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Groundwater Feasibility Assessment Report
1750 Hwy 3, Osoyoos, B.C.

Prepared for:

Mr. Steinar Johnsen
220-2450 Radio Tower Road
Osoyoos, BC
V0H 1T1

October 2022
Project: 21-090-01VR

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October 28, 2022

Mr. Steinar Johnsen
220-2450 Radio Tower Road
Osoyoos, BC
V0H 1T1

Re: Groundwater Feasibility Assessment Report: OCP / Rezoning of 1750 Highway 3, Osoyoos, B.C.

Western Water Associates Ltd. (WWAL) is pleased to provide this groundwater feasibility assessment to support Official Community Plan and Zoning Bylaw Amendments for the property located at 1750 Hwy 3 near Osoyoos, BC. If the amendments are approved, the plan is to complete a 5-lot subdivision.

This report documents a pumping test conducted on a new domestic water supply test well (WPID 62040) while observing aquifer response in existing onsite and offsite wells in the vicinity. This 150 mm (6") diameter drilled well was completed to a depth of 122 m (400 ft), encountered bedrock at 5.5 m (18 ft) below grade, and is interpreted as drawing water from provincially mapped bedrock Aquifer 808.

The tested well was pumped at a flow rate of 8 L/min (2.1 USgpm) for 72 hours, comparable to five times the Regional District of Okanagan Similkameen (RDOS) Subdivision Servicing bylaw rate[1], to stress the aquifer and simulate the effect of groundwater withdrawal of the subdivision at full build out. Offsite wells were monitored during the testing program and the report includes a discussion of the aquifer water balance as requested by the Regional District of Okanagan Similkameen.

A raw water quality sample was collected from the well and submitted for analysis. The raw well water is considered potable, meeting the applicable health-based Guidelines for Canadian Drinking Water Quality.

Based on our assessment, the bedrock formation beneath the proposed subdivision has demonstrated sufficient water is available to supply the proposed development at full build-out. Subsequent drilling and testing of the remaining wells for the proposed subdivision will be required and subject to evaluation against the RDOS subdivision servicing bylaw requirements.

We trust that the professional opinions and advice presented in this document are sufficient for your current requirements. Should you have any questions, or if we can be of further assistance in this matter, please contact the undersigned.

WESTERN WATER ASSOCIATES LTD.
(EGBC Permit to Practice No. 1001419)

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[1] RDOS Subdivision Servicing Bylaw Rate of 2,300 L/day x 5 lots = 11,500 L/day or 2.1 USgpm.

TABLE OF CONTENTS

List of Figures (following report)

List of Tables

List of Appendices

1. INTRODUCTION

At the request of the developer, Mr. Steinar Johnsen, Western Water Associates Ltd. (WWAL) has completed a groundwater feasibility assessment for a proposed 5-lot subdivision, located at 1750 Highway 3, Osoyoos, BC (the Site) (Figure 1). This report summarizes the bedrock aquifer attributes at the site and presents the results of a pumping test completed on an existing well, analysis of sustainable well yield, discussion of well interference with neighboring wells, and water quality testing of the pumped well.

1.1 Project Background

The site is located approximately 2 km east of Osoyoos, BC, situated along the steep western-facing embankment overlooking Highway 3. The site (PID 002-165-481) is comprised of Bareland Strata Lot 15 of Plan KAP21789, District Lot 2709, Sublot 2, Similkameen Division of the Yale Land District except Plan KAP90322.

The 31-acre parcel is located downslope and west of the Regal Ridge residential development located on the Anarchist Mountain highlands to the east. Plans for development of this lot include five approximately 2.5-acre residential lots on the western portion of the site, with the 14-acre remainder lot upslope to the east being set aside as a conservation area (Figure 2).

A review of bedrock wells in the vicinity of the site indicated that the depth to bedrock in this area can be quite variable, with bedrock outcrop observed onsite. Further, the well yields in this area can also vary, with lower producing (< 2 USgpm) wells located along the face of the bluff, and higher producing wells located downslope toward the west (in the valley bottom Aquifer #194) and upslope to the east (in the Osoyoos Mountain Estates Aquifer #808).

Two existing groundwater wells were identified onsite at the time of our assessment, as well as two offsite wells on the adjacent property (1806 Hwy 3), and select details for these wells are provided in Table 1.1

Table 1.1 Select Well Details

Well Information	WTN 105407 (WPID 27891)	WTN 124408 (WPID 62040)	WTN 84786 (Driveway Well)	WTN 69157 (Goat Paddock)
Well Location	Onsite, south adjacent to access driveway	Onsite, north, eastern portion of Lot 5	Offsite, west, adjacent to driveway for 1806 Hwy 3.	Offsite west, adjacent to goat paddock at 1806 Hwy 3.
Date drilling completed	June 30, 2009	April 30, 2021	March 30, 2005	May 27, 1995
Drilling company	Cyclone Drilling Ltd.	Aqua Source Drilling Ltd.	Cyclone Drilling Ltd.	Quality Water Well Drilling Ltd.
Borehole diameter	150 mm (6 inch) 100 mm (4 inch) liner	150 mm (6 inch) 100 mm (4 inch) liner	150 mm (6 inch) 100 mm (4 inch) liner	150 mm (6 inch) unlined[2]
Total Depth (bgs)	55 m (180 ft)	122 m (400 ft)	158 m (520 ft)	155 m (510 ft)
Casing stick-up (ags)	0.61 m (2 ft)	4.6 m (15 ft)[1]	0.61 m (2 ft)	0.61 m (2 ft)
Static water level (btoc)	20.83 m (68.3 ft) *September 14, 2022*	13.62 m (44.7 ft)[1] *September 14, 2022*	61.11 m (200.5 ft) *September 14, 2022*	61.70 m (202.42 ft) *September 14, 2022*
Well Coordinates (Google Earth)	Lat: 49.019602 °E, Long: -119.409547 °N	Lat: 49.024753 °E, Long: -119.410779 °N	Lat: 49.024248 °N, Long: -119.413237 °E	Lat: 49.023961 °N, Long: -119.413112 °E
Distance to pumped well	581 m south	0 m (pumped well)	188 m west	193 m west

Notes: [1] Initial casing stick-up above current ground level. Cut down to 0.60 m to facilitate testing/monitoring.
[2] Well log indicated unlined and steel cap at surface. New wellhead completion has aluminum well cap and PVC liner.

The site is currently vacant and is primarily in its natural state, except for one residence on proposed Lot 5 (under construction) and a preliminary construction roadway for temporary stockpiling of excavated materials. Satellite imagery showed no significant development of the site prior to fall 2015, when the access road into the upper reaches of the site (and proposed Lot 5) was established, as seen in the 2016 imagery (Google Earth, 2022).

Each of the proposed residential lots is to be serviced by onsite private domestic water supply wells and private septic disposal systems. The site requires both rezoning and OCP amendments from current zoned Large Holdings (LH1) to support the proposed subdivision, which were applied for in 2021[2]. In a June 15, 2021 response letter, the RDOS requested a hydrogeological assessment be prepared that would evaluate and report on the water balance for the aquifer underlying the site, and whether there is an adequate water supply to support the proposed development and associated water demands.

WWAL designed and oversaw an assessment program, which included a desktop review of the underlying bedrock aquifer(s), a pumping test program and water quality testing of one of the existing wells on site. A flow rate of approximately 8 L/min (2.1 USgpm) was targeted, as this flow rate would simulate the withdrawal rate of up to five residential wells pumping simultaneously at the *RDOS Subdivision Servicing Bylaw No. 2000 (2002)* rate of ≥ **2,300 L/day** (equivalent to 1.6 L/min or 0.42 USgpm) to meet or exceed the residential onsite level-of-service demand at full build-out. The second bylaw requirement of demonstrating a flow capacity of ≥ 20 L/min for one hour can be met by wellbore

[2] Both Electoral Area "A" Official Community Plan Amendment Bylaw No. 2905.01(2021) and Electoral Area "A" Zoning Amendment Bylaw No. 2451.27(2021) were applied for in 2021 and referenced in the RDOS response letter dated July 15, 2021.

storage. Future use of onsite storage (i.e. pressure tank or cistern) could also be considered to manage peaks in demand.

1.2 Scope of Services

WWAL provided the following hydrogeological services during the groundwater feasibility and well assessment program:

1) Reviewed available data including existing reports and letters pertaining to the site, well and aquifer mapping for the area, and weather and climate data from Environment Canada.
2) Reviewed the conceptual lot layout. Completed a site visit to assess wellhead access for the pumping test equipment, potential sources of contamination in the vicinity, and identified suitable offsite wells to monitor during the pumping test. Installed a pressure transducer into WTN 105407 to monitor potential well interference during the test.
3) Designed and oversaw a pumping test program to evaluate the sustainable yield and water quality from the onsite existing well WTN 124408.
    a. In order to simulate the effect of groundwater withdrawal at full build-out, the well was pumped at a constant flow rate comparable to five times the RDOS bylaw rate (5 x 2,300 L/day or 2.1 USgpm) for 72 hours.
    b. A WWAL hydrogeologist contacted the pumping test contractor prior to the start of the pumping test and provided direction on pumping rate and data collection requirements. We maintained communications with the contractor throughout the testing procedure.
    c. We identified two offsite wells and one onsite well to be monitored during the pumping test. The observation wells were monitored manually with a water level tape during the test by the contractor, to assess the potential for well interference.
    d. Prior to the end of the pumping test, the contractor collected a water sample of the pumped discharge and delivered the sample to a laboratory for potability analysis testing. We evaluated the lab results against the Guidelines for Canadian Drinking Water Quality (GCDWQ).
    e. Following the test, long-term water level recovery was monitored with a pressure transducer. The pressure transducer was moved from WTN 105407 into WTN 124408 by the contractor and retrieved from the well roughly one week later.
4) Analyzed and evaluated the pumping test data to estimate long-term sustainable well yield and aquifer yield for the bedrock aquifer underlying the site.
5) Prepared this groundwater feasibility assessment report, suitable for submission to the RDOS as a supporting document for the rezoning/OCP amendments.

2. SITE DESCRIPTION AND HYDROGEOLOGY

2.1 Physiography and Surrounding Land Use

The site is located approximately 2 km east of downtown Osoyoos, B.C. The site is accessed directly off of Highway 3 and sits upon a southwest facing slope at the eastern edge of Okanagan Valley (Figure 1).

To the north, east, and south of the site lie mountains dominated by predominantly undeveloped grasslands and sparse forests, with multiple watercourses draining these upland areas westward into the Okanagan Valley. The Regal Ridge residential development is situated at the top of the hill, approximately 2.5 km east of the site. Agricultural lands are located to the northwest, west and southwest of the site, Osoyoos Lake is 1.7 km to the west at its closest point, and the US border is 2.5 km south of the site.

Topography at the subject site itself is relatively steep, sloping southwesterly towards the highway. Elevations at the property range from approximately 623 metres above-sea-level (m asl) at the eastern boundary, to approximately 496 m asl at the western boundary (Google Earth, 2022). For comparison, the elevation of Osoyoos Lake at the valley floor is 276 m asl.

Figure 1 illustrates the general location of the site and Figure 2 depicts a more detailed site layout and surrounding land use in the area.

2.2 Geologic Setting

Bedrock geological mapping by the BC Geological Survey (BCGS) show the area as underlain by intrusive granite and alkali feldspar originating as porphyritic granite, granodiorite, and monzonite from the middle Jurassic period , some 157-178 Mya (Cui et al., 2019).

While we were not able to find surficial geology mapping extending up the hillside to the site, mapping of the Okanagan Valley indicates that post-glacial outwash terraces following the Wisconsin Glaciation period lie 520 m west of the site, extending to Osoyoos Lake, and running up the length of the Okanagan Valley (Nasmith, 1962). These sediments thin as you approach site, and only a thin veneer of sediment lies overtop bedrock over much of the site property.

The driller's log for onsite well WTN 105407 reports surficial deposits comprised of fine to medium sand with boulders and cobbles were encountered from 0 to 9 m below ground level (bgl), where crystalline bedrock was encountered. Toward the north of the site on proposed Lot 5, and approximately 67 m higher in elevation, the log for WTN 124408 reports surficial silt and boulders encountered from surface to 6 m bgl, underlain by crystalline bedrock. The logs for offsite wells WTN 69157 and WTN 84786, directly west of the site, report thin bouldery surficial deposits to a depth of up to 3 m, underlain by bedrock.

2.3 Hydrogeological Setting and Mapped Aquifers

Using the BC Water Resources Atlas (WRA) mapping tool (ENV 2022) and the RDOS Parcel Viewer (RDOS 2022), we identified two unnamed mapped drainages oriented east to west, breaking up the western-facing hillside into sections, with several more drainages in the vicinity of the site (Appendix A).

The nearest named creeks include Bourguiba Creek (40 m south of the site) which feeds into Haynes Creek (230 m southwest of the site). All nearby creeks convey water from the upland plateau east of the site toward the valley bottom, draining into Osoyoos Lake, the ultimate receptor for surface waters in this area. At the time of our site visit prior to the pumping test (September 7, 2022), WWAL field staff did not observe any groundwater seepages at the subject site or surface water flowing in these watercourses.

There are three provincially mapped aquifers within 1.6 km of the site (Appendix A), but only one is mapped as underlying the site. Details on the three aquifers are summarized in Table 2.1 below. As the bedrock aquifers (808 and 936) are of primary interest for our assessment of groundwater availability at the site, water level hydrographs from Provincial observation wells in those two aquifers are provided in Figures 2.1 and 2.2.

