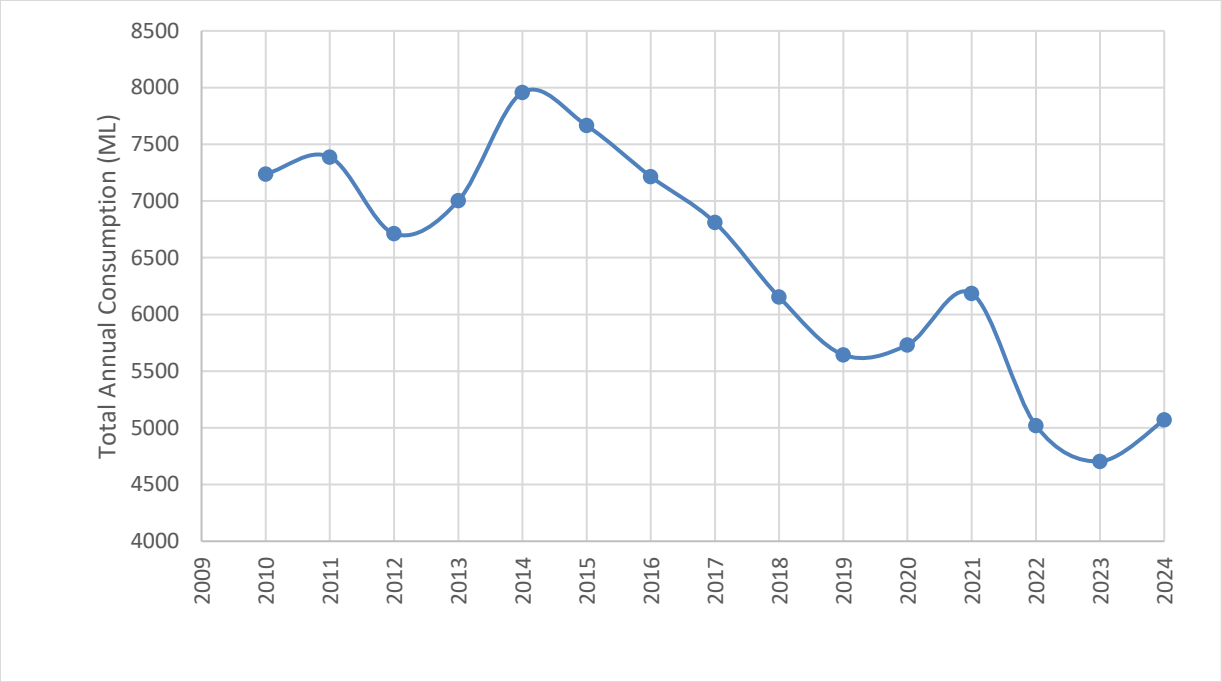

FIGURE 4-4: TOTAL WATER CONSUMPTION IRRIGATION SYSTEM

5.0 Water Sampling and Testing

5.1 Bacteriological and Chlorine Residual Testing

The Town undertakes sampling for bacteriological analysis and chlorine residual for both the irrigation and municipal systems. Sampling is undertaken weekly with the sampling locations listed below.

SAMPLING LOCATIONS			
MUNICIPAL SAMPLING LOCATIONS:			IRRIGATION SYSTEM SAMPLING LOCATIONS:
12th Ave.	122nd Ave.	Well #1	**System 9:**
17202 – 103rd St.	402 Reservoir	Well #3	7002 97th
Dividend Ridge	Highway 97th at 89th St.	Well #4	#9 Reservoir
Cottonwood Dr.	6087 Maple Dr.	Well #5	
Lobelia Dr.	6800 Cottonwood Dr.	Well #6	**System 8:**
Cottonwood Dr.	8401 Kingfisher Dr.	Well #8	17202 103rd
Hummingbird Ln.	8103 92nd Ave.		
115th St.	Sawgrass Dr.		
74th Ave.	3808 Lakeshore Dr.		
Tamarack Dr.			

Bacteriological and chlorine residual sampling results for 2024 are available upon request and summarized as follows:

Municipal System

- Bacteriological:
  - Total number of Bacteriological Samples – 522
  - Number of Positive Results for EColi – 1
    - Sample Event: January 16, 2024, Location: 17202 103rd St.
      - Residual Chlorine concentration: 0.18 mg/L
  - Number of Positive Results for Total Coliform – 3
    - Sample Event: January 16, 2024, Location: 17202 103rd St.
      - Residual Chlorine concentration: 0.18 mg/L
    - Sample Event: August 6, 2024, Location: 17202 103rd St.
      - Residual Chlorine concentration: 0.46 mg/L
    - Sample Event: October 9, 2024, Location: 17202 103rd St.
      - Residual Chlorine concentration: 0.71 mg/L
- Chlorine Residual
  - Total No. of Chlorine Residual Samples – 219
  - Chlorine Residual Concentration Range: <0.02 mg/L to 1.23 mg/L
    - One sample did not have a detectable residual chlorine concentration during the April 30th, 2024 sampling event at Tamarack Drive.

Irrigation Systems

- Bacteriological:
  - Total number of Bacteriological Samples – 20
  - Number of Positive Results for E. Coli – 0
  - Number of Positive Results for Total Coliform – 1
    - Sample Event: July 17, 2024, Location: Station 9
      - Residual Chlorine concentration: 0.45 mg/L
- Chlorine Residual
  - Total number of Chlorine Residual Samples – 10
  - Chlorine Residual Concentration Range: <0.02 mg/L and 1.89 mg/L
    - Chlorine residual concentrations at Station 8 and 9 during September 24, 2024, sampling event were below detectable limits.

When positive results for E. Coli or Total Coliforms are discovered, the Town's procedure is to thoroughly flush the area where the results were obtained and then re-sample. This has always resulted in the elimination of positive E. Coli and Total Coliform test results. The Town introduces chlorine into the municipal water system at all municipal Wells on a continuous basis. Bacteriological test results and monthly water reports are submitted to Interior Health.

5.2 Domestic System Boil Water Advisory

In February 2024, a boil water advisory was issued for parts of the domestic water system, and a system wide water quality advisory was issued. Impacts on water quality were caused by one of the water storage reservoirs emptying which allowed sediments to be disturbed. This event was caused by instrumentation failures resulting from a power outage on February 11, 2024. The Town immediately issued public notices to inform residents of the water advisories. The Town then began an extensive flushing program to remove impacted water from the system. This was successful as confirmed by water quality results on February 16, 2024 allowing the water advisories to be rescinded.

5.3 Agriculture Irrigation System Boil Water Advisory

Treatment provided for water supplied from Systems 8 and 9 water intakes in Osoyoos Lake does not meet the Provincial Drinking Water Treatment Objectives. The principal deficiencies are:

- Inadequate chlorine contact time to services in proximity to the two pumphouses,
- There is no treatment, typically filtration, for the removal or inactivation of parasites, most common being giardia and cryptosporidium.

In accordance with instructions from IHA, the Town annually issues a boil water advisory for residents within the service area of Irrigation Systems 8 and 9. The boil water advisory was issued

in April 2024 at the start of the irrigation season and rescinded in November at the end of the irrigation season.

Residents in the service area of Irrigation Systems 8 and 9 are advised of the Boil Water Advisory by notices published in the Osoyoos Times and posted on the Town's website. Notices are published in the Osoyoos Times as follows:

- Advanced notice at the end of March or first week of April,
- Weekly notices in April,
- Monthly notices in May, June, July, August and September, and
- Final notice at the end of October or first week of November.

The final notice is followed by a notice to rescind the Boil Water Advisory.

5.4 Municipal System Trihalomethane Testing

Trihalomethanes are a group of organic chemicals that are formed by the reaction of chlorine and organic materials which may be present in the water. Organic materials typically include algae and other natural organic matter. Trihalomethanes are described as disinfection byproducts with the concentration being dependent on a number of factors including concentration of organic materials (usually measured as total organic carbon), chlorine dose and retention time in the distribution system.

The domestic water system was sampled for trihalomethane in January and September of 2024. Analytical results can be viewed in Appendix B. The sample results are summarized in Table 5-1.

TABLE 5-1: DOMESTIC WATER SYSTEM TRIHALOMETHANE SAMPLING

SAMPLE DATE/LOCATION	JAN 2, 2024 COTTONWOOD	SEPT 10, 2024 DIVIDEND RIDGE	CDWQ STANDARD
Total Trihalomethanes	0.0291	0.0325	0.1 mg/L MAC
Volatile Organic Compounds			
Bromodichloromethane	0.0031	0.0058	
Bromoform	<0.0010	<0.0010	
Chloroform	0.0260	0.0249	
Dibromochloromethane	<0.0010	0.0018	

5.5 Municipal System Full Spectrum Analysis

In addition to bacteriological testing as described in Section 5.1, the Town samples all six water supply wells annually for a full spectrum analysis. In 2024 full spectrum water quality testing was conducted during the August 6th sampling event.

In addition to this event, manganese was sampled at each well as per the sample events summarized in Table 5-2. The results of this analysis are provided in Appendix B.

TABLE 5-2: WELL TESTING SAMPLING EVENTS

WATER SUPPLY WELL	2024 SAMPLE EVENTS
Well No. 1	Aug 6, Sep 3
Well No. 3	Jul 9, Aug 6, Sep 3, Oct 5, Nov 30
Well No. 4	Mar 19, Apr 16, Jun 11, Jul 9, Aug 6, Sep 3, Oct 5, Nov 30
Well No. 5	Jun 11, Jul 9, Aug 6, Sep 3, Oct 5, Nov 30
Well No. 6	Mar 19, Apr 16, Jun 11, Jul 9, Aug 6, Sep 3, Oct 5, Nov 30
Well No. 8	Mar 19, Apr 16, Jun 11, Jul 9, Aug 6, Sep 3, Oct 5, Nov 30
Station 8	Apr 29, Jul 22
Station 9	Apr 29, Jul 22

Summaries of 2024 analytical results for manganese are presented in Table 5-3. This table shows dissolved manganese concentration in source water wells #4, #5, #6, and #8 are at or above the maximum allowable concentration (MAC=0.12 mg/L) as specified in the Canadian Drinking Water Quality Standards. To the greatest extent practical the Town maximizes the use of Wells 1# and #3 to minimize the amount of dissolved manganese in the water system. The Town is exploring the option to implement a surface water treatment plant to provide treated water to the system.

TABLE 5-3: SUMMARY OF 2022 FULL SPECTRUM ANALYSIS – IRON AND MANGANESE

		Analyte		Manganese
LAB ID	DATE	Std (CDWQG)		MAC=0.12
24H0605-01	9-Aug	Well	#1	0.00437
24I0343-01	10-Sep	Well	#1	0.00472
24G1144-01	9-Jul	Well	#3	0.0126
24H0605-02	9-Aug	Well	#3	0.0119
24I0343-02	10-Sep	Well	#3	0.0123
24J0238-01	5-Oct	Well	#3	0.0132
24K3131-01	30-Nov	Well	#3	0.0153
24C2341-03	19-Mar	Well	#4	0.133
24D2076-02	16-Apr	Well	#4	0.138
24F1725-01	11-Jun	Well	#4	0.127
24G1144-02	9-Jul	Well	#4	0.125
24H0605-03	9-Aug	Well	#4	0.122
24I0343-03	10-Sep	Well	#4	0.149
24J0238-02	5-Oct	Well	#4	0.0992
24K3131-02	30-Nov	Well	#4	0.128
24F1725-02	11-Jun	Well	#5	0.0105
24G1144-03	9-Jul	Well	#5	0.157
24H0605-04	9-Aug	Well	#5	0.150
24I0343-04	10-Sep	Well	#5	0.155
24J0238-03	5-Oct	Well	#5	0.163
24K3131-03	30-Nov	Well	#5	0.174
24C2341-02	19-Mar	Well	#6	0.117
24D2076-01	16-Apr	Well	#6	0.118
24F1725-03	11-Jun	Well	#6	0.119
24G1144-04	9-Jul	Well	#6	0.117
24H0605-05	9-Aug	Well	#6	0.120
24I0343-05	10-Sep	Well	#6	0.132
24J0238-04	5-Oct	Well	#6	0.138
24K3131-05	30-Nov	Well	#6	0.113
24C2341-01	19-Mar	Well	#8	0.125
24D2076-03	16-Apr	Well	#8	0.115
24F1725-05	11-Jun	Well	#8	0.116
24G1144-05	9-Jul	Well	#8	0.11
24H0605-06	9-Aug	Well	#8	0.119
24I0343-06	10-Sep	Well	#8	0.135
24J0238-05	5-Oct	Well	#8	0.148
24K3131-04	30-Nov	Well	#8	0.168

Figures 5-1 shows these sampling events graphically.

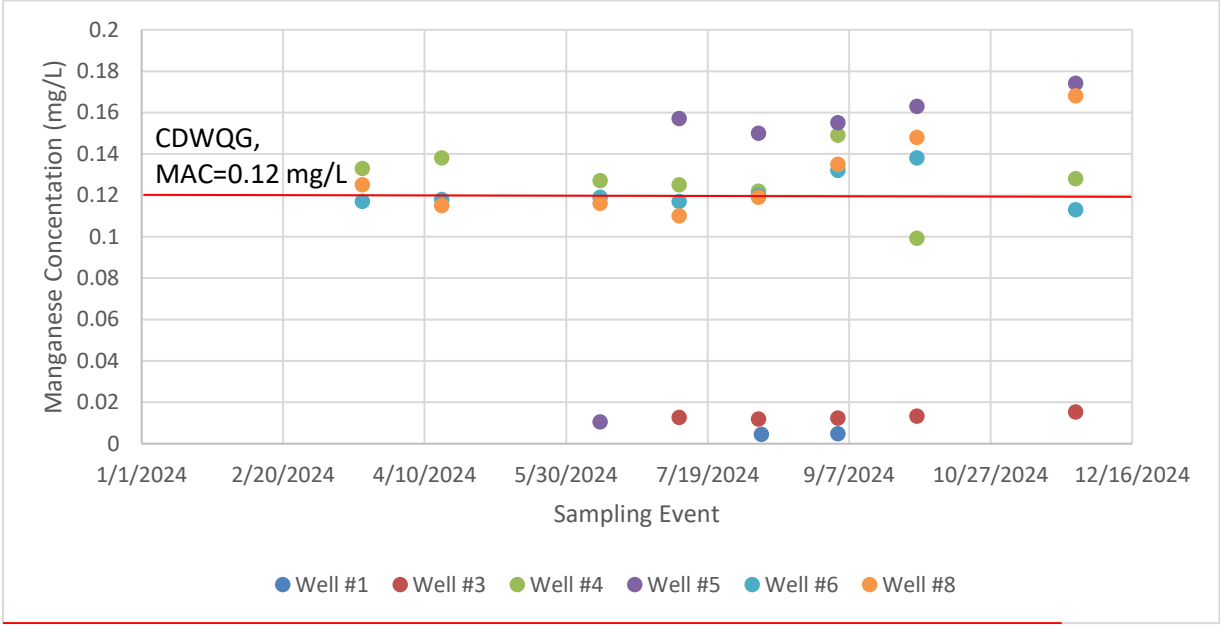

FIGURE 5-1: MANGANESE CONCENTRATION MONITORING

As shown in Table 5-4, turbidity is elevated at the irrigation system intakes. This is expected from a non-filtered surface water source.

TABLE 5-4: SUMMARY OF 2022 FULL SPECTRUM ANALYSIS - TURBIDITY

LAB ID	DATE	STD (CDWQG)		TURBIDITY OG<1
24D2989-02	29-Apr	Station	#9	1.09
24G2026-02	22-Jul	Station	#9	1.36

5.6 Groundwater Source Nitrate Monitoring

High nitrate concentrations in groundwater are experienced throughout the South Okanagan area. High nitrate concentrations are attributed to fertilizer use by the agricultural industry. The Town monitors nitrate concentration in all six of the source water supply wells. Sample events for nitrate monitoring were not consistent for each well as shown in Figure 5-2. Nitrate data for each well is provided in Appendix B. The data is summarized below.

TABLE 5-5: NITRATE CONCENTRATION MONITORING RESULTS SUMMARY

CANADIAN DRINKING WATER QUALITY MAXIMUM ACCEPTABLE CONCENTRATION	NITRATE AS N (MG/L)
	10 MG/L
Well No. 1	5.02 – 5.07
Well No. 3	3.11
Well No. 4	<0.010 – 0.145
Well No. 5	0.019 – 0.104
Well No. 6	1.38 – 2.41
Well No. 8	0.391 – 0.546

Figure 5-2 illustrates that the nitrate concentrations in each well are compliant with the Canadian Drinking Water Quality Guidelines. Notably, nitrate concentrations in Well #4 and #5 are below the detection limit.

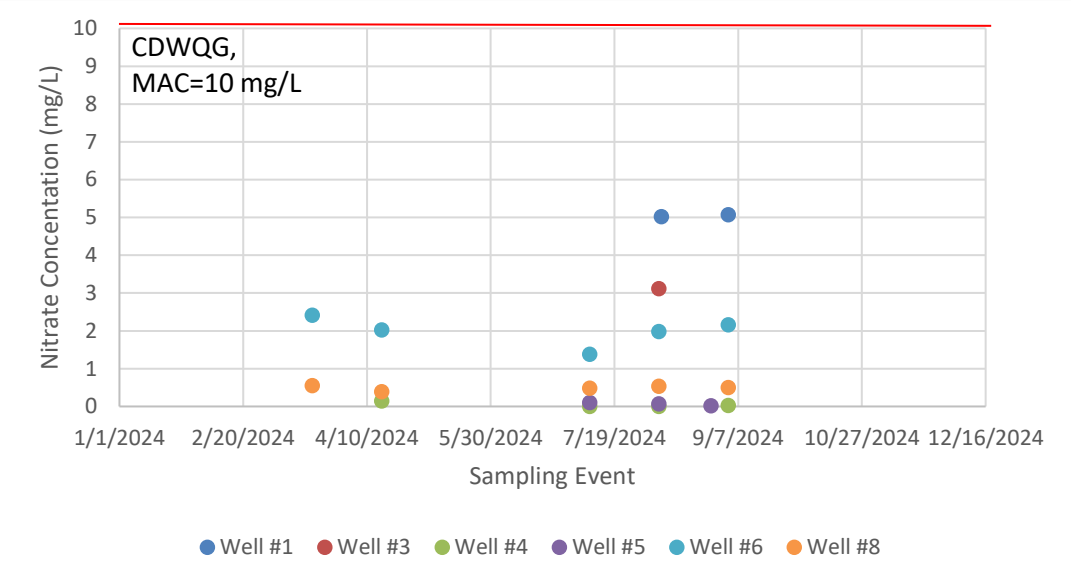

FIGURE 5-2: NITRATE CONCENTRATION MONITORING RESULTS

5.7 Water Quality Complaints and Operational Incidents

On any given year the Town of Osoyoos receives concerns with regards to water quality, they range from issues with water colour, taste, and odour. These concerns are addressed as they are presented to the Town.

6.0 Operation and Maintenance

6.1 Routine Maintenance Program

- **Water Supply Wells**
  - Daily checks of all wells are completed to confirm satisfactory operation. Logged operating parameters including discharge pressure, flow, running time, and service voltage.
  - Pump lubrication and packing are checked and adjusted as required.
  - Annual water sampling.
- **Irrigation Systems 8 and 9 Intake/Pump house**
  - Daily checks during the irrigation season are completed. Operating parameters are logged.
  - Pump lubrication and packing are checked and adjusted as required.
  - Chlorine residual and turbidity analyser calibration is checked monthly.
  - Chlorine cylinders are removed when empty and replaced with full cylinders.
  - Pump house maintenance is completed on an as required basis.
- **Booster Stations 402 and Fairway Hills**
  - Daily inspections are completed to check site security and to record operating parameters.
  - Pump lubrication and packing are checked and adjusted as required.
- **Reservoirs**
  - All reservoirs are inspected daily, excluding weekends, to confirm site and reservoir structure security.
- **Distribution System**
  - Water main flushing is conducted to maintain chlorine residuals.
  - Weekly bacteriological sampling.
  - Weekly chlorine residual sampling.

6.2 SCADA (Supervisory Control and Data Acquisition)

A SCADA computer control and monitoring system is used by the Town to control major components of the water systems. System capabilities include:

- Water Supply Wells and Intakes
  - Pump operational status.
  - Flow, elapsed running times.
  - Well levels where applicable.
  - Chlorine residuals at irrigation intake.

- Booster Stations
  - Pump operational status.
  - Flow and elapsed running time.
- Reservoirs
  - Reservoir level.
  - Pump start/stop and alarm set points.
  - Intruder alarms.

The Town has an ongoing program to upgrade the capabilities of the SCADA system.

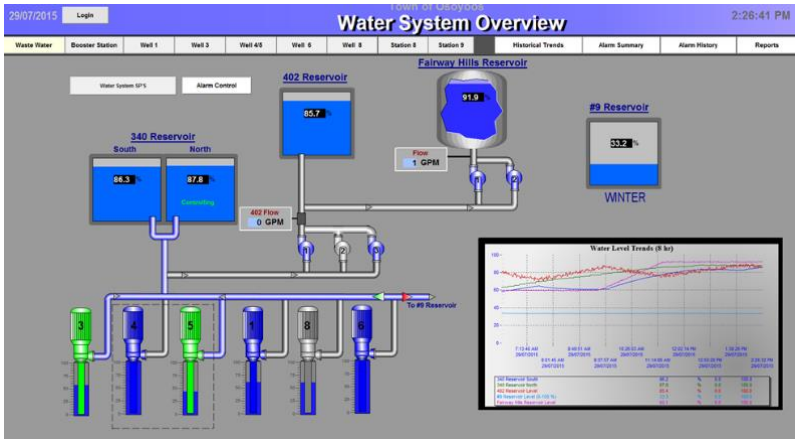

FIGURE 6-1: SCADA SYSTEM OVERVIEW DISPLAY

6.3 Major Maintenance – 2024

Major maintenance projects undertaken in 2024 include:

- Water main flushing program,
- Valve exercising, and
- Visual inspection of Hydrants.

6.4 Cross Control Program

A cross connection is most commonly a plumbing system in a building that represents the risk of backflow into the Town's water distribution system thereby representing the potential of adversely affecting water quality. The Town has a program for identifying cross connections and requires the installation and maintenance of backflow prevention devices to prevent reverse flow from a service connection to the Town's water distribution system.

The implementation and administration of the Town's cross connection program is contracted to Mr. Wayne Muzyka of Personnel Development & Consulting of Vernon. The Town's cross connection control program includes a total of 395 devices of which:

- 88 are classified as high hazard,
- 103 are classified as medium hazard,
- 44 are classified as low hazard,
- 12 are classified as none, and
- 135 devices are outstanding.

To the end of December 2024, a total of 76% of the backflow devices have been surveyed which comprises an inspection of the premises and backflow prevention devices. Of the high hazard group, 92% have been surveyed. At the end of December 2024, compliance with the Town's cross connection control program is summarized as follows.

TABLE 6-1: CROSS CONTROL CONNECTION – 2024 PROGRAM SUMMARY

HAZARD RANKING	QUANTITY	NOT SURVEYED	SURVEYED	VACANT	NUMBER COMPLIANT	% COMPLIANT
High	88	7	81	0	51	58%
Medium	103	30	73	0	52	50%
Low	44	11	33	0	13	30%
None	12	11	1	11	0	
Totals	**247**	**59**	**188**	**11**	**116**	

Non-compliance generally means a deficient (or lack of) backflow prevention device or failure by the property owner to provide certification of annual testing.

6.5 Emergency Response Plan

The Operational Services Department is in the process of reviewing and updating our Emergency Response Plan for the Town's municipal water system. This review and update will be completed by the end of 2025. The current Plan is available upon request.

6.6 Operator Certifications

The operator certifications are summarized as follows:

TABLE 6-2: OPERATOR CERTIFICATION

OPERATOR	CERTIFICATION
David Stene	Water Distribution 2
Karl Fitcher	Water Distribution 2
David Gordin	Journeyman Plumber
Gabriel Wood	Operator in Training
Manuel Mora	Equipment Operator

7.0 Capital Program

7.1 Municipal System

7.1.1 Budgeted Capital Projects in 2025

- 74th Ave. Water Main Upsizing, Heron Lane and Loon Cr. Replacement, and Loon Cr. Looping
- Magnolia Place Sanitary Sewer and Water Replacement
- Ponderosa Dr. Sanitary Upgrades and Watermain Replacement
- Floodworks
- OH and S Upgrades
- East Osoyoos Reservoir - Design
- Water District Agricultural Asset Management Plan
- Quail Place Watermain Upgrades
- 340-402 Booster and 340 Reservoir PRV

7.1.2 Other Water Related Budget Items

- Universal water metering program.

7.1.3 Asset Management, Capital and Implementation Plan

A domestic water system infrastructure master plan was completed in 2023 by TRUE 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.

This plan was updated in 2024 to reflect changes to zoning requirements based on the small-scale, multi-unit housing Provincial requirements. The updated report can be viewed in Appendix C. It determines new projected water demands, fire flow analysis and capital upgrades in-line with the most recent water system directives.

APPENDIX A

Interior Health Authority Well #7 Letter

Interior Health

April 24, 2023

Sent via email:

Town of Osoyoos
8707 Main Street
Osoyoos, BC V0H 1V0

Dear Jared Brounstein:

Re: Town of Osoyoos Water Supply System New Well Source Application

The Town of Osoyoos application for the proposed new source well 7 has been reviewed.

Section 8 (1) of the Health Hazard Regulation states that the person who installs a well must ensure that the well is located at least 30 m from any probable source of contamination.

The application indicates that the proposed new Well 7 will be 4.2 m from a gravity feed sewer main.

The proposed new well location does not meet the required setback distance outlined in section 8 of the Health Hazard Regulation, therefore, it is not approved for use as a drinking water source.

It is recommended that an alternate location be explored as a long term solution to meet increasing water demands in this community.

Thank you for your efforts towards improving the drinking water for the Town of Osoyoos Water Supply System.

If you have any questions please call me directly at (250) 469-7070 ext. 12274.

Sincerely,

Judi Ekkert, B.Sc., CPHI(C)
Specialist Environmental Health Officer

cc: Dr. Sue Pollock, Medical Health Officer, IHA
J. Ivor Norlin, Manager, Drinking Water Systems Program, IHA
Steve Underwood, Project Engineer, TRUE Consulting
Ariana Paulson, P.Eng., TRUE Consulting

We recognize and acknowledge that we are collectively gathered on the traditional, ancestral, and unceded territories of the seven Interior Region First Nations, where we live, learn, collaborate, and work together. This region is also home to 15 Chartered Métis Communities. It is with humility that we continue to strengthen our relationships with First Nation, Métis, and Inuit peoples across the Interior.

INTERIOR HEALTH DEPARTMENT | 505 DOYLE AVE, KELOWNA, BC V1Y 0C5
PHONE 250.469.7070 FAX 250.469.7068 EMAIL info@interiorhealth.ca

APPENDIX B

Water Sampling Results

CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24A0088
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-01-02 15:30 / 10.0°C
PROJECT	THM Analysis	**REPORTED**	2024-01-09 15:26
PROJECT INFO			

Introduction:

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Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

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Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: https://www.caro.ca/terms-conditions

If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24A0088
PROJECT	THM Analysis	**REPORTED**	2024-01-09 15:26

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Cotton Wood (24A0088-01) | Matrix: Water | Sampled: 2024-01-02 07:55						
Calculated Parameters						
Total Trihalomethanes	**0.0291**	MAC = 0.1	0.00400	mg/L	N/A	
Field Parameters						
Chlorine, Total	**0.96**	None Required	0.02	mg/L	2024-01-02	
Haloacetic Acids						
Monochloroacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-01-06	
Monobromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-01-06	
Dichloroacetic Acid	**0.0110**	N/A	0.0020	mg/L	2024-01-06	
Trichloroacetic Acid	**0.0124**	N/A	0.0020	mg/L	2024-01-06	
Dibromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-01-06	
Total Haloacetic Acids (HAA5)	**0.0234**	MAC = 0.08	0.00200	mg/L	N/A	
Surrogate: 2-Bromopropionic Acid	*114*		*70-130*	%	*2024-01-06*	
Volatile Organic Compounds (VOC)						
Bromodichloromethane	**0.0031**	N/A	0.0010	mg/L	2024-01-05	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-01-05	
Chloroform	**0.0260**	N/A	0.0010	mg/L	2024-01-05	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-01-05	
Surrogate: Toluene-d8	*107*		*70-130*	%	*2024-01-05*	
Surrogate: 4-Bromofluorobenzene	*88*		*70-130*	%	*2024-01-05*	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24A0088
PROJECT	THM Analysis	**REPORTED**	2024-01-09 15:26

Analysis Description	Method Ref.	Technique	Accredited	Location
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, September 2022)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

General Comments:

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24A1522
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-01-16 16:05 / 6.9°C
PROJECT	General Potability	**REPORTED**	2024-01-18 15:14
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24A1522
PROJECT	General Potability	**REPORTED**	2024-01-18 15:14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #4 (24A1522-01) | Matrix: Water | Sampled: 2024-01-16 08:05						
General Parameters						
Ammonia, Total (as N)	**0.712**	None Required	0.050	mg/L	2024-01-17	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24A1522
PROJECT	General Potability	**REPORTED**	2024-01-18 15:14

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
mg/L	Milligrams per litre
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24A3005
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-01-30 15:25 / 6.4°C
PROJECT	General Potability	**REPORTED**	2024-02-01 14:02
PROJECT INFO		**COC NUMBER**	No Number

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24A3005
PROJECT	General Potability	**REPORTED**	2024-02-01 14:02

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #4 (24A3005-01) | Matrix: Water | Sampled: 2024-01-30 09:30						
Anions						
Phosphate (as P)	**0.0480**	N/A	0.0050	mg/L	2024-02-01	
General Parameters						
Phosphorus, Total (as P)	**0.0795**	N/A	0.0050	mg/L	2024-02-01	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24A3005
PROJECT	General Potability	**REPORTED**	2024-02-01 14:02

Analysis Description	Method Ref.	Technique	Accredited	Location
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
mg/L	Milligrams per litre
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24B0688
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-02-06 16:20 / 11.1°C
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59
PROJECT INFO		**COC NUMBER**	No Number

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Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Tamarack (24B0688-01) | Matrix: Water | Sampled: 2024-02-06 08:10						
Anions						
Chloride	**18.5**	AO ≤ 250	0.10	mg/L	2024-02-08	
Fluoride	**0.22**	MAC = 1.5	0.10	mg/L	2024-02-08	
Nitrate (as N)	**0.609**	MAC = 10	0.010	mg/L	2024-02-08	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-02-08	
Sulfate	**37.4**	AO ≤ 500	1.0	mg/L	2024-02-08	
Calculated Parameters						
Hardness, Total (as CaCO3)	**198**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.4**	N/A	-5.0		2024-02-12	CT6
Solids, Total Dissolved	**267**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**179**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Bicarbonate (as CaCO3)	**179**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2024-02-13	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-02-08	
Conductivity (EC)	**480**	N/A	2.0	µS/cm	2024-02-09	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-02-09	
pH	**7.93**	7.0-10.5	0.10	pH units	2024-02-09	HT2
Temperature, at pH	**23.2**	N/A		°C	2024-02-09	HT2
Turbidity	**0.48**	OG < 1	0.10	NTU	2024-02-08	
Microbiological Parameters						
Coliforms, Total	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
E. coli	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-02-08	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-02-08	
Arsenic, total	**0.00212**	MAC = 0.01	0.00050	mg/L	2024-02-08	
Barium, total	**0.0611**	MAC = 2	0.0050	mg/L	2024-02-08	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-02-08	
Cadmium, total	**0.000013**	MAC = 0.007	0.000010	mg/L	2024-02-08	
Calcium, total	**53.8**	None Required	0.20	mg/L	2024-02-08	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-02-08	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-02-08	
Copper, total	**0.00326**	MAC = 2	0.00040	mg/L	2024-02-08	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-02-08	
Lead, total	**0.00022**	MAC = 0.005	0.00020	mg/L	2024-02-08	
Magnesium, total	**15.4**	None Required	0.010	mg/L	2024-02-08	
Manganese, total	**0.0564**	MAC = 0.12	0.00020	mg/L	2024-02-08	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Tamarack (24B0688-01) | Matrix: Water | Sampled: 2024-02-06 08:10, Continued						
Total Metals, Continued						
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-02-09	
Molybdenum, total	**0.00696**	N/A	0.00010	mg/L	2024-02-08	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2024-02-08	
Potassium, total	**4.10**	N/A	0.10	mg/L	2024-02-08	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-02-08	
Sodium, total	**26.1**	AO ≤ 200	0.10	mg/L	2024-02-08	
Strontium, total	**0.504**	MAC = 7	0.0010	mg/L	2024-02-08	
Uranium, total	**0.00406**	MAC = 0.02	0.000020	mg/L	2024-02-08	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-02-08	
12th Ave (24B0688-02) | Matrix: Water | Sampled: 2024-02-06 09:10						
Anions						
Chloride	**43.8**	AO ≤ 250	0.10	mg/L	2024-02-08	
Fluoride	**0.27**	MAC = 1.5	0.10	mg/L	2024-02-08	
Nitrate (as N)	**4.94**	MAC = 10	0.010	mg/L	2024-02-08	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-02-08	
Sulfate	**74.0**	AO ≤ 500	1.0	mg/L	2024-02-08	
Calculated Parameters						
Hardness, Total (as CaCO3)	**343**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.7**	N/A	-5.0		2024-02-12	CT6
Solids, Total Dissolved	**469**	AO ≤ 500	2.50	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**259**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Bicarbonate (as CaCO3)	**259**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2024-02-13	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-02-08	
Conductivity (EC)	**816**	N/A	2.0	µS/cm	2024-02-09	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-02-09	
pH	**7.91**	7.0-10.5	0.10	pH units	2024-02-09	HT2
Temperature, at pH	**23.0**	N/A		°C	2024-02-09	HT2
Turbidity	< 0.10	OG < 1	0.10	NTU	2024-02-08	
Microbiological Parameters						
Coliforms, Total	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
E. coli	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-02-08	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12th Ave (24B0688-02) | Matrix: Water | Sampled: 2024-02-06 09:10, Continued						
Total Metals, Continued						
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-02-08	
Arsenic, total	**0.00429**	MAC = 0.01	0.00050	mg/L	2024-02-08	
Barium, total	**0.0694**	MAC = 2	0.0050	mg/L	2024-02-08	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-02-08	
Cadmium, total	**0.000020**	MAC = 0.007	0.000010	mg/L	2024-02-08	
Calcium, total	**102**	None Required	0.20	mg/L	2024-02-08	
Chromium, total	**0.00083**	MAC = 0.05	0.00050	mg/L	2024-02-08	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-02-08	
Copper, total	**0.0101**	MAC = 2	0.00040	mg/L	2024-02-08	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-02-08	
Lead, total	**0.00038**	MAC = 0.005	0.00020	mg/L	2024-02-08	
Magnesium, total	**21.6**	None Required	0.010	mg/L	2024-02-08	
Manganese, total	**0.00091**	MAC = 0.12	0.00020	mg/L	2024-02-08	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-02-09	
Molybdenum, total	**0.0115**	N/A	0.00010	mg/L	2024-02-08	
Nickel, total	**0.00133**	N/A	0.00040	mg/L	2024-02-08	
Potassium, total	**6.66**	N/A	0.10	mg/L	2024-02-08	
Selenium, total	**0.00080**	MAC = 0.05	0.00050	mg/L	2024-02-08	
Sodium, total	**41.2**	AO ≤ 200	0.10	mg/L	2024-02-08	
Strontium, total	**0.860**	MAC = 7	0.0010	mg/L	2024-02-08	
Uranium, total	**0.00857**	MAC = 0.02	0.000020	mg/L	2024-02-08	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-02-08	
Dividend Ridge (24B0688-03) | Matrix: Water | Sampled: 2024-02-06 08:35						
Anions						
Chloride	**33.3**	AO ≤ 250	0.10	mg/L	2024-02-08	
Fluoride	**0.27**	MAC = 1.5	0.10	mg/L	2024-02-08	
Nitrate (as N)	**2.61**	MAC = 10	0.010	mg/L	2024-02-08	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-02-08	
Sulfate	**57.8**	AO ≤ 500	1.0	mg/L	2024-02-08	
Calculated Parameters						
Hardness, Total (as CaCO3)	**279**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.6**	N/A	-5.0		2024-02-12	CT6
Solids, Total Dissolved	**379**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**227**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Bicarbonate (as CaCO3)	**227**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Dividend Ridge (24B0688-03) | Matrix: Water | Sampled: 2024-02-06 08:35, Continued						
General Parameters, Continued						
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2024-02-13	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-02-08	
Conductivity (EC)	**662**	N/A	2.0	µS/cm	2024-02-09	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-02-09	
pH	**7.96**	7.0-10.5	0.10	pH units	2024-02-09	HT2
Temperature, at pH	**22.7**	N/A		°C	2024-02-09	HT2
Turbidity	**0.40**	OG < 1	0.10	NTU	2024-02-08	
Microbiological Parameters						
Coliforms, Total	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
E. coli	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-02-08	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-02-08	
Arsenic, total	**0.00325**	MAC = 0.01	0.00050	mg/L	2024-02-08	
Barium, total	**0.0709**	MAC = 2	0.0050	mg/L	2024-02-08	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-02-08	
Cadmium, total	**0.000016**	MAC = 0.007	0.000010	mg/L	2024-02-08	
Calcium, total	**76.8**	None Required	0.20	mg/L	2024-02-08	
Chromium, total	**0.00053**	MAC = 0.05	0.00050	mg/L	2024-02-08	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-02-08	
Copper, total	**0.0139**	MAC = 2	0.00040	mg/L	2024-02-08	
Iron, total	**0.019**	AO ≤ 0.3	0.010	mg/L	2024-02-08	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-02-08	
Magnesium, total	**21.1**	None Required	0.010	mg/L	2024-02-08	
Manganese, total	**0.0366**	MAC = 0.12	0.00020	mg/L	2024-02-08	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-02-09	
Molybdenum, total	**0.00947**	N/A	0.00010	mg/L	2024-02-08	
Nickel, total	**0.00067**	N/A	0.00040	mg/L	2024-02-08	
Potassium, total	**5.51**	N/A	0.10	mg/L	2024-02-08	
Selenium, total	**0.00062**	MAC = 0.05	0.00050	mg/L	2024-02-08	
Sodium, total	**34.0**	AO ≤ 200	0.10	mg/L	2024-02-08	
Strontium, total	**0.703**	MAC = 7	0.0010	mg/L	2024-02-08	
Uranium, total	**0.00629**	MAC = 0.02	0.000020	mg/L	2024-02-08	
Zinc, total	**0.0068**	AO ≤ 5	0.0040	mg/L	2024-02-08	
Town Hall (24B0688-04) | Matrix: Water | Sampled: 2024-02-06 08:35						
Anions						
Chloride	**24.7**	AO ≤ 250	0.10	mg/L	2024-02-08	
Fluoride	**0.24**	MAC = 1.5	0.10	mg/L	2024-02-08	
Nitrate (as N)	**1.43**	MAC = 10	0.010	mg/L	2024-02-08	