Table 2.1 Mapped Aquifers within 1.6 km of Site

	Aquifer 808	Aquifer 194	Aquifer 936
Distance from site	Underlying	450 m west	1590 m northeast
Descriptive Location	East of Osoyoos, Anarchist Mountain	Osoyoos East	East of Osoyoos, Anarchist Mountain
Estimated area	18.6 km^2	5.3 km^2	16.1 km^2
Aquifer Classification	IIA	IIA	IIB
Aquifer Type	Fractured crystalline bedrock	Unconfined sand & gravel – late glacial outwash	Fractured crystalline bedrock
Productivity	Moderate	Moderate	Moderate
Demand	Moderate	Moderate	Moderate
Vulnerability	High	High	Moderate
Observation Well	OBS Well 401 – Osoyoos (Bullmoose Rd.)	OBS Well 467 – Osoyoos East (52nd Ave and 25th St.)	OBS Well 402 – Osoyoos (Anarchist Mtn. Summit)

Notes: All information gathered from BC WRA (ENV 2022).

The bedrock aquifer underlying site (Aquifer 808, hydrograph illustrated in Figure 2.1) shows a strong seasonality with springtime highs (snow melt) followed by late fall/early winter lows, and a seasonal range on the order of 2 m. The long-term water level trend of this aquifer is stable.

Adjacent bedrock Aquifer 936 (Figure 2.2) also displays a strong seasonality (springtime spikes) with a seasonal range of water level fluctuation closer to 4 m. Seasonal low water levels in the aquifer have declined by approximately 1 m since 2012, but the overall water level trend over the last decade is stable.

Figure 2.1 Water Level Hydrograph - Ministry Observation Well 401 (Aquifer 808)

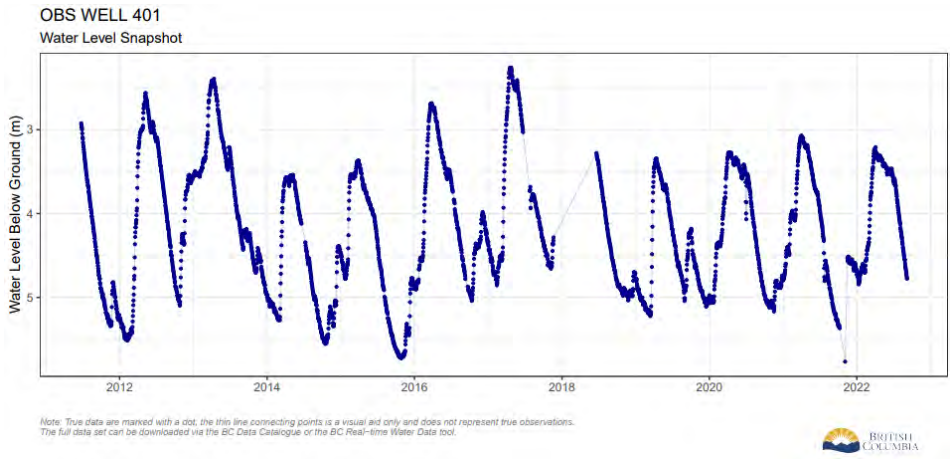
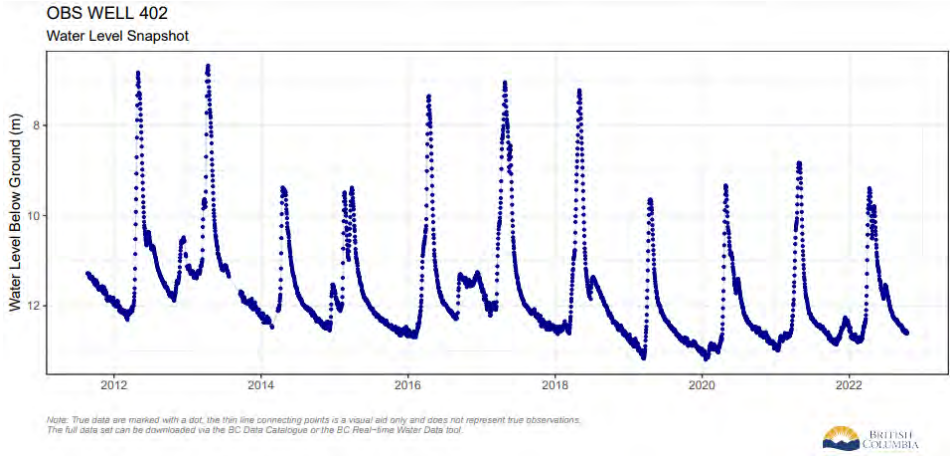


Figure 2.2 Water Level Hydrograph - Ministry Observation Well 402 (Aquifer 936)



Well density in the area surrounding the site is fairly sparse, with most of the wells within 1km of the site either located in the valley bottom (and unconfined Aquifer 194) or at the crest of the hill (in Aquifer 808).

Reviewing wells listed on the WRA, there are 16 wells within 1km but only 14 of these are attributed to the fractured crystalline bedrock Aquifer 808 (Appendix A). Of these 14 wells, the average well depth is 400 ft, depth to bedrock ranges from 0 (bedrock at surface) to 67 ft, and well yields range from low (0.75 USgpm) to high (124 USgpm) depending on fracture connectivity and possible hydraulic connection to overlying Aquifer 194. The average driller-estimated yield of bedrock wells in the area is 19.2 USgpm.

Regional groundwater flow is inferred to be topographically driven and at this location, where groundwater flows west off the Anarchist Mountain highlands toward Osoyoos Lake. Aquifer recharge is likely comprised of direct infiltration of snowmelt and precipitation from these upland regions and surface water runoff from the several creeks originating in the Anarchist Mountain highlands to the east, including

the nearby Bourguiba and Haynes Creek watersheds northeast and east of the site. Groundwater use in the area is reported to be largely for rural private domestic and irrigation (orchard/vineyard) water purposes.

Five current surface water licenses and one groundwater extraction licence exist within 1km of the site (Appendix A). Four of the five surface water licences are allocated to Bourguiba Creek to the south of site, with the remaining one on Haynes Creek to the north. The surface water licences on Bourguiba Creek are for domestic water supply and stock-watering purposes. The groundwater extraction licence and the licence on Haynes Creek are for the Osoyoos Irrigation District, for irrigation (Haynes Ck.) and to be able to use WTN 95265 and extract 25,000 m^3/year at a rate of up to 468 L/min (124 USgpm) from Aquifer 808 for waterworks purposes.

The Okanagan Basin Water Board (OBWB) funded the *Phase 2 Okanagan Water Supply and Demand Project* which developed water budgets for the Okanagan Basin. A pair of OBWB reports (OBWB 2007, 2009) summarize regional aquifer information used in their Okanagan Basin modelling efforts. Provincially mapped Aquifer 808 was given OBWB Aquifer numbers of #206B and #208A in their report, essentially splitting the aquifer into two parts: a northern part and a southern part. The southern part (OBWB Aquifer #206B) corresponds with the bedrock aquifer underneath the site, though there could be some communication between these two mapped hydrostratigraphic units at depth. Average annual precipitation for the 26.1 km^2 aquifer footprint is given as 1.73×10^7 m^3/year and annual runoff was estimated at 1.94×10^6 m^3/year. Allowing for evapotranspiration, estimated recharge to bedrock Aquifer #206B is 1.36×10^6 m^3/year.

Assuming groundwater extraction at the RDOS bylaw rate of 2,300 L/day, the groundwater extraction for the proposed development at full build-out would require 11,500 L/day on average, equivalent to an annualized water demand of 4,200 m^3/year. Based on the OBWB model input projections, this groundwater withdrawal would account for approximately 0.3% of the overall estimated recharge to the bedrock aquifer in this area.

3. WELL TESTING METHODS

Value Contracting of Okanagan Falls, B.C. supplied, installed, and operated a submersible pump powered by portable generator for the pumping test program. WWAL provided input on the testing program design, general test program oversight, and water sample collection. Photographs of the pumping test set up are included in Appendix D.

The test well was disinfected with chlorine bleach solution and circulated within the well for a few minutes prior to the start of the pumping test. The pumping test on WTN 124408 was completed using a single-phase, 0.5HP submersible pump powered by a 240V portable Honda generator. The temporary submersible pump was installed on a rigid drop pipe with the pump intake set at a depth of 117.3 m (385 ft) below top of casing (btoc). The well was pumped at a rate of 8 L/min (2.1 USgpm) for 72-hours, followed by recovery monitoring.

Value Contracting collected water level measurements using a graduated water level sounder to the nearest centimeter, referenced to the top of the production casing. They also periodically measured and calibrated the pumped flow rate with a graduated bucket and stopwatch and held the flow rate constant with a control valve on the discharge line. The pumped discharge was routed approximately 30 m (100 ft) north of the well to a grassy area at the top-of-bank that sloped towards the dry unnamed stream (draw dry at the time of testing), where the discharge water was observed infiltrating to ground.

Value Contracting personnel collected a water sample for a comprehensive suite of analyses. The water sample was collected in laboratory supplied bottles directly from the discharge line near the end of the pumping test period. The sample was shipped in a cooler with ice packs via ACE Courier and arrived at CARO Analytical Laboratory in Kelowna, BC for analysis within hold times and under chain-of-custody protocol.

4. WELL TESTING RESULTS

To interpret the pumping test results, we compiled and analyzed the test data to determine whether the aquifer at the site could supply the long-term sustainable yield for the intended use.

4.1 Constant Rate Test Results

Water level data, hydrographs, and semi-log plots of drawdown over time from the constant rate test are presented in Appendix B (Table B1, Figures B1 and B2).

For WPID 124408, the water level in the well dropped approximately 6 m during the first 200 minutes of pumping, after which the rate of drawdown slowed. The pumping water level in the well continued to decline over the remainder of the 72-hour test, and never fully stabilized (Appendix B, Figure B1). After 72-hours of pumping at a rate of 8 L/min (2.1 USgpm), the well had drawn down 9.2 m (30.3 ft) relative to the pre-test static. The well recovered 61% of this drawdown within 4 hours following the end of pumping. Datalogger measurements extending the recovery period indicated the well recovered to 84% of the observed drawdown six days following the end of pumping. The testing was completed during a time when aquifer levels were naturally declining towards seasonal lows, and as such, full recovery following the test was not expected.

4.2 Potential Well Interference

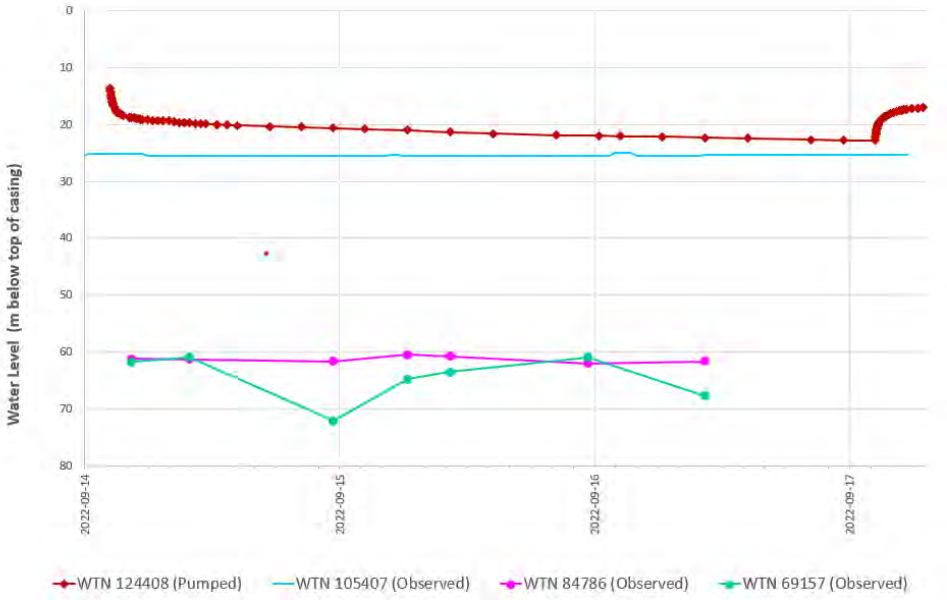
Figure 2 shows the location of the onsite and offsite wells, relative to the property boundary. During the testing program, we used a datalogging pressure transducer to monitor the water levels in the other onsite domestic well (WTN 105407) for the drawdown portion of the testing program. Value Contracting also manually measured and recorded observed water levels in the two offsite wells (WTNs 69157 and 84786) on adjacent property 1806 Hwy 3 prior to, during and following the test. The offsite wells were monitored to assess:

1) Whether the onsite well is hydraulically connected to the same bedrock fracture sets these other domestic well are completed in; and
2) Observe and measure any well interference induced from pumping the onsite well (if any).

Figure 4.1 shows water levels in the pumped well and observation wells over the course of the pumping test and continues for several days thereafter. During the pumping tests, the homeowner at 1806 Hwy 3 continued to use their well for domestic household use, so fluctuation of the water level in observation well WTN 69157 is seen over the course of the week. From our assessment, WWAL concludes that no interference was observed in the offsite domestic wells from operation of the onsite well.

In addition to the datalogger, Value Contracting also took periodic water level measurements at the other onsite well (WTN 105407) to the south of the property while the tested well was being pumped. Water levels in this southern well did not deviate from its static water level during the entire pumping program on the northern well, further indicating a low potential for interference to occur between wells completed in the bedrock aquifer.

Figure 4-1 Pumping and Observation Well Water Levels



With dedicated wells drilled and installed on each parcel, the average pumping rate from each well will likely be less than the aggregate pumping rate used during our testing. Consequently, the amount of induced drawdown is expected to be lower but spread out over a larger area.

4.3 Seasonal Water Level Effects

Seasonal water level fluctuations, where severe enough, can affect the ability of a well to supply the desired yield. Seasonal variations in water levels are particularly important in shallow wells and dug wells associated with nearby ephemeral streams that may not flow year-round. Seasonal water level fluctuations in confined or bedrock aquifers such as the one at the site are often muted, with fluctuation a result of snow melt recharge, as well as seasonal use of the aquifer (i.e. the irrigation season or seasonal occupancy).

In general, aquifer water levels are expected to be higher during periods of recharge (during and following spring freshet) and lower in the late summer and throughout the winter months. However, there may be a delay between when recharge starts and when the effect is seen in confined or bedrock aquifer systems.

In section 2, the three aquifers in the area are described and Figures 2.1 and 2.3 illustrate the water levels trends within each of the aquifers as observed in the Ministry Observation Wells dedicated to each aquifer.

Based on the type of aquifer the onsite wells draw from (bedrock, with weathered and fractured bedrock exposed at surface), and our conceptual understanding of the aquifer recharge in this area, seasonal water level fluctuations can be expected on the order of 2 m in the bedrock aquifer. Seasonal water level fluctuations of this magnitude are small compared to the available drawdown in the onsite and offsite wells.

4.4 Short and Long Term Well Yield

WWAL estimates the long-term sustainable yield of a well based on an industry-accepted methodology for assessing long-term well yield by applying a 30% safety factor to the available drawdown in the well and to multiply this by the specific capacity projected forward for 100-days of continuous pumping. The 30% safety factor applied is intended to account for seasonal and longer-term variations in static water levels and well interference effects. This method is outlined in the Guidelines for Obtaining a Certificate of Public Convenience and Necessity (Allen et al., 1999).

The details of the sustainable yield calculation for WTN 124408 are provided on Appendix B, Figure B2. Based on a pre-test static water level of 13.6 m (44.7 ft), the dominant water producing fracture set for the well at 36.6 m (120 ft) and a projection of the observed drawdown during the pumping test, we estimate a sustainable well yield of 7.2 L/min (1.91 USgpm) from this well. While slightly less than the tested rate of 8 L/min (2.1 USgpm), this calculation indicates that this individual well can sustainably produce water at a rate higher than the bylaw rate of 1.6 L/min (0.42 USgpm).

Further, this well was drilled to a depth of 122 m (400 ft). Based on a nominal borehole diameter of 150mm (6 inches), the amount of water stored within the well is approximately 1,977 L (522 USgal). To meet the second part of the bylaw, a flow rate of 20 L/min must be sustained for 1 hour, which equates to 1,200 L over that hour. Consequently, the amount of wellbore storage present is sufficient to meet the bylaw's short-term yield requirement.

4.5 Aquifer Yield and Future Well Location Considerations

WWAL concludes the bedrock aquifer underlying the site is capable of producing groundwater at a rate that would satisfy the RDOS Subdivision Servicing Bylaw's long-term requirement (11,500 L/day for five lots). The short-term peak flow bylaw requirement of 20 L/min for one hour can be met in the tested well through borehole and pump installed at a suitable depth.

Subsequent wells on proposed Lots 1, 2, 3 and 4 should be located 30 m away from any potential sources of contamination (such as septic fields or tanks), including any on the neighbouring property to the north (1806 Hwy 3). We recommend that septic feasibility on each proposed lot be confirmed, and a primary and reserve septic field be established prior to drilling the remaining required wells.

Wells should be spaced such that wells are at least 30 m apart to minimize well interference effects. The *Water Sustainability Act* requires a minimum horizontal separation between wells on adjacent properties of 15 m.

WTN 105407 is located on proposed common property based on the subdivision concept drawing provided and not allocated to servicing any particular lot. This well should be held in reserve, should the test well on any of the proposed lots prove insufficient to meet the bylaw rate. An easement to WTN 105407 could then be established, linking the well to the property on which it is to serve.

5. WATER QUALITY

All laboratory water testing was completed by CARO Analytical Laboratory of Kelowna, BC, a CALA accredited laboratory. Our sample was analyzed for a comprehensive list of analytes for drinking water sources. Table 5.1 summarizes the water quality testing results, with complete laboratory reports provided as an attachment (Appendix C).

When compared to the Guidelines for Canadian Drinking Water Quality (Health Canada 2022), the raw water from WTN 124402 is considered **potable**, as it meets both the health-based Maximum Acceptable Concentrations (MACs) and the aesthetic (taste and odour) Aesthetic Objective (AO) concentrations for all of the analytes tested.

The groundwater is considered very hard, with a hardness (as $CaCO_3$) concentration of 250 mg/L. This is typical for aquifers in the area and groundwater with a longer residence time in the subsurface, where water-rock interactions can mineralize the water. Water chemistry was not available from the Ministry observation well OW 401 (located in Aquifer 808) for comparison.

The well was disinfected by shock-chlorination (dosed with granular chlorine crystals) prior to sample collection to prevent potential for sampling bias from stagnant water sitting in the well or discharge lines. Bacteriological parameters including total coliforms and *E. Coli* were below detection limits in the collected samples.

Concentrations of water quality parameters typically associated with anthropogenic impacts on groundwater such as agricultural activities or wastewater disposal-to-ground were all relatively low and all below guidelines. We note that nitrate, measured at a concentration of 3.19 mg/L, is elevated above background typical groundwater levels and suggestive of anthropogenic impacts, the source of which is not clear.

Table 5.1 Water Quality Summary

Parameters	Units	1750 Highway 3 September 15, 2022	GCDWQ
General Parameters			
Hardness, Total (as CaCO3)	mg/L	250	n/a
Solids, Total Dissolved (calc)	mg/L	335	AO<=500
Colour, True	CU	<5.0	AO<=15
Alkalinity, Total (as CaCO3)	mg/L	286	n/a
Cyanide, Total	mg/L	<0.0020	MAC=0.2
Turbidity	NTU	<0.10	OG<1
pH	pH units	8.25	7.0-10.5
Conductivity (EC)	uS/cm	546	n/a
Anions			
Fluoride	mg/L	0.19	MAC = 1.5
Nitrate, N	mg/L	3.19	MAC =10
Nitrite, N	mg/L	<0.010	MAC = 1
Chloride	mg/L	12.9	AO ≤ 250
Sulfate	mg/L	18.6	AO ≤ 500
Total Metals			
Aluminum	mg/L	0.0073	MAC = 2.9
Antimony	mg/L	<0.00020	MAC = 0.006
Arsenic	mg/L	<0.00050	MAC = 0.01
Barium	mg/L	0.0061	MAC = 2
Boron	mg/L	<0.0500	MAC = 5
Cadmium	mg/L	<0.000010	MAC = 0.005
Calcium	mg/L	74.9	n/a
Chromium	mg/L	0.0008	MAC = 0.05
Cobalt	mg/L	<0.00010	n/a
Copper	mg/L	0.00125	MAC = 2 AO ≤ 1
Iron	mg/L	0.013	AO ≤ 0.3
Lead	mg/L	<0.00020	MAC = 0.005
Magnesium	mg/L	15.1	n/a
Manganese	mg/L	0.0005	MAC = 0.12 AO ≤ 0.02
Mercury	mg/L	<0.000010	MAC=0.001
Molybdenum	mg/L	0.00336	n/a
Nickel	mg/L	<0.00040	n/a
Potassium	mg/L	4.47	n/a
Selenium	mg/L	<0.00050	MAC = 0.05
Sodium	mg/L	20.2	AO ≤ 200
Strontium	mg/L	0.329	MAC = 7
Uranium	mg/L	0.00999	MAC = 0.02
Zinc	mg/L	<0.0040	AO ≤ 5
Bacteriological			
Total Coliforms	CFU/100mL	<1	MAC = non-detect
E. Coli	CFU/100mL	<1	MAC = non-detect

Notes: MAC = Maximum Allowable Concentration (highlighted orange if above guideline);
AO = Aesthetic Objective (highlighted green if above guideline);
OG = Operational Guideline, for water treatment plants.

6. SOURCE WATER PROTECTION CONSIDERATIONS

As the vicinity of the site is largely undeveloped, overall current risk to the wells is considered low. The three main issues to consider in developing a source water protection plan for the wells are as follows:

- Historical land uses and potential water quality impacts to the aquifer;
- Location of proposed onsite and existing offsite septic fields relative to the wells;
- Nature of the aquifer; and

We reviewed the historical land use at the site (undeveloped, greenfield) and found no evidence of potential for groundwater impact from former land use activities. If blasting occurred onsite during the installation of the access road, this could account for the presence of nitrate in the water.

The primary risk factors after site development will be the proposed septic disposal fields, which are planned to be installed outside of the setback (> 30 m) from the wells. No dwellings or structures should be constructed within 6 m of either well.

Information from well logs in the vicinity suggest the upper contact of the bedrock aquifer has the potential to be near surface and unconfined. Fracture sets within the bedrock that facilitate groundwater recharge may extend to surface in bedrock outcrop or faces along road cuts or ditches. Consequently, onsite disturbance and removal of surficial soils should be limited to the extent possible, and potential sources of contamination constrained such that any leakage to ground is minimized. This includes thoughtful design of the development's sewerage systems and septic fields and should be considered by septic field designers in future.

7. CONCLUSIONS

C1. WWAL oversaw a pumping test conducted on an existing 150 mm (6-inch) diameter domestic water supply well (WTN 124408) on the proposed development site near Osoyoos, BC. The well is completed in bedrock aquifer 808 beneath the site to a depth of 122 m (400 ft). The well was pumped for 72-hours at a rate of 8 L/min (2.1 USgpm). No well interference was observed in other nearby wells monitored onsite during the pumping test program, and no interference was observed in the monitored offsite domestic wells. Based on the results of the testing program, we assign a sustainable well yield of 7.2 L/min (1.9 USgpm) for this well, which is more than four times the Subdivision Servicing Bylaw requirement for one well.

C2. Water quality of a sample from the well was assessed and raw water is considered potable with no exceedances of health based GCDWQ Maximum Acceptable Concentrations (MAC) nor Aesthetic Objectives (AO) t. Water in the well was hard, which is typical for deep bedrock wells in this area. Nitrate in the sample collected is elevated above typical background conditions, but the source of the elevated nitrate is not apparent.

C3. The RDOS Subdivision Servicing bylaw requires proof of 1) 2,300 L/day and 2) 20L/min for one hour is sustainable for each lot of a proposed subdivision. The tested well was pumped at 5x this bylaw rate to test the aquifer below by simulating the aggregate pumping of all of the wells at full

build-out. WTN 124402 meets the RDOS Subdivision Servicing requirements, and the aquifer below can supply sufficient water to meet the aggregate subdivision demand.

As this report was intended to support an OCP/rezoning application, not all wells required have been drilled to satisfy full subdivision approval. Should the rezoning be approved, at the subdivision stage wells for each proposed lot must be drilled and testing to confirm compliance with the RDOS Subdivision Servicing Bylaw will be required.

C4. The OBWB developed a water budget for several aquifers within the Okanagan Basin, and the one for this site is OBWB Aquifer #206B. Groundwater demand for the proposed subdivision represents nominally 0.3 % of annual recharge to the aquifer.

8. RECOMMENDATIONS

R1. Based on the performance of WTN 124406 pumping at 5x the bylaw rate, and assuming the proposed OCP/rezoning amendments are approved, we recommend additional wells be drilled and tested on the remaining proposed lots (Lots 1-4) to determine site specific yields of each well and to demonstrate compliance with the RDOS Subdivision Servicing Bylaw requirements.

R2. We recommend a septic system designer be engaged as early as possible to complete the onsite assessment for septic system feasibility and sizing. Given the lot density, potential for shallow bedrock at (outcrop) or near surface, and the need for offsets from drinking water wells, the constraints for onsite septic system design should be established in coordination with ongoing domestic water well development (i.e. if the surficial soils in a portion of a lot are not conducive for use in septic infiltration, this may have direct bearing on test well placement).

R3. As well, the placement of future wells and sewerage system components should be coordinated with the architectural design for the proposed residences. The number of bedrooms/washrooms in the proposed residences will have a bearing on both the sewerage and water supply demands for each lot and may vary from lot to lot.

R4. We recommend a minimum 30m buffer be placed about the existing wells (onsite WTNs 124408 and 125407 and offsite WTN 84786 and 69157) and any future domestic supply wells, and development within the buffer be constrained. Potential sources of contamination are to be kept outside of the buffer zones, of both onsite and offsite receptors.

R5. Well completions should include provisions to allow for manual water level measurements to be collected if needed (by means of a sounding tube). We recommend that groundwater levels continue to be monitored once the wells are put into service, and during the first few years following commissioning. This would be best accomplished with a pressure transducer installed within each of the supply wells, set separately apart from the pump control switches.

Lastly, well owners and groundwater users in B.C. have important responsibilities under the various regulations that pertain to wells and groundwater use. Important information is outlined in the following section.