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Town Hall (24B0688-04) | Matrix: Water | Sampled: 2024-02-06 08:35, Continued						
Anions, Continued						
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-02-08	
Sulfate	**47.2**	AO ≤ 500	1.0	mg/L	2024-02-08	
Calculated Parameters						
Hardness, Total (as CaCO3)	**229**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.4**	N/A	-5.0		2024-02-12	CT6
Solids, Total Dissolved	**319**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**209**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Bicarbonate (as CaCO3)	**209**	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-02-09	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2024-02-13	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-02-08	
Conductivity (EC)	**564**	N/A	2.0	µS/cm	2024-02-09	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-02-09	
pH	**7.91**	7.0-10.5	0.10	pH units	2024-02-09	HT2
Temperature, at pH	**22.6**	N/A		°C	2024-02-09	HT2
Turbidity	**0.36**	OG < 1	0.10	NTU	2024-02-08	
Microbiological Parameters						
Coliforms, Total	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
E. coli	< 1	MAC = 0	1	CFU/100 mL	2024-02-07	HT3
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-02-08	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-02-08	
Arsenic, total	**0.00253**	MAC = 0.01	0.00050	mg/L	2024-02-08	
Barium, total	**0.0591**	MAC = 2	0.0050	mg/L	2024-02-08	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-02-08	
Cadmium, total	**0.000018**	MAC = 0.007	0.000010	mg/L	2024-02-08	
Calcium, total	**62.5**	None Required	0.20	mg/L	2024-02-08	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-02-08	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-02-08	
Copper, total	**0.0298**	MAC = 2	0.00040	mg/L	2024-02-08	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-02-08	
Lead, total	**0.00031**	MAC = 0.005	0.00020	mg/L	2024-02-08	
Magnesium, total	**17.8**	None Required	0.010	mg/L	2024-02-08	
Manganese, total	**0.0330**	MAC = 0.12	0.00020	mg/L	2024-02-08	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-02-09	
Molybdenum, total	**0.00796**	N/A	0.00010	mg/L	2024-02-08	
Nickel, total	**0.00049**	N/A	0.00040	mg/L	2024-02-08	

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Town Hall (24B0688-04) | Matrix: Water | Sampled: 2024-02-06 08:35, Continued						
Total Metals, Continued						
Potassium, total	**4.58**	N/A	0.10	mg/L	2024-02-08	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-02-08	
Sodium, total	**29.0**	AO ≤ 200	0.10	mg/L	2024-02-08	
Strontium, total	**0.581**	MAC = 7	0.0010	mg/L	2024-02-08	
Uranium, total	**0.00476**	MAC = 0.02	0.000020	mg/L	2024-02-08	
Zinc, total	**0.0052**	AO ≤ 5	0.0040	mg/L	2024-02-08	

Sample Qualifiers:

CT6	Results were based on lab temperature & lab pH.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
HT3	Microbiological analysis was initiated beyond the maximum holding time of 30 hours. Results may not be valid.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	SM 9222* (2015)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
E. coli in Water	SM 9222* (2015)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CFU/100 mL	Colony Forming Units per 100 millilitres
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B0688
PROJECT	General Potability	**REPORTED**	2024-02-13 14:59

General Comments:

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.

CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24B1552
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-02-14 15:50 / 11.6°C
PROJECT	General Potability	**REPORTED**	2024-02-21 08:37
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: https://www.caro.ca/terms-conditions

If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B1552
PROJECT	General Potability	**REPORTED**	2024-02-21 08:37

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well 4 (24B1552-01) | Matrix: Water | Sampled: 2024-02-13 11:15						
General Parameters						
Carbon, Total Organic	**3.71**	N/A	0.50	mg/L	2024-02-16	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24B1552
PROJECT	General Potability	**REPORTED**	2024-02-21 08:37

Analysis Description	Method Ref.	Technique	Accredited	Location
Carbon, Total Organic in Water	SM 5310 B (2022)	Combustion, Infrared CO2 Detection	✓	Kelowna

Glossary of Terms:

RL	Reporting Limit (default)
mg/L	Milligrams per litre
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, September 2022)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

General Comments:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24C0500
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-03-05 16:32 / 8.6°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-03-10 15:09
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24C0500
PROJECT	Nitrate/Manganese	**REPORTED**	2024-03-10 15:09

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12 Ave (24C0500-01) | Matrix: Water | Sampled: 2024-03-05 09:05						
Total Metals						
Manganese, total	**0.0162**	MAC = 0.12	0.00020	mg/L	2024-03-10	
Cottonwood (24C0500-02) | Matrix: Water | Sampled: 2024-03-05 08:10						
Total Metals						
Manganese, total	**0.0297**	MAC = 0.12	0.00020	mg/L	2024-03-10	
Hummingbird (24C0500-03) | Matrix: Water | Sampled: 2024-03-05 08:30						
Total Metals						
Manganese, total	**0.00414**	MAC = 0.12	0.00020	mg/L	2024-03-10	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24C0500
PROJECT	Nitrate/Manganese	**REPORTED**	2024-03-10 15:09

Analysis Description	Method Ref.	Technique	Accredited	Location
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

RL	Reporting Limit (default)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, September 2022)

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24C2341
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-03-20 08:04 / 9.8°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-03-25 11:46
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24C2341
PROJECT	Nitrate/Manganese	**REPORTED**	2024-03-25 11:46

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well 8 (24C2341-01) | Matrix: Water | Sampled: 2024-03-19 08:10						
Anions						
Nitrate (as N)	**0.546**	MAC = 10	0.010	mg/L	2024-03-21	
Total Metals						
Manganese, total	**0.125**	MAC = 0.12	0.00020	mg/L	2024-03-23	
Well 6 (24C2341-02) | Matrix: Water | Sampled: 2024-03-19 08:25						
Anions						
Nitrate (as N)	**2.41**	MAC = 10	0.010	mg/L	2024-03-21	
Total Metals						
Manganese, total	**0.117**	MAC = 0.12	0.00020	mg/L	2024-03-23	
Well 4 (24C2341-03) | Matrix: Water | Sampled: 2024-03-19 08:45						
Total Metals						
Manganese, total	**0.133**	MAC = 0.12	0.00020	mg/L	2024-03-23	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24C2341
PROJECT	Nitrate/Manganese	**REPORTED**	2024-03-25 11:46

Analysis Description	Method Ref.	Technique	Accredited	Location
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

RL	Reporting Limit (default)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24D2076
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-04-16 16:40 / 12.0°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-04-21 13:54
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24D2076
PROJECT	Nitrate/Manganese	**REPORTED**	2024-04-21 13:54

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #6 (24D2076-01) | Matrix: Water | Sampled: 2024-04-16 09:35						
Anions						
Nitrate (as N)	**2.02**	MAC = 10	0.010	mg/L	2024-04-17	
Total Metals						
Manganese, total	**0.118**	MAC = 0.12	0.00020	mg/L	2024-04-18	
Well #4 (24D2076-02) | Matrix: Water | Sampled: 2024-04-16 09:15						
Anions						
Nitrate (as N)	**0.145**	MAC = 10	0.010	mg/L	2024-04-17	
Total Metals						
Manganese, total	**0.138**	MAC = 0.12	0.00020	mg/L	2024-04-18	
Well #8 (24D2076-03) | Matrix: Water | Sampled: 2024-04-16 08:35						
Anions						
Nitrate (as N)	**0.391**	MAC = 10	0.010	mg/L	2024-04-17	
Total Metals						
Manganese, total	**0.115**	MAC = 0.12	0.00020	mg/L	2024-04-18	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24D2076
PROJECT	Nitrate/Manganese	**REPORTED**	2024-04-21 13:54

Analysis Description	Method Ref.	Technique	Accredited	Location
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

RL	Reporting Limit (default)
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mg/L	Milligrams per litre
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SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Kelly McDonald	**WORK ORDER**	24F1725
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-06-12 08:00 / NA
PROJECT	Nitrate/Manganese	**REPORTED**	2024-06-19 11:10
PROJECT INFO		**COC NUMBER**	No Number

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Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24F1725
PROJECT	Nitrate/Manganese	**REPORTED**	2024-06-19 11:10

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well 4 (24F1725-01) | Matrix: Water | Sampled: 2024-06-11 08:20						
Total Metals						
Manganese, total	**0.127**	MAC = 0.12	0.00020	mg/L	2024-06-18	
Well 5 (24F1725-02) | Matrix: Water | Sampled: 2024-06-11 08:20						
Total Metals						
Manganese, total	**0.0105**	MAC = 0.12	0.00020	mg/L	2024-06-18	
Well 6 (24F1725-03) | Matrix: Water | Sampled: 2024-06-11 08:20						
Total Metals						
Manganese, total	**0.119**	MAC = 0.12	0.00020	mg/L	2024-06-18	
Well 7 (24F1725-04) | Matrix: Water | Sampled: 2024-06-11 08:20						
Total Metals						
Manganese, total	**0.169**	MAC = 0.12	0.00020	mg/L	2024-06-17	
Well 8 (24F1725-05) | Matrix: Water | Sampled: 2024-06-11 08:20						
Total Metals						
Manganese, total	**0.116**	MAC = 0.12	0.00020	mg/L	2024-06-17	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24F1725
PROJECT	Nitrate/Manganese	**REPORTED**	2024-06-19 11:10

Analysis Description	Method Ref.	Technique	Accredited	Location
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

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mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods

Guidelines Referenced in this Report:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Dave Stene	**WORK ORDER**	24G1144
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-07-09 16:30 / 11.2°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-07-15 09:26
PROJECT INFO		**COC NUMBER**	No Number

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Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24G1144
PROJECT	Nitrate/Manganese	**REPORTED**	2024-07-15 09:26

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #3 (24G1144-01) | Matrix: Water | Sampled: 2024-07-09 08:00						
Total Metals						
Manganese, total	**0.0126**	MAC = 0.12	0.00020	mg/L	2024-07-11	
Well #4 (24G1144-02) | Matrix: Water | Sampled: 2024-07-09 08:25						
Anions						
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2024-07-11	
Total Metals						
Manganese, total	**0.125**	MAC = 0.12	0.00020	mg/L	2024-07-11	
Well #5 (24G1144-03) | Matrix: Water | Sampled: 2024-07-09 08:20						
Anions						
Nitrate (as N)	**0.104**	MAC = 10	0.010	mg/L	2024-07-11	
Total Metals						
Manganese, total	**0.157**	MAC = 0.12	0.00020	mg/L	2024-07-11	
Well #6 (24G1144-04) | Matrix: Water | Sampled: 2024-07-09 09:20						
Anions						
Nitrate (as N)	**1.38**	MAC = 10	0.010	mg/L	2024-07-11	
Total Metals						
Manganese, total	**0.117**	MAC = 0.12	0.00020	mg/L	2024-07-11	
Well #8 (24G1144-05) | Matrix: Water | Sampled: 2024-07-09 08:36						
Anions						
Nitrate (as N)	**0.483**	MAC = 10	0.010	mg/L	2024-07-11	
Total Metals						
Manganese, total	**0.110**	MAC = 0.12	0.00020	mg/L	2024-07-11	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24G1144
PROJECT	Nitrate/Manganese	**REPORTED**	2024-07-15 09:26

Analysis Description	Method Ref.	Technique	Accredited	Location
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
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General Comments:

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Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:bwhitehead@caro.ca

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Dave Stene	**WORK ORDER**	24H0605
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-08-07 08:07 / 15.7°C
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: https://www.caro.ca/terms-conditions

If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #1 (24H0605-01) | Matrix: Water | Sampled: 2024-08-06 07:05						
Anions						
Chloride	**37.4**	AO ≤ 250	0.10	mg/L	2024-08-07	
Fluoride	**0.33**	MAC = 1.5	0.10	mg/L	2024-08-07	
Nitrate (as N)	**5.02**	MAC = 10	0.010	mg/L	2024-08-07	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-08-07	
Sulfate	**62.0**	AO ≤ 500	1.0	mg/L	2024-08-07	
Calculated Parameters						
Hardness, Total (as CaCO3)	**293**	None Required	0.500	mg/L	N/A	
Solids, Total Dissolved	**395**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**209**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Bicarbonate (as CaCO3)	**209**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Conductivity (EC)	**683**	N/A	2.0	µS/cm	2024-08-07	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-08-09	
pH	**7.19**	7.0-10.5	0.10	pH units	2024-08-07	HT2
Turbidity	< 0.10	OG < 1	0.10	NTU	2024-08-07	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-08-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-08-09	
Arsenic, total	**0.00450**	MAC = 0.01	0.00050	mg/L	2024-08-09	
Barium, total	**0.0567**	MAC = 2	0.0050	mg/L	2024-08-09	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-08-09	
Cadmium, total	**0.000026**	MAC = 0.007	0.000010	mg/L	2024-08-09	
Calcium, total	**88.7**	None Required	0.20	mg/L	2024-08-09	
Chromium, total	**0.00053**	MAC = 0.05	0.00050	mg/L	2024-08-09	
Copper, total	**0.00574**	MAC = 2	0.00040	mg/L	2024-08-09	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-08-09	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-08-09	
Magnesium, total	**17.3**	None Required	0.010	mg/L	2024-08-09	
Manganese, total	**0.00437**	MAC = 0.12	0.00020	mg/L	2024-08-09	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2024-08-09	HG1
Potassium, total	**6.01**	N/A	0.10	mg/L	2024-08-09	
Selenium, total	**0.00058**	MAC = 0.05	0.00050	mg/L	2024-08-09	
Sodium, total	**34.0**	AO ≤ 200	0.10	mg/L	2024-08-09	
Strontium, total	**0.728**	MAC = 7	0.0010	mg/L	2024-08-09	

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #1 (24H0605-01) | Matrix: Water | Sampled: 2024-08-06 07:05, Continued						
Total Metals, Continued						
Uranium, total	**0.00685**	MAC = 0.02	0.000020	mg/L	2024-08-09	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-08-09	
Well #3 (24H0605-02) | Matrix: Water | Sampled: 2024-08-06 08:05						
Anions						
Chloride	**19.2**	AO ≤ 250	0.10	mg/L	2024-08-07	
Fluoride	**0.47**	MAC = 1.5	0.10	mg/L	2024-08-07	
Nitrate (as N)	**3.11**	MAC = 10	0.010	mg/L	2024-08-07	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-08-07	
Sulfate	**58.0**	AO ≤ 500	1.0	mg/L	2024-08-07	
Calculated Parameters						
Hardness, Total (as CaCO3)	**312**	None Required	0.500	mg/L	N/A	
Solids, Total Dissolved	**396**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**267**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Bicarbonate (as CaCO3)	**267**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Conductivity (EC)	**703**	N/A	2.0	µS/cm	2024-08-07	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-08-09	
pH	**7.40**	7.0-10.5	0.10	pH units	2024-08-07	HT2
Turbidity	< 0.10	OG < 1	0.10	NTU	2024-08-07	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-08-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-08-09	
Arsenic, total	**0.00139**	MAC = 0.01	0.00050	mg/L	2024-08-09	
Barium, total	**0.0876**	MAC = 2	0.0050	mg/L	2024-08-09	
Boron, total	**0.0635**	MAC = 5	0.0500	mg/L	2024-08-09	
Cadmium, total	**0.000021**	MAC = 0.007	0.000010	mg/L	2024-08-09	
Calcium, total	**86.8**	None Required	0.20	mg/L	2024-08-09	
Chromium, total	**0.00085**	MAC = 0.05	0.00050	mg/L	2024-08-09	
Copper, total	**0.00758**	MAC = 2	0.00040	mg/L	2024-08-09	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-08-09	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-08-09	
Magnesium, total	**23.2**	None Required	0.010	mg/L	2024-08-09	

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #3 (24H0605-02) | Matrix: Water | Sampled: 2024-08-06 08:05, Continued						
Total Metals, Continued						
Manganese, total	**0.0119**	MAC = 0.12	0.00020	mg/L	2024-08-09	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2024-08-09	HG1
Potassium, total	**6.59**	N/A	0.10	mg/L	2024-08-09	
Selenium, total	**0.00155**	MAC = 0.05	0.00050	mg/L	2024-08-09	
Sodium, total	**25.9**	AO ≤ 200	0.10	mg/L	2024-08-09	
Strontium, total	**0.964**	MAC = 7	0.0010	mg/L	2024-08-09	
Uranium, total	**0.0119**	MAC = 0.02	0.000020	mg/L	2024-08-09	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-08-09	
Well #4 (24H0605-03) | Matrix: Water | Sampled: 2024-08-06 07:40						
Anions						
Chloride	**5.40**	AO ≤ 250	0.10	mg/L	2024-08-07	
Fluoride	**0.47**	MAC = 1.5	0.10	mg/L	2024-08-07	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2024-08-07	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-08-07	
Sulfate	**35.0**	AO ≤ 500	1.0	mg/L	2024-08-07	
Calculated Parameters						
Hardness, Total (as CaCO3)	**238**	None Required	0.500	mg/L	N/A	
Solids, Total Dissolved	**294**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**244**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Bicarbonate (as CaCO3)	**244**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Conductivity (EC)	**544**	N/A	2.0	µS/cm	2024-08-07	
Cyanide, Total	**0.0031**	MAC = 0.2	0.0020	mg/L	2024-08-09	
pH	**7.74**	7.0-10.5	0.10	pH units	2024-08-07	HT2
Turbidity	**0.86**	OG < 1	0.10	NTU	2024-08-07	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-08-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-08-09	
Arsenic, total	**0.00686**	MAC = 0.01	0.00050	mg/L	2024-08-09	
Barium, total	**0.151**	MAC = 2	0.0050	mg/L	2024-08-09	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-08-09	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010	mg/L	2024-08-09	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO Osoyoos, Town of
PROJECT General Potability

WORK ORDER 24H0605
REPORTED 2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #4 (24H0605-03) | Matrix: Water | Sampled: 2024-08-06 07:40, Continued						
Total Metals, Continued						
Calcium, total	**42.8**	None Required	0.20	mg/L	2024-08-09	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Copper, total	**0.00041**	MAC = 2	0.00040	mg/L	2024-08-09	
Iron, total	**0.284**	AO ≤ 0.3	0.010	mg/L	2024-08-09	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-08-09	
Magnesium, total	**31.7**	None Required	0.010	mg/L	2024-08-09	
Manganese, total	**0.122**	MAC = 0.12	0.00020	mg/L	2024-08-09	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2024-08-09	HG1
Potassium, total	**5.69**	N/A	0.10	mg/L	2024-08-09	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Sodium, total	**24.2**	AO ≤ 200	0.10	mg/L	2024-08-09	
Strontium, total	**0.676**	MAC = 7	0.0010	mg/L	2024-08-09	
Uranium, total	**0.000782**	MAC = 0.02	0.000020	mg/L	2024-08-09	
Zinc, total	**0.0042**	AO ≤ 5	0.0040	mg/L	2024-08-09	
Well #5 (24H0605-04) | Matrix: Water | Sampled: 2024-08-06 07:45						
Anions						
Chloride	**11.2**	AO ≤ 250	0.10	mg/L	2024-08-07	
Fluoride	**0.44**	MAC = 1.5	0.10	mg/L	2024-08-07	
Nitrate (as N)	**0.064**	MAC = 10	0.010	mg/L	2024-08-07	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-08-07	
Sulfate	**32.7**	AO ≤ 500	1.0	mg/L	2024-08-07	
Calculated Parameters						
Hardness, Total (as CaCO3)	**204**	None Required	0.500	mg/L	N/A	
Solids, Total Dissolved	**267**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**207**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Bicarbonate (as CaCO3)	**207**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Conductivity (EC)	**499**	N/A	2.0	µS/cm	2024-08-07	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-08-09	
pH	**7.50**	7.0-10.5	0.10	pH units	2024-08-07	HT2
Turbidity	**0.36**	OG < 1	0.10	NTU	2024-08-07	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
Total Metals						

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #5 (24H0605-04) | Matrix: Water | Sampled: 2024-08-06 07:45, Continued						
Total Metals, Continued						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-08-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-08-09	
Arsenic, total	**0.00197**	MAC = 0.01	0.00050	mg/L	2024-08-09	
Barium, total	**0.105**	MAC = 2	0.0050	mg/L	2024-08-09	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-08-09	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010	mg/L	2024-08-09	
Calcium, total	**50.6**	None Required	0.20	mg/L	2024-08-09	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Copper, total	**0.00479**	MAC = 2	0.00040	mg/L	2024-08-09	
Iron, total	**0.102**	AO ≤ 0.3	0.010	mg/L	2024-08-09	
Lead, total	**0.00026**	MAC = 0.005	0.00020	mg/L	2024-08-09	
Magnesium, total	**18.9**	None Required	0.010	mg/L	2024-08-09	
Manganese, total	**0.150**	MAC = 0.12	0.00020	mg/L	2024-08-09	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2024-08-09	HG1
Potassium, total	**4.74**	N/A	0.10	mg/L	2024-08-09	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Sodium, total	**22.1**	AO ≤ 200	0.10	mg/L	2024-08-09	
Strontium, total	**0.588**	MAC = 7	0.0010	mg/L	2024-08-09	
Uranium, total	**0.00292**	MAC = 0.02	0.000020	mg/L	2024-08-09	
Zinc, total	**0.0062**	AO ≤ 5	0.0040	mg/L	2024-08-09	
Well #6 (24H0605-05) | Matrix: Water | Sampled: 2024-08-06 08:35						
Anions						
Chloride	**16.4**	AO ≤ 250	0.10	mg/L	2024-08-07	
Fluoride	**0.45**	MAC = 1.5	0.10	mg/L	2024-08-07	
Nitrate (as N)	**1.98**	MAC = 10	0.010	mg/L	2024-08-07	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-08-07	
Sulfate	**57.1**	AO ≤ 500	1.0	mg/L	2024-08-07	
Calculated Parameters						
Hardness, Total (as CaCO3)	**292**	None Required	0.500	mg/L	N/A	
Solids, Total Dissolved	**387**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**277**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Bicarbonate (as CaCO3)	**277**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Conductivity (EC)	**700**	N/A	2.0	µS/cm	2024-08-07	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-08-09	
pH	**7.64**	7.0-10.5	0.10	pH units	2024-08-07	HT2

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #6 (24H0605-05) | Matrix: Water | Sampled: 2024-08-06 08:35, Continued						
General Parameters, Continued						
Turbidity	< 0.10	OG < 1	0.10	NTU	2024-08-07	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-08-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-08-09	
Arsenic, total	**0.00475**	MAC = 0.01	0.00050	mg/L	2024-08-09	
Barium, total	**0.0678**	MAC = 2	0.0050	mg/L	2024-08-09	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-08-09	
Cadmium, total	**0.000024**	MAC = 0.007	0.000010	mg/L	2024-08-09	
Calcium, total	**67.1**	None Required	0.20	mg/L	2024-08-09	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Copper, total	**0.00248**	MAC = 2	0.00040	mg/L	2024-08-09	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-08-09	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-08-09	
Magnesium, total	**30.1**	None Required	0.010	mg/L	2024-08-09	
Manganese, total	**0.120**	MAC = 0.12	0.00020	mg/L	2024-08-09	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2024-08-09	HG1
Potassium, total	**6.02**	N/A	0.10	mg/L	2024-08-09	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Sodium, total	**32.4**	AO ≤ 200	0.10	mg/L	2024-08-09	
Strontium, total	**0.819**	MAC = 7	0.0010	mg/L	2024-08-09	
Uranium, total	**0.00549**	MAC = 0.02	0.000020	mg/L	2024-08-09	
Zinc, total	**0.0043**	AO ≤ 5	0.0040	mg/L	2024-08-09	
Well #8 (24H0605-06) | Matrix: Water | Sampled: 2024-08-06 07:20						
Anions						
Chloride	**12.3**	AO ≤ 250	0.10	mg/L	2024-08-07	
Fluoride	**0.34**	MAC = 1.5	0.10	mg/L	2024-08-07	
Nitrate (as N)	**0.528**	MAC = 10	0.010	mg/L	2024-08-07	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-08-07	
Sulfate	**33.2**	AO ≤ 500	1.0	mg/L	2024-08-07	
Calculated Parameters						
Hardness, Total (as CaCO3)	**164**	None Required	0.500	mg/L	N/A	
Solids, Total Dissolved	**225**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**159**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #8 (24H0605-06) | Matrix: Water | Sampled: 2024-08-06 07:20, Continued						
General Parameters, Continued						
Alkalinity, Bicarbonate (as CaCO3)	**159**	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2024-08-07	
Conductivity (EC)	**417**	N/A	2.0	µS/cm	2024-08-07	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-08-09	
pH	**7.27**	7.0-10.5	0.10	pH units	2024-08-07	HT2
Turbidity	**0.16**	OG < 1	0.10	NTU	2024-08-07	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2024-08-07	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2024-08-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-08-09	
Arsenic, total	**0.00209**	MAC = 0.01	0.00050	mg/L	2024-08-09	
Barium, total	**0.0472**	MAC = 2	0.0050	mg/L	2024-08-09	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-08-09	
Cadmium, total	**0.000030**	MAC = 0.007	0.000010	mg/L	2024-08-09	
Calcium, total	**44.9**	None Required	0.20	mg/L	2024-08-09	
Chromium, total	**0.00078**	MAC = 0.05	0.00050	mg/L	2024-08-09	
Copper, total	**0.00609**	MAC = 2	0.00040	mg/L	2024-08-09	
Iron, total	**0.019**	AO ≤ 0.3	0.010	mg/L	2024-08-09	
Lead, total	**0.00038**	MAC = 0.005	0.00020	mg/L	2024-08-09	
Magnesium, total	**12.6**	None Required	0.010	mg/L	2024-08-09	
Manganese, total	**0.119**	MAC = 0.12	0.00020	mg/L	2024-08-09	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2024-08-09	HG1
Potassium, total	**3.54**	N/A	0.10	mg/L	2024-08-09	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-08-09	
Sodium, total	**19.6**	AO ≤ 200	0.10	mg/L	2024-08-09	
Strontium, total	**0.435**	MAC = 7	0.0010	mg/L	2024-08-09	
Uranium, total	**0.00306**	MAC = 0.02	0.000020	mg/L	2024-08-09	
Zinc, total	**0.0338**	AO ≤ 5	0.0040	mg/L	2024-08-09	

Sample Qualifiers:

HG1	Sample bottle and preservation submitted is not suitable for Mercury analysis and analyte stability may be affected.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	SM 9223 (2016)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
E. coli in Water	SM 9223 (2016)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
MPN/100 mL	Most Probable Number per 100 millilitres
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24H0605
PROJECT	General Potability	**REPORTED**	2024-08-09 15:29

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Dave Stene	**WORK ORDER**	24I0343
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-09-03 16:30 / 14.4°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-09-10 15:45
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24I0343
PROJECT	Nitrate/Manganese	**REPORTED**	2024-09-10 15:45

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #1 (24I0343-01) | Matrix: Water | Sampled: 2024-09-03 07:20						
Anions						
Nitrate (as N)	**5.07**	MAC = 10	0.010	mg/L	2024-09-05	
Total Metals						
Manganese, total	**0.00472**	MAC = 0.12	0.00020	mg/L	2024-09-10	
Well #3 (24I0343-02) | Matrix: Water | Sampled: 2024-09-03 08:50						
Total Metals						
Manganese, total	**0.0123**	MAC = 0.12	0.00020	mg/L	2024-09-10	
Well #4 (24I0343-03) | Matrix: Water | Sampled: 2024-09-03 08:20						
Anions						
Nitrate (as N)	**0.026**	MAC = 10	0.010	mg/L	2024-09-05	
Total Metals						
Manganese, total	**0.149**	MAC = 0.12	0.00020	mg/L	2024-09-10	
Well #5 (24I0343-04) | Matrix: Water | Sampled: 2024-09-03 07:50						
Anions						
Nitrate (as N)	**0.019**	MAC = 10	0.010	mg/L	2024-09-05	
Total Metals						
Manganese, total	**0.155**	MAC = 0.12	0.00020	mg/L	2024-09-09	
Well #6 (24I0343-05) | Matrix: Water | Sampled: 2024-09-03 10:00						
Anions						
Nitrate (as N)	**2.16**	MAC = 10	0.010	mg/L	2024-09-05	
Total Metals						
Manganese, total	**0.132**	MAC = 0.12	0.00020	mg/L	2024-09-10	
Well #8 (24I0343-06) | Matrix: Water | Sampled: 2024-09-03 07:20						
Anions						
Nitrate (as N)	**0.500**	MAC = 10	0.010	mg/L	2024-09-05	
Total Metals						
Manganese, total	**0.135**	MAC = 0.12	0.00020	mg/L	2024-09-09	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24I0343
PROJECT	Nitrate/Manganese	**REPORTED**	2024-09-10 15:45

Analysis Description	Method Ref.	Technique	Accredited	Location
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

RL	Reporting Limit (default)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, September 2022)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Dave Stene	**WORK ORDER**	24J0238
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-10-02 08:07 / 10.2°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-10-05 21:09
PROJECT INFO		**COC NUMBER**	No Number

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24J0238
PROJECT	Nitrate/Manganese	**REPORTED**	2024-10-05 21:09

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #3 (24J0238-01) | Matrix: Water | Sampled: 2024-10-01 11:10						
Total Metals						
Manganese, total	**0.0132**	MAC = 0.12	0.00020	mg/L	2024-10-04	
Well #4 (24J0238-02) | Matrix: Water | Sampled: 2024-10-01 09:45						
Anions						
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2024-10-02	
Total Metals						
Manganese, total	**0.0992**	MAC = 0.12	0.00020	mg/L	2024-10-04	
Well #5 (24J0238-03) | Matrix: Water | Sampled: 2024-10-01 09:30						
Anions						
Nitrate (as N)	**0.010**	MAC = 10	0.010	mg/L	2024-10-02	
Total Metals						
Manganese, total	**0.163**	MAC = 0.12	0.00020	mg/L	2024-10-04	
Well #6 (24J0238-04) | Matrix: Water | Sampled: 2024-10-01 11:20						
Anions						
Nitrate (as N)	**2.25**	MAC = 10	0.010	mg/L	2024-10-02	
Total Metals						
Manganese, total	**0.138**	MAC = 0.12	0.00020	mg/L	2024-10-04	
Well #8 (24J0238-05) | Matrix: Water | Sampled: 2024-10-01 08:10						
Anions						
Nitrate (as N)	**0.459**	MAC = 10	0.010	mg/L	2024-10-02	
Total Metals						
Manganese, total	**0.148**	MAC = 0.12	0.00020	mg/L	2024-10-04	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24J0238
PROJECT	Nitrate/Manganese	**REPORTED**	2024-10-05 21:09

Analysis Description	Method Ref.	Technique	Accredited	Location
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0		
ATTENTION	Dave Stene	**WORK ORDER**	24K3131
PO NUMBER	Drinking Water	**RECEIVED / TEMP**	2024-11-27 10:07 / 7.8°C
PROJECT	Nitrate/Manganese	**REPORTED**	2024-11-30 15:07
PROJECT INFO		**COC NUMBER**	No Number

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If you have any questions or concerns, please contact me at hhannaoui@caro.ca

Authorized By:

Hanane El Hannaoui
Junior Account Manager

TEST RESULTS

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24K3131
PROJECT	Nitrate/Manganese	**REPORTED**	2024-11-30 15:07

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #3 (24K3131-01) | Matrix: Water | Sampled: 2024-11-26 08:19						
Total Metals						
Manganese, total	**0.0153**	MAC = 0.12	0.00020	mg/L	2024-11-29	
Well #4 (24K3131-02) | Matrix: Water | Sampled: 2024-11-26 11:35						
Total Metals						
Manganese, total	**0.128**	MAC = 0.12	0.00020	mg/L	2024-11-29	
Well #5 (24K3131-03) | Matrix: Water | Sampled: 2024-11-26 11:46						
Total Metals						
Manganese, total	**0.174**	MAC = 0.12	0.00020	mg/L	2024-11-29	
Well #8 (24K3131-04) | Matrix: Water | Sampled: 2024-11-26 11:03						
Total Metals						
Manganese, total	**0.168**	MAC = 0.12	0.00020	mg/L	2024-11-29	
Well #6 (24K3131-05) | Matrix: Water | Sampled: 2024-11-26 13:05						
Total Metals						
Manganese, total	**0.113**	MAC = 0.12	0.00020	mg/L	2024-11-29	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Osoyoos, Town of	**WORK ORDER**	24K3131
PROJECT	Nitrate/Manganese	**REPORTED**	2024-11-30 15:07

Analysis Description	Method Ref.	Technique	Accredited	Location
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Glossary of Terms:

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MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods

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APPENDIX C

Domestic Water and Community Sewerage System Capacity Update for Small-scale, Multi-unit Housing

Domestic Water and Community Sewerage System Capacity Update for Small-scale, Multi-unit Housing

Osoyoos
Canada's warmest welcome ®*

December, 2024

Project No. 302-185

ENGINEERING ■ PLANNING ■ URBAN DESIGN ■ LAND SURVEYING

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List of Acronyms

ADD	Average Day Demand
DCC	Development Cost Charge
MBBR	Moving Bed Biofilm Reactor
MDD	Maximum Day Demand
MWWPS	Main Wastewater Pumping Station
OIB	Osoyoos Indian Band
PE	Population Equivalent
PRV	Pressure Reducing Valve
PWWF	Peak Wet Weather Flow
PZ	Pressure Zone
RDOS	Regional District of Okanagan Similkameen
SSMUH	Small-scale, Multi-unit Housing
TRUE	TRUE Consulting
WWTP	Wastewater Treatment Plant

Units of Measure

ft	feet
Igpm	Imperial gallons per minute
km	kilometre
L/d	Litres per day
L/m	Litres per minute
L/s	Litres per second
lpcd	Litres per capita per day
m	metre
mg/L	milligrams per Litre
mm	millimetre
NTU	Nephelometric Turbidity Units
psi	pounds per square inch
USgpm	US gallons per minute

Referenced Reports

Bylaw 1395, 2024	Town of Osoyoos, “Zoning Bylaw”, Updated September 24, 2020
Bylaw 1085, 1998	Town of Osoyoos, “Zoning Bylaw”, Updated August 19, 2020
Bylaw 1375.04, 2024	Town of Osoyoos, “DRAFT Official Community Plan Amendment”
Bylaw 1375, 2021	Town of Osoyoos, “Official Community Plan,” Adopted April 2022
TRUE File: 302-1354	TRUE Consulting, “Wastewater Treatment Long Term Plan” April 2021
TRUE File: 302-2051	TRUE Consulting, “2023 Osoyoos Sanitary System Infrastructure Plan,” September 2023
TRUE File: 302-2061	TRUE Consulting, “2023 Osoyoos Water System Infrastructure Plan” July 2023

Executive Summary

This report is considered to be an update to the capacity sections from the following detailed system assessment documents:

- TRUE 2023a. 2023 Osoyoos Water System Infrastructure Plan, dated July 2023
- TRUE 2023b. 2023 Osoyoos Sanitary System Infrastructure Plan, dated September 2013

The subject assessment is being completed on the basis of legislated changes that were made official in late 2023 through Provincial Bills 44, 46, and 47. These bills will allow for infilling of parcels currently associated with low density zoning. The goal of this assessment was to determine if increased capacity or expansion of the water and sewer infrastructure is required as either a short-term or long-term goal.