9. WELL OWNER RESPONSIBILITIES

In November 2005, the Groundwater Protection Regulation was enacted in British Columbia, intended to improve the safety and quality of groundwater in the Province. This regulation was replaced by a new Groundwater Protection Regulation on February 29, 2016 (BC Reg 29/2016) and continues previously established standards to protect groundwater supplies by requiring all water wells in British Columbia be properly constructed, maintained and, at the end of their service, properly decommissioned. More specifically, all newly constructed and altered wells must meet minimum construction standards including incorporation of a surface annular seal, a minimum of 30 cm casing stickup [above existing or modified ground surface], appropriate drainage away from the well, and completion with a secure well cap plus well identification plate. After a well is drilled, responsibility for the well transfers from the driller to the owner to maintain the casing stickup, surface drainage away from the well, secure cap and well identification plate. This also includes maintaining the surface annular seal, if a pitless adapter is installed. Part 3 of the regulation has requirements for siting wells. Part 10 requires that well construction reports for all new and altered water supply wells be submitted to the Province (prior to 2016, submission of well reports was voluntary). The regulation also requires that all work on a well, including pump installation, be completed by qualified contractors registered to practice with the Province of B.C.

With the implementation of the *Water Sustainability Act* in 2016, certain groundwater uses in the Province of BC now require a groundwater licence. Private domestic groundwater use (i.e. one well supplying domestic water to one household) does not require a groundwater licence, and private domestic wells are provided with a deemed water right of 2 m^3/day. Permitted domestic uses include indoor domestic water, watering poultry or animals kept for household use, and irrigation of a garden up to 1,000 m^2 in area. Use of water beyond the volumes and purposes associated with domestic use as defined in the *Water Sustainability Act* require a licence which must be applied for. Regional District or other approving authority proof of water requirements for subdivision or building permit approval may exceed the 2 m^3/day deemed water right for domestic use, but do not allow the well owner to exceed that deemed right without a licence. Individual well owners have the responsibility to carefully monitor their own water supplies and to use water responsibly, especially in times of drought

With regard to water quality and private well water treatment, this is the homeowner's responsibility as the Ministry of Health does not regulate private water sources.

REFERENCES

BC Ministry of Environment (MOE). 1999. *Evaluating long-term well capacity for a Certificate of Public Convenience and Necessity.* Water Management Branch, B.C. Ministry of Environment, Land and Parks. Victoria.

BC Ministry of Environment and Climate Change Strategy (ENV). 2022. *Water Resources Atlas* (WRA). Accessed on-line at: http://www.env.gov.bc.ca/wsd/data_searches/wrbc/

BC Ministry of Environment and Climate Change Strategy (ENV). 2022. *iMapBC Online Database*. Accessed on-line at: https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc

BC Ministry of Environment and Climate Change Strategy (ENV). 2021. *The British Columbia Field Sampling Manual: Part E2 - Groundwater*. Accessed on-line at: https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/field-manal/part_e2_groundwater.pdf

BC Ministry of Environment and Climate Change Strategy (ENV). 2022. *Groundwater Level Data, Provincial Groundwater Well Network*. Accessed on-line at: https://governmentofbc.maps.arcgis.com/apps/webappviewer/index.html?id=b53cb0bf3f6848e79d66ffd09b74f00d&find=OBS%20WELL%20402

Cui, Y., Miller, D., Schiarizza, P., and Diakow, L.J., 2017. *British Columbia digital geology*. British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Open File 2017-8, 9p. Data version 2019-12-19.

Health Canada. 2022. Guidelines for Canadian Drinking Water Quality. Accessed online at: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Nasmith, H. 1962. *Late Glacial History and Surficial Deposits of the Okanagan Valley, British Columbia*. Bulletin No. 46. Issued by the BC Department of Mines and Petroleum Resources, 1962.

Neilson-Welch, L., & D.M. Allen (OBWB) 2007. *Groundwater and Hydrogeological Conditions in the Okanagan Basin, British Columbia, A State-of-the-Basin Report.* Issued by the Okanagan Basin Water Board, December 2007.

Golder Associates & Summit Environmental Consultants Ltd. (OBWB) 2009. *The Okanagan Basin Water Board Basin Study, Phase 2 Okanagan Water Supply and Demand Project, Groundwater Objectives 2 and 3*. Report issued July 2009.

Regional District of Okanagan-Similkameen (RDOS). 2022. *RDOS Parcel Viewer*. Accessed online at: https://maps.rdos.bc.ca/Html5Viewer/?viewer=publicparcels

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2. The scope and the period of service provided by Western Water Associates Ltd are subject to restrictions and limitations outlined in subsequent numbered limitations.
3. A complete assessment of all possible conditions or circumstances that may exist at the Site or within the Study Area referenced, has not been undertaken. Therefore, if a service is not expressly indicated, it has not been provided and if a matter is not addressed, no determination has been made by Western Water Associates Ltd. in regards to it.
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Figures

Figure 1 - General Site Location

Date: October 21, 2022	Image: WRA 2022	Client: Steinar Johnsen	WWAL Project: 21-090-01VR
Drawn by: CDH	Checked by: CDH	Project: GW Feas. Ass., 5-Lot Subdivision, Osoyoos, BC	

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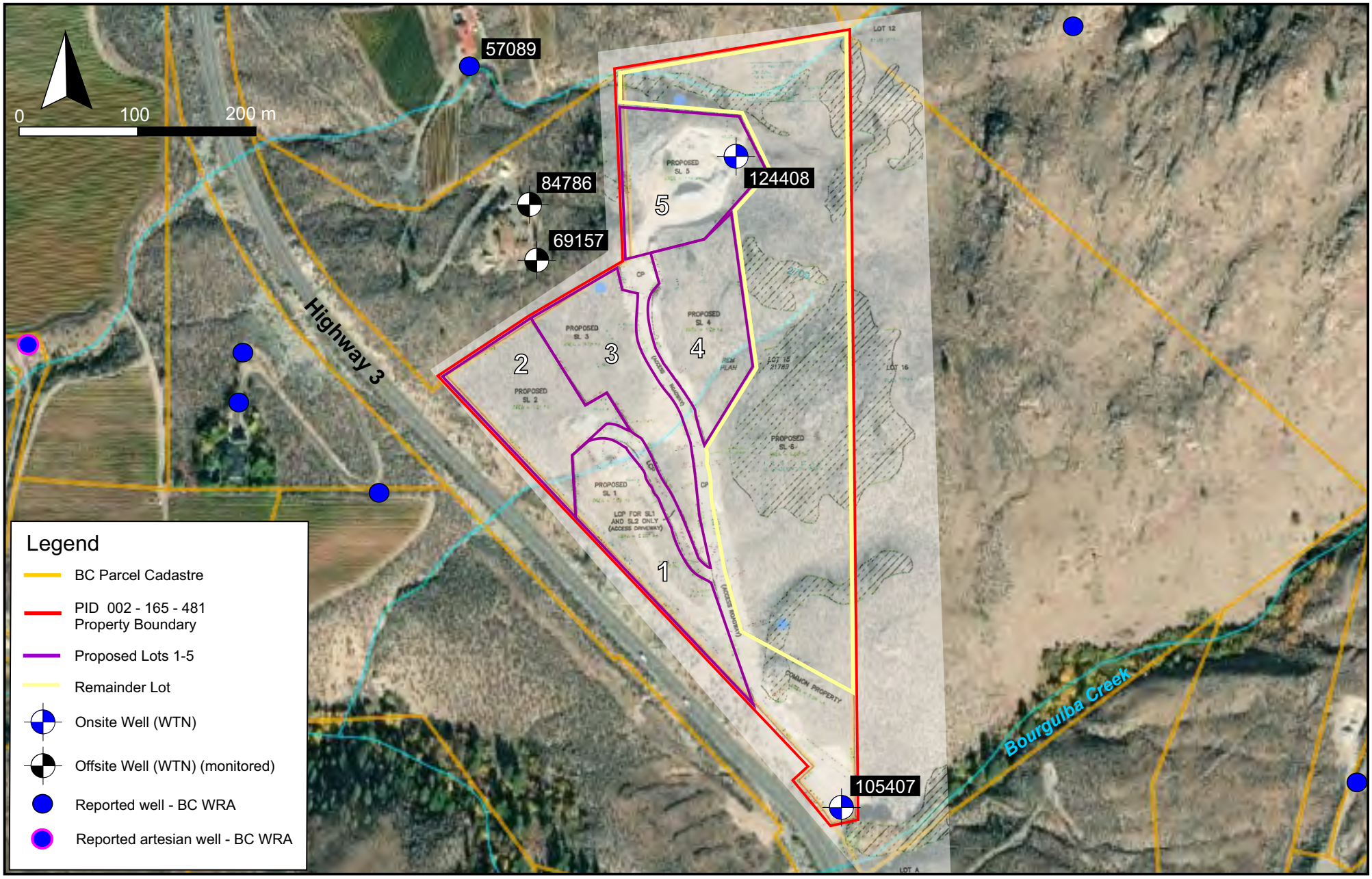

Figure 2 - Detailed Site Location and Reported Wells in the Area

Date: September 26, 2022	Image: iMapBC 2022	Client: Steinar Johnsen	WWAL Project: 21-090-01VR
Drawn by: LM	Checked by: CDH	Project: Groundwater Feasibility Assessment - Osoyoos	

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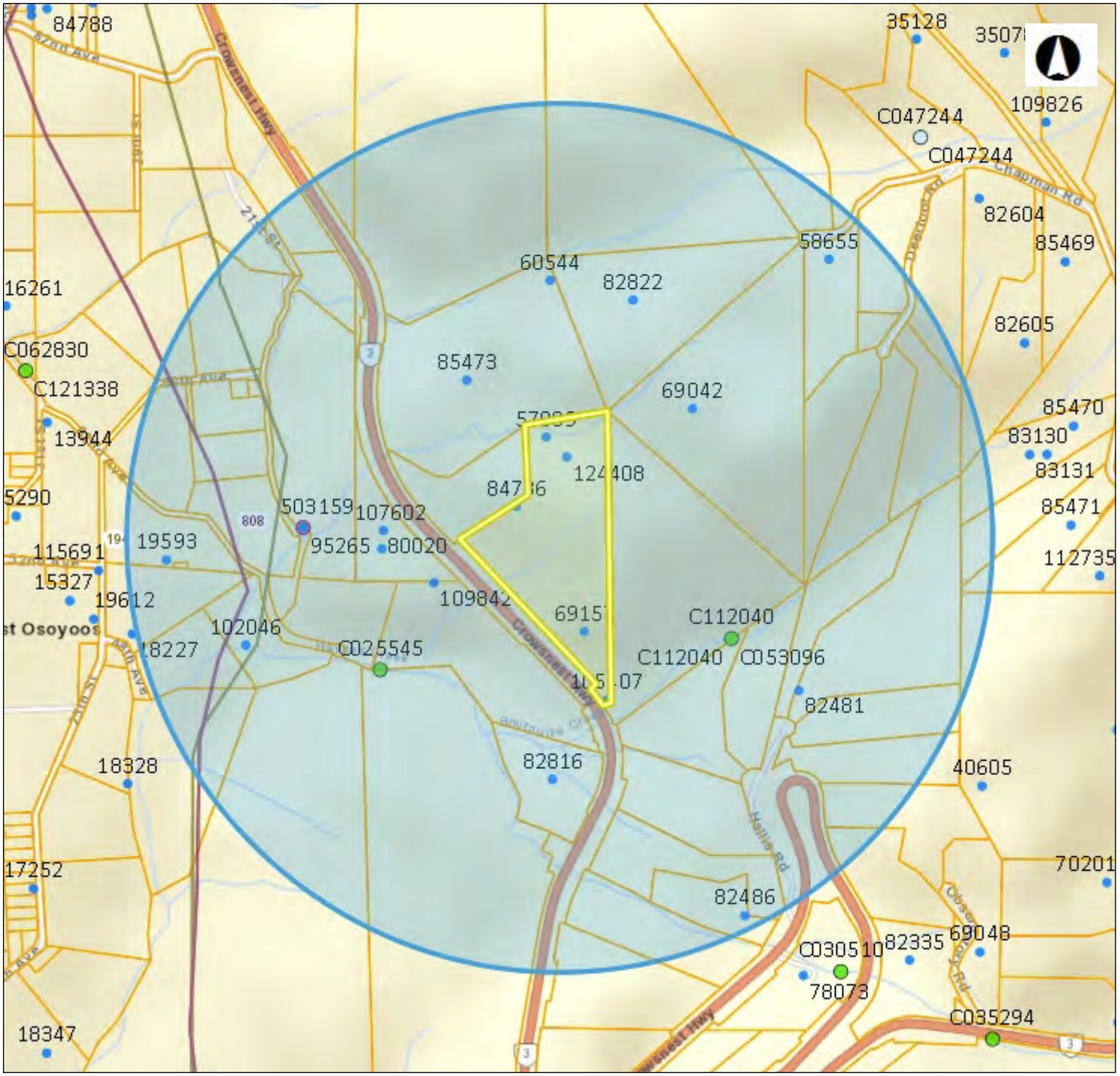
Appendix A

RDOS and WRA Output and Relevant Well Logs



Water Resources Atlas

Legend

Groundwater Wells - All

ARTESIAN_IND

- Reported Artesian Well
- Well

Water Rights - Licences

POD_STATUS

- Active
- Inactive

Aquifers - All

MATERIAL

- Unconsolidated
- Bedrock

PMBC Parcel Cadastre - Ou

0 0.41 0.81 km

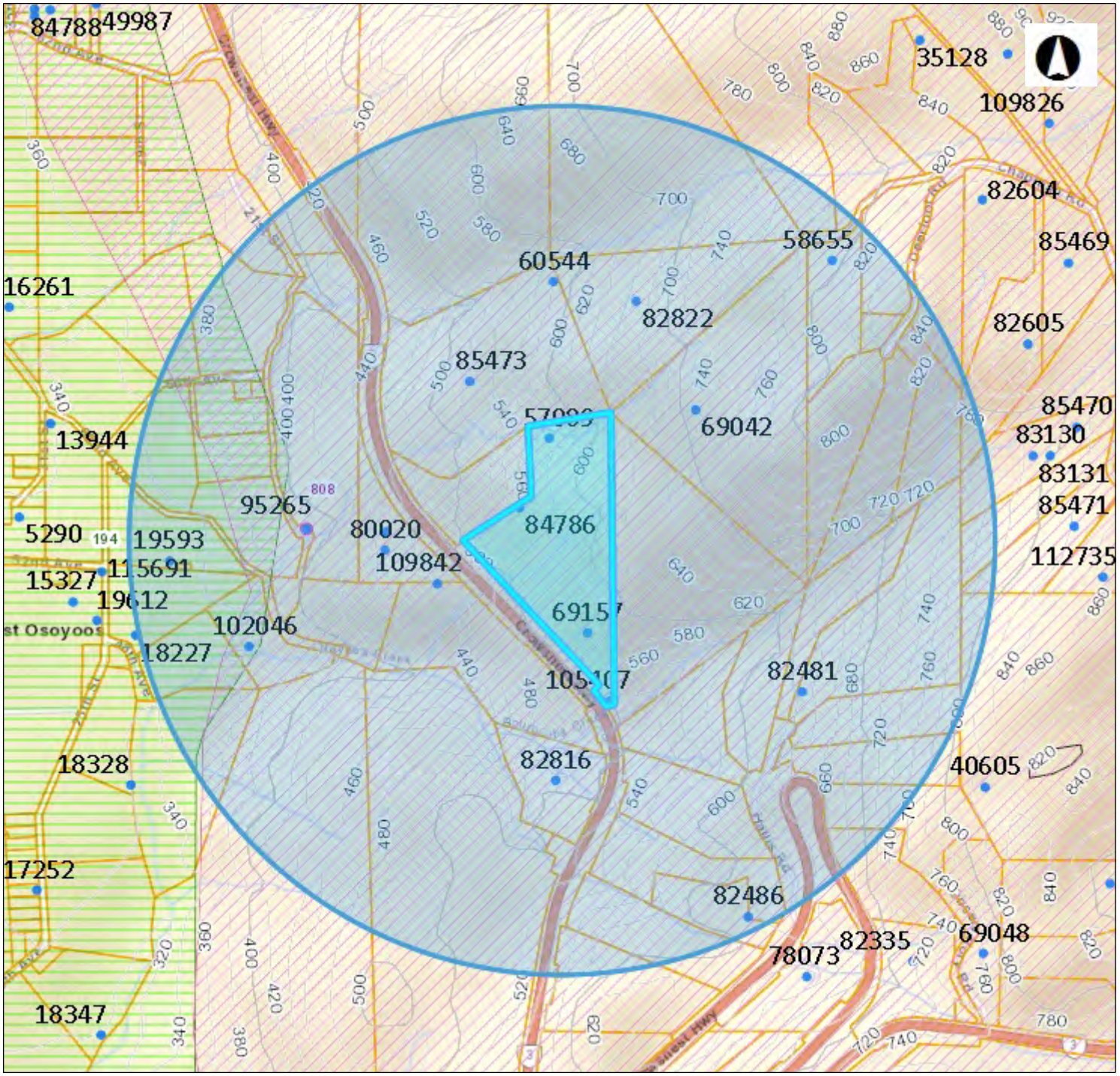
1: 20,000

Copyright/Disclaimer

Datum: NAD83

Projection: BC Albers

Key Map of British Columbia



BRITISH COLUMBIA

Water Resources Atlas

Legend

Groundwater Wells - All

ARTESIAN_IND

- Reported Artesian Well
- Well

Contours - 20K

FCODE

- Contour - Index
- Contour - Index Indefinite
- Contour - Index Depression
- Contour - Index Depression Inde
- Contour - Intermediate
- Contour - Intermediate Indefinite
- Contour - Intermediate Depressi
- Contour - Intermediate Depressi

0 0.41 0.81 km

1: 20,000

Copyright/Disclaimer

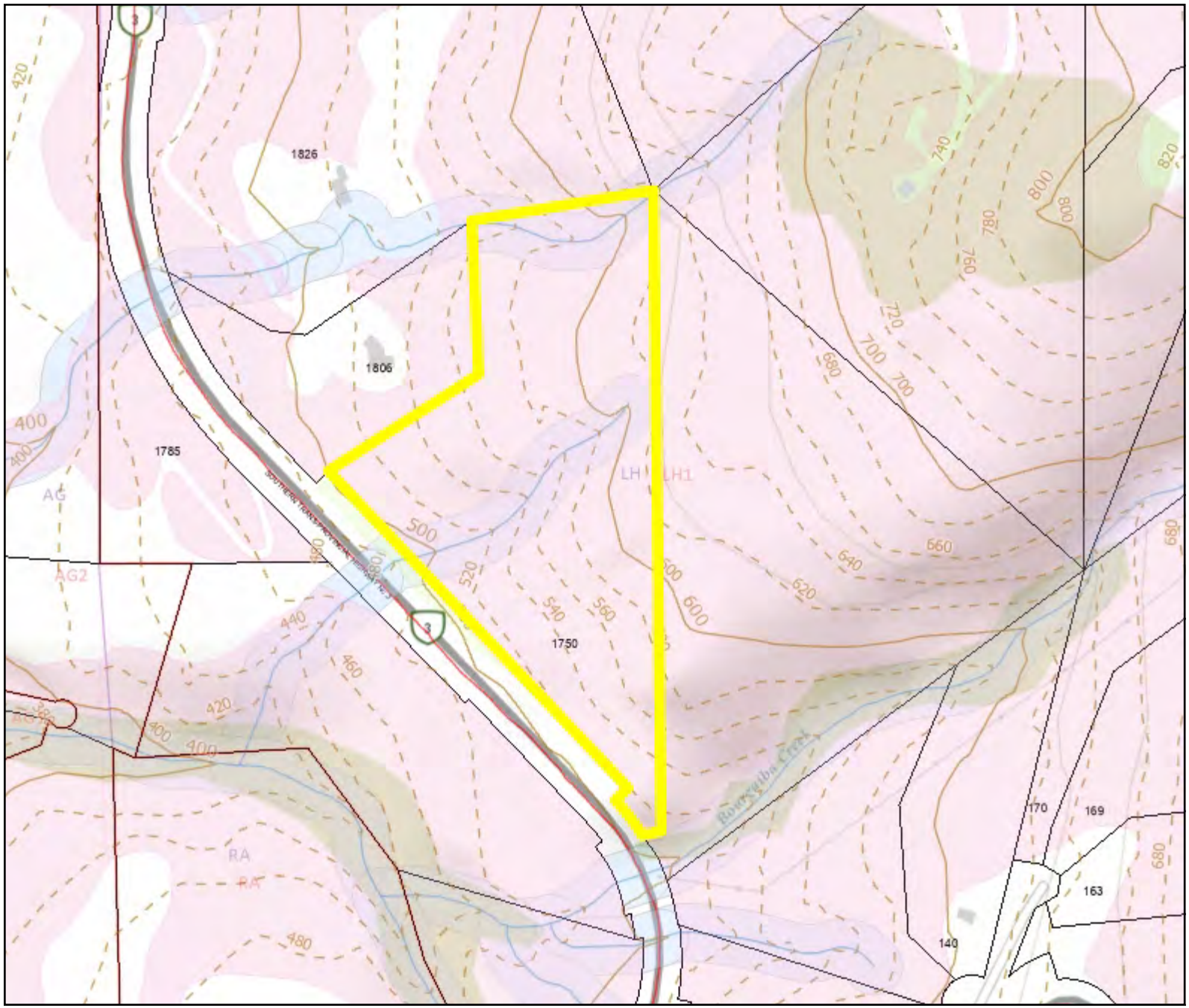
Datum: NAD83

Projection: BC Albers

Key Map of British Columbia

Well Tag Number	Well ID Plate	Well Status	Well Class	Intended Water Use	Well Depth (ft bgl)	Well Diameter (in)	Water Depth (ft bgl)	Bedrock Depth (ft bgl)	Well Yield (USgpm)	Aquifer Material	Aquifer Number
19593		New	Unknown	Unknown Well Use	38		30		0	Unconsolidated	194
58655		New	Water Supply	Private Domestic	360		110		0	Unconsolidated	194
57089		New	Water Supply	Private Domestic	490		140	0	30	Bedrock	808
60544		New	Water Supply	Private Domestic	480		265	7	0	Bedrock	808
69042		New	Water Supply	Private Domestic	363	6	83	8	1.5	Bedrock	808
69157		New	Water Supply	Private Domestic	510	6		8	2.5	Bedrock	808
80020		New	Water Supply	Private Domestic	180	6.63	100		50	Bedrock	808
82481		New	Unknown	Unknown Well Use	300	5.75		5	2	Bedrock	808
82486		New	Water Supply	Unknown Well Use	200	5.75	55	9	30	Bedrock	808
82822		New	Water Supply	Private Domestic	400	6.63	147		0.75	Bedrock	808
84786		New	Water Supply	Private Domestic	520	4.5		6	2	Bedrock	808
95265	30229	New	Water Supply	Water Supply System	540	6.62		67	124	Bedrock	808
102046	24083	New	Water Supply	Private Domestic	400	6.63	23	73	1.5	Bedrock	808
105407	27891	New	Water Supply	Private Domestic	180	6.63	72	33	10	Bedrock	808
109842	38628	New	Water Supply	Water Supply System	420	6.62	250	34	24	Bedrock	808
124408	62040	New	Water Supply	Private Domestic	400	6	40	18	3.5	Bedrock	808
82816		Alteration	Water Supply	Private Domestic	406	6.63			8	Unknown	808
85473		Alteration	Water Supply	Unknown Well Use	541	6	160		18	Bedrock	808
107602	34659	Alteration	Water Supply	Private Domestic	680	6.63	487	20		Bedrock	808

POD Number	POD Subtype	POD Status	Well Tag Number	Licence Number	Licence Status	Purpose Use	Source Name	Quantity	Quantity Units	Quantity Diversion Max Rate (m3/sec)	Primary Licensee Name
PW201907	PWD	Active	95265	503159	Current	00A - Waterworks: Local Provider	808	25000	m3/year	0.0078	Osoyoos Irrigation District (38030)
PD53942	POD	Active		C025545	Current	03A - Irrigation: Local Provider	Haynes Creek	222026.4	m3/year		Osoyoos Irrigation District (38030)
PD53944	POD	Active		C053096	Current	01A - Domestic	Bourguiba Creek	4.54609	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Active		C053097	Current	01A - Domestic	Bourguiba Creek	4.54609	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Active		C112040	Current	01A - Domestic	Bourguiba Creek	2.27305	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Active		C112040	Current	02I31 - Livestock & Animal: Stockwatering	Bourguiba Creek	2.27305	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Inactive		C068152	Cancelled	01A - Domestic	Bourguiba Creek	2.27305	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Inactive		C072664	Abandoned	01A - Domestic	Bourguiba Creek	2.27305	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Inactive		C053100	Abandoned	01A - Domestic	Bourguiba Creek	4.54609	m3/day		PRIVATE INDIVIDUAL NAME
PD53944	POD	Inactive		C072665	Abandoned	01A - Domestic	Bourguiba Creek	2.27305	m3/day		PRIVATE INDIVIDUAL NAME