Population projections for this assessment were based on the number of single-family lots within the municipal boundary that can be serviced by the Town's water and sewer systems. A count of 1,830 applicable lots was utilized as the basis for the subsequent projections. Based on this lot count, four population projections with increasing increments of 25% infill were determined. It was confirmed that the 25% infill scenario would be used for future projections with the 100% infill scenario carried through for discussion. This was done because infilling greater than 25% (equivalent population growth rate approximately 3.0%) would be unrealistic based on census growth. As such, the water system service population is projected to increase from 6,384 (2021), to 12,812 (2044) based on 25% infilling, and could increase to 21,047 based on 100% infilling. The sanitary sewer service population is projected to increase from 20,062 (2024), to 22,807 (2044) based on 25% infilling, and could increase to 31,042 based on 100% infilling. It is noted that the OIB service population is roughly 14% of the sanitary sewer service population.

Based on the 20-year population projections, water demand and sanitary flow projections were calculated for 25% infilling and 2.0% growth in all other areas of the municipality. These parameters were used to assess impacts to the existing system infrastructure. Recommendations for infrastructure upgrades are summarized as follows. In general, most system capacity recommendations are similar to those in the capital plans but their implementation schedule is accelerated based on increased growth projections. It is noted that system upgrades addressing projected capacity constraints are eligible as Development Cost Charge (DCC) driven projects. These projects will subsequently be incorporated into the DCC bylaw which the percent DCC eligible increasing based on infilling projections.

Water System Upgrades:

- The following watermain upgrade projects are recommended to accommodate additional flows for infilling.
  1. Project W5: 74th Ave. Watermain Upsizing, Heron Lane and Loon Crescent Replacement, and Loon Crescent Looping
  2. Project W22: Watermain Upgrades and Replacement on 89th St. from 70th Ave. to Kingfisher Dr.

3. Project W30: Watermain Upgrades and Replacement on 89th St. from Kingfisher Dr. to Oleander Dr. and 62nd Ave. Tie-in to 89th St. (Chute Intersection)
4. Project W21: Watermain Upgrades and Replacement on 89th St. from Main St. to 70th Ave.
5. Project W29: Watermain Upgrade and Replacement on Kingfisher Dr. from 89th St. to Gyro Park.
6. Project W34: Watermain Upgrade and Replacement on Main St. from the East Lake Crossing to Cottonwood Dr., and on Cottonwood Drive from Main St. to Maple Drive.
7. Project W38: Watermain Connecting Nighthawk Dr. and 89th St, adjacent to 89th St and Kingfisher Dr. Intersection
8. Project W39: Watermain Upgrades on 74th Ave. from 97th St. to Nighthawk Dr.
9. Project W23: East 340 Reservoir – Construction
10. Project W31: 340 Reservoir Watermain Upgrades

- One additional well is immediately required to achieve n-1 flows to meet the current MDD.
- Three supply wells will likely be required to service increased demand even with water conservation. A new well is projected every 6 - 12 years, depending on the sustainable well yield. This project will not be required if a surface water treatment is implemented.
- Well Pumps re-sizing and maintenance is recommended to optimize flows from the source wells to improve deficient supply redundancy.
  - It is noted that this project would not be DCC eligible because it is largely a maintenance project.
- The existing capacities in each PZ may become deficient because of infilling. It is recommended that storage requirements in each pressure zone be reduced by implementing auxiliary power at each well pump and pumpstation.
  - It is noted that the capacity of the Fairway Hills and 402 Reservoirs should likely be increased to accommodate future demands. Replacement of the 402 Reservoir is projected to occur in the 10-year Horizon. During detailed design, it is also recommended to consider cascading fire flows from Fairway Hills to the 402 pressure zone to minimize storage requirements.

Sanitary Sewer System:

- Upgrading the WWTP with the MBBR system is recommended to ensure adequate system capacity. It is noted that this project is included in the 10-year horizon of the Capital plan. The corresponding project is S38 – Cell #1 Process Upgrades.
  - Projected flows may also exceed the design treatment system flow as early as 2027, for the 25% infill scenario. This would require an increase in WWTP capacity, likely resulting in upsizing the MBBR system proposed in TRUE 2021, Wastewater Treatment Long Term Plan.
- Flows may exceed the permitted maximum daily discharge as early as 2030. Increasing this value may be necessary to be compliant with permitted discharge requirements.
- Projected average day sewer flow associated with the 25% infilling scenario may result in an exceedance of the effluent storage capacity as early as 2030-2031. It is recommended that an additional 145,000 m³ of wastewater storage be implemented.

1.0 Introduction

As requested by the Town of Osoyoos (the Town) staff, TRUE Consulting (TRUE) has prepared this report to summarize findings from a capacity assessment of the Town's domestic water and community sewerage systems. This report is considered to be an update to the capacity sections from the following detailed system assessment documents:

- TRUE 2023a. 2023 Osoyoos Water System Infrastructure Plan, dated July 2023
- TRUE 2023b. 2023 Osoyoos Sanitary System Infrastructure Plan, dated September 2013

The subject assessment is being completed on the basis of legislated changes that were made official in late 2023 through Provincial Bills 44, 46, and 47. These bills will allow for infilling of parcels currently associated with low density zoning. From the Town's perspective, the key consideration allowed by these bills is that four dwelling units (i.e. 4-plexes or comparable) will be permitted on parcels that are currently zoned for single-family or duplex use and are serviced by both the Town's domestic water and community sewerage systems.

The goal of this assessment is therefore to determine whether the Town should be planning to expand the capacity of their water and sewer infrastructure as either a short-term or long-term goal arising from potentially significant population growth related to Provincial Bills 44, 46, and 47. A 20-year horizon has been considered for this assessment.

The following sections discuss:

- Population projections used as the basis for updated system capacity assessments.
- From the preferred population project scenario, a detailed review of the capacity of the Town's domestic water and community sewerage systems.
- A discussion of potential key capacity deficiencies related to utility systems.
- A summary of findings relating to this assessment.

2.0 Population Projections

The basis for this assessment is the number of single-family lots within the Town boundary that can be serviced by the Town's water and sewer systems. The following table provides a summary of existing parcels (differentiated by existing zoning designation) within the Town boundary that can be serviced via these infrastructure systems. This table has been summarized based on parcel data retrieved from the Regional District of Okanagan Similkameen (RDOS) Parcel Identifier GIS platform, on September 3, 2024.

TABLE 2-1: PARCEL COUNT WITHIN TOWN BOUNDARY

ZONING DESIGNATION	TOTAL PARCEL COUNT
R1	1,466
R2	172
R3	55
R4	33
R5	104
Remaining Designations	2,587
Total	**4,417**

Further to the above table:

- The zones referenced in Table 2-1 are from Zoning Bylaw No. 1085, 1998, last updated in 2023. These zones were used because they are present on the RDOS Parcel Identifier GIS platform.
  - The Town has recently updated the Zoning Bylaw (Bylaw No. 1395, 2024) to include zoning for small-scale, multi-unit housing (SSMUH) as required by the province. It is understood that new zones in this bylaw that encompass the zones presented in Table 2-1 are RS1: Small-scale multi-unit Residential, and RSM: Residential Manufactured Home Park. Viewing these new zones on the corresponding Zoning Map (Schedule 2 of Bylaw No. 1395) shows that only two parcels are RSM. For this reason, the RS1 lots were closely approximated as the total lots for the R1 through R5 designations, as determined from the RDOS Parcel Identifier GIS platform.
- A count of 1,830 applicable lots was utilized as the basis for the subsequent capacity assessment. This total number of parcels was chosen as it represents the total potential build-out of existing single-family zoned parcels that have the potential to be re-developed within the Town boundary (i.e. currently serviced or un-serviced).
- Note that this total number of R1 through R5 zoned parcels represents all existing developed lots that are serviced by the Town's water and sewer systems and a small number of currently undeveloped lots that could be connected to these utility systems.

The subsequent capacity assessment also requires consideration for population growth associated with parcels with other zoning designations than R1 through R5. The Town's 2021 census population (for Osoyoos, Town) has been used as a basis for population projections. An assumed growth rate of 2.0% was then utilized to project a maximum population over the 20-year horizon for this assessment. This maximum growth rate is consistent with recommendations from the Town's Official Community Plan, dated July 2022.

The following figure illustrates a projected population based on this 2.0% growth rate over the 20-year horizon. As noted, the census population from 2021 was used as the basis for population projections. Osoyoos census population for 2011, 2016, and 2021 are each noted on this figure.

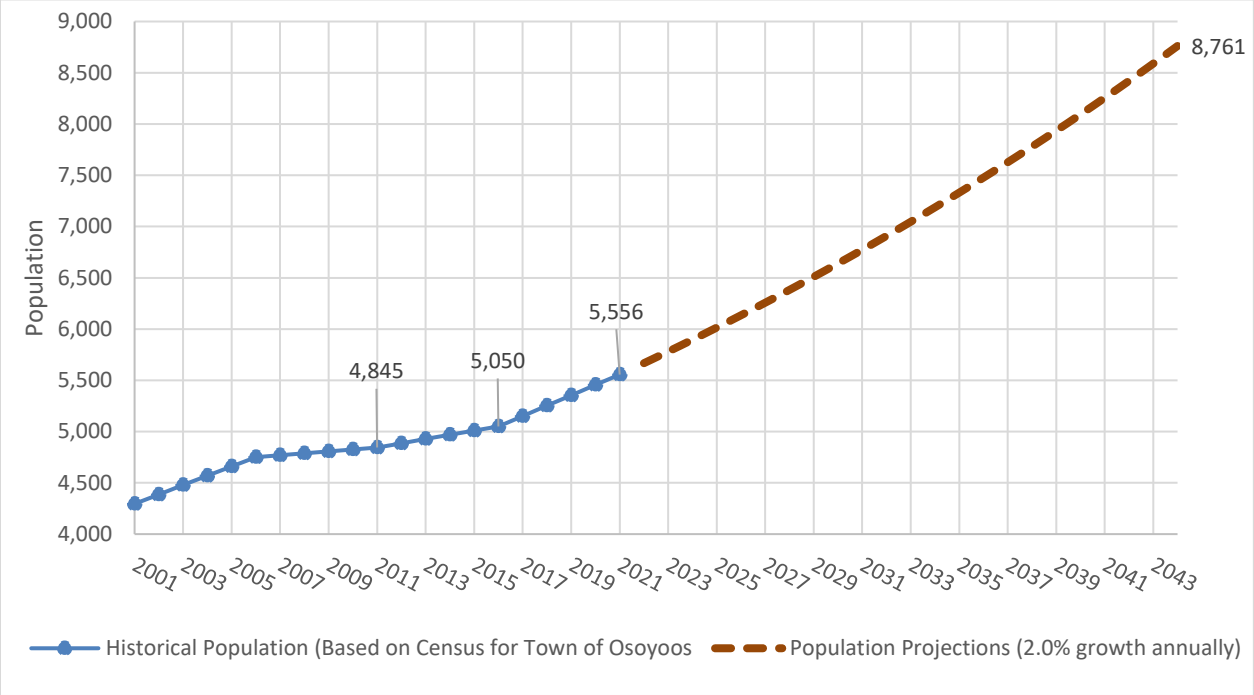


FIGURE 2-1: TOWN OF OSOYOOS POPULATION (HISTORICAL AND 20-YEAR PROJECTION)

Figure 2-1 does not yet include population projections related to possible infilling scenarios for applicable parcels being redeveloped to 4-plexes within the Town boundary. A variety of infilling scenarios have been considered for their impact on the Town's domestic water and community sewerage infrastructure systems. The infilling scenarios considered are 0% (i.e. status quo), 25%, 50%, 75%, 100%. Note that these infilling scenarios consider a population density of 2.0 capita/unit as per 2021 Census data* and do not include equivalent population of parcels that have not been re-developed (i.e. population of RS1 parcels that do not re-develop to 4-plexes). The following figure illustrates the various infilling scenarios considered in this assessment.

* *Source: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=osoyoos&DGUIDlist=2021A00055907005&GENDERlist=1,2,3&STATISTIClist=1,4&HEADERlist=0*

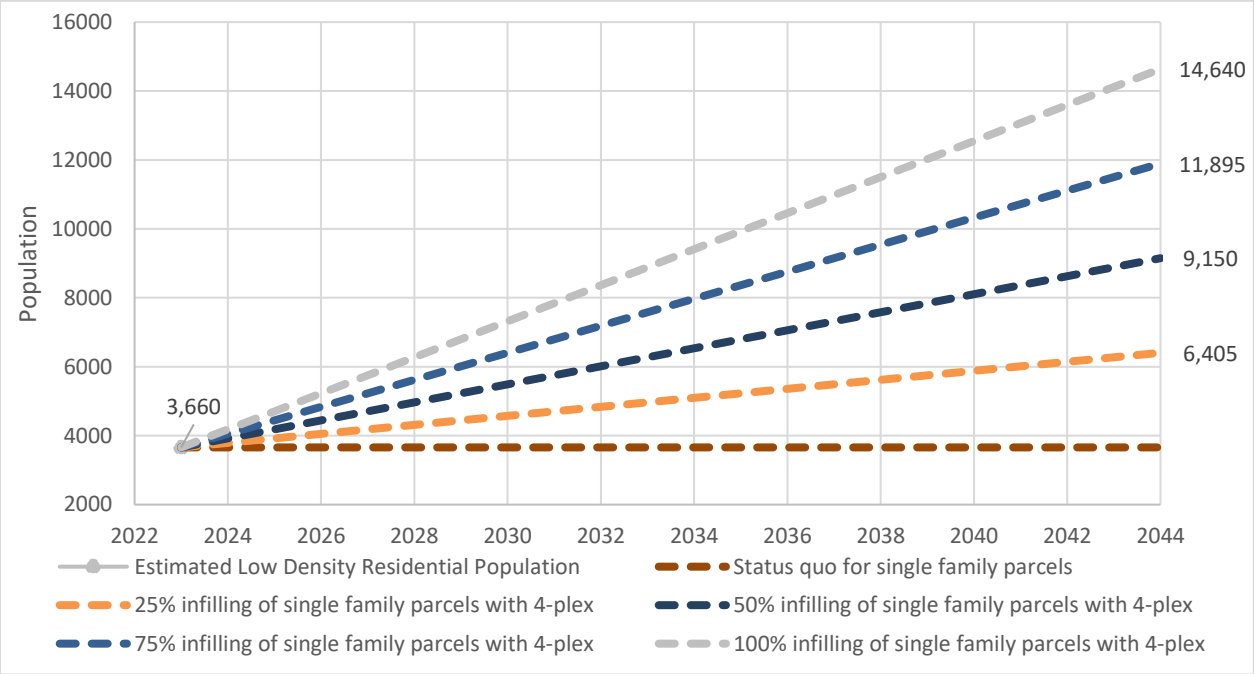


FIGURE 2-2: PROJECTED EQUIVALENT POPULATION OF SSMUH PARCELS WITH VARIOUS INFILLING SCENARIOS

Further to the above figure:

- Figure 2-2 assumes that an equal number of applicable parcels are re-developed each year over the 20-year assessment period.
- Infilling may therefore have the impact of increasing the Town's population associated with existing SSMUH applicable parcels from around 3,660 to 14,640.
- Considering that the Town's census population only increased by 711 people in the period between 2011 and 2021, the higher infilling projections are considered to be unrealistic. Even the 25% infilling option would be associated with the re-development of more than eighty-seven parcels each year over the 20-year horizon.
- With the above in mind, the 25% infilling options have been utilized as the basis for the subsequent capacity assessments. A growth rate exceeding this 25% infilling scenario is considered unrealistic based on past population growth within the Town of Osoyoos and surrounding regions. As noted, TRUE has also considered a 2.0% growth rate associated with all parcels with current zoning designations other than SSMUH applicable parcels.

As described in TRUE 2023a and TRUE 2023b, the water and sewer systems population projections are based on different methods. The following sections detail the application of the SSMUH population projections considering these two systems.

2.1 Water Population Projections

As described in TRUE 2023a., the population projections are based on census populations within the municipal boundary and the equivalent population being provided with domestic water service outside the municipal boundary. From this referenced report, the following table provides the total estimated 2021 service population associated with the water system.

TABLE 2-2: ESTIMATED DOMESTIC WATER SYSTEM EQUIVALENT SERVICE POPULATION (2021)

INFRASTRUCTURE SYSTEM	ESTIMATED SERVICE POPULATION
Domestic Water	6,384

Utilizing the referenced 2.0% growth rate, the 2024 service population is therefore estimated as 6,775 for the domestic water system. All subsequent service population projections have been based on this estimate.

The SSMUH infilling scenarios discussed previously (along with consideration for a 2.0% growth rate associated with existing parcels not currently designated as SSMUH applicable) would therefore result in a service population ranging between 10,067 and 21,047 at the end of the 20-year assessment horizon. The following table illustrates this range of possible service populations.

TABLE 2-3: WATER 20-YEAR INFILLING HORIZON (2044) OF ESTIMATED EQUIVALENT SERVICE POPULATION

INFILLING SCENARIO	DOMESTIC WATER
Status Quo (2.0% universal growth rate)	10,067
25% infilling of SSMUH parcels	12,812
50% infilling of SSMUH parcels	15,557
75% infilling of SSMUH parcels	18,302
100% infilling of SSMUH parcels	21,047

As noted, the 25% infilling option is likely the maximum growth rate that the Town will achieve under this new legislation. As such, the estimated equivalent service population based on this infilling scenario will be utilized for the subsequent capacity assessments for the Town's domestic water system. As shown in the previous table, the estimated equivalent service population at the end of the 20-year horizon associated with this infilling scenario is 12,812 for the domestic water system.

2.2 Sanitary Sewer Population Projections

As described in TRUE 2023b., the system population projections are based on a Population Equivalent (PE) basis, rather than census populations. Individual parcel PEs were determined by

multiplying the parcel areas with the corresponding zone population density. These values were totaled to represent the current systems equivalent service population of 13,950.

Future population projections were determined as per TRUE 2023b. These projections resulted from rezoning in the OCP and projected connections outside the municipal boundary. In short, the population increase results from minor rezoning in the municipal boundary and mostly from system extensions outside the municipal boundary. These extensions are mostly attributed to Osoyoos Indian Band (OIB) developments. As per TRUE 2023b, the projected future population equivalent was reported to be 17,210 with additional flows accounting for OIB development. At this point, additional OIB development may be pursued and additional service population is considered. This estimated increase is summarized in the following table.

TABLE 2-4: ESTIMATED SANITARY SEWER EQUIVALENT SERVICE POPULATION

DOCUMENT	POPULATION SCENARIO		POPULATION EQUIVALENT
TRUE 2023b.	Existing Town & Rural System	A	13,950
	Existing OIB	B	1,180[1]
	Total Existing Service Population	C= A + B	15,130
	Projected Town & Rural System	D	17,210
	Projected OIB	E	2,650[2]
	Total Projected Service Population	F = D + E	19,860
TRUE 2024 Memo[3]	2024 Projected OIB Service Population	G	2,852[4]
	Total Projected Service Population	**H = G + D**	**20,062**

1. Equivalent service population for 16.1 L/s OIB flows considered in system modelling in TRUE 2023b.
2. Equivalent service population for 36.2 L/s OIB flows considered in system modelling in TRUE 2023b.
3. 2024, TRUE Consulting, Memo: Updated Domestic Water and Community Sewerage System Capacity Assessment
4. Equivalent service population for OIB service population.

All subsequent service population projections have been based on this estimate. It is noted that this population estimate will be conservative given that the OIB development projections are for full build-out of the OIB lands. There is uncertainty regarding OIB development which is considered for discussion later in Section: Sewer Flow Analysis.

The SSMUH infilling scenarios discussed previously would therefore result in a service population ranging between 20,062 and 31,042 at the end of the 20-year assessment horizon. The following table illustrates this range of possible service populations. To be clear, the status quo scenario does not consider a 2.0% growth rate because the population equivalent method considers the maximum equivalent population that is allowed to be serviced. It is noted that the town population in the summer significantly increases. For this reason, an equivalent population approach is more appropriate because the maximum service population exceeds that of the resident population.

TABLE 2-5: SANITARY 20-YEAR INFILLING HORIZON (2044) OF ESTIMATED EQUIVALENT SERVICE POPULATION

SCENARIO	SANITARY SEWER
Status Quo (Existing System)	20,062
25% infilling of SSMUH parcels	22,807
50% infilling of SSMUH parcels	25,552
75% infilling of SSMUH parcels	28,297
100% infilling of SSMUH parcels	31,042

Similar to the water system, the 25% infilling option equivalent service population will be utilized for the subsequent capacity assessments for the Town's sanitary sewer system. As shown in Table 2-5, the estimated equivalent service population at the end of the 20-year horizon associated with this infilling scenario is 22,807 for the domestic water system.

3.0 Domestic Water System Assessment

3.1 Description of Water System

The Town of Osoyoos domestic water system consists of six (6) active wells, and four reservoirs. Additionally, the Town is proceeding with an extensive test well drilling program to ensure long-term viability of groundwater sources. The domestic water system serves approximately 3,500 connections with high volume consumers being monitored with water meters. The Town is currently implementing water meters and exploring an associated tiered user fee structure on all other users. The Town is also considering surface water as a potential water source.

The Town of Osoyoos currently has two separate water systems. One system serves the domestic users throughout the year, and a second system supplements irrigation water to users throughout the irrigation season. The irrigation system consists of two separate pipe networks known as System 8 and System 9. Since 2017, the Town has been working to twin Irrigation Systems 8 and 9. This will allow for both a domestic and irrigation service to be provided to users in those service areas. Recently, the System 8 and System 9 twinning projects have been completed and commissioned.

Additional details of the Town's existing water system can be found in TRUE 2023a. Please refer to the Water System Composite drawing for an overview of the Town's domestic water systems, located in Appendix A. A more detailed discussion related to the capacity of the Town's domestic water sources (i.e. groundwater production wells) is provided following.

3.2 Water Demand Analysis

The following table provides a summary of historical water demands associated with the Town's domestic water system in the period from 2017 to 2021. This data is based on the Town's historical water records.

TABLE 3-1: HISTORICAL WATER DEMANDS (2017 TO 2021)

YEAR	TOTAL SERVICED POPULATION	TOTAL DOMESTIC WATER USAGE (ML)	AVERAGE DAY DEMAND (L/CAP/D)
2017	5,342	2,384	1,223
2018	5,323	2,109	1,085
2019	5,354	2,244	1,148
2020	5,886	2,548	1,186
2021	6,384	2,558	1,098
		5-year Average	**1,148**

Utilizing a 5-year average to account for annual variation in water usage and the estimated service population discussed in previous sections, a per capita Average Day Demand (ADD) of 1,148 lpcd was derived for the domestic water system. Maximum Day Demand (MDD) was calculated by applying a multiplier to this ADD which was derived from the long-term average ratio of ADD to MDD. The multiplier was determined to be 2.439 which results in an MDD of 2,799 lcpd. This MDD has been utilized for subsequent water demand projections to the 20-year horizon. MDD is considered to be the key design criteria for this water system as the Town maintains treated water reservoirs which provide equalization storage for peak hour demand events.

The following figure illustrates projected MDD to the 20-year horizon, considering the water conservation (water metering) scenario presented in the TRUE 2023a. In this scenario, per capita water demand is expected to decrease with the implementation of universal metering within the town. For illustrative purposes, three growth rates have been included (status quo i.e. no infilling, the preferred 25% infilling scenario, and the maximum 100% infilling scenario). Also, the available water source capacity, pump capacity and the n-1[1] capacities of the municipal water system have been included for discussion.

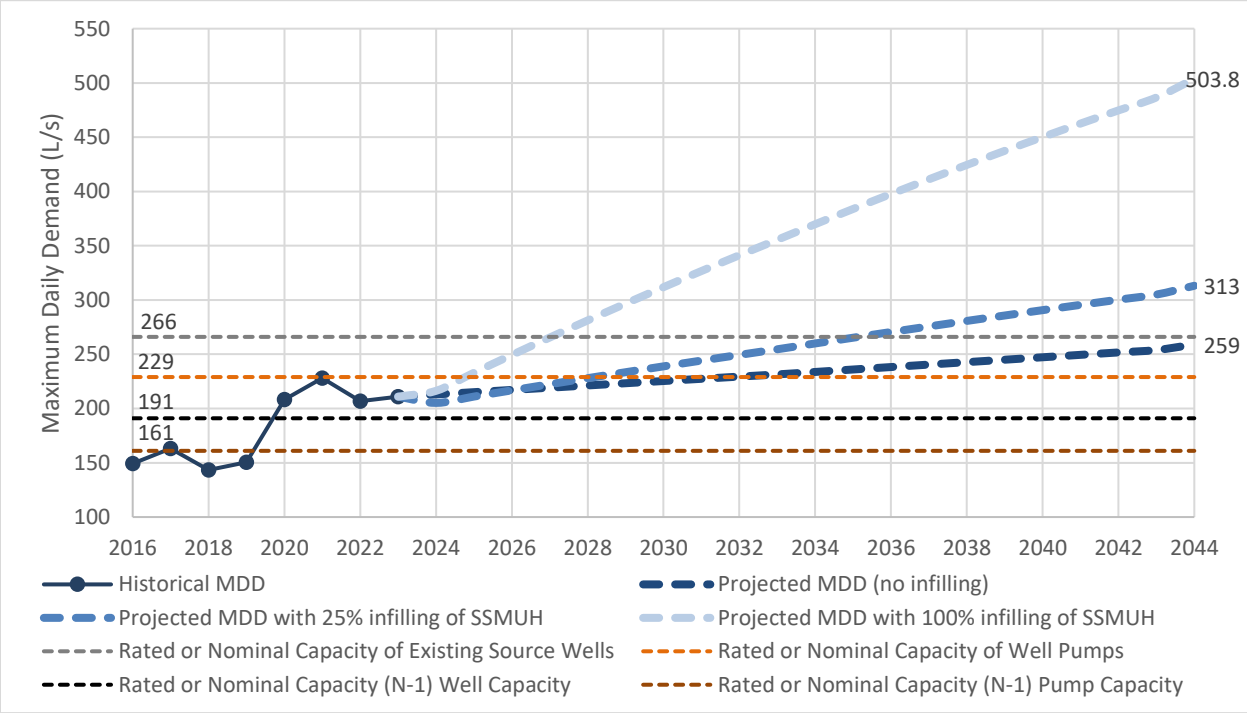


FIGURE 3-1: PROJECTED MDD TO 20-YEAR HORIZON

[1] The "n-1" principle considers the largest pump or well out of service in consideration of system redundancy.

Further to Figure 3-1:

- The infilling growth scenarios include allowances for a 10% reduction in per capita demand for all parcels that have been re-developed within the 20-year horizon. TRUE elected to include this reduction in water usage to account for typical water savings associated with lower irrigation usage observed within higher density type development (as compared to typical single-family irrigation usage).
- The existing MDD is at or above the 'n-1' capacity for this water system (pump capacity). This represents an immediate risk for the water utility as a loss of a production well may result in the Town having to implement emergency water conservation measures.

The 25% infill scenario has an equivalent average growth rate of roughly 3.5%. Comparing this scenario to the projected MDD without infill (2.0% population growth), the population projection without infilling will equal the 2044 MDD with 25% infill in 2053.

3.3 Water System Modelling

The Town of Osoyoos water model was updated with new water demands calculated based on 25% infilling over a 20-year horizon (2044). Increased demands were applied to all low-density residential lots that are eligible for infill as per the SSMUH requirements. The key assumption with this approach is that infilling will be equal throughout the municipality (limitations of this approach are further discussed in the following sections). This allowed analysis of impacts to the water system resulting from increased water demand. Impacts were assessed based on available fire flows provided to the system by reservoir fire flow storage. The following sections describe this analysis and proposed upgrading projects to accommodate the increased water demand. Upgrades were determined based on many factors which are summarized and discussed as follows (in a non-prioritized order).

- Hydraulic connectivity to improve distribution considering a future water treatment plant and the East Sector Reservoir. Specifically, effective transmission in the municipal pressure zone (PZ) from the West to the East is a high priority to support any water treatment plant configuration and supplying flows to the East Sector Reservoir.
- Existing knowledge of the domestic water system, future projects, and the Town's upgrading objectives.
- Improve system resilience by providing multiple flow pathways to mitigate system disruptions and emergencies.
- Improve system performance by reconfiguring, upsizing and looping watermains.
- Provide reliable system performance and cost efficiencies by coinciding upgrading projects with replacement of high-risk asbestos cement watermains.
- Eliminating challenging works in highway ROW, environmentally sensitive areas, or utility dense corridors by strategically upgrading the system.

In general, system upgrades considering these factors were determined to sufficiently support increased infilling demands, opposed to localized upsizing projects.

3.3.1 Scenario 1: Existing System

The figures in this analysis show six areas in the water system that experience increased demand from infilling. These areas are described as follows and can be viewed in Figure 3-2 on the next page.

1. The town core and Northwest sector of the municipal PZ. Key features in this area include supply mains from the 340 reservoir, transmission mains to the lake crossing, and single-family residences primarily in the Northwest sector of the municipal PZ.
2. The Southwest sector of the municipal PZ. Key features in this area include supply mains from the 340 Reservoir on Nighthawk Dr. and 89th St., and most lots being single family residential.
3. The 402 Reduced PZ, West of the town core area. This area experiences increased demands because most lots are single family residential.
    a. Other areas of the 402 Reduced PZ, being the rural area Systems 8 and 9, were not found to be significantly impacted. This is the case because they are not within the municipal boundary which is not applicable to infilling demands. For this reason, they are not a focus of this analysis.
4. The East sector of the municipal PZ which is supplied from the West sector via watermains at the lake crossing. This sector is mostly single-family residential lots except most lots in proximity to Main Street.
5. The Southeast sector of the municipal PZ which is supplied from the East sector. Challenges in this area arise from its distance from the west sector and watermain elevations as they rise away from the lake. In general, flow improvements in Area 5 coincide with those in Area 4.
6. Dividend Ridge subdivision in the Fairway Hills PZs. This area was analyzed because it is a single-family lot subdivision with few other lots.

Two cases from TRUE 2023a. are summarized for discussion. Existing and future (considering 2.0% growth without water conservation) fire flows in these six areas were observed for a baseline comparison with those impacted by infilling water demands. Table 3-2 summarizes the range of fire flows experienced for the existing and future cases. Furthermore, Figure 3-2 shows the 2023 conditions with hydrants highlighted in red to show where fire flows below the FUS required flowrates are experienced. In short, there is a 5 to 40 L/s decrease in fire flows when comparing the existing (2023) and future (2043) existing system results. This results from increased demands from a 2.0% population growth rate and considering water conservation is achieved through metering.

TABLE 3-2: SCENARIO 1, CURRENT AND FUTURE FIRE FLOW RANGES

AREA	2023 EXISTING FIRE FLOWS (L/S)	2043 EXISTING FIRE FLOWS (L/S)
1	60 – 150	60 - 110
2	60-130	60 - 110
3	60 – 150	60 - 145
4	50 – 130	50 - 95
5	35 - 60	25 – 45
6	60 - 150	60 - 135

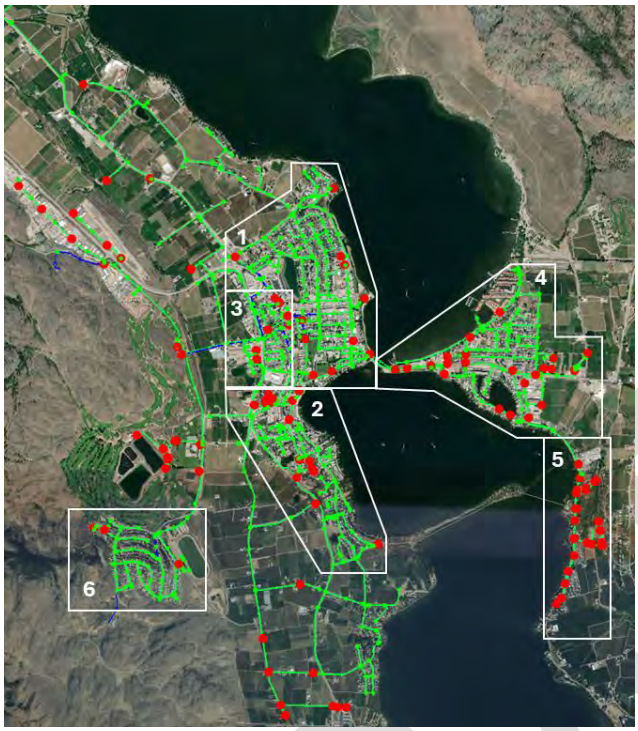


FIGURE 3-2: SCENARIO 1, EXISTING CASE FIRE FLOW RESULTS

3.3.2 Scenario 2: 2044 Existing System with 25% Infilling and Water Conservation

This scenario and all future scenarios, considers the existing system, and water demands for the future 2044 population considering 25% infilling and water conservation measures. Table 3-3 shows the range of fire flows per area and Figure 3-3 shows hydrants that are below the FUS required fire flows. It is observed that infilling demands significantly impact fire flow provision; however, it is more severe in certain areas than others. Areas where fire flows are not significantly impacted includes Area 3 and 6. The decrease in these areas compared to the Future condition of Scenario 1 show the lower range of fire flows slightly below the FUS requirements (approximately 2 L/s). This margin is not likely significant and can be addressed with upsizing existing 150 mm watermains to 200 mm watermains. It is noted that this is more likely to occur in area 1 where existing asbestos cement pipes have been flagged for replacement in the asset management plan. The upper range of fire flows in these areas are still acceptable for residential fire flows where watermains are looped.

Considering fire flows in Areas 1, 2, 4, and 5, they are highly impacted with flows decreasing by 10 to 45 L/s when compared to the Future condition of Scenario 1. The lower range of flows are below the FUS required fire flows for single family residential. The upper range is just above the FUS requirements for single family residential lots which will not be compliant for residential zones with greater density, and commercial and institutional lots.

TABLE 3-3: SCENARIO 2 FIRE FLOW RANGES

AREA	SCENARIO 2 FIRE FLOWS (L/S)
1	55 - 65
2	40 - 65
3	58 - 135
4	40 – 60
5	15 - 30
6	60 - 115

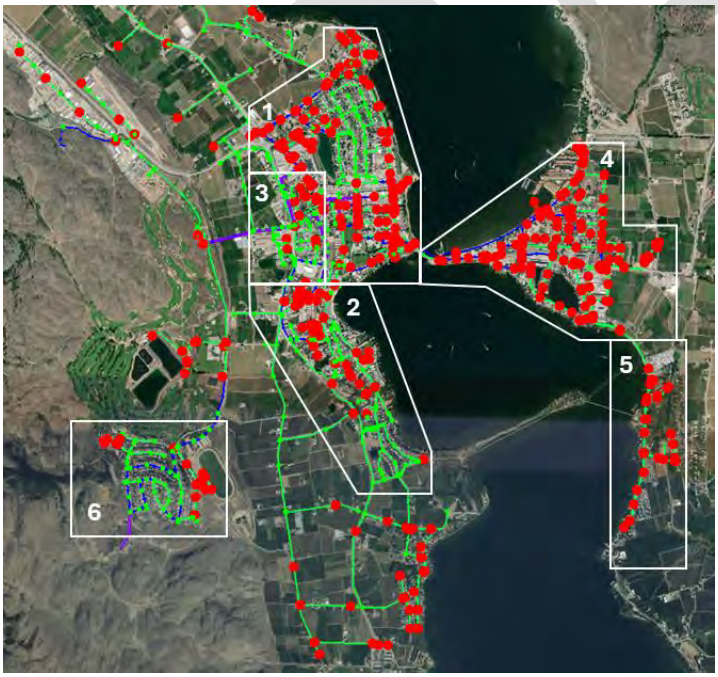


FIGURE 3-3: SCENARIO 2 FIRE FLOW RESULTS

3.3.3 Upgrades To 74th Ave., 89th St., And 62nd Ave.

System upgrades modelled in this scenario are listed below with corresponding project sheets located in Appendix B.

1. **Project W5:** 74th Ave. Watermain Upsizing, Heron Lane and Loon Crescent Replacement, and Loon Crescent Looping
    a. Upsizing and replacing a section of the 74th Ave. watermain which allows a continuous 350 mm water main from the 340 Reservoir supply main to 89th Street.
2. **Project W22:** Watermain Upgrades and Replacement on 89th St. from 70th Ave. to Kingfisher Dr.
    a. Upsizing and replacing an existing 200 mm water main to a 400 mm watermain on 89th Street. This removes a system constriction and a constricting hydrant lead watermain connection.
3. **Project W30:** Watermain Upgrades and Replacement on 89th St. from Kingfisher Dr. to Oleander Dr. and 62nd Ave. Tie-in to 89th St. (Chute Intersection)
    a. Connecting and upsizing the 62nd Ave. water main to 89th Street allowing looped flows from Nighthawk Drive.

Table 3-4 shows the range of fire flows per area and shows locations that do not comply with the FUS required fire flows. These projects improve flows in Areas 1, 2, 4, and 5, by 5 to 35 L/s when compared to scenario 2. Area 1 has the greatest improvement in fire flows given that projects W5 and W22 are in the town core. This allows fire flows in this area to be generally compliant with FUS requirements. Further from this area, flow improvements decrease in proportion to proximity to the 340 Reservoirs with area 2, 4 and 5 improvements lessening in that order. These three areas still experience deficient fire flows.

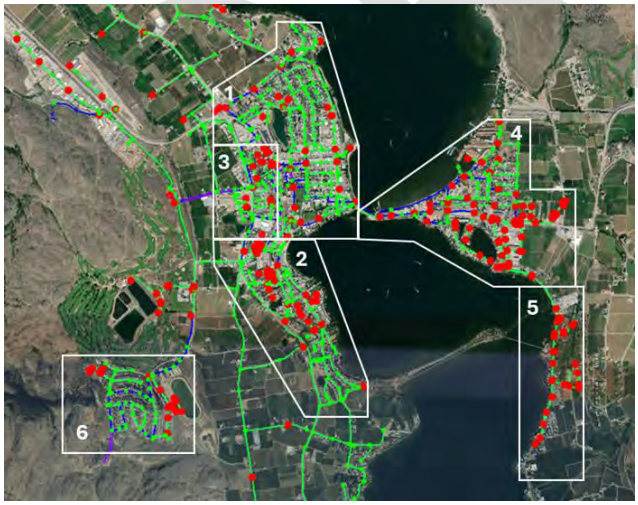


FIGURE 3-4: SCENARIO 3 FIRE FLOW RESULTS

TABLE 3-4: SCENARIO 3 FIRE FLOW RANGES

AREA	SCENARIO 3 FIRE FLOWS (L/S)
1	60 - 100
2	50 - 85
3	58 - 135
4	45 - 80
5	20 - 35
6	60 - 115

3.3.4 Upgrades to 89th St., Kingfisher Dr. and East Main St.

System upgrades modelled in this scenario are listed below with corresponding project sheets located in Appendix B.

1. **Project W21:** Watermain Upgrades and Replacement on 89th St. from Main St. to 70th Ave.
    a. Upsizing and replacing the watermain on 89th Street to a 350 mm watermain.
2. **Project W29:** Watermain Upgrade and Replacement on Kingfisher Dr. from 89th St. to Gyro Park.
    a. Upsizing and replacing the watermain on Kingfisher Dr. to a 300 mm watermain.
3. **Project W34:** Watermain Upgrade and Replacement on Main St. from the East Lake Crossing to Cottonwood Dr., and on Cottonwood Drive from Main St. to Maple Drive.
    a. Upsizing and replacing the watermain on Main Street. Modelling was completed for a 400 mm watermain. It is noted that this watermain may be required to be upsized if the water treatment plant is located in the East Sector.

Table 3-5 shows the range of fire flows per area and **Error! Reference source not found.** shows locations that do not comply with FUS required fire flows. These projects improve flows in Areas 1, 2, 4, and 5 by 5 to 30 L/s when compared to Scenario 3. Area 4 has the greatest improvement in fire flows given that the proposed upgrades provide increased flows to the lake crossing and improved distribution to the East sector core. With improved flows to the East Sector, the Southeast Sector (Area 5) experiences improvements but they are still not sufficient to provide adequate fire flows. It is noted that some fire flows are still below the FUS requirements. Lastly, Area 2 experiences increased fire flows resulting from upgrades on 89th Street. At this point, the Area 2 fire flows are approximately 10 L/s below the 2043 case for Scenario 1.

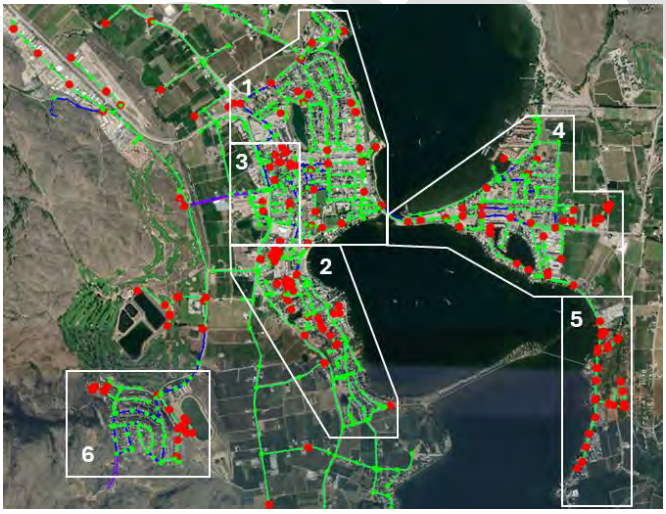


FIGURE 3-5: SCENARIO 4 FIRE FLOW RESULTS

TABLE 3-5: SCENARIO 4 FIRE FLOW RANGES

AREA	SCENARIO 4 FIRE FLOWS (L/S)
1	60 - 110
2	50 - 100
3	58 - 135
4	55 -110
5	25 - 45
6	60 – 115

3.3.5 Scenario 5: 74th Ave. Twinning and Nighthawk to 89th Looping

System upgrades modelled in this scenario are listed below with corresponding project sheets located in Appendix B.

1. **Project W38:** Watermain Connecting Nighthawk Dr. and 89th St, adjacent to 89th St and Kingfisher Dr. Intersection
    a. Connecting the Nighthawk Dr. watermain to 89th St. to achieve system looping.
2. **Project W39:** Watermain Upgrades on 74th Ave. from 97th St. to Nighthawk Dr.
    a. Twinning the 350 mm watermain on 74th Ave. to provide enhanced flows from the 340 West Reservoir.

Table 3-6 shows the range of fire flows per area and Figure 3-6 shows hydrants that are below the FUS required fire flows. These projects improve flows in Areas 1, 4, and 5 by 3 to 20 L/s when compared to Scenario 4. The majority of improvement is observed in Areas 1 and 4 because the upgrades focus on transmission from the 340 Reservoir to the East sector in preparation for implementation of the East Reservoir and potentially the water treatment plant (to be confirmed). At this point, Areas 1, 4 and 5 provide similar fire flows to the future case of scenario 1. It is noted the Area 5 still experiences deficient fire flows and Area 2 is below the future case, scenario 1 fire flows.

TABLE 3-6: SCENARIO 5 FIRE FLOW RANGES

AREA	SCENARIO 5 FIRE FLOWS (L/S)
1	60 - 130
2	50 - 100
3	58 - 135
4	60 - 120
5	28 - 50
6	60 - 115

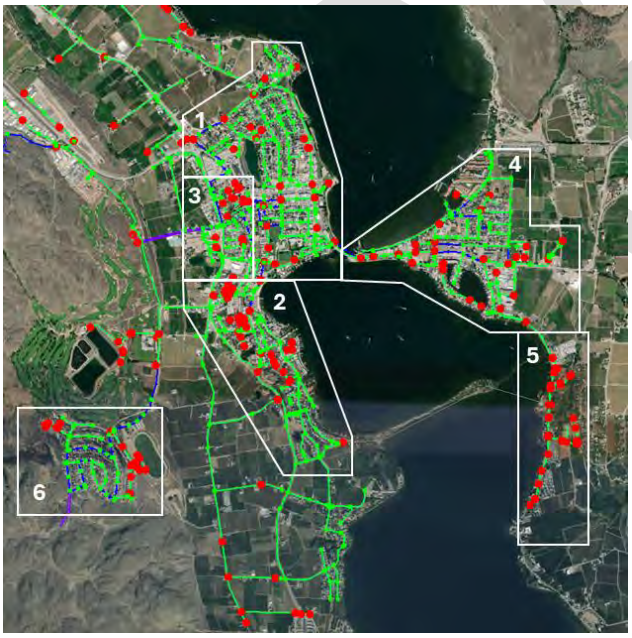


FIGURE 3-6: SCENARIO 5 FIRE FLOW RESULTS

3.3.6 Scenario 6: East Sector Reservoir and Watermains

System upgrades modelled in this scenario are listed below with corresponding project sheets located in Appendix B.

1. **Project W23:** East 340 Reservoir – Construction
    a. Construction of a 2,550 m^3 water reservoir in the East Sector.
2. **Project W31:** 340 Reservoir Watermain Upgrades
    a. Supply watermains from the 340 East Reservoir to Nk'Mips Corner and Cottonwood Drive.

Table 3-7 shows the range of fire flows per area and Figure 3-7 shows hydrants that are below the FUS required fire flows. These projects improve flows in Areas 1, 2, 4, and 5 by 12 to 40 L/s when compared to Scenario 5. The greatest improvements are seen in areas 4 and 5 which are serviced by the East Reservoir. This also improves fire flows West of the lake crossing during fire events because the east sector domestic demand is supported by the East Reservoir balancing storage. Furthermore, fire flows in Area 5 are improved significantly with the lower range of fire flows being approximately the same as the upper range of fire flows for the future case of Scenario 1. In summary, the fire flows in this scenario meet or exceed those of Scenario 1 for the future case (excluding areas 3 and 6 which have compliant fire flows).

TABLE 3-7: SCENARIO 6 FIRE FLOW RANGES

AREA	SCENARIO 6 FIRE FLOWS (L/S)
1	60 - 130
2	60 - 110
3	58 - 135
4	60 - 160
5	40 - 75
6	60 - 115

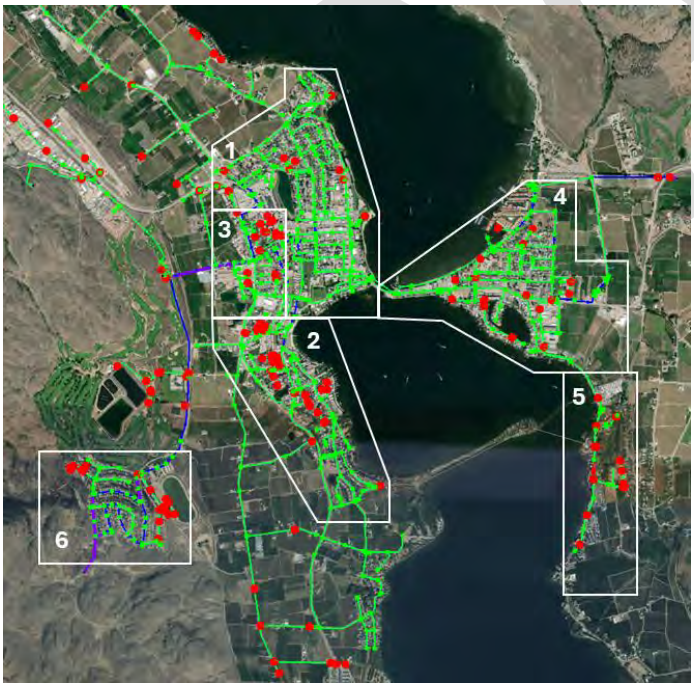


FIGURE 3-7: SCENARIO 6 FIRE FLOW RESULTS

3.3.7 Scenario 7: Pressure Reducing Valve from 402 Reduced to Municipal Pressure Zone

In addition to these scenarios, other upgrades were investigated during this analysis to improve fire flows in the town core. One upgrade that was identified with a high-performance potential was implementing a Pressure Reducing Valve (PRV) from the 402 Reduced to the Municipal PZ. This was modelled with a PRV connection located at the 87th St. and 92 Avenue. Table 3-8 shows the range of fire flows per area and Figure 3-8 shows locations that are below the FUS required fire flows. Areas 1 and 4 experience the greatest increase while other areas are relatively unaffected. Although this upgrade is not currently required, it may be considered if increased fire flows for high density residential, commercial, or institutional developments are deemed necessary. It is likely that developments of this scale would only occur in the downtown core or along Main Street in the East Sector.

TABLE 3-8: SCENARIO 7 FIRE FLOW RANGES

AREA	SCENARIO 7 FIRE FLOWS (L/S)
1	60 - 200
2	60 - 110
3	58 - 135
4	60 - 200
5	40 - 80
6	60 - 115

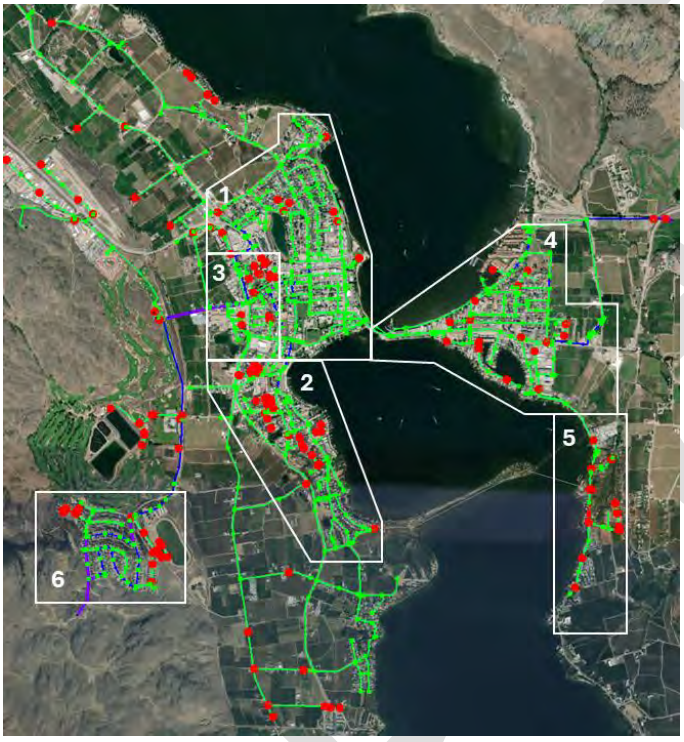


FIGURE 3-8: SCENARIO 7 FIRE FLOW RESULTS

3.3.8 Water Modelling Limitations

Limitations to this modelling approach arise from the demand distribution within the model. Increased demand resulting from the 25% infilling scenario were evenly distributed throughout the applicable areas. As such, no consideration was given to irregular infilling patterns that could localize increased demands. This could drive localized watermain project, but this is unlikely for the following reasons.

- The proposed upgrades improve water distribution throughout the municipal PZ, in particularly Areas One and Four. These two areas experience improved fire flows which will allow additional demand to be serviced while maintaining fire flows. These areas are relatively well looped but dead end 150 mm watermains may be a concern. These watermains should be replaced with 200 mm watermains.
- Area Two fire flows are maintained when compared to the future Case for Scenario 1. Thus, additional demand in this area may be challenging. However, low fire flows in this area are commonly caused by dead end 150 mm watermains. Solutions to this would be to loop or upsize these watermains.
- Area 3 watermains North of 74th Ave. are aging asbestos cement watermains which should be replaced with 200 mm watermains. Area 3 watermains South of 74th Ave are commonly 150 mm PVC watermains that could be looped or upsized.
- Infill in Area 5 is not projected to be significant with a relatively low number of lots.
- Fire flows in Area 6 are not likely to be significantly impacted because of steep grades, looped watermains and 200 mm watermains.

In general, it is advised that infilling should be monitored to assess impacts of increased water demand in localized areas.

3.3.9 Water System Summary

In addition to the hydraulic system modelling and proposed upgrading projects, other aspects of the water system are impacted from increased demands. The 20-year horizon MDD for 25% infilling scenario with water conservation is estimated at 313 L/s. This demand is similar to the projected 2043 water demand scenario without water conservation (326 L/s), as reported TRUE 2023a. As such, recommendations in TRUE 2023a. will be triggered earlier than recommended. These recommendations are listed and discussed below.

- One additional well is immediately required to achieve n-1 flows to meet the current MDD for adequate system redundancy.
- Three additional wells would be required to meet water demands for the future water demand scenario without conservation. It is likely that this number of wells would be required to service the increased demand resulting from a 25% infill scenario with water conservation. Furthermore, the sequence of well installation would be similar to Table 3-8 in TRUE 2023a. In short, a new well is projected to be installed every 6 to 12 years, depending on the sustainable well yield.

- Well Pumps could be re-sized to optimize flows from the source wells to improve deficient supply redundancy. The total sustainable well yield for the system is 266 L/s and the "n-1" total well yields is 191 L/s. This is in excess of the corresponding pump capacity values, being 229 L/s, and 161 L/s for the total and "N-1" pump capacities, respectively.
  - It is noted that Well #6 is operating at approximately 12 L/s when it could be at 36 L/s.
  - For direct comparison of sustainable well yields and well pump rates, compare Tables 1-1 and 1-2 in TRUE 2023a.
- A high-level reservoir capacity analysis was completed considering the increased MDD resulting from 25% infill and existing system conditions. Increased demands for each PZ were taken from the hydraulic model which assumes even distribution of increased demands. It is noted that this approach has limitations (discussed in the previous section) and actual demand increases from experienced infill should be considered. Calculated reservoir capacities are presented in the following table and compared to the existing storage capacities. Notably, the existing capacity of the Fairway Hills and Industrial Reservoirs only have capacity for fire storage.

TABLE 3-9: RESERVOIR CAPACITY FOR 2044 25% INFILL

PRESSURE ZONE	MUNICIPAL	FAIRWAY HILLS	402 (INDUSTRIAL)
2044, 25% Infill MDD (M^3/D)	19,000	2,300	5,700
A – Fire Storage**	1,080	1,080	1,080
B – Equalization Storage	4750	575	1425
C – Emergency Storage	1458	414	626
Total Storage (A + B + C)	7,288	2,069	3,131
Existing Storage[1]	3,900	1,100	1,000

1. Existing storage capacities from the 2023 Osoyoos Water Infrastructure Report.

The existing capacities in each PZ may become deficient as a result of infilling. This was also identified in TRUE 2023a. for the existing system and 2043 future projection without water conservation. In this report, storage requirements were recommended to be reduced by implementing auxiliary power at each well pump. This is an acceptable approach because it will provide a dependable and reliable water supply to the reservoirs.

Auxiliary power at the well pumps could reduce storage requirements for the Municipal PZ which is directly supplied by the wells, but not for the other pressure zones. The 402 (Industrial) PZ is provided flows from a booster station at the 340 reservoirs and a booster station from the 402 PZ supplies the Fairway Hills PZ. To relieve storage requirements in these PZ, auxiliary power would

be required at each booster station. Furthermore, this water supply would likely only be reliable if the “n-1” well capacity was equal or exceeds the system MDD to ensure flows could reliably be supplied to the 402 and Fairway Hills PZ. In summary, auxiliary power could be implemented at each well pump and pumpstation to help reduce required reservoir capacities. However, the Fairway Hills and 402 Reservoirs should likely be increased to accommodate future demands.

4.0 Community Sewerage System Assessment

4.1 Description of Community Sewerage System

The Town's community sewerage system is considered two distinct systems: the sanitary collection network and the treatment system. The sanitary collection network consists of gravity pipe, twenty-one lift stations, and their respective forcemain. The collection network converges at the Main Wastewater Pumping Station (MWWPS) where the treatment process begins with screening. All components beyond the MWWPS comprise the treatment system.

The current treatment process consists of a small complete mix aerated lagoon followed by two partial mix aerated lagoons. All cells provide means of separating the sludge from the wastewater before the reclaimed water is treated and stored in the large basins for reuse in the summer months. A full description of the WWTP process and effluent quality can be found in the 2021 WWTP Long Term Plan located in Appendix A of the TRUE 2023b.

4.2 Sewer Flow Analysis

Per capita average day sewer flow for the Town and Rural areas was set to 230 lpcd (as per TRUE 2023b) and per capita average day flows for OIB areas were set between 300 and 350 lpcd. OIB values very based on residential and commercial development. These average day sewer flows have been utilized for subsequent sewer flow projections to the 20-year horizon. Average day sewer flow is considered to be the key design criteria for the treatment system processes. A discussion related to peak weather flow events that impact the sanitary collection network is included later in this section.

Projected average sewer flows to the 20-year horizon were analyzed for three growth rate scenarios which are listed and described as follows.

- Status quo i.e. no infilling
  - This scenario represents the base population of 20,062 as presented in Table 2-5. This population projection was broken out into two components because they will not likely follow the same growth projection. These two components are the Town and rural systems, and OIB service populations, as described in Section 2.2 Sanitary Sewer Population Projections.
    - Population projections for the Town and Rural system would instantaneously increase from SSMUH infilling population densities based on the population equivalent approach used in TRUE 2023b. This approach was not used to estimate projected flow increases because it is unlikely they will be experienced instantaneously. For this reason, a uniform growth rate was interpolated between

the existing 2023 service population and projected service population (as per Table 2-5) to estimate projected flow increases.

OIB population projections are irregular because they are interpreted based on OIB development planning. Interpretation of OIB development was surmised based on OIB development plans provided to the Town as part of TRUE 2023B, implemented over thirteen years.

- The preferred 25% infilling scenario includes additional service population for the service population within the town boundary.
- Similar to the previous scenario, the maximum 100% infilling scenario considers additional service population.

The results of these scenarios are compared to the wastewater treatment capacity and permit limits as shown in the figure on the next page. Wastewater treatment limits include the existing summer sustained high flow rate and design treatment system flow are reported (as report in the 2021, Osoyoos, Wastewater Treatment Long Term Plan). The existing summer sustained flow rate represents the current approximate wastewater treatment capacity, and the design treatment system flow considers increased capacity from the implementation of a Moving Bed Biofilm Reactor (MBBR). The current permitted discharge limits of the wastewater treatment facility have also been illustrated on this figure as this facility represents the most critical infrastructure.

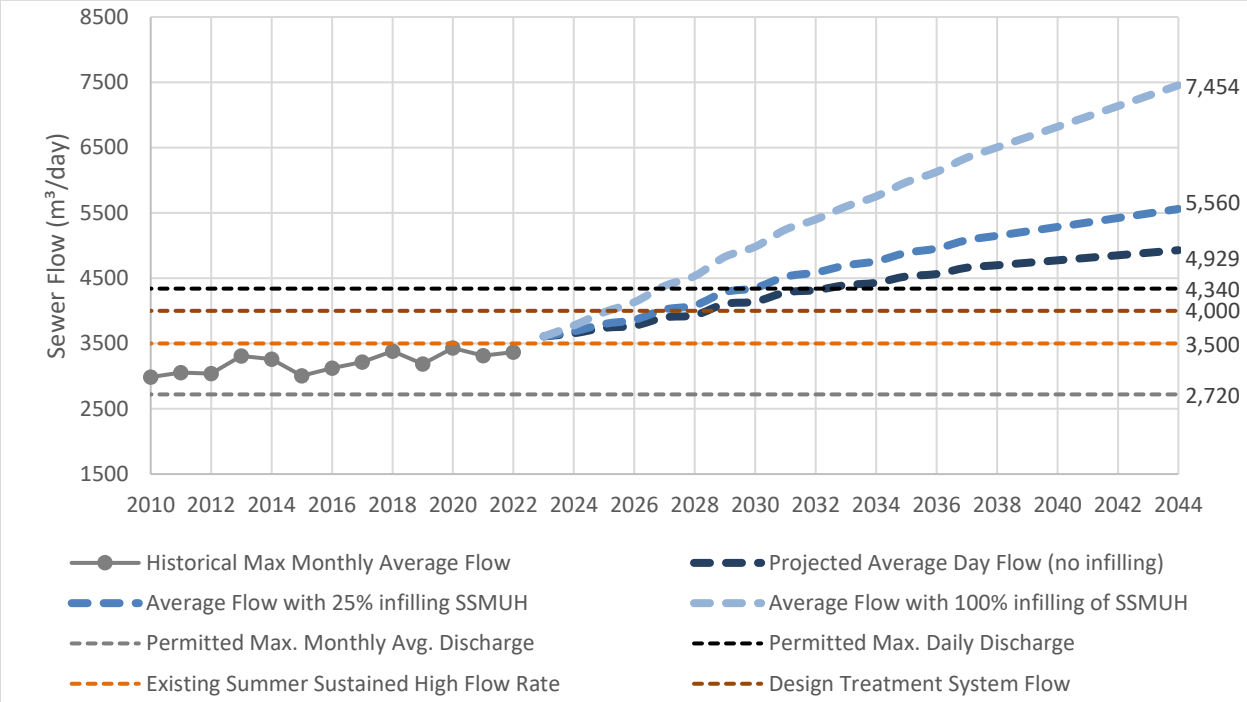


FIGURE 4-1: PROJECTED AVERAGE DAY SEWER FLOW TO 20-YEAR HORIZON

Further to the above figure:

- As opposed to the water demand projections, a reduction in per capita sewer flow was not included for SSMUH applicable parcels that may be re-developed within the 20-year horizon. Anticipated reduction in water usage for high-density development is typically associated with a reduced irrigation demand. As such, and to be conservative, this type of reduction is not anticipated to be associated with future sewer flows.
- Existing sanitary flows are nearing the summer sustained high flow rate for the wastewater treatment system. For this reason, the MBBR upgrade is recommended to ensure adequate system redundancy, increasing capacity to 4,000 m^3/day.
- It is projected that flows could exceed the wastewater treatment plant (WWTP) sustained high flow rate. Projected flows may also exceed the design treatment system flow as early as 2030, for the 25% infill scenario. This would require an increase in WWTP capacity, likely resulting in upsizing the MBBR system proposed in TRUE 2021, Wastewater Treatment Long Term Plan.
- Flows may exceed the maximum daily discharge as early as 2028 to 2029. Increasing this value may be necessary to be compliant with permitted discharge requirements.
- The projected 20-year horizon average day sewer flow associated with the 25% infilling scenario may result in an exceedance of the effluent storage capacity. TRUE completed a winter effluent storage capacity assessment in 2014 which is located in Appendix C. This assessment projected that a permanent residence population of 8,628 capita would require an additional 145,000 m^3 of wastewater storage. Considering updated population projections with 25% infilling, results in this population potentially being achieved in 2030-2031.

4.3 Sanitary System Capacity Assessment

The sanitary collection network cannot be analyzed in relation to average day sewer flows. This network must be sized to convey peak flow events. To aid with development of TRUE 2023b, a sewer network model was previously developed to determine whether collection network upgrades would be required to convey future Peak Wet Weather Flow (PWWF) events. This model was developed on the basis of distributing average daily flows throughout the model utilizing the spatial proximity of a parcel to the sanitary network. The model then calculates the peak flow for each pipe segment by applying a diurnal curve to the average daily flow, routing the flows through the system, and applying a constant inflow for I&I.

Average daily flows associated with the preferred 25% infilling scenario (including full build-out of OIB development) to the projected 20-year horizon were therefore input into the future PWWF sewer system model. The peak flow modelled under these conditions totaled 236 L/s at the WWTP outlet, with total daily volume of 11,022 m^3. Please refer to TRUE 2023b for further details relating to model development and calibration. It is noted that, the future PWWF sewer model

includes all recommended system upgrades in TRUE 2023b. As such, any deficiencies would result in upgrades in addition to those identified in TRUE 2023b.

During future wet weather conditions for the updated future PWWF model, there are five sections of gravity pipe operating at or above 80% of full flow, twenty-four sections below 80% and above 50% of full flow, and no flooding manholes. Only sanitary mains within the municipal boundary were considered because outside flows were not impacted. The following table summarizes these pipe sections. Furthermore, it is advised that the model assumes an even distribution of flow increases. This may not be representative of actual growth and localized flow increases. This should be observed and quantified to assess the existing system's performance.

TABLE 4-1: FUTURE PWWF WITH 25% INFILLING - GRAVITY PIPE ABOVE 50% CAPACITY

ID	DIAM (MM)	SLOPE (%)	LENGTH (M)	MAX/FULL FLOW RATIO SSMUH 25%	MAX/FULL FLOW RATIO FUTURE[1]	MAX/FULL FLOW RATIO DIFFERENCE
SML0081	**200**	**0.06%**	**75.7**	**0.80**	**0.79**	**0.01**
SML0083	200	0.08%	57.7	0.73	0.73	0
SML0086	200	0.27%	38.5	0.51	0.56	-0.05
SML0089	200	0.40%	86.1	0.52	0.64	-0.12
SML0106	375	0.34%	88.6	0.62	0.59	0.03
SML0117	**375**	**0.19%**	**72.8**	**0.84**	**0.80**	**0.04**
SML0123	375	0.10%	51.0	0.67	0.62	0.05
SML0128	375	0.27%	48.1	0.69	0.66	0.03
SML0129	**375**	**0.08%**	**62.2**	**0.82**	**0.76**	**0.06**
SML0136	**375**	**0.13%**	**30.2**	**0.89**	**0.84**	**0.05**
SML0155	300	0.18%	27.9	0.52	0.52	0
SML0174	300	0.19%	31.8	0.50	0.49	0.01
SML0407	250	0.05%	44.3	0.54	0.47	0.07
SML0551	**250**	**0.26%**	**94.9**	**0.87**	**0.54**	**0.33**
SML0554	250	0.51%	52.0	0.60	0.33	0.27
SML0555	200	-0.14%	74.1	0.66	0.58	0.08
SML0575	250	0.25%	39.3	0.57	0.32	0.25
SML0591	250	0.35%	79.7	0.62	0.29	0.33
SML0594	250	0.28%	65.3	0.74	0.36	0.38
SML0595	250	0.33%	36.8	0.53	0.28	0.25
SML0596	250	0.37%	93.6	0.55	0.27	0.28
SML0597	250	0.26%	62.5	0.57	0.31	0.26
SML0609	250	0.15%	104.3	0.63	0.41	0.22
SML0612	250	0.46%	18.6	0.68	0.42	0.26
SML0628	200	1.05%	71.4	0.60	0.60	0
SML0637	200	1.38%	78.9	0.53	0.52	0.01
SML0640	200	0.66%	68.3	0.76	0.75	0.01
SML0670	250	0.41%	46.2	0.77	0.5	0.27
SML0915	250	0.07%	32.7	0.51	0.45	0.06

1. Future flows as report in TRUE 2023b.

Please refer to Figure SK1 in Appendix D for a plan view of the sections of gravity sewer pipe above 50% capacity during future PWWF conditions. The following sanitary mains may equal or exceed 80% capacity.

- The Acacia Court sanitary main (SML0551) is modelled to be at 87% capacity which results from a 0.33 L/s flow increase from 25% infill. Downstream of this main section, the

sanitary main is regularly above 50% but below 80% capacity. Although this main shows little residual capacity, the sanitary main may function appropriately. For this reason, it is advised that flows be monitored, and actual system performance be assessed.

- The sanitary main in the beach, flowing into the Starlite Lift Station, has two sections that may exceed 80% capacity (SML0117 and SML0136). These sanitary mains already experienced flows around 80% with minor increases from this exercise. As such, their performance will likely be unaltered.
- The sanitary main on Cottonwood Drive, adjacent to Cottonwood Park may be above 80% capacity (SML0129). It is noted that sanitary main has little grade which will be rectified as part of planned upgrades. These upgrades occur in Project S18 – Cottonwood Drive Trunk Main Upsizing as per the 2025 Town of Osoyoos Capital Plan. The corresponding project sheet is located in Appendix E.
- A section of sanitary main on Harbour Key Drive (SML0081) has a minor flow increase that shows it at 80% capacity. This results from shallow pipe grades, but it is not expected to be significant with a 0.01 L/s flow increase.

Also based on the updated future PWWF model, the following table shows the peak inflows to each lift station (within the municipal boundary) under the referenced maximum flow conditions (future wet weather), the operating capacity of each lift station (referenced from the model), and the capacity surplus or deficit at peak flow.