RDOS Map

Legend

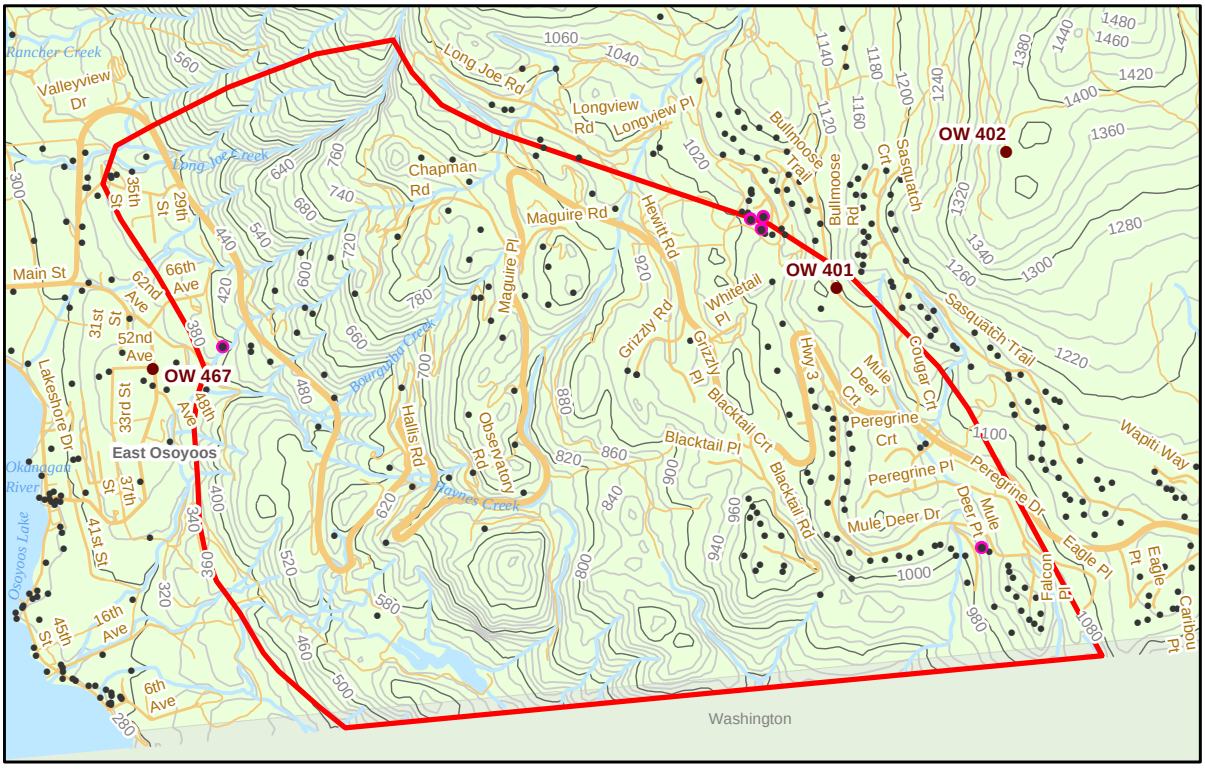
- Zoning
- OCP
- Environmentally Sensitive
- Important Ecosystem
- Gallagher Lake Commercial
- Hillside and Steep Slope
- Naramata Townsite
- Okanagan Falls Commercial
- Okanagan Falls Industrial
- Okanagan Falls Multiple Famil
- Development Permits Areas
- Water Course Development Ar
- Electoral Area Boundaries
- Major Highways
- Indian Reserve
- Parks
- Contours - 100m
- Contours - 20m
- Contours - 1m (OliverOnly)
- Streams
- Major Lakes

1: 9,028

0.3 0 0.14 0.3 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere

Aquifer #808
Anarchist Mountain



Legend

- Registered Water Well - Artesian
- Registered Water Well
- Active Observation Well
- Aquifer Boundary

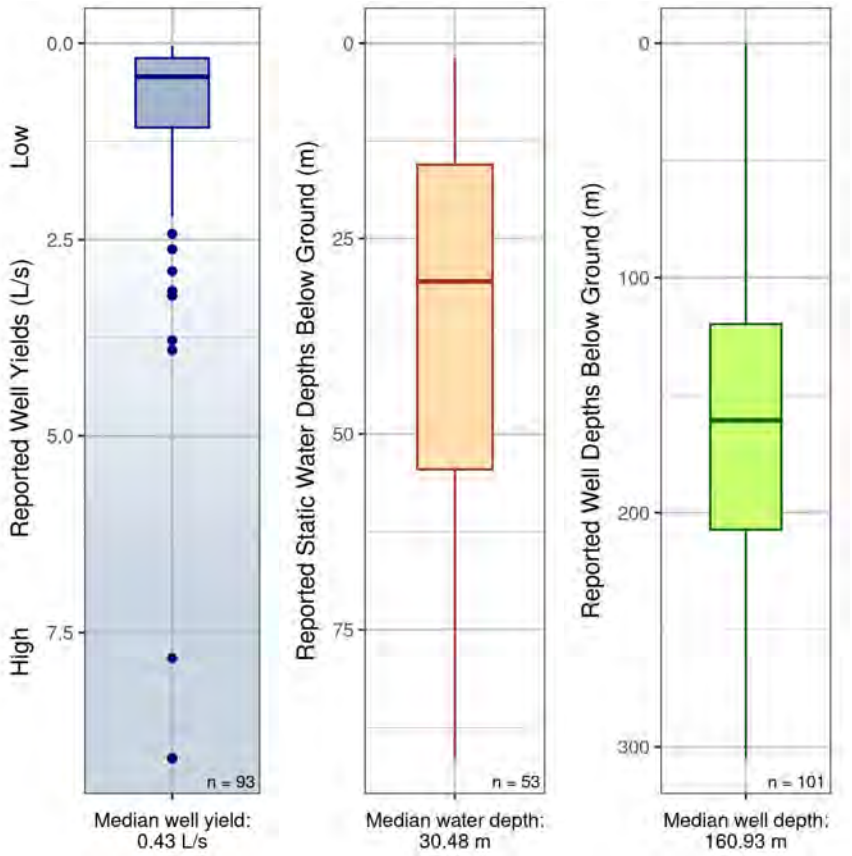
N

0 0.6 1.2 km

Aquifer Description (Mapping Report - 2012): Fractured crystalline (igneous intrusive or metamorphic, meta-sedimentary, meta-volcanic, volcanic) rock aquifer (subtype = 6b).

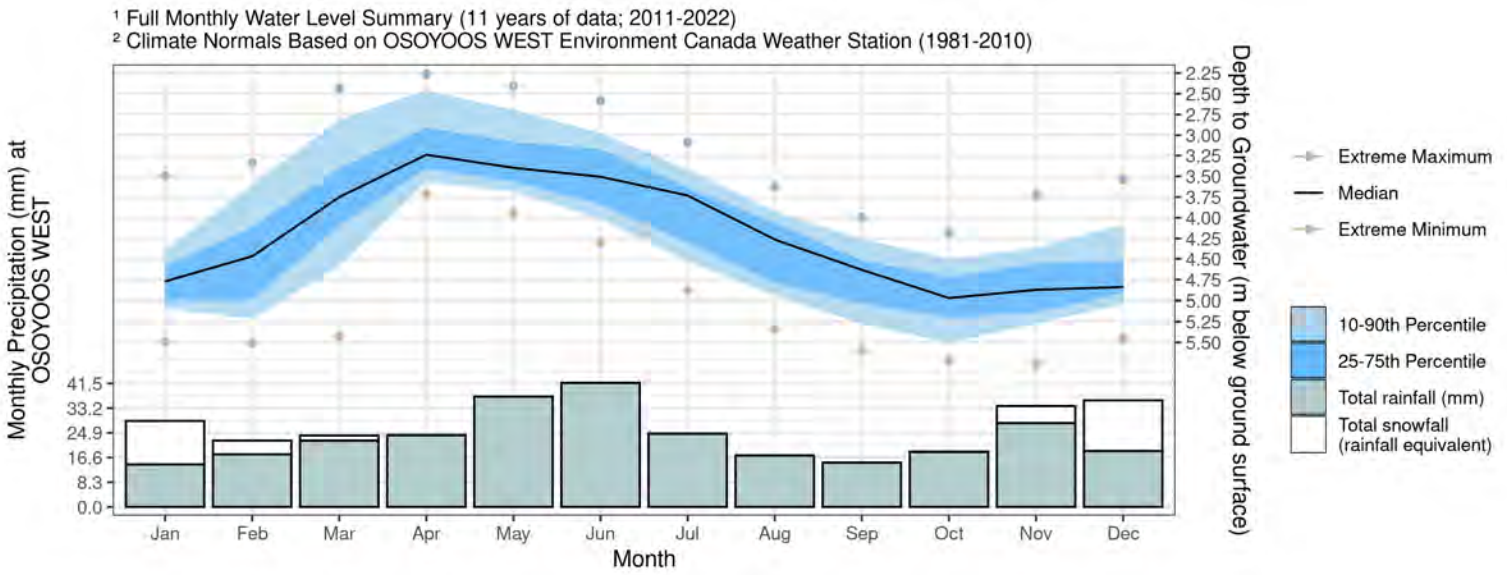
Aquifer Details	
Region	Thompson-Okanagan
Water District	Penticton
Aquifer Area	18.6 km^2
No. Wells Correlated	101
Vulnerability to Contamination	High
Productivity	Moderate
Aquifer Classification	IIA
Hydraulic Conductivity *	Unknown
Transmissivity *	Unknown
Storativity *	Unknown
No. Water Licences Issued to Wells	1
Observation Wells (**Active**, Inactive)	**401**

* min - max
For Hydraulic Connection see guidance document

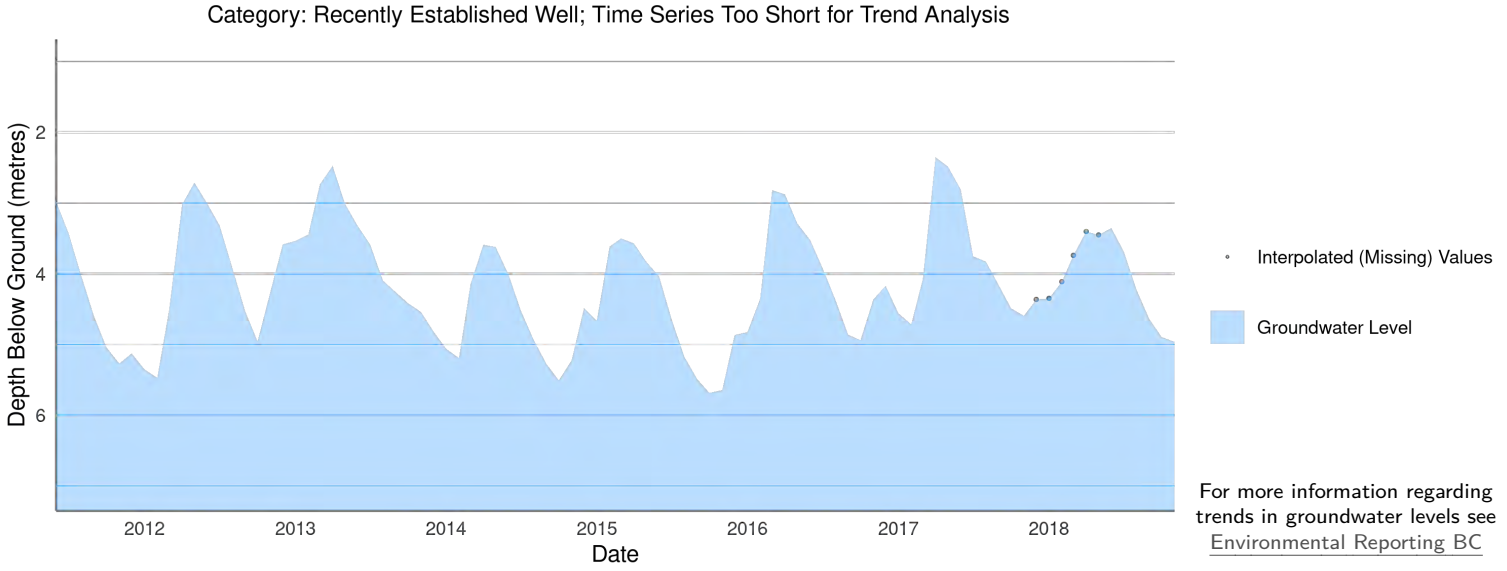


Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf).
Factsheet generated: 2022-07-27. Aquifers online: https://apps.nrs.gov.bc.ca/gwells/aquifers.

Monthly Groundwater Level[1] with Precipitation from Climate Normals[2]



Groundwater Levels and Long-term Trend



For more information regarding trends in groundwater levels see Environmental Reporting BC

Piper Plot

No summary at this point

Graph not available
(insufficient chemistry data)

AQUIFER CLASSIFICATION WORKSHEET

DATE:	02-Mar-12
AQUIFER REFERENCE NUMBER:	808
DESCRIPTIVE LOCATION OF AQUIFER:	East of Osoyoos, Anarchist Mountain
NTS MAP SHEET:	082E03 and 082E04
BCGS MAP SHEET:	082E003 and 82e004

CLASSIFICATION: IIA **RANKING: 11**

Aquifer Size: 18.5 km^2

Aquifer Boundaries:

The eastern boundary was determined using geological data and coincides with the limit of the intrusive rock group. The national border was used to delineate the southern boundary. Quarternary limits and well development extents were used for the western boundary while the northern boundary was determined using topographic information and the extent of well development. Dashed lines were used to indicate the uncertainty associated with the delineated aquifer boundary.

Aquifer Sub-type: 6b

Characterized as fractured crystalline (igneous intrusive or metamorphic, meta-sedimentary, meta-volcanic, volcanic) rock aquifers.

Aquifer Priority Rating for Observation Wells: 57.62

Geologic Formation (overlying materials):

Approximately 30 percent of wells have silt, clay, or till material overlying the bedrock. Confining materials are generally limited to two clustered locations in the southeast portion of the aquifer where well density is higher and at several wells in the northwest section. The interlayering of confining materials with more permeable deposits appears to occur with lateral variations. Where confining materials are absent, permeable sand and gravel materials are generally present or the overburden thickness is limited. The depth of unconsolidated material overlying the bedrock ranges from 0 to 64.62 m with a median of 4.57 m and an average of 10.13 m.

Geologic Formation (aquifer): Bedrock

Metamorphic rock from the Mesozoic era. The main rock types include granite and alkali feldspar granite intrusive rocks. There is potential for the aquifer to be connected to Aquifer No. 936 located upgradient.