TABLE 4-2: FUTURE PWWF WITH 25% INFILLING – SEWER SYSTEM PUMP STATION CAPACITY

PUMPING STATION	DESIGN CAPACITY (L/S)	MODELLED PEAK INFLOW (L/S)	SURPLUS (+) / DEFICIT (-) IN CAPACITY (L/S)
Starlite Lift Station	80.0	85.4	-5.4
Bayview Lift Station	18.5	3.0	15.5
Haynes Lift Station	13.0	2.3	10.7
Smith and Loveless Lift Station	45.0	41.4	3.6
Piazza Lift Station	25.2	21.2	4.0
Lobelia Lift Station	10.0	6.7	3.3
Oasis Lift Station	16.4	7.4	9.0
44th Avenue Lift Station	37.0	38.2	-1.2
Cottonwood Drive Lift Station	22.0	6.0	16.0
Blue Blinker Lift Station	12.6	25.1	-12.5
Harbour Key Lift Station	8.0	10.7	-2.7
Lacey Point Lift Station	9.5	1.7	7.8
Gala Lift Station	5.7	1.7	4.0
Meadowlark Lift Station	8.0	1.3	6.7
Main Lift Station	253.0	227.9	25.1
Golf Course Lift Station	15.0	6.7	8.3

Further to the previous two tables:

- The gravity sewer piping network performs well under future peak wet weather conditions. While five sections of gravity sewer piping are shown to operate above 80% of full flow capacity, there are no instances of flooded manholes.
- Surcharging is difficult to assess, but it is noted four lifts stations may have capacity concerns considering increased flows. It is recommended that flows be monitored at these lift stations to assess performance.
- The Blue Blinker LS likely has deficit capacity during future peak wet weather conditions. It may not be capable of keeping up with these peak flow events with only one pump running.
- The Starlite LS may have deficit capacity during future peak wet weather conditions because of increased flows from infilling. It is noted that the Starlite Lift Station is planned for upgrades as per Project S36 – Starlite Lift Station Pumping Capacity Increase, as per the 2025 Town of Osoyoos Capital Plan (located in Appendix E).
- The 44th Avenue LS and Harbour Key LS appear to be at their capacity limits when increasing flows to accommodate infilling. It is recommended that performance at these lift stations be monitored based on actual inflow increases.

5.0 Assessment Summary

The goal of this assessment has been to determine whether the Town should be planning to expand the capacity of their water and sewer infrastructure as either a short-term or long-term goal arising from potentially significant population growth related to Provincial Bills 44, 46, and 47.

The following capacity related infrastructure upgrading recommendations have been considered in relation to the preferred growth scenario of 25% infilling of currently zoned single-family parcels with four dwelling units. This scenario considers infilling taking place at a steady pace over a 20-year period and also considers a consistent 2.0% population growth rate associated with all other parcels currently serviced by the Town's domestic water and sewerage systems.

It should also be noted that all infrastructure upgrades that may be necessary to address projected capacity constraints would be eligible as Development Cost Charge (DCC) driven projects. Based on the accelerated growth rate from infilling, these projects will be needed earlier then anticipated in the original capital plans. These project will subsequently be incorporated into the DCC bylaw which the percent DCC eligible increasing based on infilling projections.

5.1 Domestic Water System

The following watermain upgrade projects are recommended to accommodate additional flows for infilling.

1. Project W5: 74th Ave. Watermain Upsizing, Heron Lane and Loon Crescent Replacement, and Loon Crescent Looping
2. Project W22: Watermain Upgrades and Replacement on 89th St. from 70th Ave. to Kingfisher Dr.
3. Project W30: Watermain Upgrades and Replacement on 89th St. from Kingfisher Dr. to Oleander Dr. and 62nd Ave. Tie-in to 89th St. (Chute Intersection)
4. Project W21: Watermain Upgrades and Replacement on 89th St. from Main St. to 70th Ave.
5. Project W29: Watermain Upgrade and Replacement on Kingfisher Dr. from 89th St. to Gyro Park.
6. Project W34: Watermain Upgrade and Replacement on Main St. from the East Lake Crossing to Cottonwood Dr., and on Cottonwood Drive from Main St. to Maple Drive.
7. Project W38: Watermain Connecting Nighthawk Dr. and 89th St, adjacent to 89th St and Kingfisher Dr. Intersection
8. Project W39: Watermain Upgrades on 74th Ave. from 97th St. to Nighthawk Dr.
9. Project W23: East 340 Reservoir – Construction
10. Project W31: 340 Reservoir Watermain Upgrades

In addition to these projects, an overall system capacity assessment showed increased demands from infilling will trigger water system projects earlier than projected in TRUE 2023a. These are listed as follows.

- One additional well is immediately required to achieve n-1 flows to meet the current MDD for adequate system redundancy.
- Three additional water supply wells will likely be required to service the increased demand resulting from a 25% infill scenario with water conservation. In short, a new well is projected to be installed every 6 to 12 years, depending on the sustainable well yield.
  - This project will not be required if a surface water treatment plant is implemented.
- Well Pumps re-sizing and maintenance is recommended to optimize flows from the source wells to improve deficient supply redundancy.
  - It is noted that this project would not be DCC eligible because it is largely a maintenance project.
- The existing capacities in each PZ may become deficient because of infilling. It is recommended that storage requirements in each pressure zone be reduced by implementing auxiliary power at each well pump and pumpstation.
  - It is noted that the capacity of the Fairway Hills and 402 Reservoirs should likely be increased to accommodate future demands. Replacement of the 402 Reservoir is projected to occur in the 10-year Horizon. During detailed design, it is also recommended to consider cascading fire flows from Fairway Hills to the 402 pressure zone to minimize storage requirements.

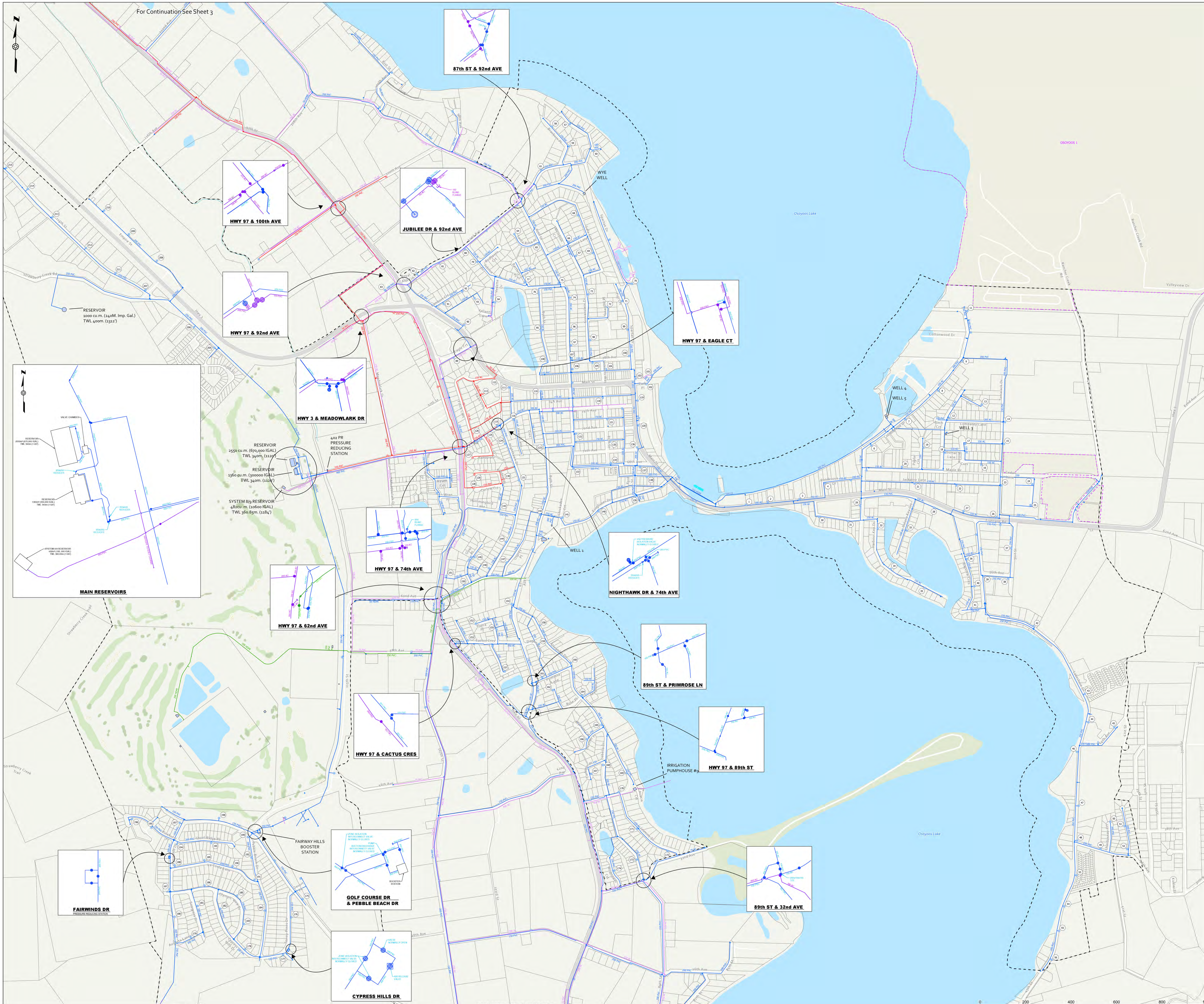
5.2 Community Sewerage System

- Upgrading the WWTP with the MBBR system is recommended to ensure adequate system capacity. It is noted that this project is included in the 10 year horizon of the Capital plan. The corresponding project is S38 – Cell #1 Process Upgrade. A brief project sheet is located in Appendix E.
  - Projected flows may also exceed the design treatment system flow as early as 2027, for the 25% infill scenario. This would require an increase in WWTP capacity, likely resulting in upsizing the MBBR system proposed in TRUE 2021, Wastewater Treatment Long Term Plan.
- Flows may exceed the permitted maximum daily discharge as early as 2030. Increasing this value may be necessary to be compliant with permitted discharge requirements.

Projected average day sewer flow associated with the 25% infilling scenario may result in an exceedance of the effluent storage capacity as early as 2030-2031. It is recommended that an additional 145,000 m3 of wastewater storage be implemented.

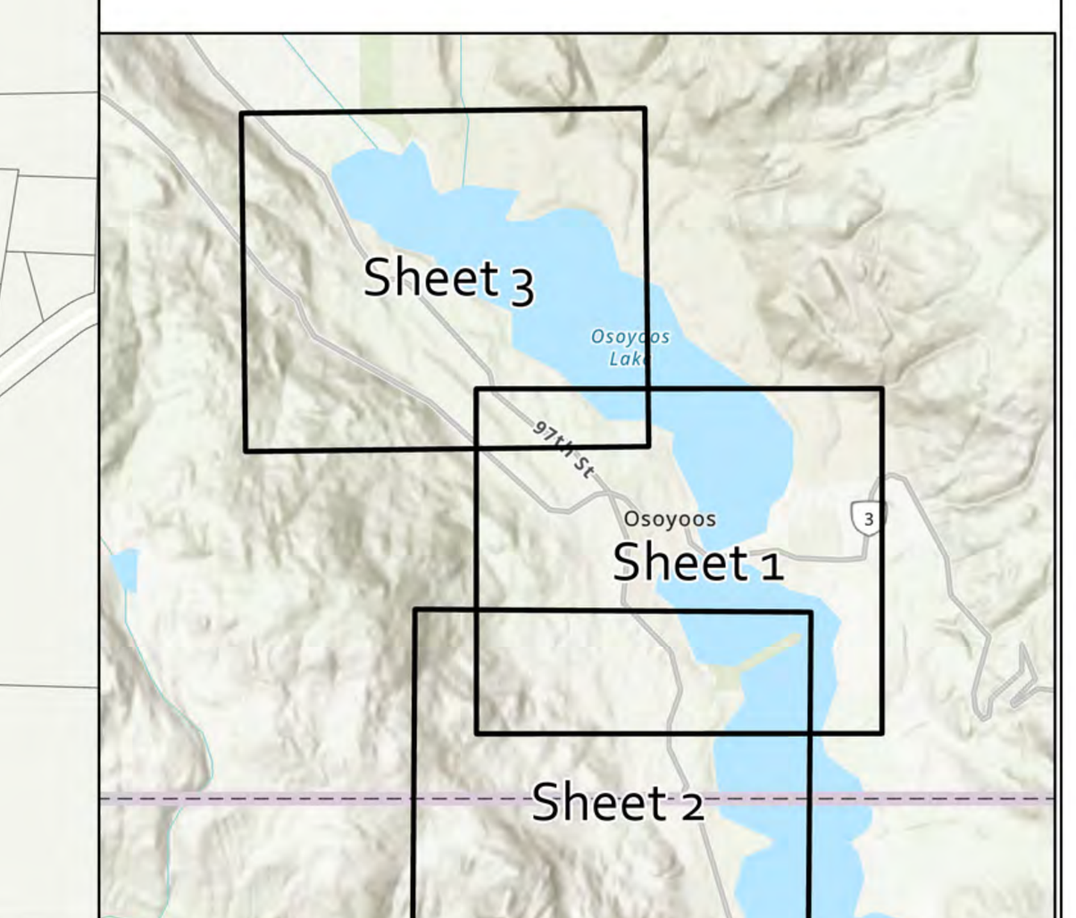
APPENDIX A

Water System Composite



Legend

- Fire Hydrant Assembly
- Gate Valve
- Blowoff / Standpipe
- Municipal Watermain
- Municipal Watermain - 402 Pressure Reduced
- Irrigation Main
- Irrigation Main - System 9A
- Water Utility Structure
- Municipal Boundary
- First Nation Reserve Boundary
- Cadastral



TRUE CONSULTING

Osoyoos Canada's warmest welcome

WATER SYSTEM COMPOSITE

MUNICIPAL SYSTEM

OVERALL PLAN

SCALE	1:5,000
DESIGN BY	
DRAWN BY	ET
DATE	3/13/2023
PROJECT REF No.	305-2061

DRAWING No. **305-2061-01**

SHEET 1 OF 3

REVISION -

APPENDIX B

Water System Project Sheets

Our File: 302-658
November 28, 2024

2025 Capital Plan

Project W5 and R1: 74th Ave. Water Main Upsizing, Heron Lane and Loon Crescent Replacement, and Loon Crescent Looping

There is not currently a continuous large diameter trunk main between the East and West portions of the Town. This limits distribution capacity for fire flows. This trunk main on 74th Ave. enhances flows to the East side of the Town core and East of Osoyoos Lake, allowing flows to gravity flow more effectively from the 340 reservoirs (under non-pumping conditions). Also, these benefits will be critical to improve system performance when water treatment plants, the East Reservoir, and Small Scall, Multi-unit housing demands (SSMUH) are implemented.

Watermain works on Heron Lane and Loon Crescent replace expired 150 mm asbestos cement pipes with upgraded 200 mm PVC mains. Upsizing these mains ensures compliant fire flows will be achieved when experiencing increased SSMUH demands.

Loon Crescent is being looped to 89th Street with a 200 mm watermain. This addresses concerns of chlorine residual degradation at the end of watermains that only experience low residential demands, resulting in low water turnover. Also, it improves fire flows on Loon Crescent

Scope: All following watermain works include replacement of valves, services, hydrants and all other appurtenances.

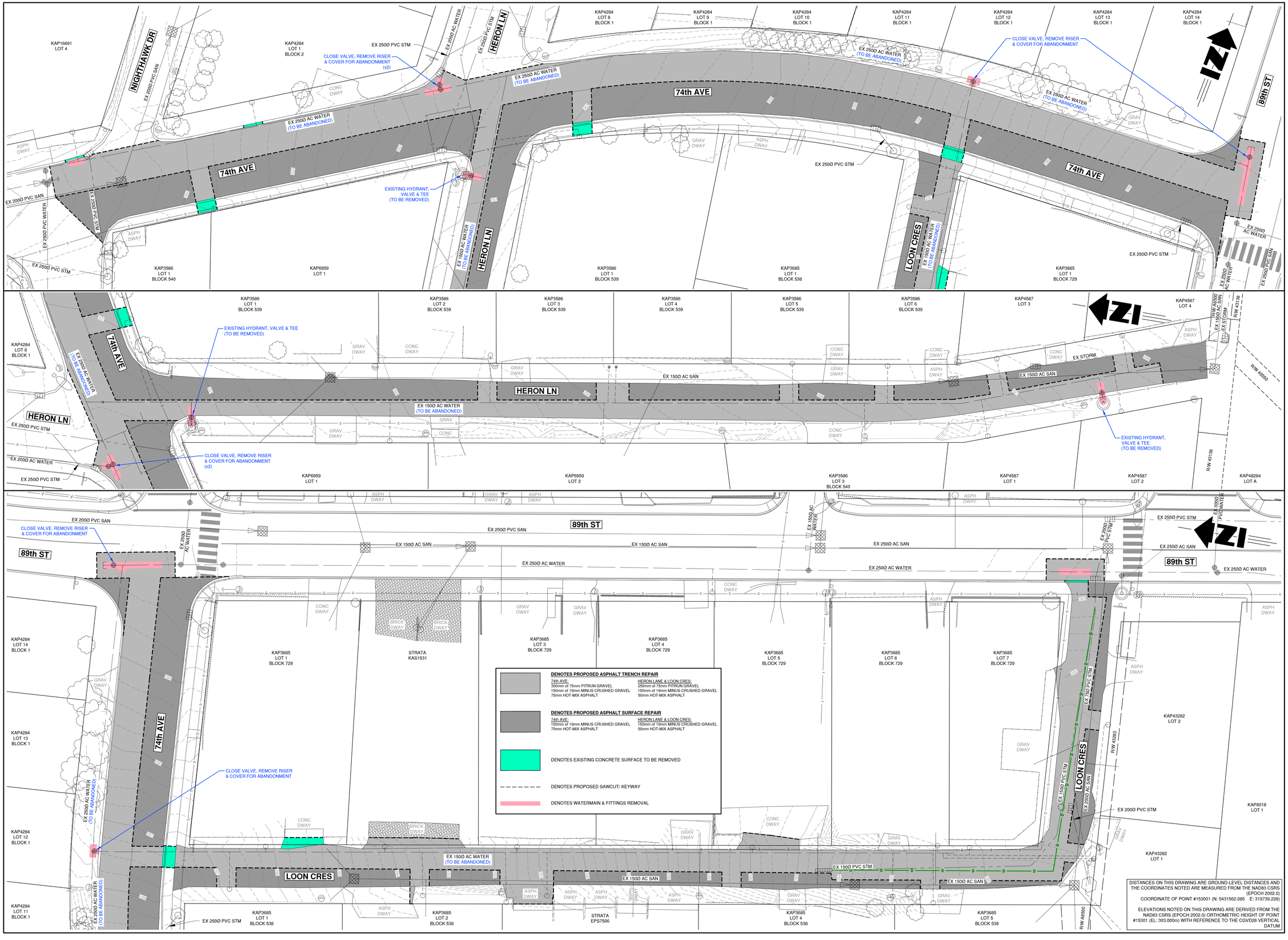
74th Avenue: Supply and install 200 m of 350 mm pipe with applicable appurtenances and connection to the existing water system on 74th Avenue from Nighthawk Dr. to 89th Street.

Heron Lane and Loon Crescent: Supply and install 360 m of 200 mm pipe with applicable appurtenances and connection to the existing water system on 74th Ave for Heron Lane and Loon Crescent, and connection to 89th Street for Loon Crescent.

Road Works: This scope only includes the re-instating of impacted road surfaces from trenching works. The remainder of scope for complete road restoration including replacing road surfaces, curb and gutters, and sidewalks are considered in the Roads Capital Plan Projects.

Capital cost (including 25% contingency, excluding GST) estimate:

$167,963.78 (Roads)
$781,800.86 (Water)
$949,764.64



LEGEND

EXISTING	PROPOSED	DESCRIPTION
		ASPHALT ROAD
		GRAVEL ROAD
S	S	SANITARY MAIN
		SANITARY FORCEMAIN
		SANITARY MANHOLE
		SERVICE & IC
D	D	STORM MAIN
		STORM DITCH
		STORM CULVERT
		SERVICE & IC
		STORM MANHOLE
		CB - STD & SIDE INLET
		DRYWELL
W	W	WATER MAIN
		SERVICE & CURB STOP
		VALVE
		STANDPIPE
		HYDRANT
G	G	GAS
P	P	POWER
T	T	TEL
C	C	CABLE
SL	SL	ST LIGHT CONDUIT
		POLE & ANCHOR
		STREET LIGHT
		CONTROL MONUMENT
		IRON POST
		TRAVERSE HUB

No.	DATE	DESCRIPTION	BY	APPD
3	NOV 11/24	ISSUED FOR TENDER	TT	SU
2	AUG 09/24	RE-ISSUED FOR IHA PERMIT	TT	SU
1	JUNE 26/24	ISSUED FOR IHA PERMIT	TT	SU

ISSUES / REVISIONS

CONSULTANT SEAL

TRUE
201 - 2079 Falcon Road ≡ Kamloops BC ≡ V2C 4J2
tel 250.828.0881 ≡ fax 250.828.0717
info@TRUE.bc.ca

Osoyoos
Canada's warmest welcome®

74th AVE, HERON LANE, LOON CRES WATERMAIN REPLACEMENT

REMOVALS PLAN

SCALE	0 1:250 10
DESIGN BY	TT
DRAWN BY	OWL
DATE	2024-01-24
PROJECT REFERENCE No.	302-2161
DRAWING No.	302-2161 03
SHEET	OF
ISSUE/REV.	3

P:\Projects\302-2161\03 drawings\cad\02 design drawings\302-2161

December 3, 2024 Our File: 302-2161

Town of Osoyoos
PO Box 3010
Osoyoos, BC V0H 1V0

Attention: Rod Risling

RE: ***Tender Results and Recommendation of Award – 74th Avenue, Heron Lane, Loon Crescent Watermain Replacement***

Tenders for the above noted project were opened at the Town of Osoyoos office on Thursday November 28th, 2024, at 2:00 pm. A total of eleven (11) tenders were received prior to closing time. The tenders were complete with a bid bond, and surety's consent for performance bond.

The tenders have been audited with minor mathematical errors corrected.

The audited tender results are summarized as follows:

	Tender	Tender Price (incl taxes)	Location
1.	H&M Excavating Ltd.	$949,764.64	Penticton, BC
2.	Double T Dirtworx	$959,281.05	Kelowna, BC
3.	Grizzly Excavating Ltd.	$1,065,705.06	Penticton, BC
4.	Con-Ex Civil Contracting Ltd.	$1,133,846.18	Kamloops, BC
5.	Superior Excavating Services	$1,145,649.75	Peachland, BC
6.	TwinCon Enterprises Ltd.	$1,226,770.20	Penticton, BC
7.	Okanagan Civil Constructors Ltd.	$1,256,234.70	Summerland, BC
8.	Siteline Earthworks Ltd.	$1,299,480.00	Chilliwack, BC
9.	Triahn Enterprises (2018) Ltd.	$1,369,520.25	Chilliwack, BC
10.	General Assembly Excavating Ltd.	$1,717,954.14	Salmon Arm, BC
11.	Dawson Civil Ltd.	$1,890,000.00	Kamloops, BC

The above totals contain 5% GST and a $40,000.00 contingency allowance.

This project enhances flows to the east side of the town core and east of Osoyoos Lake, allowing flows-to-gravity flow more effectively from the 340 reservoir. Furthermore, these benefits will be critical to improve system performance when water treatment plants , the east side reservoir, and multi-unit housing demands are implemented. Fire flow capacity will be improved.

74th Avenue will have the existing aged and undersized 250Ø asbestos cement watermain replaced with a proposed 350Ø PVC main complete with appurtenances and services from 89th Street to Nighthawk Drive.

Heron Lane and Loon Crescent are proposed to have a 200Ø PVC watermain, appurtenances, and services installed to replace the expired 150Ø asbestos cement watermain south of 74th Avenue.

Upon completion of these water system installations , the road surface will be completely re-paved avoiding any asphalt trench patches and future joint/seam maintenance.

A comparison of the H&M Excavating Ltd. tender with the 2024 Capital Cost Estimate is presented following:

	2024 Budget	**H&M Tender Price**
Water System	Included	$744,572.25
Roadworks	Included	$159,965.50
Total Project	**$2,175,000.00**	**$904,537.75**

The above totals contain contingencies. The tender as submitted by H&M Excavating Ltd. is $1,270,462.25 below the 2024 capital budget amount of $2,175,000 (above costs exclude 5% GST).

H&M Excavating Ltd. is a Penticton, BC based construction company who has previously completed an extensive number of projects on the behalf of the Town of Osoyoos with great success. There are no concerns with their ability to complete this work on time and within budget.

Considering the above, we recommend that the tender, as submitted by H&M Excavating Ltd. on November 28, 2024 in the amount of $949,764.64 (inclusive of contingency and taxes), be awarded by the Town of Osoyoos. Should any questions arise, please do not hesitate to contact the undersigned.

Yours truly,

TRUE CONSULTING

Todd Turnbull, AScT, CPWI 3

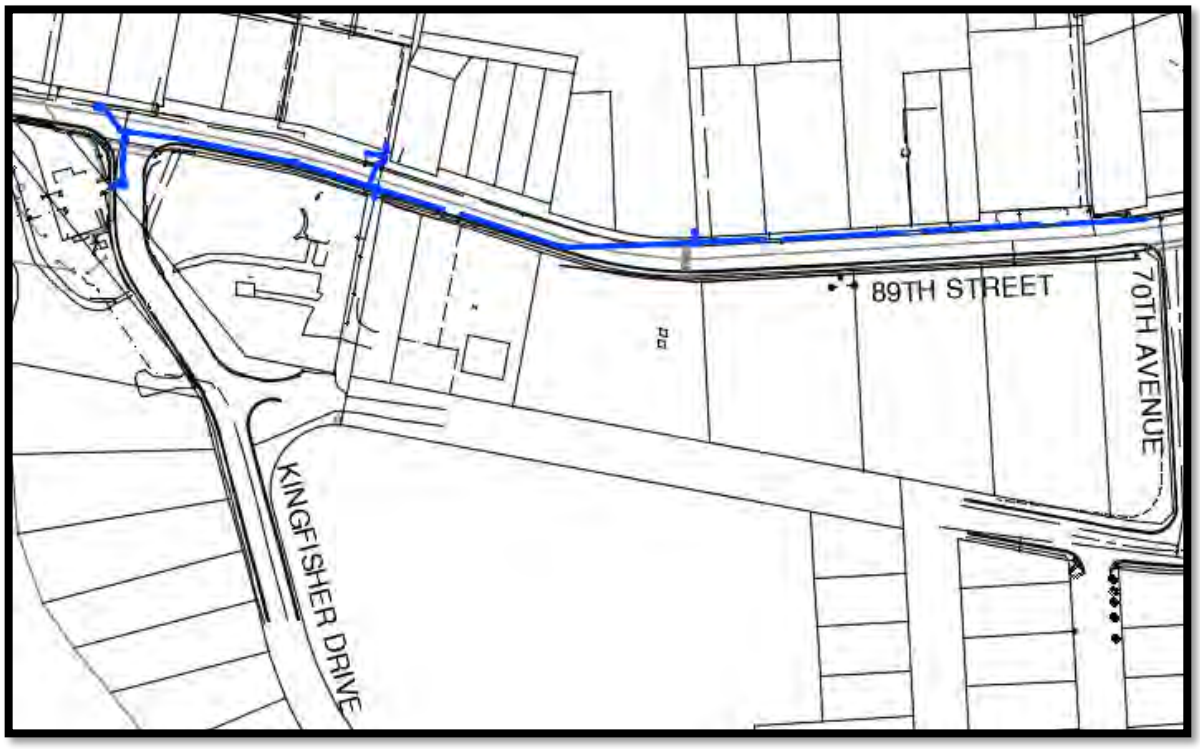
TT/er

Project W22 (R11 and S13): Watermain Upgrades and Replacement on 89th St. from 70th Ave. to Kingfisher Dr.

Priority: High **Type:** Upgrade, Replacement

Trigger: Growth, Asset Management

Location Map



Issue

This project is intended to be completed in conjunction with upgrades on 89th St. from the 74th Ave. connection to support southwards distribution in the municipal pressure zone. The current watermain on 89th St. decreases from 250 mm to 200 mm between Kingfisher Drive and 70th Ave. which limits system capacity to provide fire flow. This impacts flows from Well #1 under pumping conditions, potential future water treatment plant flows, and eastward distribution. Connection to the east is intended to be achieved in conjunction with upgrades on Kingfisher Drive from 89th St. to the lake crossing.

Also, Watermain works on 89th St. will replace existing 250 mm and 200 mm asbestos cement pipes at the end of their service lives. Given that these pipes have a high probability of failure (age based) and high system criticality (high flows), replacing them with PVC will improve system reliability.

Scope

Works include installing 440 m of 400 mm PVC watermain on 89th St. and roughly 60 m of 150 - 300 mm PVC watermain to tie-into connecting watermains including the future Kingfisher Drive watermain. All works include replacing hydrants, services, valves and other appurtenances. It is recommended that this work be completed simultaneously with S13 to confirm the sanitary main does not need to be reconstructed.

Cost Estimate (Class D, see Project R11 for a project sketch and detailed cost estimate)

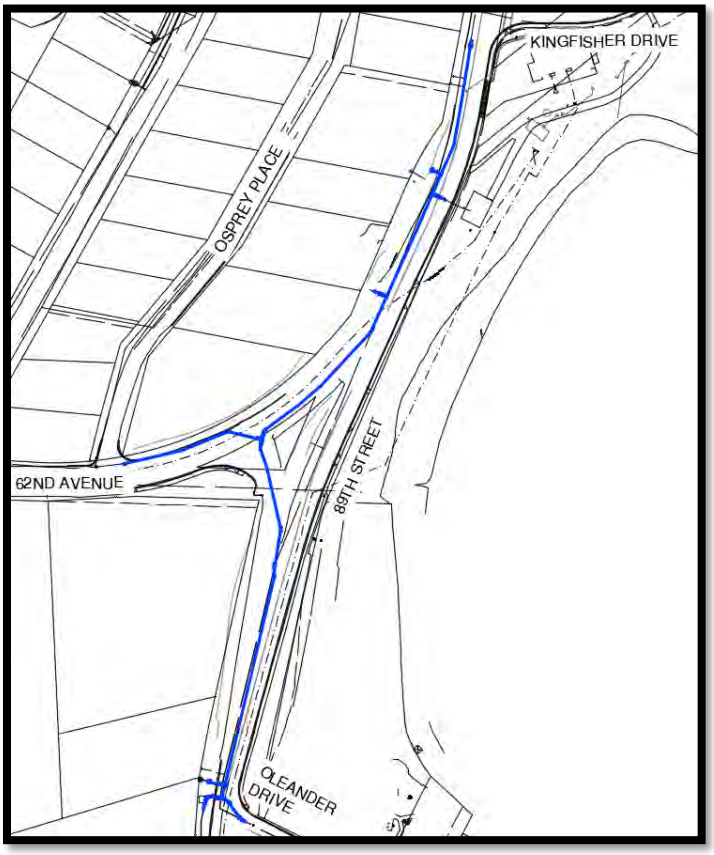
DESCRIPTION	TOTAL PAYMENT
Part 2.0 - Water System	**$682,180.00**
Contingency & Engineering (25%)	**$170,545.00**
Total Contract Sum	**$852,725.00**

Project W30: Watermain Upgrades and Replacement on 89th St. from Kingfisher Dr. to Oleander Dr. and 62nd Ave. Tie-in to 89th St. (Chute Intersection)

Priority: High **Type:** Upgrade, Replacement

Trigger: Growth, Asset Management

Location



Issue

There is currently no connection between the watermains along 89th and 62nd avenue which limits system capacity to provide fire flow. This would be significantly improved with this connection creating a looped water system in this area. Additionally, replacement of the existing 250 mm asbestos cement (AC) watermain on 89th St. would improve system reliability to the south sector

of the municipal pressure zone. This would allow two large diameter watermains to feed this area. Furthermore, it supports hydraulic connectivity for future water treatment plants and eastward conveyance to the lake crossing.

Scope

This scope includes replace existing asbestos cement watermains on 89th St. from Kingfisher drive to Oleander Drive, and on 62nd St. East of Osprey Pl. and tie-in 62nd St. to 89th Street. New watermains include 320 m of 300 mm, and 100 m of 250 mm PVC watermains including, hydrants, services, an air release valve, and all other appurtenances.

Cost Estimate (Class C, See R12 for detailed cost estimate and project layout)

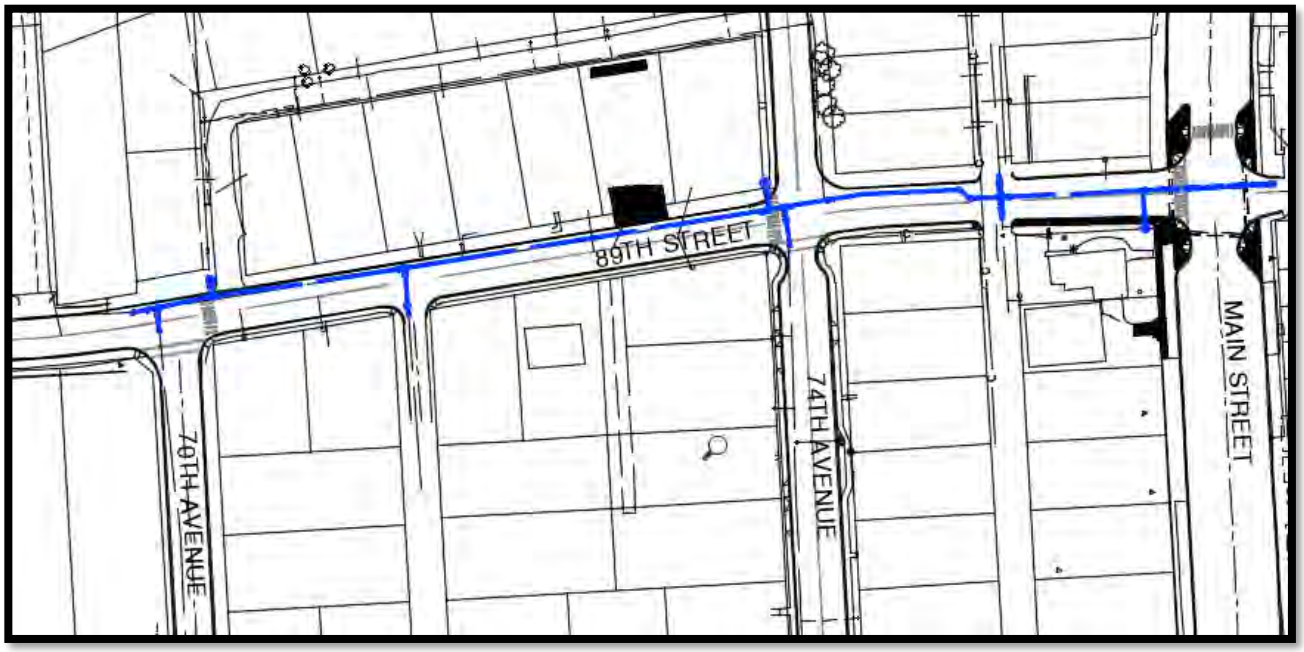
DESCRIPTION	TOTAL PAYMENT
Part 2.0 - Water System	**$348,820.00**
Contingency & Engineering (30%)	**$104,646.00**
Total Contract Sum	**$453,466.00**

Project W21 (R10 and S12): Watermain Upgrades and Replacement on 89th St. from Main St. to 70th Ave.

Priority: High **Type:** Upgrade, Replacement

Trigger: Growth, Asset Management

Location Map



Issue

Increased distribution is required throughout the municipal pressure zone to accommodate flows from the future water treatment plant, flows to the east reservoir, and increased water demand from proposed developments (development referrals) and infilling to the North, South and East. Upgrades to the 89th St. corridor achieve an efficient and harmonious solution to accommodate these multiple dynamics. This corridor ties into the 74th Ave watermain upsizing which provides a large trunk main connected to the 340 Reservoir that will direct flows to upgrades Northwards and Southwards of this project. Northwards, it is intended to cross Main Street to create a large trunk main to the northern area of the municipal pressure zone. Southwards, increased flows may support water treatment plant distribution and will support increased water demand, but most importantly flows to the east to support the east reservoir (in conjunction with upgrades to Kingfisher Dr.).

Also, Watermain works on 89th St. will replace existing 250 mm asbestos cement pipes with expired service lives. Given these pipes are at a high probability of failure (age based) and high system criticality (high flows), replacing them with PVC watermain will improve system reliability.

Scope

Works include installing 300 m of 350 mm PVC watermain on 89th St. and roughly 90 m of 150 - 300 mm PVC watermain to tie-into connecting watermains. All works include replacing hydrants, services, valves and other appurtenances. It is recommended that this work be completed simultaneously with S12 to confirm the sanitary main does not need to be reconstructed.

Cost Estimate (Class C, see Project R10 for a project sketch and detailed cost estimate)

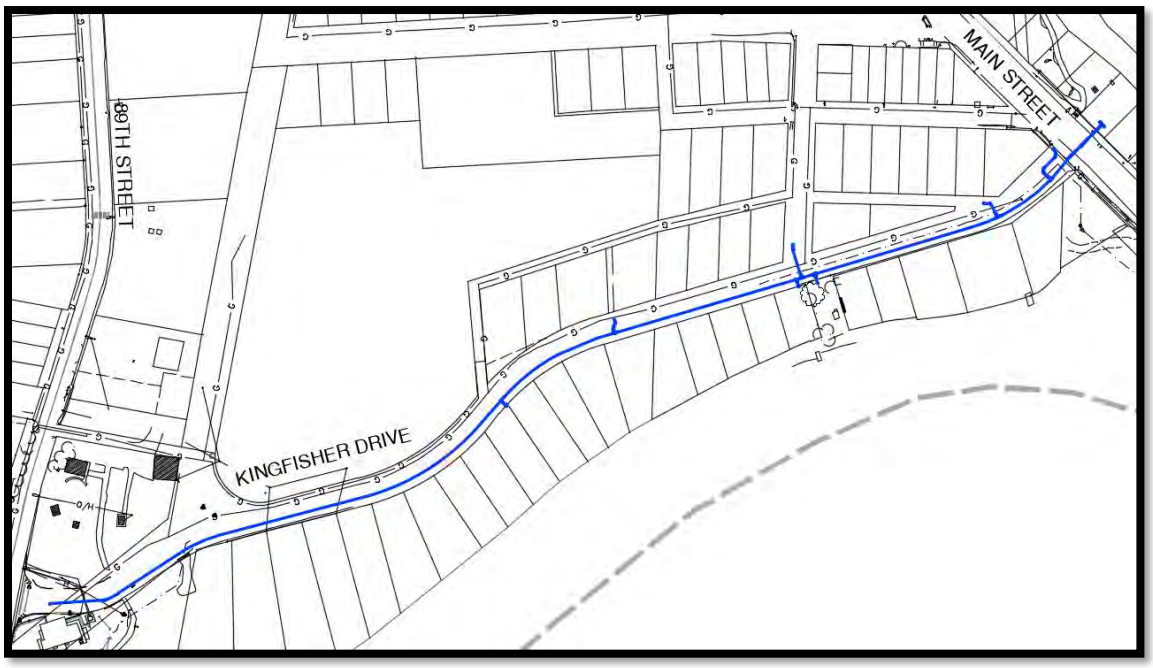
DESCRIPTION	TOTAL PAYMENT
Part 2.0 - Water System	**$484,540.00**
Contingency & Engineering (25%)	**$121,135.00**
Total Contract Sum	**$605,675.00**

Project W29 & R13: Watermain Upgrade and Replacement on Kingfisher Dr. from 89th St. to Gyro Park

Priority: High **Type:** Upgrade, Replacement

Trigger: Growth, Asset Management

Location Map



Issue

Increased hydraulic connectivity is required to convey flows between the West and East sectors of the municipal pressure zone to support infilling east of the lake crossing and the implementation of the East Reservoir. The system currently has a 300 mm diameter through the town core to the lake crossing, but a second pathway is required to provide additional flows. Kingfisher Dr. achieves this with several other advantages as follows:

- Improve system resilience by providing a large trunk main loop to the lake crossing, in conjunction with upgrades to 89th Street.
- Replacing a high-risk 150 mm asbestos cement (AC) water main which is at the end of its service life.

- Improves hydraulic connectivity to Well #1 and #8.
- Supports hydraulic connectivity for the future water treatment plant throughout the municipal pressure zone.

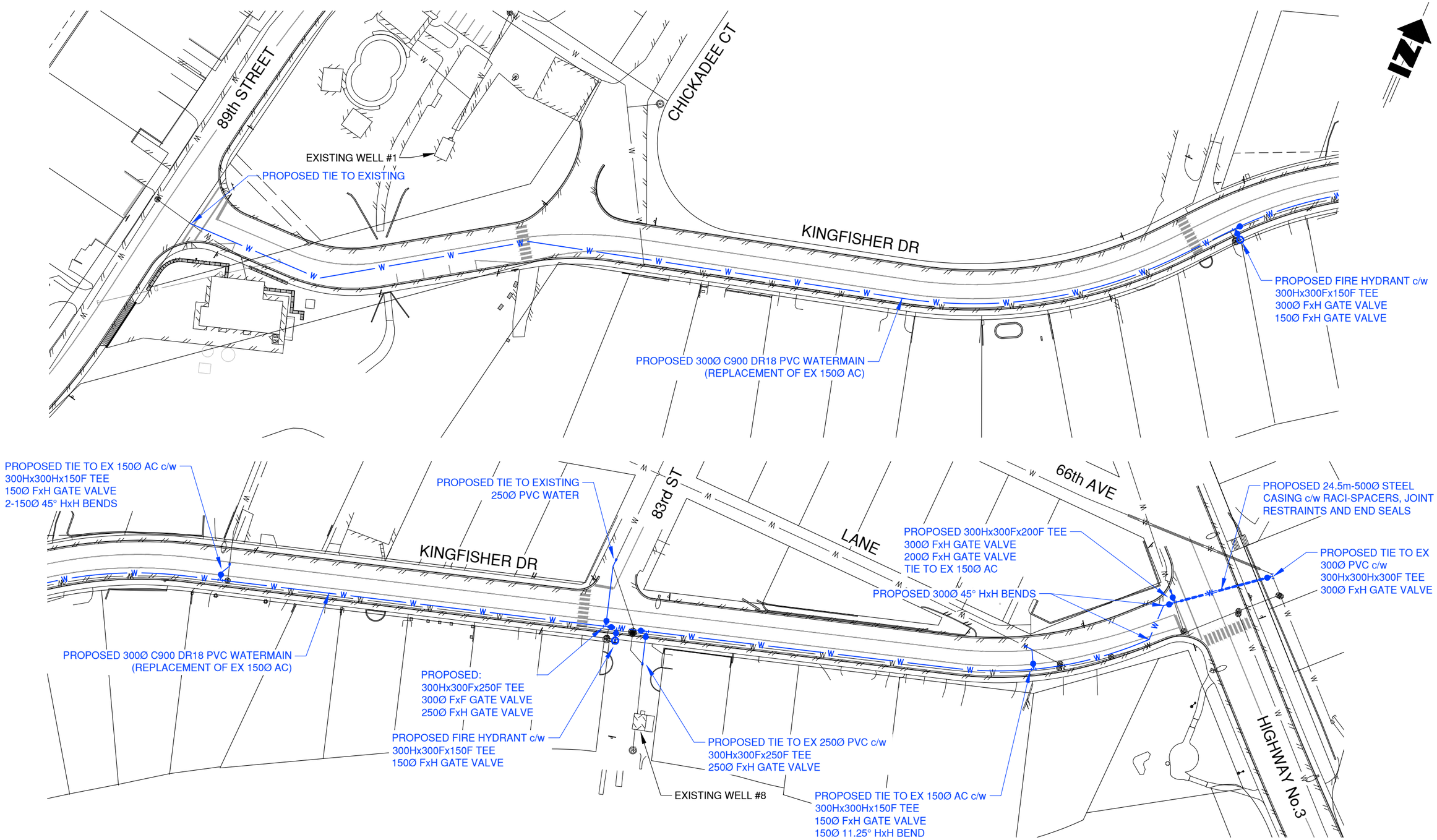
Scope

Works include installing 670 m of 300 mm PVC watermain on Kingfisher Drive from 89th St. to Gyro Park. All works include replacing hydrants, services, valves and other appurtenances. Notably, a highway crossing is included for crossing Main St. at Gyro Park. Road works are included for surface restoration.
Road works include replacing the asphalt structure on Kingfisher Drive, but do not include replacing existing curb and gutter, and sidewalks. This is necessary because recent trucking activity has damaged the pavement structure.

Cost Estimate (Class D)

Water: $ 1,078,038.00

Roads: $ 802,750.00



TOWN OF OSOYOOS
WATERMAIN REPLACEMENTS
KINGFISHER DRIVE

TRUE

DESIGN BY: SU/TT	
SCALE: 1:1000	
DRAWN BY: TT	DWG NO.: SK1 302-2142
DATE: SEPT 2024	REV:

FILE:n:\clients\300-389\302\302-2142\03 drawings\cad\02 design drawings\dn 302-2142.dwg

Town of Osoyoos

Watermain Upgrade and Replacement on Kingfisher Dr. from 89th St. to the Gyro Park

Class D Cost Estimate

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART A1.0 - REMOVALS					
1.1	Asphalt surfaces c/w sawcutting	m^2	6500	$10.00	$65,000.00
1.2	Concrete surfaces c/w sawcutting				
1.2.1	Curbs	m	120	$30.00	$3,600.00
1.2.2	Sidewalks	m^2	170	$30.00	$5,100.00
1.3	Topsoil and sod	m^2	180	$12.00	$2,160.00
1.4	Existing water system				
1.4.1	150Ø AC piping	m	640	$150.00	$96,000.00
				Subtotal Part A1.0	**$171,860.00**
PART A2.0 - WATER SYSTEM					
2.1	Supply and install watermain				
2.1.1	300Ø PVC c/w Class B sand bedding	m	640	$420.00	$268,800.00
2.1.2	250Ø PVC c/w Class B sand bedding	m	35	$320.00	$11,200.00
2.1.3	200Ø PVC c/w Class B sand bedding	m	10	$300.00	$3,000.00
2.1.4	150Ø PVC c/w Class B sand bedding	m	20	$280.00	$5,600.00
2.2	Appurtenances c/w thrust blocks and joint restraints				
2.2.1	300 x 300 x 300 tee	ea.	1	$3,000.00	$3,000.00
2.2.2	300 x 300 x 250 tee	ea.	2	$3,000.00	$6,000.00
2.2.3	300 x 300 x 200 tee	ea.	1	$3,000.00	$3,000.00
2.2.4	300 x 300 x 150 tee	ea.	2	$3,000.00	$6,000.00
2.2.5	300Ø gate valve	ea.	5	$6,000.00	$30,000.00
2.2.6	250Ø gate valve	ea.	2	$4,000.00	$8,000.00
2.2.7	200Ø gate valve	ea.	1	$3,500.00	$3,500.00
2.2.8	150Ø gate valve	ea.	2	$3,000.00	$6,000.00
2.2.9	300Ø bends	ea.	12	$2,000.00	$24,000.00
2.2.10	300 x 250 reducer	ea.	2	$2,000.00	$4,000.00
2.2.11	300 x 200 reducer	ea.	1	$2,000.00	$2,000.00
2.2.12	300 x 150 reducer	ea.	2	$2,000.00	$4,000.00
2.2.13	300Ø Flanged transitions	ea.	2	$3,800.00	$7,600.00

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART A2.0 - WATER SYSTEM - continued					
2.2.14	Air release chamber	ea.	2	$6,000.00	$12,000.00
2.2.15	Hydrant Assembly	ea.	2	$12,000.00	$24,000.00
2.2.16	Water Service	ea.	28	$2,500.00	$70,000.00
2.3	Locate and tie to existing c/w couplers				
2.3.1	To existing 300Ø PVC @ Gyro Park	ea.	1	$5,000.00	$5,000.00
2.3.2	To existing 300Ø PVC @ 89th St.	ea.	1	$5,000.00	$5,000.00
2.3.3	To existing 250Ø PVC @ Well #8	ea.	1	$5,000.00	$5,000.00
2.3.4	To existing 250Ø PVC @ 83rd St.	ea.	1	$5,000.00	$5,000.00
2.3.5	To existing 200Ø PVC @ Main St.	ea.	1	$4,500.00	$4,500.00
2.3.6	To existing 150Ø PVC @ ROW & Lane	ea.	2	$4,000.00	$8,000.00
2.4	Directional drill c/w 26 m steel casing, casing spacers, joint restraints and end seals	m	26	$4,000.00	$104,000.00
				Subtotal Part A2.0	**$638,200.00**
PART A3.0 - ROADWORKS					
3.1	Standard curb and gutter c/w base gravels	m	120	$280.00	$33,600.00
3.2	Concrete sidewalk c/w base gravels	m²	170	$250.00	$42,500.00
3.3	Asphalt trench repair c/w 75mm hot-mix asphalt and base gravels	m²	6500	$85.00	$552,500.00
3.4	Topsoil and sod	m²	180	$45.00	$8,100.00
				Subtotal Part A3.0	**$636,700.00**

SUMMARY

Subtotal Part A1.0	**$171,860.00**
Subtotal Part A2.0	**$638,200.00**
Subtotal Part A3.0	**$636,700.00**
Subtotal All Parts	**$1,446,760.00**
Contingency and Engineering (30%)	**$434,028.00**
Total Estimate	**$1,880,788.00**

Class D Cost Estimate

10/10/2024

Permit to Practice
No. 1000129

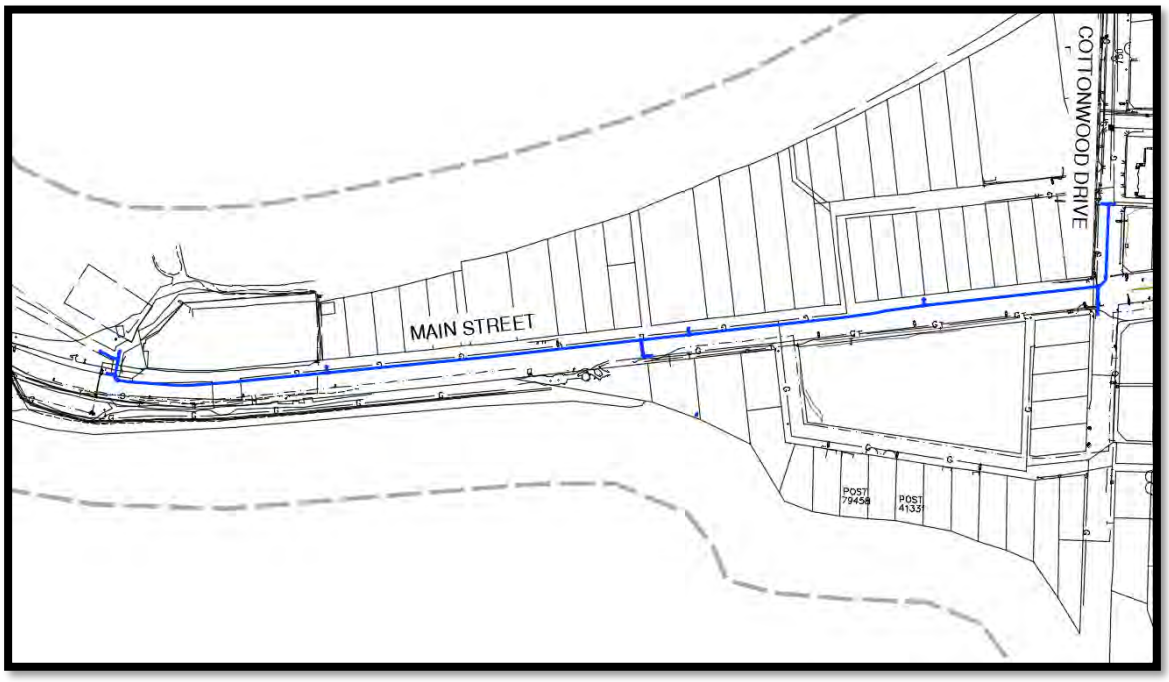
Prepared by: Anthony Martins, P.Eng.

Project W34: Watermain Upgrade and Replacement on Main St. from the East Lake Crossing to Cottonwood Dr., and on Cottonwood Drive from Main St. to Maple Dr.

Priority: High **Type:** Upgrade, Replacement

Trigger: Growth, Asset Management

Location Map



Issue

The domestic water system is restricted by undersized water mains east of the lake crossing when considering fire flows and implementation of the East Reservoir. For these reasons, a large diameter water main is required to optimally convey flows from the West to the East. This configuration has several advantages including:

- Improve system resilience by providing a large trunk main from the lake crossing into the core of the east sector.
- This will negate the replacement of the 300 mm water main in the beach line which is not expected to be feasible for environmental concerns in the future.

- In the short term, this watermain may be used as a raw water supply line if groundwater treatment is pursued.

- Replacing a high-risk 200 mm asbestos cement (AC) water main which is at the end of its service life.
- Improves hydraulic connectivity to Well #3, #4, #5, #9 and #10.
- Supports hydraulic connectivity for the future water treatment plant throughout the municipal pressure zone.

Scope

This work includes upsizing the watermain on Main Street from the lake crossing to Cottonwood Dr. to enhance flow capacity from the lake crossing. A 500 mm water main will replace the existing 200 mm AC watermain on Main St., and a new section of 500 mm main will be installed between Cottonwood Dr. and Ponderosa Drive. Also, a 350 mm watermain is included from Main St. to Maple Dr. to tie into recent upgrades to improve flows from the source wells in this area.

Cost Estimate (Class D)

DESCRIPTION	TOTAL PAYMENT
Part 1.0 - Removals	**$89,580.00**
Part 2.0 - Water System	**$1,512,750.00**
Part 3.0 - Roadworks	**$726,650.00**
Subtotal Parts 1.0 – 3.0	**$2,328,980.00**
Contingency & Engineering (30%)	**$698,694.00**
Total Contract Sum	**$3,027,674.00**

Town of Osoyoos

Highway No.3 And Cottonwood Drive

Class D Cost Estimate

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 1.0 - REMOVALS					
1.1	Asphalt surfaces c/w sawcutting	m²	5720	$10.00	$57,200.00
1.2	Concrete surfaces c/w sawcutting				
1.2.1	Curbs	m	104	$30.00	$3,120.00
1.2.2	Sidewalk and driveways	m²	155	$30.00	$4,650.00
1.2.3	Concrete dump pad	LS	1	$400.00	$400.00
1.3	Strip, clear and grub	m²	30	$8.00	$240.00
1.4	Existing water system				
1.4.1	300Ø D.I. piping	m	15	$180.00	$2,700.00
1.4.2	300Ø PVC piping	m	4	$180.00	$720.00
1.4.3	250Ø D.I. piping	m	35	$170.00	$5,950.00
1.4.4	200Ø AC piping	m	4	$150.00	$600.00
1.4.5	150Ø AC piping	m	30	$150.00	$4,500.00
1.4.6	Valves, tees, hydrants, fittings, c/w capping for abandonment	ea.	19	$500.00	$9,500.00
				Subtotal Part 1.0	**$89,580.00**
PART 2.0 - WATER SYSTEM					
2.1	Supply and install watermain c/w Class B sand bedding				
2.1.1	500Ø C900 DR18 PVC	m	715	$1,300.00	$929,500.00
2.1.2	350Ø C900 DR18 PVC	m	110	$600.00	$66,000.00
2.1.3	300Ø C900 DR18 PVC	m	15	$420.00	$6,300.00
2.1.4	250Ø C900 DR18 PVC	m	5	$320.00	$1,600.00
2.1.5	150Ø C900 DR18 PVC	m	110	$260.00	$28,600.00
2.1.6	100Ø C900 DR18 PVC	m	15	$220.00	$3,300.00
2.1.7	19Ø municipex	m	45	$90.00	$4,050.00
2.2	Appurtenances c/w thrust blocks and joint restraints				
2.2.1	500H x 500F x 250F tee	ea.	1	$8,000.00	$8,000.00
2.2.2	500H x 500H x 150F tee	ea.	6	$8,000.00	$48,000.00
2.2.3	500H x 500F x 150F tee	ea.	2	$14,000.00	$28,000.00
2.2.4	500H x 500H x 100F tee	ea.	3	$8,000.00	$24,000.00
2.2.5	300F x 300F x 300F tee	ea.	1	$3,000.00	$3,000.00
2.2.6	150H x 150H x 150H tee	ea.	1	$1,800.00	$1,800.00
2.2.7	500Ø gate valve	ea.	4	$32,000.00	$128,000.00
2.2.8	350Ø gate valve	ea.	1	$14,000.00	$14,000.00

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 2.0 - WATER SYSTEM - continued					
2.2.9	300Ø gate valve	ea.	2	$6,000.00	$12,000.00
2.2.10	250Ø gate valve	ea.	1	$4,000.00	$4,000.00
2.2.11	150Ø gate valve	ea.	9	$2,500.00	$22,500.00
2.2.12	100Ø gate valve	ea.	3	$1,500.00	$4,500.00
2.2.13	500Ø bends	ea.	5	$5,000.00	$25,000.00
2.2.14	350Ø bends	ea.	2	$2,500.00	$5,000.00
2.2.15	300Ø bends	ea.	1	$2,000.00	$2,000.00
2.2.16	250Ø bends	ea.	2	$1,700.00	$3,400.00
2.2.17	Hydrant assembly	ea.	7	$10,000.00	$70,000.00
2.2.19	450F x 500F increasor	ea.	1	$4,500.00	$4,500.00
2.2.20	350H x 300F reducer	ea.	2	$2,100.00	$4,200.00
2.2.21	350HxF adapter	ea.	1	$3,800.00	$3,800.00
2.2.23	500FxH adapter	ea.	1	$8,000.00	$8,000.00
2.3	Locate and tie to existing c/w couplers				
2.3.1	To existing 450Ø HDPE domestic water supply (Sta 5+010)	ea.	1	$8,000.00	$8,000.00
2.3.2	To existing 150Ø (AC) on Cottonwood Drive	ea.	2	$4,000.00	$8,000.00
2.3.3	To existing 150Ø AC on Ponderosa Dr (Sta 5+520)	ea.	1	$4,000.00	$4,000.00
2.3.4	To existing 300Ø PVC on beach (Sta 6+240)	ea.	1	$5,000.00	$5,000.00
2.3.5	To existing 250Ø DI (5+032)	ea.	1	$3,500.00	$3,500.00
2.3.6	To existing 100Ø service (typical)	ea.	3	$2,000.00	$6,000.00
2.4	Water services				
2.4.1	500Ø x 19Ø service saddle and 19Ø corp stops	ea.	8	$1,500.00	$12,000.00
2.4.2	19Ø curb stop, service box and connection to existing	ea.	8	$400.00	$3,200.00
				Subtotal Part 2.0	**$1,512,750.00**

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 3.0 - ROADWORKS					
3.1	Standard curb and gutter c/w base gravels	m	100	$280.00	$28,000.00
3.2	Concrete sidewalk c/w base gravels				
3.2.1	Concrete sidewalks	m²	140	$250.00	$35,000.00
3.2.2	Thickened driveway crossover	m²	35	$190.00	$6,650.00
3.3	Asphalt trench repair				
3.3.1	100mm hot-mix c/w base gravels	m²	5000	$120.00	$600,000.00
3.3.2	50mm hot-mix c/w base gravels	m²	760	$75.00	$57,000.00
				Subtotal Part 3.0	**$726,650.00**
				Subtotal Part 1.0 - 3.0	**$2,328,980.00**
				Contingency and Engineering (30%)	**$698,694.00**
				Grand Total	**$3,027,674.00**
				Class D Cost Estimate	

Permit to Practice
No. 1000129

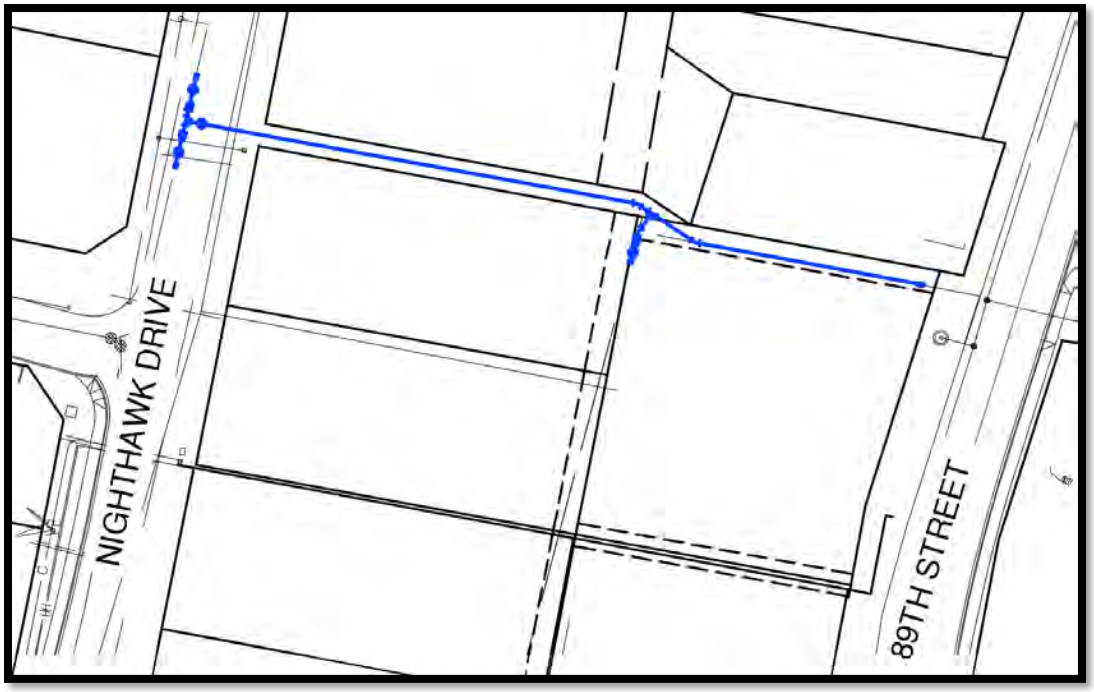
Prepared by: Anthony Martins, P.Eng.

Project W38: Watermain Connecting Nighthawk Dr. and 89th St, adjacent to 89th St and Kingfisher Dr. Intersection

Priority: High **Type:** Upgrade, Replacement

Trigger: Growth, Asset Management

Location Map



Issue

The current system layout in susceptible to service interruption because the 74th Ave. and 89th St. watermains provide major flows from the existing 340 Reservoirs eastwards to the lake crossing. Without an additional large diameter watermain, flows to the town core and east sector would be severely impacted in any case where these mains would be out of commission. For this reason, a 300 mm connection between Nighthawk Dr. to 89th St. is recommended to allow the proposed upgraded Kingfisher watermain to provide an alternative flow pathway. This configuration has several other advantages including:

- An existing right-of-way is present at the project location which corresponds to the proposed alignment.

- Replacing a 150 mm asbestos cement (AC) water main connecting Osprey Pl. and 89th Street.
- Supports hydraulic connectivity for the future water treatment plant throughout the municipal pressure zone.
- Supports hydraulic connectivity for Eastward conveyance from the 340 reservoir to the east sector.

Scope

This work includes trenching 40 m of 300 mm PVC watermain through the Right of Way (ROW) from 89th St. to Osprey Pl. and trenching 60 m of 300 mm PVC watermain in the ROW from Osprey Pl. to Nighthawk drive. Tie-ins will be completed at 89th St., Osprey Pl. and Nighthawk Drive.

Cost Estimate (Class D)

DESCRIPTION	TOTAL PAYMENT
Subtotal Part 1.0	**$60,900.00**
Subtotal Part 2.0	**$131,700.00**
Subtotal Part 3.0	**$34,150.00**
Subtotal Parts 1.0 - 3.0	**$226,750.00**
Contingency and Engineering (45%)	**$68,025.00**
Total Estimate	**$294,775.00**

Town of Osoyoos
Watermain Connecting Nighthawk Dr. and 89th St, adjacent to 89th St and Kingfisher Dr. Intersection
Class D Cost Estimate

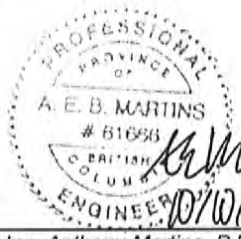
ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 1.0 - REMOVALS					
1.1	Asphalt surfaces c/w sawcutting	m^2	110	$15.00	$1,650.00
1.2	Concrete surfaces c/w sawcutting				
1.2.1	Curbs	m	10	$30.00	$300.00
1.2.2	Sidewalks	m^2	15	$30.00	$450.00
1.5	Tree Removal	l.s.	1	$50,000.00	$50,000.00
1.4	Existing water system				
1.3.1	150Ø AC piping	m	50	$170.00	$8,500.00
				Subtotal Part 1.0	**$60,900.00**
PART 2.0 - WATER SYSTEM					
2.1	Supply and install watermain				
2.1.2	300Ø PVC c/w Class B sand bedding	m	100	$500.00	$50,000.00
2.1.3	250Ø PVC c/w Class B sand bedding	m	10	$380.00	$3,800.00
2.1.4	150Ø PVC c/w Class B sand bedding	m	10	$260.00	$2,600.00
2.2	Appurtenances c/w thrust blocks and joint restraints				
2.2.1	300 x 300 x 300 tee	ea.	1	$4,000.00	$4,000.00
2.2.2	300 x 300 x 150 tee	ea.	1	$1,800.00	$1,800.00
2.2.3	300Ø gate valve	ea.	2	$6,000.00	$12,000.00
2.2.4	250Ø gate valve	ea.	2	$4,000.00	$8,000.00
2.2.5	150Ø gate valve	ea.	1	$2,500.00	$2,500.00
2.2.6	300Ø bends	ea.	2	$2,000.00	$4,000.00
2.2.7	150Ø bends	ea.	2	$1,000.00	$2,000.00
2.2.8	300 x 250 reducer	ea.	2	$2,000.00	$4,000.00
2.2.9	300 x 150 reducer	ea.	1	$2,000.00	$2,000.00
2.2.10	300Ø Watermain anchors	ea.	10	$1,500.00	$15,000.00

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 2.0 - WATER SYSTEM - continued					
2.3	Locate and tie to existing c/w couplers				
2.3.1	To existing 300Ø PVC @ 89th Street	ea.	1	$5,000.00	$5,000.00
2.3.1	To existing 250Ø PVC @ Nighthawk	ea.	2	$5,000.00	$10,000.00
2.3.2	To existing 150Ø AC @ Osprey	ea.	1	$5,000.00	$5,000.00
				Subtotal Part 2.0	**$131,700.00**
PART 3.0 - ROADWORKS					
3.1	Standard curb and gutter c/w base gravels	m	10	$280.00	$2,800.00
3.2	Concrete sidewalk c/w base gravels	m^2	15	$250.00	$3,750.00
3.3	Asphalt trench repair c/w 75mm hot-mix asphalt and base gravels	m^2	110	$120.00	$13,200.00
3.4	Topsoil and sod	m^2	320	$45.00	$14,400.00
				Subtotal Part 3.0	**$34,150.00**

SUMMARY

Subtotal Part 1.0 - Removals	**$60,900.00**
Subtotal Part 2.0 - Water System	**$131,700.00**
Subtotal Part 3.0 - Roadworks	**$34,150.00**
Subtotal Parts 1.0 - 3.0	**$226,750.00**
Contingency and Engineering (30%)	**$68,025.00**
Total Estimate	**$294,775.00**

Class D Cost Estimae



Permit to Practice
No. 1000129

10/10/2024

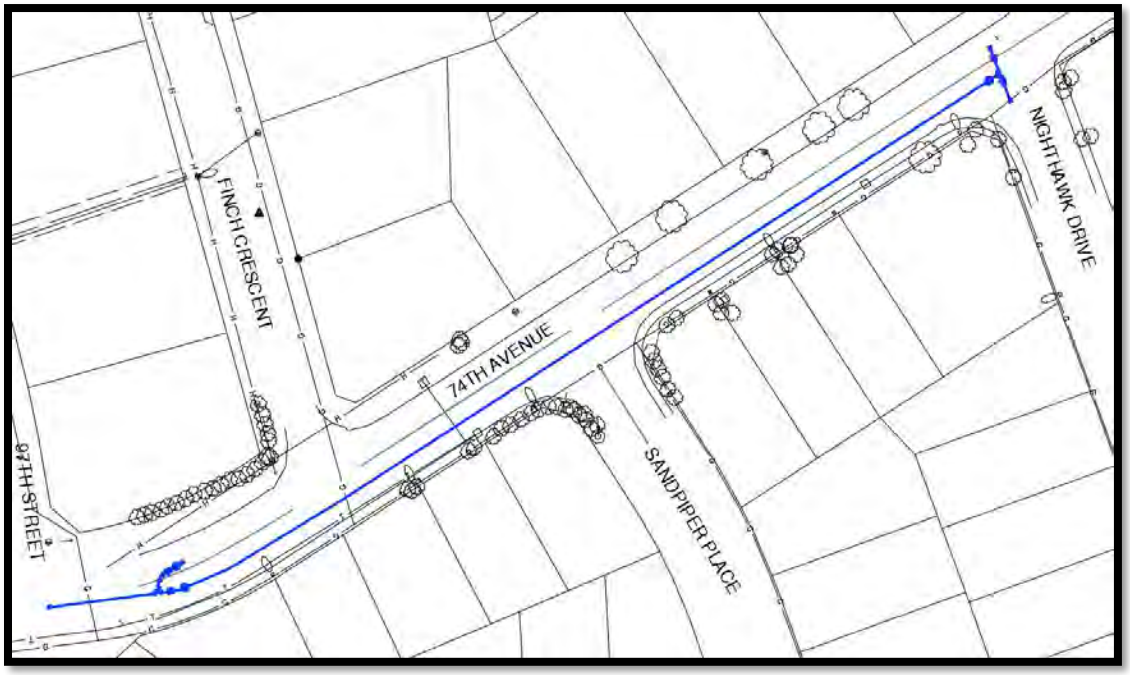
Prepared by: Anthony Martins, P.Eng.

Project W39: Watermain Upgrades on 74th Ave. from 97th St. to Nighthawk Dr.

Priority: Medium **Type:** Upgrade

Trigger: Growth, Future Planning

Location Map



Issue

The existing 350 mm watermain on 74th St. from 97th St. to Nighthawk Dr. is undersized to provide flows to the East Sector and it is unlikely that it will provide adequate hydraulic connectivity for the future Water Treatment Plant. For these reasons, it is proposed to twin this watermain with another 350 mm watermain. Furthermore, this will improve system resilience and mitigate the effects of increased demand from residential infilling and densification.

Scope

This work includes installing 180 m of 350 mm PVC watermain on 74th Street.