Confined/Partially Confined/Unconfined: Partially Confined

Vulnerability: High - A

The thickness of the predominant confining unit above the aquifer material ranges from 0.46 to 40.54 m with a median of 4.88 m and an average of 6.53 m based on 32 well records. However, the lateral extent of the confining unit does not appear to be extensive based on available information. The bedrock aquifer material generally results in relatively quick movement of water and any accompanying contaminants. Aquifer vulnerability is considered high given that bedock is generally encountered relatively close to surface and the majority of wells do not have overlying confining sediments protecting it.

Productivity: Moderate – 0.48 L/s

Reported well yields range between 0.03 to 9.10 L/s with a median of 0.43 L/s and an average of 1.17 L/s based on 93 records. Productivity is considered moderate based on a geometric mean of 0.48 L/s.

Depth to Water: Moderately Deep - Average 34.98 m

The depth to water ranged from free flowing to 91.44 m with a median of 30.48 m and an average of 34.98 m based on 53 records. Artesian groundwater conditions were noted at five wells.

Direction of Groundwater Flow:

Flow components likely to the west, southwest, and south ignoring geologic complexities in the fractured bedrock and assuming groundwater will follow the topographic gradient from high elevation to low elevation.

Recharge:

Recharge to the aquifer is likely from direct infiltration of precipitation. It is noted that the aquifer is located in a dry climatic setting with an average annual precipitation of approximately 300 mm and possibly lateral inflows from Aquifer No. 8001 located upgradient.

Domestic Well Density: Moderate – 5.03 wells/km^2

The level of density was calculated at 5.03 wells/km^2 using wells identified for domestic and unknown uses and is considered to be moderate.

Type of Water Use: Drinking Water

It is assumed water is used primarily for private domestic and water supply system uses based

on a review of well record information and aerial photography.

Reliance on Source:

Assumed to be a local source of water supply for private domestic and water supply system uses.

Conflicts between Users:

None documented.

Quantity Concerns:

None documented.

Quality Concerns:

None documented.

Comments:

References:

Bernardinucci J. and K Ronneseth, 2002. Guide to Using the BC Aquifer Classification Maps for the Protection and Management of Groundwater. BC Ministry of Water, Land and Air Protection, Water Air and Climate Change Branch, Water Protection Section.

Bostock, H.S. 1930. Surficial Geology, Keremeos Similkameen District, British Columbia, Geological Survey of Canada, Map 341A.

AQUIFER CLASSIFICATION AND RANKING

AQUIFER LOCATION: East of Osoyoos, Anarchist Mountain

AQUIFER REFERENCE NUMBER: 808

AQUIFER SUB-TYPE: 6b

AQUIFER PRIORITY RATING FOR OBSERVATION: 57.62

CLASSIFICATION: IIA RANKING: 11

Classification Component:

Level of Development: Aquifer productivity is considered moderate based on well yield. Demand is considered moderate (see below). There is a moderate level of development in relation to aquifer productivity.

Level of Vulnerability: High level of vulnerability to surface contamination.

Ranking Component:	*Ranking Value:*
Productivity:	2
Vulnerability:	3
Size:	2
Demand*:	2
Type Of Use:	2
Quality:	
Quantity:	
Total:	**11**

** Demand has been assessed subjectively. Demand is based on domestic well density, the presence of several water supply system wells, and general knowledge of well use and land use in the area. Demand assumes that the reported well capacity is the amount of water used, which can be misleading. The reported well capacity is often higher than actual use.*

Statistical Summary of Well Data for Aquifer # 808

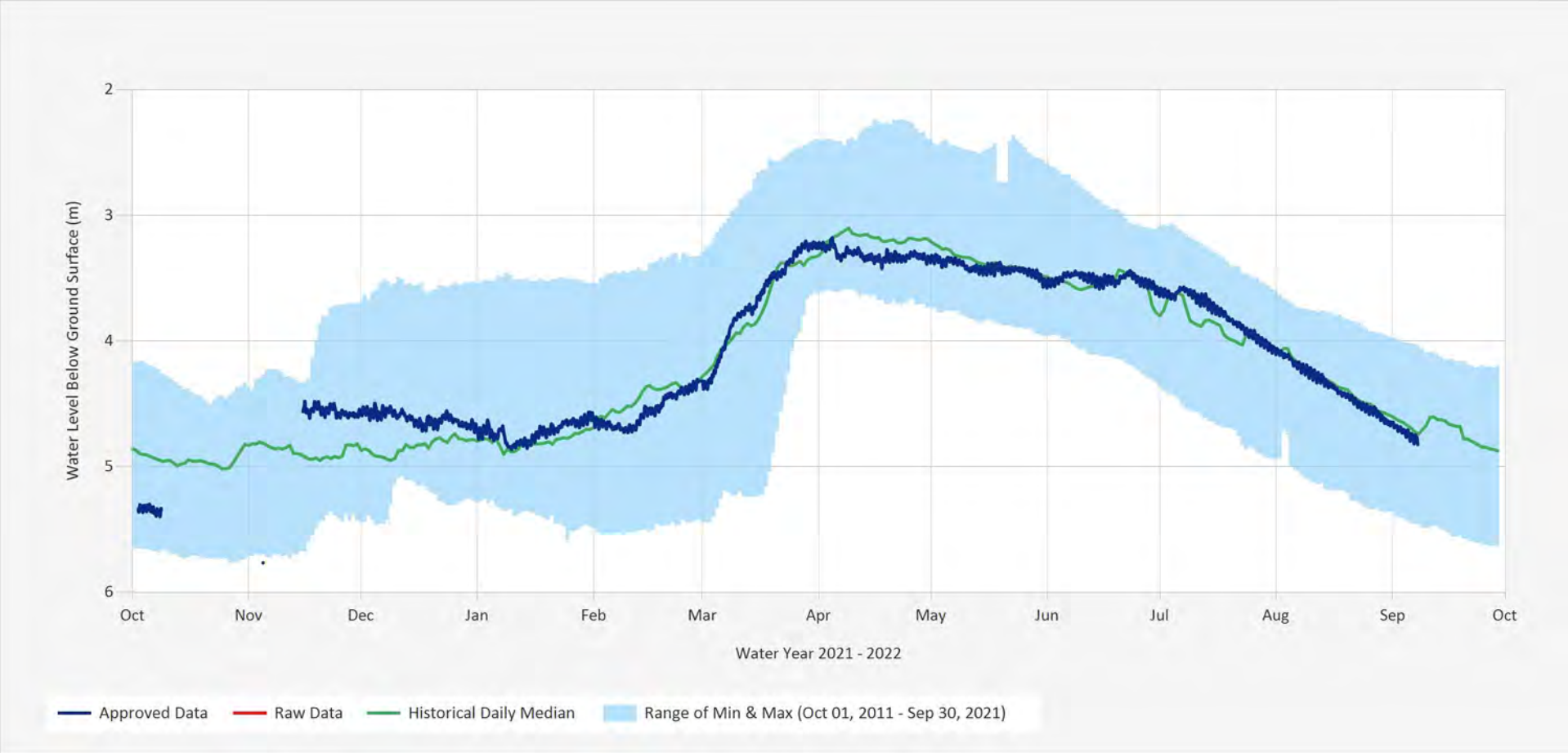
Total number of wells available for statistical analysis:

	Depth to Bedrock (m bgs)	Well Depth (m bgs)	Depth to Water (m bgs)	Reported Est. Well Yield (L/s)	Est. Thickness of Confining Materials (m)
Number of Wells	82	100	53	93	32
Minimum	0.00	5.49	Artesian	0.03	0.46
Maximum	64.62	304.80	91.44	9.10	40.54
Median	4.57	161.24	30.48	0.43	4.88
Average	10.13	164.78	34.98	1.17	6.53
Geometric Mean	4.88	147.54	25.08	0.48	4.12

Groundwater Level Statistics Chart

Groundwater.OW401.Groundwater Level Statistics Chart

Source Data: SGWL.Working@OW401
Location: OBS WELL 401 - OSOYOOS (BULLMOOSE RD), Latitude: 49.023341, Longitude: -119.363599, Elevation: : 0 m



The statistics (median/min/max) are based on the previous 10 years of available data prior to the current Water Year

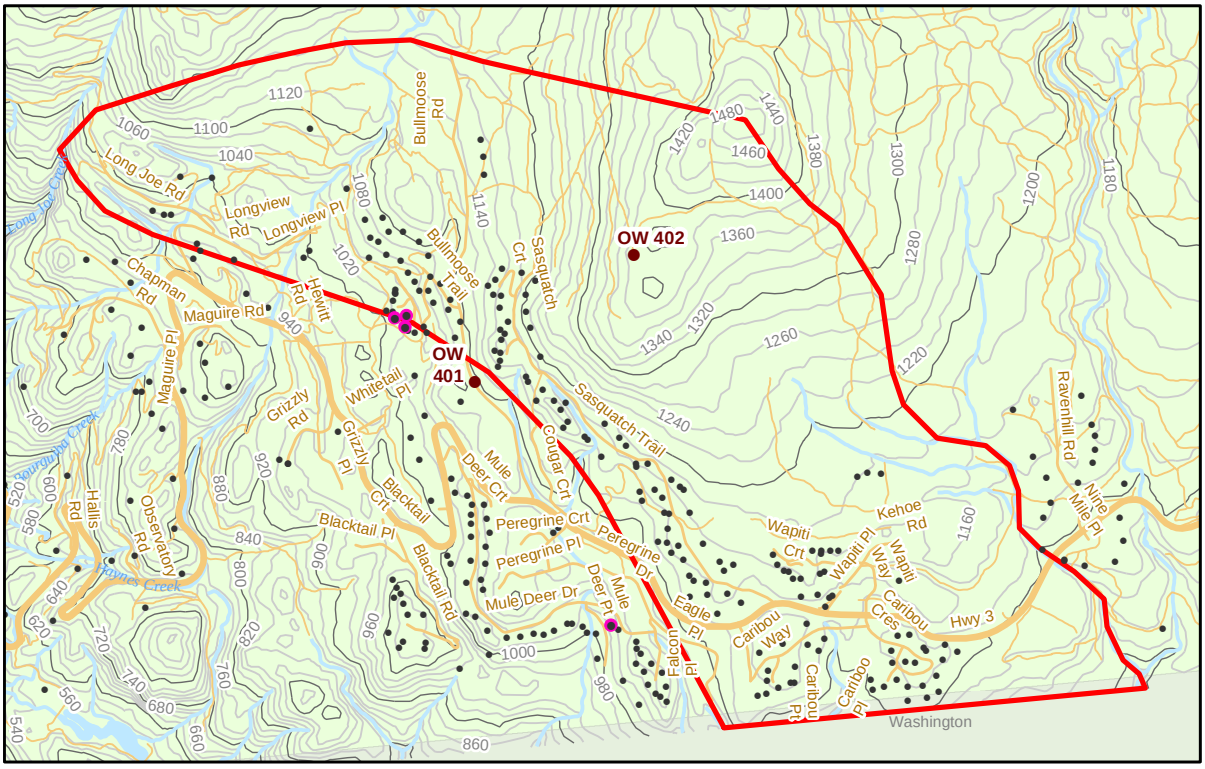
The statistics (median/min/max) are only displayed for wells with at least two years of data

The Groundwater Level Statistics Chart is only available for Active Wells

Data last appended: September 7, 2022 18:29 UTC+00:00

Status: Active

Aquifer #936



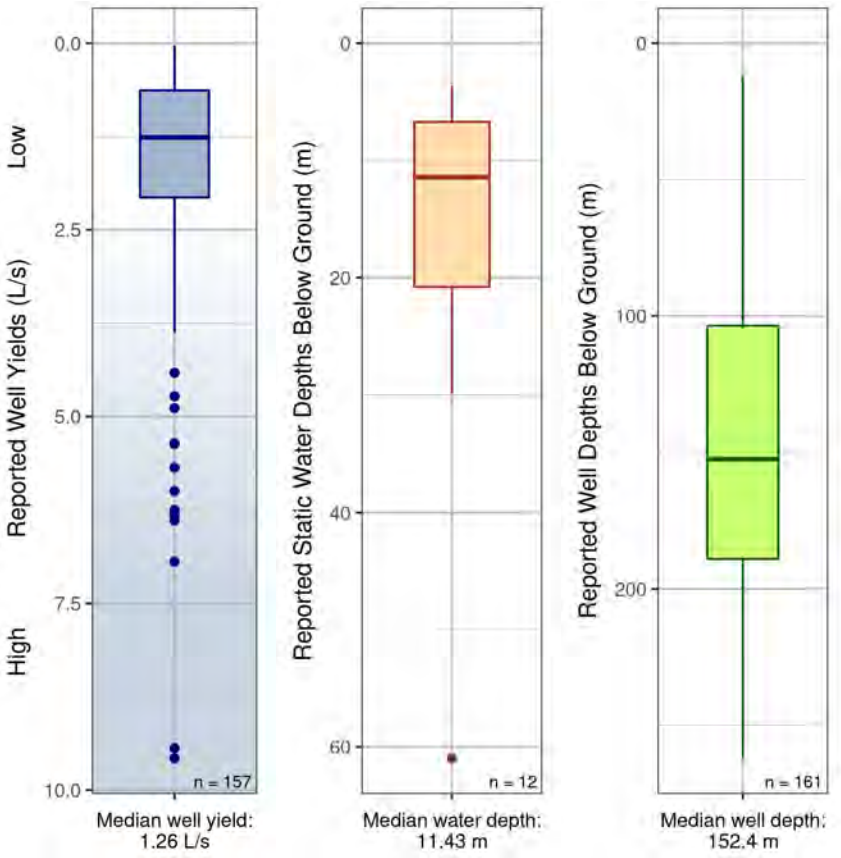
Legend

- Registered Water Well - Artesian
- Registered Water Well
- Active Observation Well
- Aquifer Boundary

Aquifer Description (Mapping Report - 2012): Fractured crystalline (igneous intrusive or metamorphic, meta-sedimentary, meta-volcanic, volcanic) rock aquifer (subtype = 6b).