Cost Estimate (Class D)

DESCRIPTION	TOTAL PAYMENT
Part 1.0 - Removals	$7,600.00
Part 2.0 – Water System	$206,300.00
Part 3.0 – Roadworks	$114,600.00
Subtotal Parts 1.0 to 3.0	$328,500.00
Contingency and Engineering (30%)	$98,550.00
Total Contract Sum	$427,050.00

Town of Osoyoos

Watermain Upgrades on 74th Ave. from 97th St. to Nighthawk Dr.

Class D Cost Estimate

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 1.0 - REMOVALS					
1.1	Asphalt surfaces c/w sawcutting	m^2	760	$10.00	$7,600.00
				Subtotal Part 1.0	**$7,600.00**
PART 2.0 - WATER SYSTEM					
2.1	Supply and install watermain				
2.1.1	400Ø PVC c/w Class B sand bedding	m	30	$800.00	$24,000.00
2.1.1	350Ø PVC c/w Class B sand bedding	m	180	$550.00	$99,000.00
2.1.2	250Ø PVC c/w Class B sand bedding	m	8	$350.00	$2,800.00
2.2	Appurtenances c/w thrust blocks and joint restraints				
2.2.1	400 x 400 x 400 tee	ea.	1	$8,000.00	$8,000.00
2.2.2	300 x 300 x 350 tee	ea.	1	$7,500.00	$7,500.00
2.2.3	350Ø gate valve	ea.	3	$7,000.00	$21,000.00
2.2.7	400Ø bends	ea.	2	$3,200.00	$6,400.00
2.2.7	350Ø bends	ea.	3	$3,000.00	$9,000.00
2.2.8	400 x 350 reducer	ea.	1	$3,000.00	$3,000.00
2.2.9	350 x 300 reducer	ea.	2	$2,800.00	$5,600.00
2.2.9	300 x 250 reducer	ea.	2	$2,500.00	$5,000.00

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 2.0 - WATER SYSTEM - continued					
2.4	Locate and tie to existing c/w couplers				
	2.4.3 To existing 400Ø PVC @ 97th St.	ea.	1	$5,000.00	$5,000.00
	2.4.2 To existing 350Ø PVC @ Nighthawk	ea.	1	$5,000.00	$5,000.00
	2.4.2 To existing 250Ø PVC @ Nighthawk	ea.	1	$5,000.00	$5,000.00
				Subtotal Part 2.0	**$206,300.00**
PART 3.0 - ROADWORKS					
3.1	Asphalt trench repair c/w 75mm hot-mix asphalt and base gravels	m^2	760	$85.00	$64,600.00
3.2	Traffic Control	L.S.	1	$50,000.00	$50,000.00
				Subtotal Part 3.0	**$114,600.00**

SUMMARY

Subtotal Part 1.0	**$7,600.00**
Subtotal Part 2.0	**$206,300.00**
Subtotal Part 3.0	**$114,600.00**
Subtotal Parts 1.0 - 3.0	**$328,500.00**
Contingency and Engineering (30%)	**$98,550.00**
Total Estimate	**$427,050.00**

Class D Cost Estimate

Permit to Practice
No. 1000129

10/10/2024

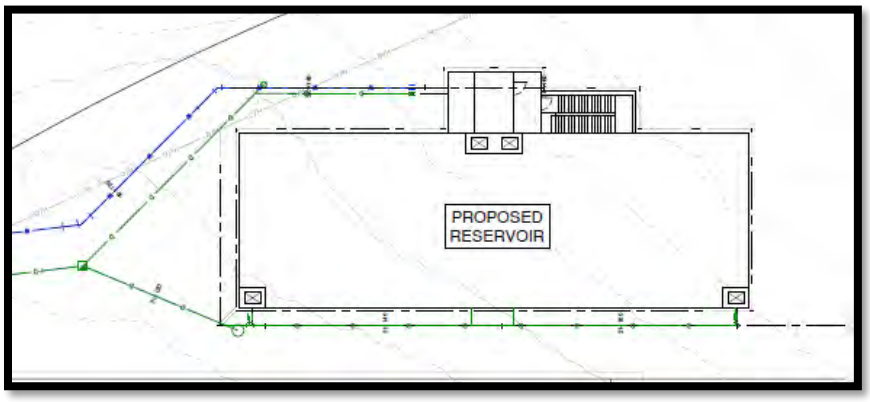
Prepared by: Anthony Martins, P.Eng.

Project W23: East 340 Reservoir - Construction

Priority: High **Type:** Upgrade

Trigger: Growth

Location Map



Issue

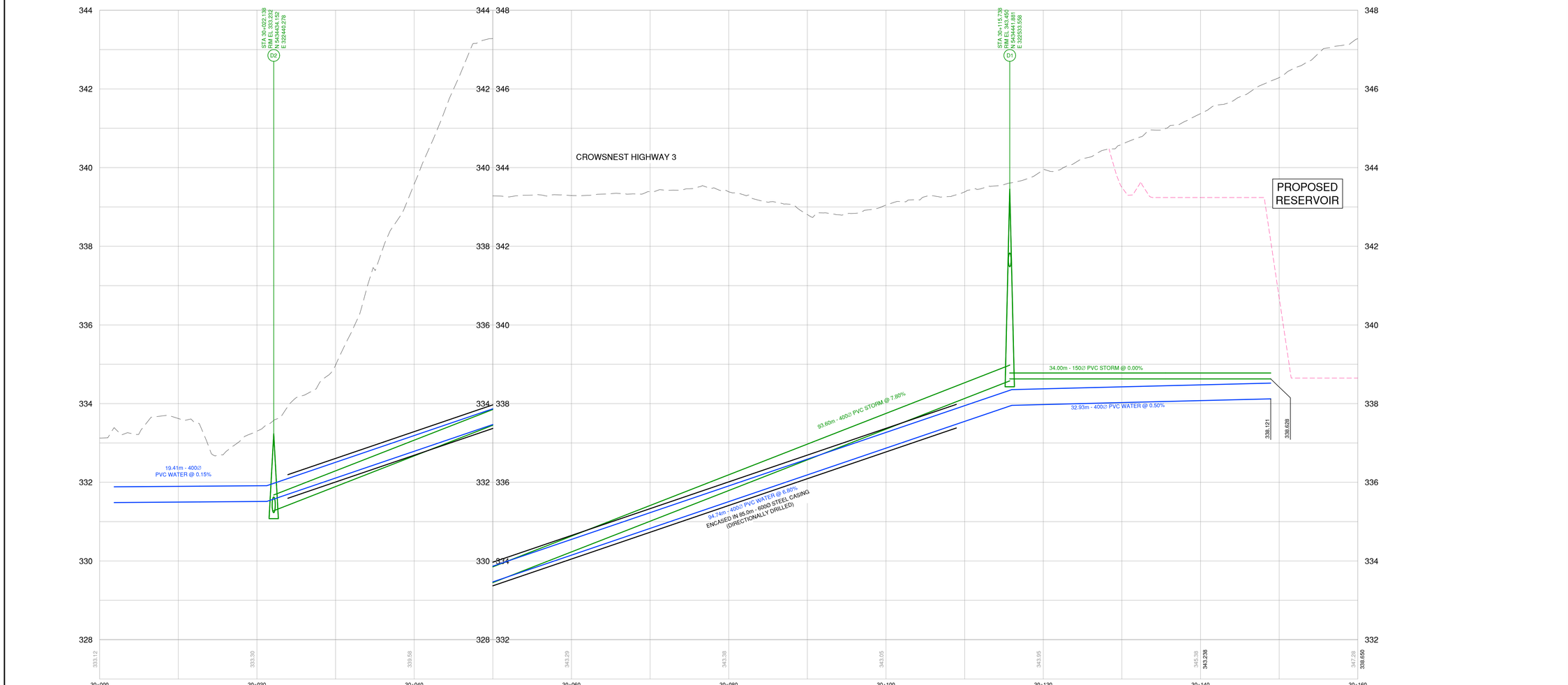
The east sector of Osoyoos is serviced by the 340 reservoir which is located to the west of the Osoyoos Lake crossing. This is not optimal based on the domestic water system layout. For this reason, an east sector reservoir would provide more efficient and resilient fire flows and emergency storage for the east sector. This is especially critical for fire flows to future high density residential, infill residential and commercial developments, and improving deficient fire flows in the SE sector.

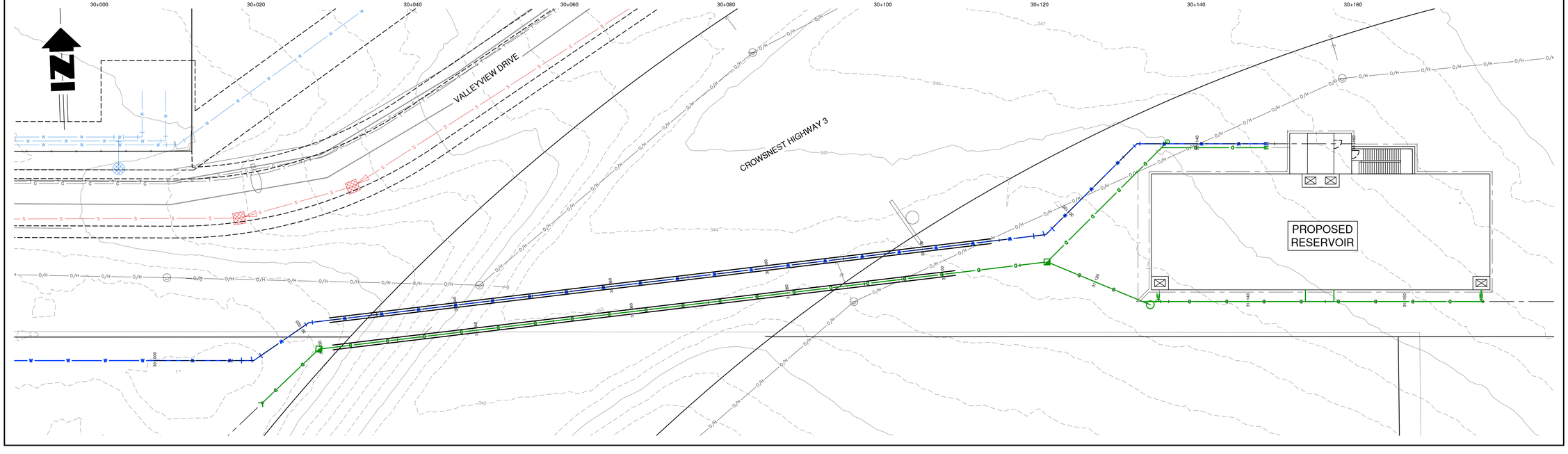
The Osoyoos Indian Band (OIB) is a stake holder in this project because the east reservoir is intended to service OIB development near the south end of Sonora Dunes Golf Course and at Nk'Mips Corner. As such, project implementation will be completed in collaboration with OIB. Also discussed in the East Sector Densification Plan, this reservoir could provide a minimum fire flow of 150 L/s to OIB developments.

Scope

Construction of a 2,550 m^3 concrete reservoir including flow control valves to ensure even reservoir filling between the West and East 340 Reservoirs.

Budgetary Cost Estimate: $5,097,559





No.	DATE	DESCRIPTION	BY	APPD
-	-	-	-	-

ISSUES / REVISIONS

CONSULTANT SEAL

TRUE CONSULTING
2089 Falcon Road ■ Kamloops BC ■ V2C 4J2
tel 250.828.0881 ■ info@true.ca

Osoyoos Indian Band

OSOYOOS RESERVOIR

WATER SUPPLY AND DISTRIBUTION PLAN & PROFILE

SCALE	0 1:250 10
DESIGN BY	DK
DRAWN BY	SPC
DATE	MAY, 2024
PROJECT REFERENCE No.	797-327
PROJECT No.	797-321
SHEET	1 OF X
DRAWING No.	303
ISSUE/REV.	0

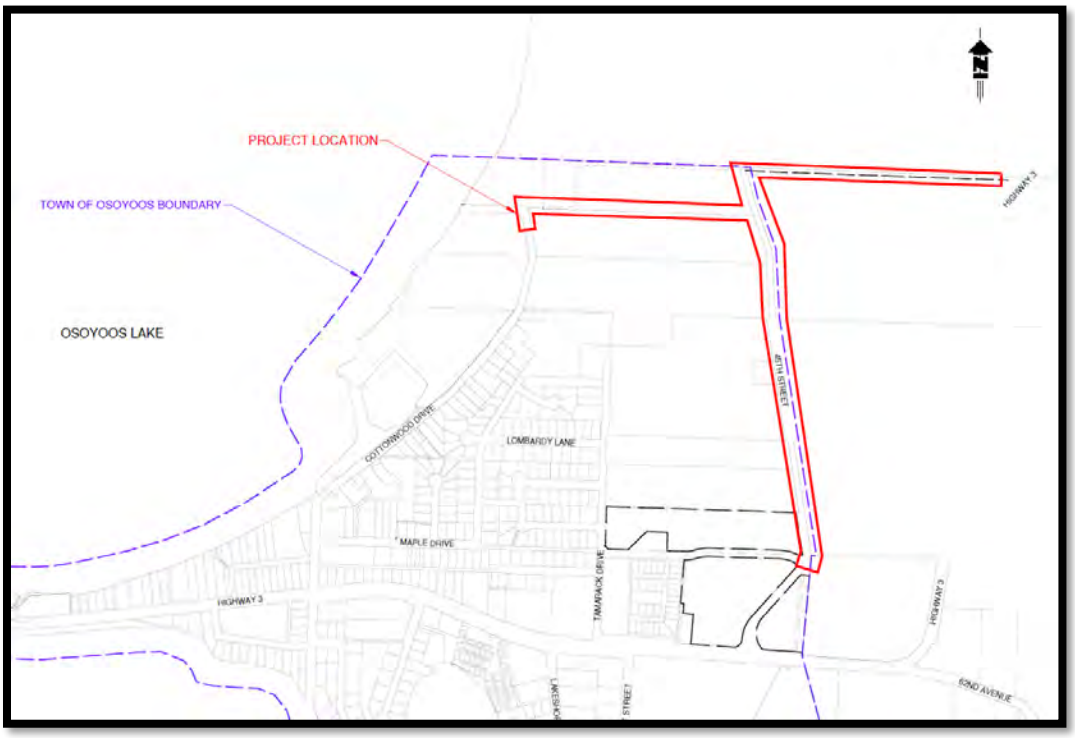
P:\Z_Clients\000-999\797\797-321\03 drawings\autoCAD design drawings\dgn\797-321 reservoir

Project W31: 340 Reservoir Watermain Upgrades

Priority: High **Type:** Upgrade

Trigger: Growth, Future Planning

Location Map



Issue

Supply to and distribution from the east sector reservoir is required. The above configuration ensures a looped system connection which optimizes hydraulic connectivity for the reservoir and for provision of fire flows to the East sector and Southeast sector.

Scope

Work includes installing a 700 m length of 300 mm PVC watermain from the East Sector Reservoir to 45th street, along the boundary of the OIB lands and the potential RDOS expansion area. This project ends at this location because connection to the domestic system can be achieved in two different pathways from this location. For this reason, this project in conjunction with the

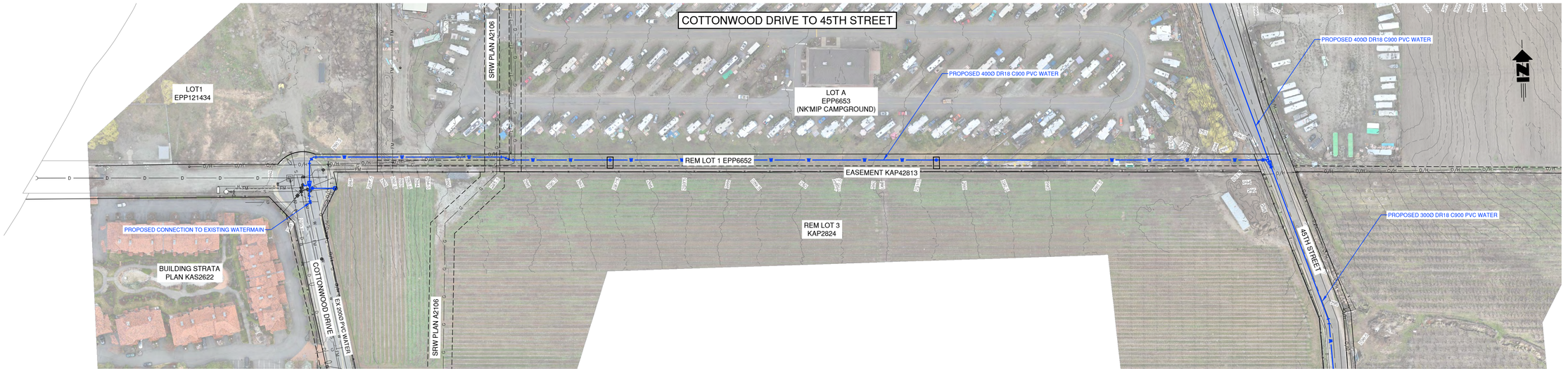
Cottonwood Drive Loop or the Nk'Mip Corner Water connection project must be completed to connect the east sector reservoir to the domestic system.

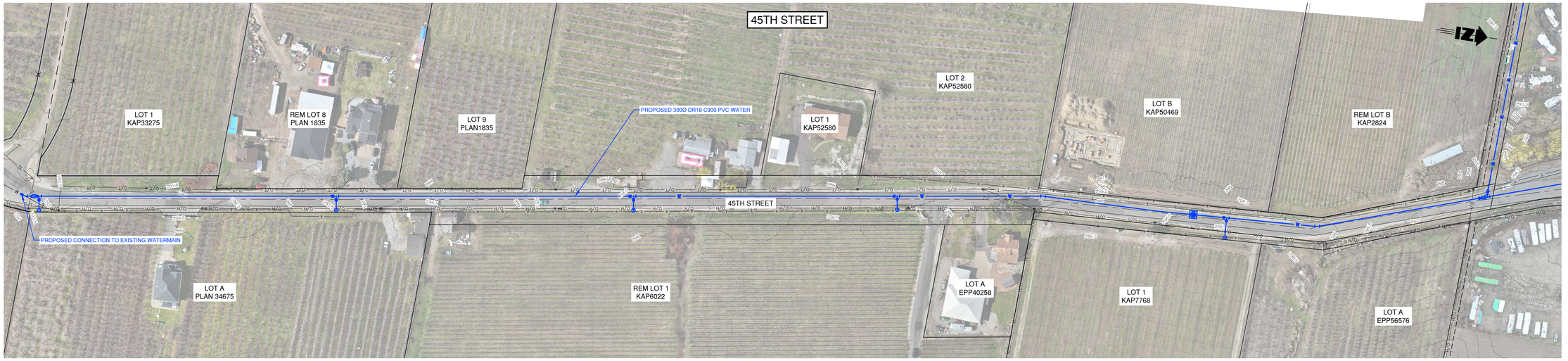
Work includes extending the watermain from 45th Street to Cottonwood Drive (total length of 570 m) and installing a back flow prevention Chamber. This option is the most cost effective to connect the east sector reservoir to the domestic water system.

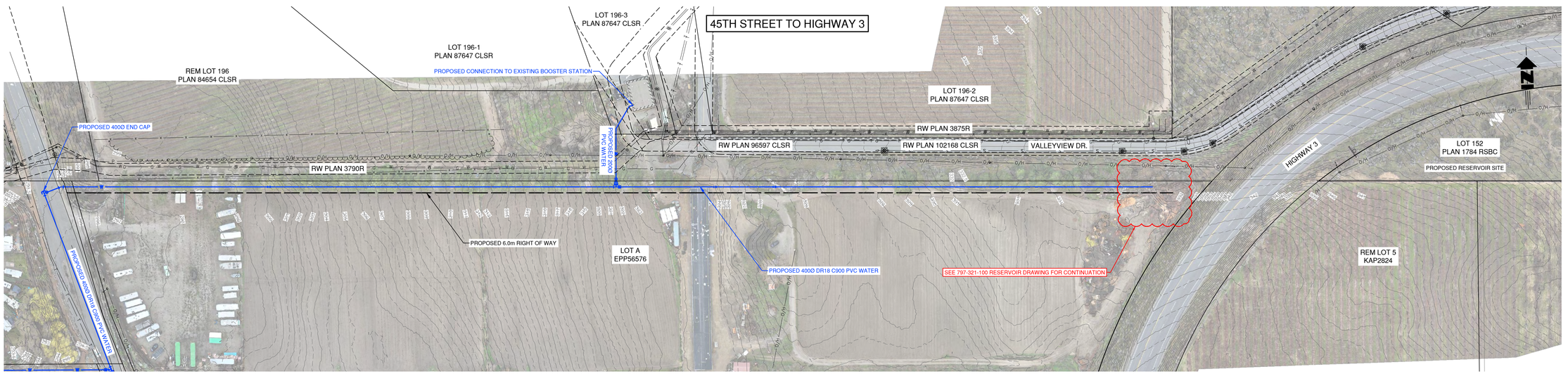
Work includes installing a 850 m, 300 mm PVC water main on 45th Street and connect to the existing system at the south end of 45th Street. This additional connection would provide beneficial system looping.

Cost Estimate (Class D)

DESCRIPTION	TOTAL PAYMENT
Part 1.0 - Removals	**$121,875.00**
Part 2.0 - Water Mains	**$1,414,450.00**
Part 3.0 - Roadworks	**$287,350.00**
Subtotal Parts 1.0 to 3.0	**$1,823,675.00**
Contingency Allowance (30%)	**$547,102.50**
Engineering Services (excluding construction management)	**$12,500.00**
GST (5% of Subtotal and Contingency Allowance)	**$119,163.88**
Total Contract Sum	**$2,502,441.38**







LEGEND

EXISTING	PROPOSED	DESCRIPTION
		ASPHALT ROAD
		GRAVEL ROAD
S	S	SANITARY MAIN
		SANITARY FORCEMAIN
		SANITARY MANHOLE
		SERVICE & IC
D	D	STORM MAIN
		STORM DITCH
		STORM CULVERT
		SERVICE & IC
		STORM MANHOLE
		CB - STD & SIDE INLET
		DRYWELL
W	W	WATER MAIN
		SERVICE & CURB STOP
		VALVE
		STANDPIPE
		HYDRANT
G	G	GAS
P	P	POWER
T	T	TEL
C	C	CABLE
SL	SL	ST LIGHT CONDUIT
		POLE & ANCHOR
		STREET LIGHT
		CONTROL MONUMENT
		IRON POST
		TRAVERSE HUB

No.	DATE	DESCRIPTION	BY	APPD
-	-	-	-	-

ISSUES / REVISIONS

CONSULTANT SEAL

TRUE CONSULTING
2089 Falcon Road ≡ Kamloops BC ≡ V2C 4J2
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Osoyoos Indian Band

340 RESERVOIR WATERMAINS

OVERALL PLAN

SCALE	0 1:1000 50
DESIGN BY	TT/SU
DRAWN BY	MC
DATE	JUNE 2024
PROJECT REFERENCE No.	797-321
PROJECT No.	797-321
SHEET	OF
DRAWING No.	202
ISSUE/REV.	1

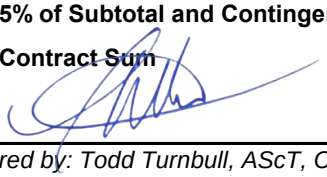
E:\Z_Projects\700\797\797-321\03 drawings\02 design drawings\dgn\797-321-101 watermains

Osoyoos Indian Band
340 Reservoir Water Main Upgrades
Cost Estimate

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 1.0 - REMOVALS					
1.1	Asphalt surface c/w sawcutting	m²	3050	$12.00	$36,600.00
1.2	Concrete curbs c/w sawcutting	m	15	$45.00	$675.00
1.3	Clear and grub to disposal	m²	2800	$18.00	$50,400.00
1.4	Relocation of existing landscaping and features on Nk'mip Campground	m²	730	$40.00	$29,200.00
1.5	Existing water system on Cottonwood Drive consisting of ±24m of 150Ø and 200Ø PVC piping, tee, 2-gate valves, fire hydrant, and reducer	LS			$5,000.00
				Subtotal Part 1.0	**$121,875.00**
PART 2.0 - WATER MAINS					
2.1	Supply and install water main piping				
2.1.1	400Ø DR18 C900 PVC	m	1155	$650.00	$750,750.00
2.1.2	300Ø DR18 C900 PVC	m	740	$450.00	$333,000.00
2.1.3	200Ø DR18 C900 PVC	m	65	$300.00	$19,500.00
2.1.4	150Ø DR18 C900 PVC	m	55	$280.00	$15,400.00
2.2	Appurtenances c/w thrust blocks and Joint Restraints				
2.2.1	400 H x 400F x 400F tee	ea.	3	$7,500.00	$22,500.00
2.2.2	300F x 300H x 150F tee	ea.	5	$3,000.00	$15,000.00
2.2.3	200H x 200F x 150F tee	ea.	1	$2,400.00	$2,400.00
2.2.4	400Ø Gate Valve	ea.	5	$8,000.00	$40,000.00
2.2.5	300Ø Gate Valve	ea.	6	$6,000.00	$36,000.00
2.2.6	200Ø Gate Valve	ea.	2	$2,800.00	$5,600.00
2.2.7	150Ø Gate Valve	ea.	6	$2,500.00	$15,000.00
2.2.8	400Ø bend (11¼° - 90)	ea.	6	$3,000.00	$18,000.00
2.2.9	400Ø 5° PVC bend	ea.	7	$1,500.00	$10,500.00
2.2.10	300Ø bend (11¼° - 90)	ea.	1	$2,100.00	$2,100.00
2.2.11	300Ø 5° PVC bend	ea.	1	$1,200.00	$1,200.00
2.2.12	200Ø bend (11¼° - 90)	ea.	4	$1,800.00	$7,200.00
2.2.13	200Ø 5° PVC bend	ea.	1	$1,000.00	$1,000.00
2.2.14	Fire hydrant assembly	ea.	6	$10,000.00	$60,000.00
2.2.15	Air release chamber	ea.	1	$6,000.00	$6,000.00

ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 2.0 - WATER MAINS - continued					
2.2.16	400F x 300F reducer	ea.	1	$4,000.00	$4,000.00
2.2.17	400F x 200F reducer	ea.	1	$3,700.00	$3,700.00
2.2.18	300F x 200H reducer	ea.	1	$2,000.00	$2,000.00
2.2.19	200F x 400H increaser	ea.	1	$3,700.00	$3,700.00
2.2.20	400Ø blind flange	ea.	1	$3,800.00	$3,800.00
2.2.21	400Ø end cap (temporary)	ea.	1	$1,500.00	$1,500.00
2.2.22	Pipe anchor blocks on the 400Ø main	ea.	14	$1,300.00	$18,200.00
2.3	Locate and tie to existing c/w couplers				
2.3.1	To existing 200Ø PVC water at Cottonwood Drive (STA 20+010) c/w capping for abandonment	LS			$4,000.00
2.3.2	To existing 200Ø PVC water on 45th Street (STA 21+010)	LS			$4,000.00
2.3.3	To existing Booster Station (STA 22+301)	LS			$7,000.00
2.4	Reset existing 200Ø PVC storm stub c/w required fittings (Cottonwood Drive)	m	10	$140.00	$1,400.00
				Subtotal Part 2.0	**$1,414,450.00**
PART 3.0 - ROADWORKS					
3.1	Concrete curb and gutter c/w base gravels	m	15	$280.00	$4,200.00
3.2	Asphalt trench restoration c/w base gravels	m^2	3050	$75.00	$228,750.00
3.3	Utility trench surface restoration c/w hydroseeding	m^2	2800	$10.00	$28,000.00
3.4	Crushed gravel surround at valve locations (±18m^2/ea)	ea.	2	$1,000.00	$2,000.00
3.5	Crushed gravel surface restoration (100mm thickness)	m^2	520	$25.00	$13,000.00
3.6	0.5m width gravel shoulder	l.m.	760	$15.00	$11,400.00
				Subtotal Part 3.0	**$287,350.00**

SUMMARY	
Part 1.0 - Removals	**$121,875.00**
Part 2.0 - Water Mains	**$1,414,450.00**
Part 3.0 - Roadworks	**$287,350.00**
Subtotal Parts 1.0 to 3.0	**$1,823,675.00**
Contingency Allowance (30%)	**$547,102.50**
Engineering Services (excluding construction management)	**$12,500.00**
GST (5% of Subtotal and Contingency Allowance)	**$119,163.88**
Total Contract Sum	**$2,502,441.38**



Prepared by: Todd Turnbull, AScT, CPWI 3

APPENDIX C

Long Range Sanitary Sewer System Expansion Plan

Memorandum

To:	Town of Osoyoos	**From:**	T.R. Underwood, P. Eng.
Attn:	Janette Van Vianen	**cc:**	Barry Romanko/Ron Doucette
Date:	September 12, 2014	**File No.:**	**302-1474**

RE: ***Landfill Area Crown Land***

Attached herewith please find a "discussion paper" on the Long Range Expansion of the Town's Sanitary Sewer System based on reclaimed water irrigation and an illustrative plan. From the discussion paper it is clear that LAR 75 is critical to the long range viability of the reclaimed water system. I am a bit unclear as to the next step. Another meeting with the province with participation of your environmental consultant might be appropriate. This would provide an opportunity to determine the terms of reference for the environmental assessment.

Regards,

T.R. Underwood, P. Eng.

TRU/cab

Enclosures

R:\Clients\300-399\302\302-1474\02 Correspondence\Outgoing\MEMO-Osoyoos-JVV-Landfill Area Crown Land-2014-09-12.docx

September 12, 2014

302-1474

Town of Osoyoos

Long Range Sanitary Sewer System Expansion Plan

DISCUSSION PAPER

Background

Since 1978, the Town of Osoyoos has practiced beneficial re-use (irrigation) for the disposal of treated wastewater. The Town was the first system in British Columbia to use treated wastewater for irrigation on a golf course. In the period 1978 to date, the reclaimed water irrigation system has been expanded onto an additional 27 holes on the Golf Course, a playing field complex in the infield of the Desert Park horseracing track, and ball diamonds. In 2015, reclaimed water will be used to irrigation the playing fields at the Osoyoos Secondary School.

In conjunction with a Liquid Waste Management Plan undertaken in the mid-1980's, it was recognized that the long term viability of the Town's land based reclaimed water re-use strategy for wastewater effluent disposal was dependent on a land base for irrigation purposes. At this time, the Town was encouraged by Provincial Agencies to register reserves on vacant, natural state Crown land in area of the landfill for future "spray irrigation" with treated wastewater effluent. The Town proceeded with registration of reserves over Crown land north and south of the landfill access road for spray irrigation purposes.

Through the 1980's, Provincial Agencies became increasingly aware of the importance of vacant, undeveloped Crown land on the Osoyoos West Bench as natural state habitat. In 1998, the Town of Osoyoos relinquished its reserve on Crown lands located on the south side of the landfill access road to enable the Desert Interpretive Centre to proceed.

The Town currently retains a reserve over a 16.6 ha area of Crown land referred to as LAR 75 (refer to TRUE Drawing No. 302-1474-01) located east of the landfill. The Province has indicated to the Town that more information is required on the expansion of the Town's wastewater disposal systems to justify "continuance" of the reserve on LAR 75. This "Discussion Paper" has the objective of presenting a long range expansion plan for the Town's wastewater treatment and disposal infrastructure to support continuance of the Town's Reserve on LAR 75.

Population and Flow Projections

The Town of Osoyoos wastewater treatment and disposal infrastructure comprises 3 components.

- aerated lagoon treatment system
- winter effluent storage basins
- areas for irrigation with reclaimed water

For a 40 year population projection, i.e. to year 2053, it is anticipated that:

- wastewater treatment capacity expansion will be located at the existing site. No additional land will be required for new or expanded treatment works.
- the existing winter storage basins have adequate capacity for a 20 year projected population. A third winter storage basin will be necessary for the 20 to 40 year horizon.
- the reclaimed water irrigation system will have to be expanded over the next 40 years as the Town grows and/or the service area of the sewer system is expanded into Electoral Area A and Osoyoos IR No. 1.

In 2013, the Town retained Kerr Wood Leidal and Associates (KWL) to undertake a capacity assessment of the Town's sanitary sewer infrastructure. A component of this review was the preparation of short and long term (20 year) projections of the service population of the Town's sanitary sewer system. Projections from the KWL report have been used to determine requirements for winter period reclaimed water storage and irrigation areas.

Winter period storage requirements are determined by the permanent (census) population serviced by the sanitary sewer system. Based on projections in the KWL report to 2033, Table 1 presents permanent (census) population projections to year 2053.

Table 1: Permanent (Census) Population Projections

Year	In Town KWL	In Town Adjusted to Census	Electoral Area A	Total
2013 (1)	4776	4921	288	5209
2018 (1)	4892	5045	623	5668
2023 (1)	5092	5246	948	6194
2033 (1)	5702	5875	1197	7072
2043 (2)	6317	6463	1316	7779
2053 (1)	6956	7168	1460	8628

(1) data to 2033 from KWL. In Town population adjusted to Census
(2) data to 2053 extrapolated from KWL average growth rate for period 2013 to 2033

Table 4.2 suggests that a permanent (census) population of 8628 may be serviced by the Town sewer system by 2053 of which 17% would be within Electoral Area A.

Irrigation area requirements are determined by the total equivalent population serviced by the Town's sanitary sewer system. In this case, wastewater generated by seasonal populations will, unlike winter storage, be reflected in irrigation area requirements. Table 2 is a projection of seasonal maximum population equivalents serviced by the Town's sanitary sewer system.

Table 2: Seasonal Population Equivalents Served by Town Sanitary Sewer System

Year	In Town	Electoral Area A and OIB	Total	Project Annual Volume
2013 (1)	10526	1308	11824 (1)	803,000m^3 (3)
2018	10718	1703	12421 (1)	844,600m^3
2023	11030	2099	13129 (1)	892,700m^3
2033	11997	2490	14487 (2)	985,100m^3
2043			16073 (2)	1,093,000m^3
2053			17734 (2)	1,206,000m^3

(1) from KWL Report
(2) projected based on KWL growth rate for 2013 to 2033
(3) Actual Annual Volume for 2013

Irrigation Area Requirements

Irrigation area requirements have been derived on the basis of historical data for the golf course. From annual reports submitted to the Ministry of Environment, historical application rates are summarized following.

Reclaimed Water Irrigation Rates on Golf Course	
2009	1.02 m
2010	0.91m
2011	0.99 m
2012	0.93 m
2013	1.00 m

Irrigation area requirements are based on an application rate of 1.0m. This design application rate modestly underestimates the land requirements. In a "wetter than normal" season, it is assumed that surplus reclaimed water quantities would be disposed of by infiltration.

Table 2 provides a projection of annual wastewater volumes. From these annual volume projections, irrigation area requirements are summarized in Table 3.

Table 3: Reclaimed Water Irrigation Area Projections

Year	Projected Annual Volume	Irrigation Area Required
2013	803,000 m^3	75.3 ha
2018	844,600 m^3	79.4 ha
2023	892,700 m^3	84.3 ha
2033	985,100 m^3	93.5 ha
2043	1,093,000 m^3	104.3 ha
2054	1,206,000 m^3	115.6 ha

Drawing 302-1474-01 illustrates existing areas irrigated with reclaimed water and opportunities for expansion in the future. The areas illustrated on drawing 302-1474-01 are briefly summarized as follows.

Existing Reclaimed Water Irrigation Area

(1) Golf Course		65.5 ha
(2) Ball Diamonds		2.4 ha
(3) Desert Park Infield		5.0 ha
(4) Secondary School (start 2015)		3.8 ha
	Total Existing	76.8 ha

Expansion Area Opportunities

(1)	Parcel South of Secondary School (Rem 1003 Plan 31183). Previously used as a site for sludge containment and drying tubes. Community Plan designation is institutional.	3.5 ha
(2)	South End of Desert Park. Supply infrastructure is in place and irrigation system design has been prepared. Project on hold awaiting better understanding of Desert Park expansion plans. Previously cleared and graded. OCP designation is parks and recreation.	1.5 ha
(3)	East Side of Desert Park Site. Generally natural state habitat. High environmental sensitivity designation in OCP.	4.8 ha
(4)	Crown Land west of Desert Park Site. Identified as not sensitive in OCP with a parks and recreation use designation. Not likely to be well received by some residents in Dividend Ridge.	3 ha
(5)	Airport Site. Available land area depends on future land use. Minimum land area assumed to be 10% of parcel area as a DP landscaping requirement.	1.5 ha
(6)	LAR 75 East of Landfill. This parcel is currently utilized for cattle grazing in the spring. Town has Reserve on parcel for “spray irrigation”.	16.6
	Expansion Opportunities Total	30.9 ha
	Total Existing and Opportunities	107.7 ha

The above total of 107.7 ha is only 8 ha less than the 40 year projected requirement of 115.6 ha. LAR 75 at the landfill represents more than 50% of the expansion opportunity and is therefore of critical importance to the long term viability of the Town’s reclaimed water irrigation system.

Other potential opportunities for future use reclaimed water are:

- industrial uses, i.e. concrete manufacture, cooling, etc.
- expanded irrigation on the Desert 18 of the golf course.
- irrigation of vineyards north of the airport site.
- irrigation of vineyards or other grassland type cover on completed areas of the landfill site.

Winter Effluent Storage

Future requirements for winter storage are based on actual utilization of the existing winter storage reservoirs and permanent population projections presented in Table 1. Historical winter storage utilization is summarized following.

Storage Period	Storage Volume Utilized
2009 – 2010	253,000 m^3
2010 – 2011	273,000 m^3
2011 – 2012	262,000 m^3
2012 – 2013	259,000 m^3

Utilization in the 2010 to 2011 winter period of 273,000 m^3 equates to 56m^3/capita. On this basis, winter storage projections are based on a requirement of 60m^3/capita.

In addition to storage for the winter period, typically mid-October to the end of March, the Town's Operating Certificate as issued by the Ministry of Environment, specifies that wastewater has to be retained for a minimum of 60 days. It is assumed that the 60 day storage period would be calculated based on the average daily inflow to the system.

Storage requirement projections for 2033 and 2053 permanent population horizons are:

	2033	2053
Permanent (Census) Population	7072	8628
60 Days Storage	162,000 m^3	198,000 m^3
Winter Storage Required @ 60m^3/capita	424,000 m^3	517,000 m^3
Total Required	586,000 m^3	715,000 m^3
(less) Existing	570,000 m^3	570,000 m^3
Additional Storage Required	Existing Adequate	145,000 m^3

A storage pond having a capacity of 150,000m^3 will have a footprint of 3 to 3.5 ha depending on the design water depth. The landfill area is considered as the only feasible area for siting of a third winter storage pond. There are no sites 3 to 3.5 ha in size on the West Bench area within Town boundaries which are considered potentially suitable for a winter effluent storage reservoir.

As shown on drawing 302-1474-01, two site options are considered as potentially suitable for a winter effluent storage reservoir in the area of the landfill. The site options are described as follows.

- gravel pit accessed from Highway 3 located at the south boundary of the Desert Interpretive Centre site. The operating status of the gravel pit is unknown however pits represent good sites for storage reservoir. Existing excavations and side slopes can be incorporated into the storage reservoir design. In the review process by the province of LAR parcels in the landfill area in 2007, inquiries were made as to the Town's potential interest in the gravel pit.
- western portion of LAR 75 adjoining the landfill site. Previously prepared long range system expansion plans illustrated a third winter storage reservoir at this location. A major disadvantage of this site is that the storage reservoir footprint would occupy about 3.5 ha of irrigable land. An advantage of the site is that excavation from the winter storage reservoir could be used for cover at the landfill.

Prepared by:

T.R. Underwood, P. Eng.

WILLOW BEACH
EX 95th STREET LIFT STATION
EX SCALES LIFT STATION
EX INKANEEP POINT LIFT STATION
EX ROBERTS POINT LIFT STATION
INKANEEP POINT
ROBERTS POINT
REFLECTION POINT
EX 81st STREET LIFT STATION
OSOYOOS TOWN BOUNDARY
EX LACEY POINT LIFT STATION
LACEY POINT
OSOYOOS LAKE
HWY 97
91st ST
CEMETERY
176th AVE
LAR 75
SITE OPTION FOR FUTURE WINTER STORAGE
LANDFILL
6
OLD RICHTER PASS RD.
146th AVE
HWY 3
DESERT INTERPRETIVE CENTER
APPROXIMATE LEASE BOUNDARY
SITE OPTION FOR FUTURE WINTER STORAGE
LAR 76 GRAVEL PIT
FUTURE RECLAIMED WATER SUPPLY MAIN (300Ø PVC)
D.L. 664s
L.915
L.2115
L.1714
1.5 ha.
AIRPORT
5
MAIN ST
97 ST
LIONS PARK
MUSEUM
PIONEER PARK
PIONEER WALKWAY
TOWN OF OSOYOOS
OSOYOOS ELEMENTARY SCHOOL
FUTURE RECLAIMED WATER SUPPLY MAIN (300Ø PVC)
74th AVE
SUN BOWL ARENA
LEGION BEACH
EX TOWN MAIN LIFT
EX GRAVITY SEWER AND 300Ø RECLAIMED WATER SUPPLY MAIN
CONNECT TO EX 300Ø RECLAIMED WATER SUPPLY
62nd AVE
BALL DIAMONDS
EX RECLAIMED WATER IRRIGATION BOOSTER STATION
FUTURE RECLAIMED WATER SUPPLY MAIN UPGRADE TO 400Ø PVC
EX FORCEMAIN
HAYNES POINT
OSOYOOS SECONDARY SCHOOL
EX 200Ø
200Ø
EX 400Ø
115th STREET
EX RECLAIMED WATER SUPPLY MAIN TO SCHOOL
1
OSOYOOS TOWN BOUNDARY
EX 400Ø RECLAIMED WATER SUPPLY MAIN
EX SEWAGE TREATMENT CELLS
EX CHLORINE CONTACT CHAMBER
EX WINTER STORAGE
OSOYOOS GOLF AND COUNTRY CLUB
REBBLE BEIGHT DR.
DESERT PARK
3
2
4
GOLF COURSE DR.
L.3311s
L.2677
L.1902
L.3556s
L.3557
L.3204
L.2468
L.1899
L.1591
L.1589
L.3559
L.3558
L.2395
L.1898
L.2672
HWY 97

LEGEND

- RECLAIMED WATER SUPPLY MAIN
- FORCEMAIN
- EX RECLAIMED WATER IRRIGATION AREAS
- RECLAIMED WATER EXPANSION AREAS

No.	DATE	DESCRIPTION	BY	APP'D

ISSUES / REVISIONS

CONSULTANT SEAL

TRUE CONSULTING
201 - 2079 Falcon Road ■ Kamloops BC ■ V2C 4J2
tel 250.828.0881 ■ fax 250.828.0717
info@TRUE.bc.ca

TOWN OF OSOYOOS

RECLAIMED WATER SYSTEM

SYSTEM EXPANSION PLAN

SCALE	Scale 1:10,000
DESIGN BY	TRU
DRAWN BY	EB
DATE	AUG 2014
PROJECT REFERENCE No.	302-1473
DRAWING No.	302-1474-01
SHEET	OF
REVISION	

FILE: c:\admin\300\302\302-1474\01-drawings\cad\02-design drawings\302-1474

APPENDIX D

Sanitary Sewer System Model Results

TOWN OF OSOYOOS
25% SSMUH SANITARY MODEL RESULTS

DESIGN BY: AM	
SCALE: NTS	
DWG NO.: SK1 302-185	REV:
DRAWN BY: AM	
DATE: OCT 2024	

FILE:r:\clients\300-399\302\302-185\03 drawings\cad\02 design drawings\dn-302-185-ssmuh sanitary model results.dwg

APPENDIX E

Sanitary Sewer System Project Sheets

Project: S18 - Cottonwood Drive Trunk Main Upsize

Priority: Medium **Type:** Growth

Trigger: Development

Location

Along Cottonwood Drive near the Sage Pub and on Ponderosa drive near the Falcon Resort. A complete set of design drawings can be seen in the drawing package 797-321.

Issue

Under current PWWF conditions, the Cottonwood trunk main is undersized. Future proposed development both within the Town boundary as well as on OIB lands further overload the existing pipe.

Scope

Approximately 540 meters of existing 250mm PVC pipe will be required to be upsized to 375mm PVC to accommodate future flows from both the Town and additional OIB development.

Cost Estimate (Class B)

DESCRIPTION	TOTAL PAYMENT
Part 1.0 - Removals	**$81,715.00**
Part 2.0 - Water System	**$395,860.00**
Part 3.0 - Roadworks	**$282,925.00**
Subtotal Parts 1.0 to 3.0	**$760,500.00**
Contingency & Engineering (25%)	**$190,125.00**
Total Contract Sum	**$950,625.00**

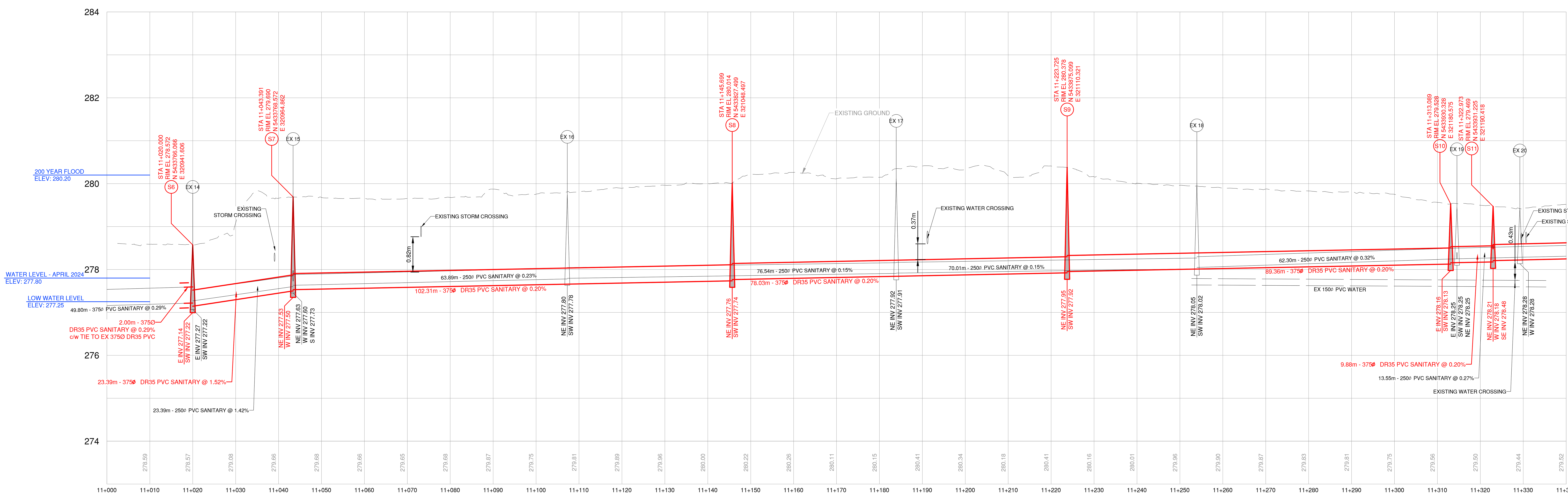
Osoyoos Indian Band
340 Reservoir Sanitary Sewer Upgrades
Cost Estimate

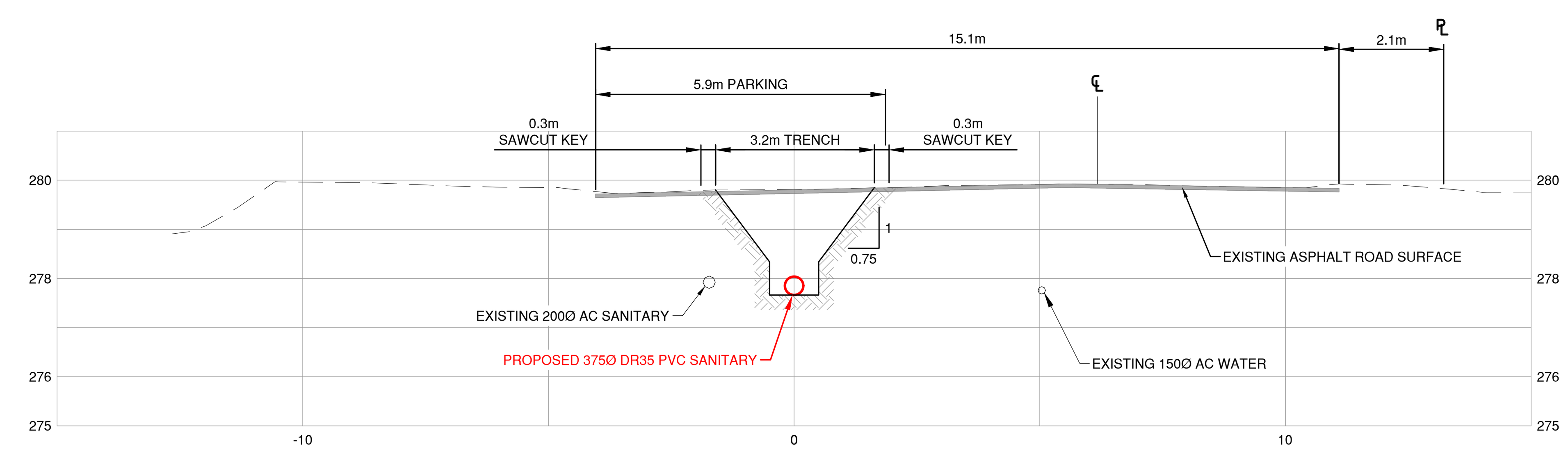
ITEM	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PAYMENT
PART 1.0 - REMOVALS					
1.1	Asphalt surfaces c/w sawcutting	m²	2105	$8.00	$16,840.00
1.2	Concrete surfaces c/w sawcutting				
1.2.1	Curbs	m	180	$30.00	$5,400.00
1.2.2	Sidewalks & Driveways	m²	180	$30.00	$5,400.00
1.2.3	Clearing & Grubing	m²	215	$15.00	$3,225.00
1.3	Existing Sanitary System				
1.3.1	1050Ø Manhole	ea	9	$2,000.00	$18,000.00
1.3.2	250Ø PVC piping	m	215	$150.00	$32,250.00
1.3.3	150Ø PVC piping	m	5	$120.00	$600.00
				Subtotal Part 1.0	**$81,715.00**
PART 2.0 - Sanitary System					
2.1	Supply & Install Piping c/w Class B Bedding				
2.1.1	375Ø DR35 PVC	m	530	$500.00	$265,000.00
2.1.2	150Ø C900 DR18 PVC	m	5	$240.00	$1,200.00
2.1.4	Wrapped Joints per Ministry Guidelines	m	34	$200.00	$6,800.00
2.1.5	Hydraulic Barrier per Ministry Guidelines	m	54	$150.00	$8,100.00
2.2	1050Ø Manholes				
2.2.1	Base, Lid, Fram & Cover	ea	9	$6,000.00	$54,000.00
2.2.1	Precast barrel Sections	vm	12.8	$1,200.00	$15,360.00
2.3	Sanitary Services				
2.3.1	Tied to Manhole	ea	2	$600.00	$1,200.00
2.3.2	Tied to Main c/w Fittings	ea	21	$1,200.00	$25,200.00
2.4	Locate & Tie to Existing c/w Couplers				
2.4.1	To Existing 375Ø PVC (Sta 11+020)	ea	1	$5,000.00	$5,000.00
2.4.2	To Existing 150Ø PVC Forcemain (Sta 11+558) c/w Fittings	ea	1	$2,500.00	$2,500.00

2.5	Watermain Crossings c/w Piping & Couplers	ea	2	$2,000.00	$4,000.00
2.6	Dewatering Allowances	L.S.	1	$7,500.00	$7,500.00
				Subtotal Part 2.0	**$395,860.00**
PART 3.0 - ROADWORKS					
3.1	Standard Curb & Gutter c/w Base Gravels	m	180	$280.00	$50,400.00
3.2	Concrete Sidewalk c/w Base Gravels				
	3.2.1 Concrete Sidewalk	m²	180	$250.00	$45,000.00
3.3	Trench Restoration c/w Base Gravels				
	& 75mm of Hot-Mix Asphalt	m²	2105	$85.00	$178,925.00
3.4	Boulevard Restoration	m²	215	$40.00	$8,600.00
				Subtotal Part 3.0	**$282,925.00**

SUMMARY	
Part 1.0 - Removals	**$81,715.00**
Part 2.0 - Water System	**$395,860.00**
Part 3.0 - Roadworks	**$282,925.00**
Subtotal Parts 1.0 to 3.0	**$760,500.00**
Contingency & Engineering (25%)	**$190,125.00**
Total Contract Sum	**$950,625.00**

Prepared by: Todd Turnbull, AScT, CPWI 3





SECTION 11+110
C / 105 — 1:100

NOTES:

1. EXISTING SANITARY SEWER SERVICE LOCATIONS ARE APPROXIMATE.
2. CONTRACTOR TO CONDUCT PRE-CONSTRUCTION CCTV INSPECTION c/w REPORTING TO CONFIRM EXISTING SANITARY SEWER SERVICE LOCATIONS FOR TIE-IN PURPOSES.
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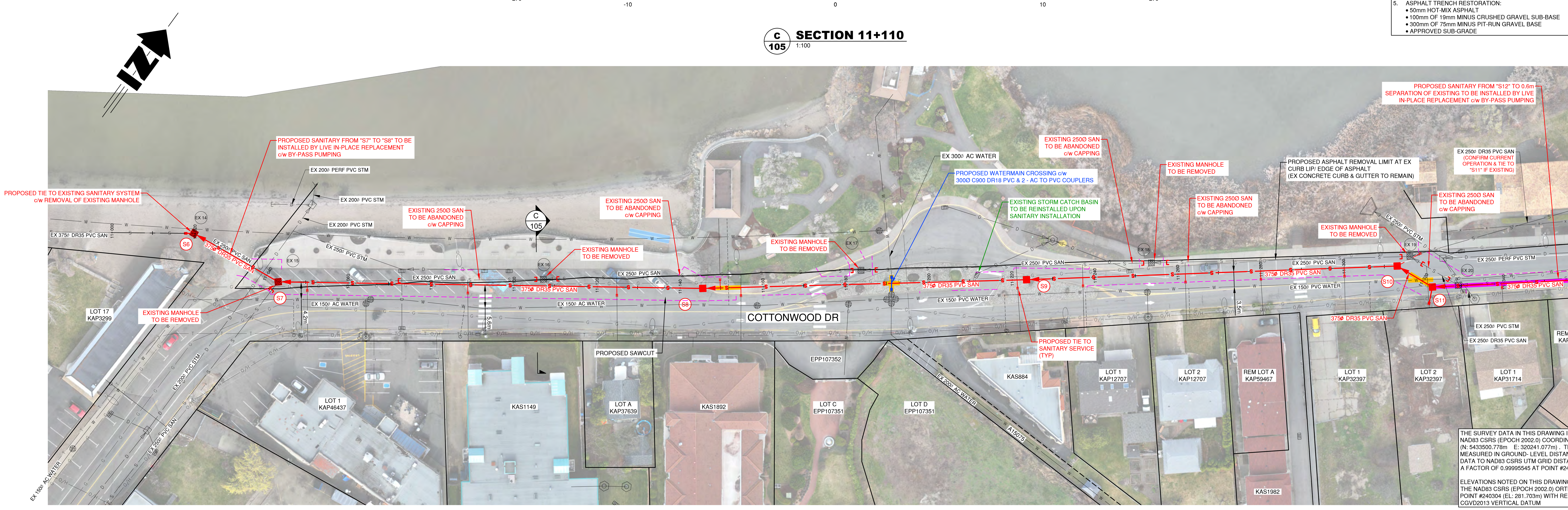
4. SUPPLY & INSTALL CONTINUOUS HYDRAULIC BARRIER BETWEEN SANITARY SEWER & WATER MAIN PER MINISTRY OF HEALTH GUIDELINES WHERE 3m SEPARATION NOT ACHIEVABLE ( ).
5. ASPHALT TRENCH RESTORATION:
   - 50mm HOT-MIX ASPHALT
   - 100mm OF 19mm MINUS CRUSHED GRAVEL SUB-BASE
   - 300mm OF 75mm MINUS PIT-RUN GRAVEL BASE
   - APPROVED SUB-GRADE



THE SURVEY DATA IN THIS DRAWING IS DERIVED FROM THE NAD83 CSRS (EPOCH 2002.0) COORDINATE OF POINT #240304 (N: 5433500.778m E: 320241.077m) . THE SURVEY DATA WAS MEASURED IN GROUND- LEVEL DISTANCES, TO CONVERT DATA TO NAD83 CSRS UTM GRID DISTANCES, SCALE DATA BY A FACTOR OF 0.99995545 AT POINT #240304.

ELEVATIONS NOTED ON THIS DRAWING ARE DERIVED FROM THE NAD83 CSRS (EPOCH 2002.0) ORTHOMETRIC HEIGHT OF POINT #240304 (EL: 281.703m) WITH REFERENCE TO THE CGVD2013 VERTICAL DATUM

LEGEND

EXISTING / PROPOSED / DESCRIPTION

ASPHALT ROAD; GRAVEL ROAD; SANITARY MAIN; SANITARY FORCEMAIN; SANITARY MANHOLE; SERVICE & IC; STORM MAIN; STORM DITCH; STORM CULVERT; SERVICE & IC; STORM MANHOLE; CB - STD & SIDE INLET; DRYWELL; WATER MAIN; SERVICE & CURB STOP; VALVE; STANDPIPE; HYDRANT; GAS; POWER; TEL; CABLE; ST LIGHT CONDUIT; POLE & ANCHOR; STREET LIGHT; CONTROL MONUMENT; IRON POST; TRAVERSE HUB; OVERHEAD POWER; OVERHEAD TELUS

No.	DATE	DESCRIPTION	BY	APP'D

ISSUES / REVISIONS

CONSULTANT SEAL

TRUE CONSULTING

2089 Falcon Road ▪ Kamloops BC ▪ V2C 4J2
tel 250.828.0881 ▪ info@true.ca

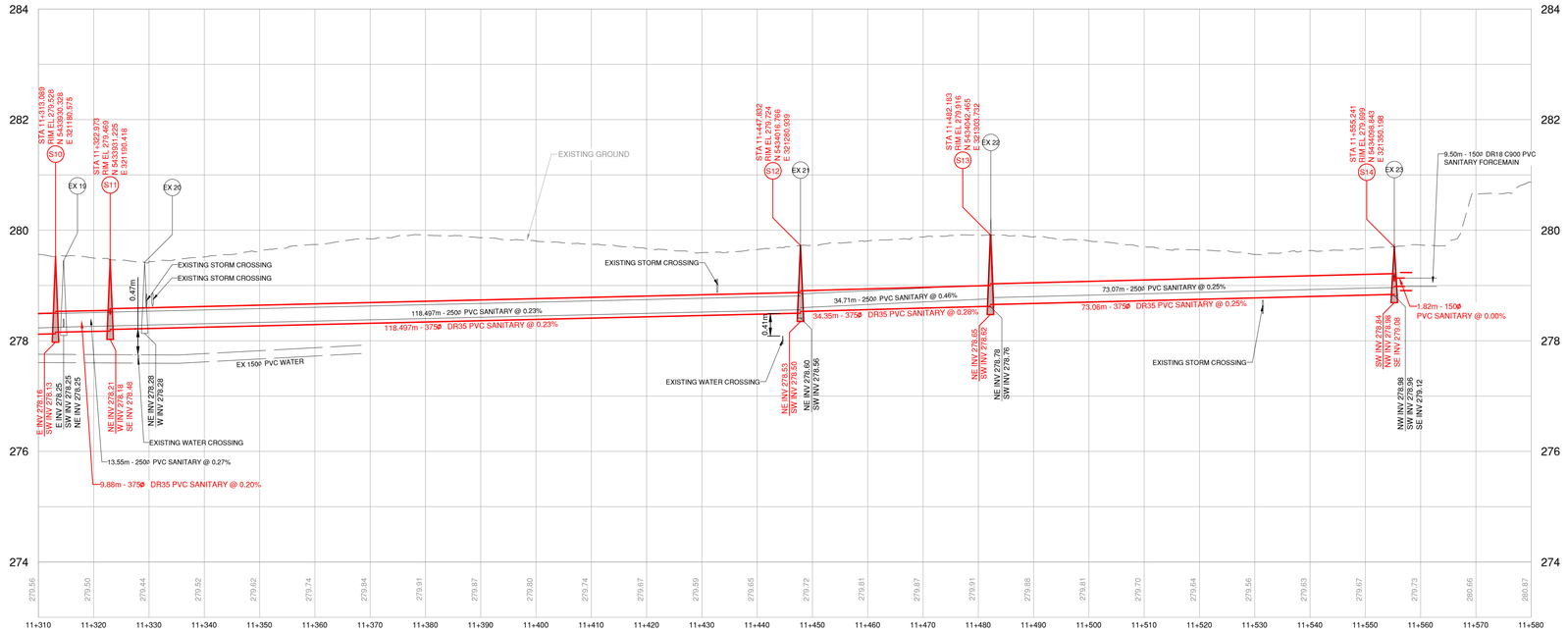
Osoyoos Indian Band

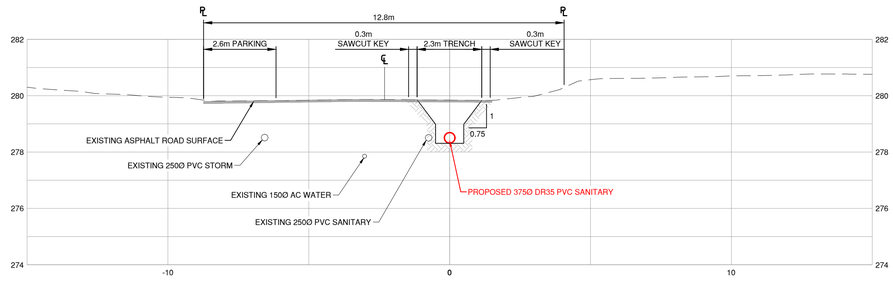
340 RESERVOIR SANITARY SEWER UPGRADES

COTTONWOOD DR PLAN & PROFILE STATION 11+000 TO 11+340

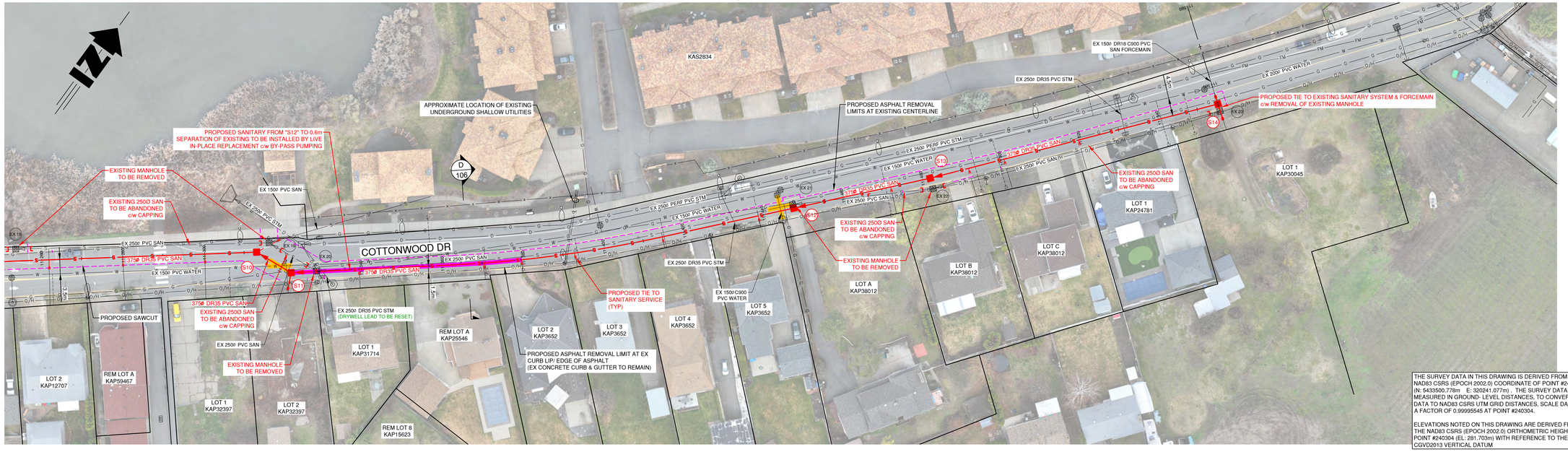
SCALE	H - 1:500 (0–25); V - 1:50 (0–2.5)
DESIGN BY	OWL
DRAWN BY	OWL
DATE	MAY 30, 2024
PROJECT REFERENCE No.	797-321
PROJECT No.	797-321
SHEET	OF
DRAWING No.	105
ISSUE/REV.	1

FILE: r:\clients\700-799\797\797-321\03 drawings\cad\02 design drawings\dn-797-321 sanitary mains





D 106 **SECTION 11+370**
1:100



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LEGEND

EXISTING	PROPOSED	DESCRIPTION
		ASPHALT ROAD
		GRAVEL ROAD
S	S	SANITARY MAIN
		SANITARY FORCEMAIN
		SANITARY MANHOLE
		SERVICE & IC
D	D	STORM MAIN
		STORM DITCH
		STORM CULVERT
		SERVICE & IC
		STORM MANHOLE
		CB - STD & SIDE INLET
		DRYWELL
W	W	WATER MAIN
		SERVICE & CURB STOP
		VALVE
		STANDPIPE
		HYDRANT
G	G	GAS
P	P	POWER
T	T	TEL
C	C	CABLE
SL	SL	ST LIGHT CONDUIT
		POLE & ANCHOR
		STREET LIGHT
		CONTROL MONUMENT
		IRON POST
		TRAVERSE HUB
O/H	O/H	OVERHEAD POWER
O/T	O/T	OVERHEAD TELUS

No.	DATE	DESCRIPTION	BY	APP'D
-	-	-	-	-

ISSUES / REVISIONS

CONSULTANT SEAL

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Osoyoos Indian Band

340 RESERVOIR SANITARY SEWER UPGRADES

COTTONWOOD DR PLAN & PROFILE STATION 11+340 TO 11+580

SCALE	H - 1:500 (0 25) / V - 1:50 (0 2.5)
DESIGN BY	OWL
DRAWN BY	OWL
DATE	MAY 30, 2024
PROJECT REFERENCE No.	797-321
PROJECT No.	797-321
SHEET	OF
DRAWING No.	106
ISSUE/REV.	1

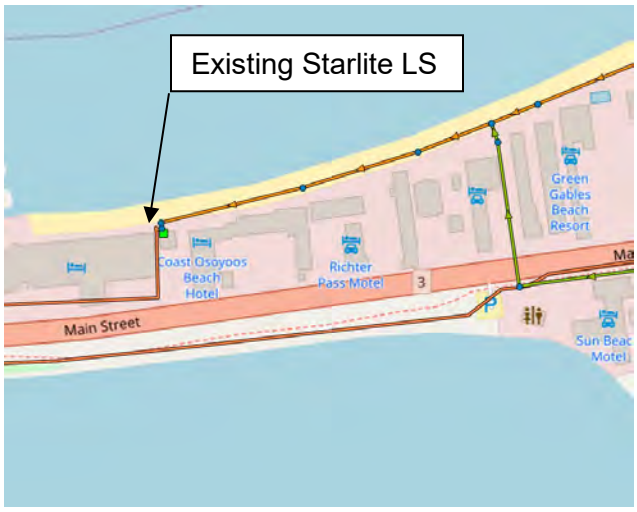
FILE: c:\owl\797\797-321\03 drawings\cad\02 design drawings\dwg\797-321 sanitary mains

Project: S36 - Starlite Lift Station Relocation

Priority: Low **Type:** Growth

Trigger: Development

Location Map



Issue

Eventually, the Starlite Lift Station will be relocated. Refer to the TRUE Report *2023 Starlite Relocation Assessment* for further information.

Scope

Lift station and associated infrastructure to be relocated.

Cost Estimate (Class B)

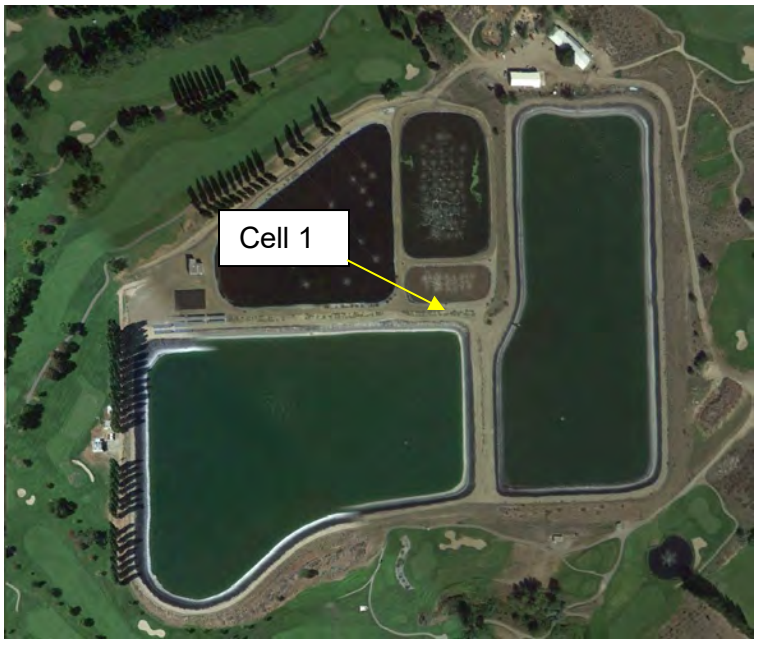
$3,700,000

Project: S38 – Cell 1 Process Upgrade

Priority: Medium **Type:** Growth

Trigger: Development

Location



Issue

Future flows and regulatory requirements will require treatment upgrades. Currently, it is anticipated that Cell 1 will be converted into a Moving Bed Biofilm Reactor to limit the need for sludge recirculation, however other processes may be pursued.

Scope

Convert Cell 1 to a MBBR including air piping and supply upgrades.

Cost Estimate (Class B)

$3,300,000

302-2051
9-Oct-24

Town of Osoyoos
S38 - Cell 1 Process Upgrade
Class 'B' Cost Estimate

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	TOTAL PRICE
S38 - Cell 1 Process Upgrade					
1.1	Wastewater System Components				
	400 m³ concrete tanks	L.S.	1	$650,000	$650,000
	Coarse bubble aeration system	L.S.	1	$1,450,000	$1,450,000
	Additional blower capacity	L.S.	1	$250,000	$250,000
	Additional air piping	L.S.	1	$130,000	$130,000
	Additional WWTP pipe network	L.S.	1	$125,000	$125,000
	Allowance for Archaeology	L.S.	1	$40,000	$40,000
				Subtotal	**$2,645,000**
				Engineering and Contingency (25%)	$661,000
				TOTAL	**$3,306,000**

APPENDIX A

Interior Health Authority Well #7 Letter

302-2051
9-Oct-24

Town of Osoyoos
S38 - Cell 1 Process Upgrade
Class 'B' Cost Estimate

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