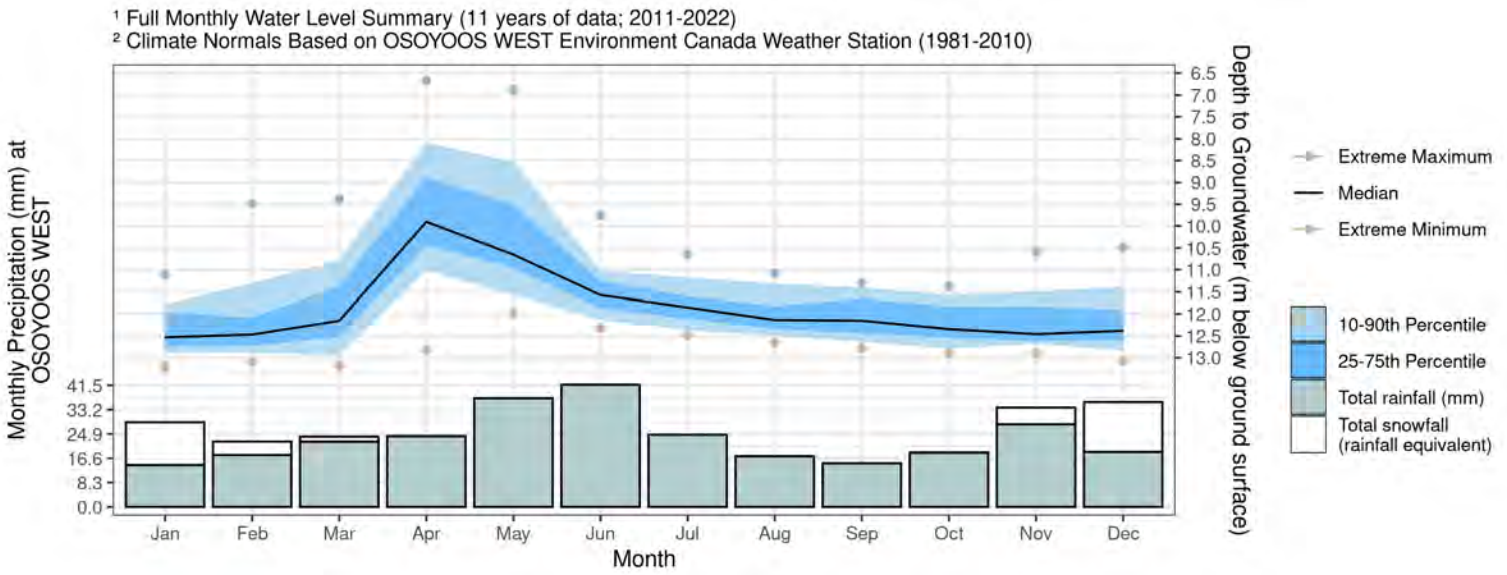
Aquifer Details	
Region	Thompson-Okanagan
Water District	Penticton
Aquifer Area	16.1 km^2
No. Wells Correlated	161
Vulnerability to Contamination	Moderate
Productivity	Moderate
Aquifer Classification	IIB
Hydraulic Conductivity *	Unknown
Transmissivity *	Unknown
Storativity *	Unknown
No. Water Licences Issued to Wells	Unknown
Observation Wells (**Active**, Inactive)	**402**

* min - max
For Hydraulic Connection see guidance document

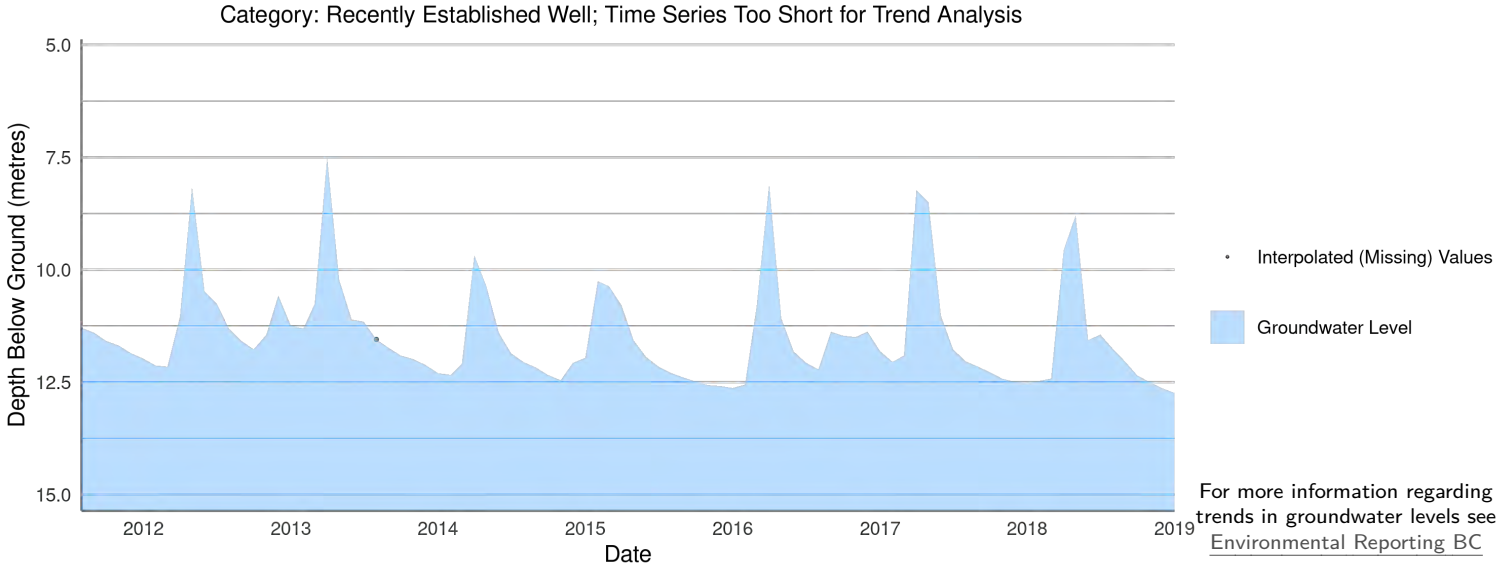


Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf).
Factsheet generated: 2022-07-27. Aquifers online: https://apps.nrs.gov.bc.ca/gwells/aquifers.

Monthly Groundwater Level[1] with Precipitation from Climate Normals[2]

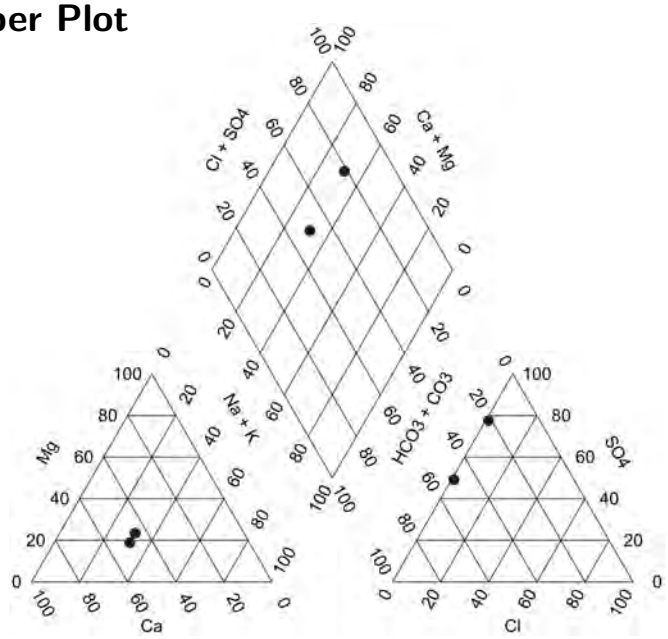


Groundwater Levels and Long-term Trend



For more information regarding trends in groundwater levels see Environmental Reporting BC

Piper Plot



The groundwater samples are typically of the Ca-Na-Mg-SO4-HCO3 & Ca-Na-SO4 type. Ca and Na are the dominant cations, the fact that aquifer #936 is fractured bedrock aquifer, Ca the dominant cation, SO4 being the dominant anion might indicate moderately evolved/medium water-rock interaction. For EMS water chemistry data, see EMS ID E283990.

AQUIFER CLASSIFICATION WORKSHEET

DATE:	02-Mar-12
AQUIFER REFERENCE NUMBER:	936
DESCRIPTIVE LOCATION OF AQUIFER:	East of Osoyoos, Anarchist Mountain
NTS MAP SHEET:	082E04
BCGS MAP SHEET:	82e004

CLASSIFICATION: IIB **RANKING: 10**

Aquifer Size: 16.1 km^2

Aquifer Boundaries:

The western boundary was determined using geological data and coincides with the limit of the Anarchist Schist formation. The national border was used to delineate the southern boundary while the remaining limits were determined using topographic information and the extent of well development. Dashed lines were used to indicate the uncertainty associated with the delineated aquifer boundary.

Aquifer Sub-type: 6b

Characterized as fractured crystalline (igneous intrusive or metamorphic, meta-sedimentary, meta-volcanic, volcanic) rock aquifers.

Aquifer Priority Rating for Observation Wells: 42.38

Geologic Formation (overlying materials):

Over 60 percent of wells have silt, clay, or till material overlying the bedrock. Confining materials are generally limited to several clustered locations. The interlayering of confining materials with more permeable deposits appears to occur with lateral variations. Where confining materials are absent, permeable sand and gravel materials are generally present. The depth of unconsolidated material overlying the bedrock ranges from 0 to 57.30 m with a median of 10.06 m and an average of 13.29 m.

Geologic Formation (aquifer): Bedrock

Despite differences in geology there is potential for the aquifer to be connected to Aquifer No. 808 located down gradient.

Confined/Partially Confined/Unconfined: Partially Confined

Vulnerability: Medium - B

There are several clusters of wells where the aquifer appears to be confined predominantly by till and clay with some areas having silt material. The thickness of the predominant confining unit above the aquifer material ranges from 0.91 to 52.73 m with a median of 7.32 m and an average of 10.06 m based on 100 well records. The depth to bottom of the confining material ranges from 0.91 to 57.30 m with an average of 17.19 m. The overlying confining sediments are considered relatively thick but the areal extent is limited to several clustered areas. The bedrock aquifer material generally results in relatively quick movement of water and any accompanying contaminants. A moderate vulnerability has been assigned based on the presence of overlying confining sediments that are substantially thick protecting over 60 percent of the aquifer.

Productivity: Moderate – 1.20 L/s

Reported well yields range between 0.03 to 9.57 L/s based on 157 records. Productivity is considered moderate based on a geometric mean of 1.20 L/s.

Depth to Water: Moderately Shallow - Average 16.76 m

The depth to water ranged from free flowing to 60.96 m with a median of 11.43 m and an average of 16.76 m based on 12 records. Artesian groundwater conditions were noted at two wells.

Direction of Groundwater Flow:

Flow components likely to the west, southwest, and south ignoring geologic complexities in the fractured bedrock and assuming groundwater will follow the topographic gradient from high elevation to low elevation.

Recharge:

Recharge to the aquifer is likely from direct infiltration of precipitation. It is noted that the aquifer is located in a dry climatic setting with an average annual precipitation of approximately 300 mm.

Domestic Well Density: Moderate – 9.8 wells/km^2

The level of density was calculated at 9.8 wells/km^2 using wells identified for domestic and unknown uses and is considered to be moderate.

Type of Water Use: Drinking Water

It is assumed water is used primarily for private domestic use based on a review of well record information and aerial photography.

Reliance on Source:

Assumed to be a local source of water supply primarily for private domestic use.

Conflicts between Users:

None documented.

Quantity Concerns:

None documented.

Quality Concerns:

None documented.

Comments:

References:

Bernardinucci J. and K Ronneseth, 2002. Guide to Using the BC Aquifer Classification Maps for the Protection and Management of Groundwater. BC Ministry of Water, Land and Air Protection, Water Air and Climate Change Branch, Water Protection Section.

Bostock, H.S. 1930. Surficial Geology, Keremeos Similkameen District, British Columbia, Geological Survey of Canada, Map 341A.

AQUIFER CLASSIFICATION AND RANKING

AQUIFER LOCATION: East of Osoyoos, Anarchist Mountain

AQUIFER REFERENCE NUMBER: 936

AQUIFER SUB-TYPE: 6b

AQUIFER PRIORITY RATING FOR OBSERVATION: 42.38

CLASSIFICATION: IIB RANKING: 10

Classification Component:

Level of Development: Aquifer productivity is considered moderate based on well yield. Demand is considered moderate (see below). There is a moderate level of development in relation to aquifer productivity.

Level of Vulnerability: Moderate level of vulnerability to surface contamination.

Ranking Component:	*Ranking Value:*
Productivity:	2
Vulnerability:	2
Size:	2
Demand*:	2
Type of Use:	2
Quality:	
Quantity:	
Total:	**10**

** Demand has been assessed subjectively. Demand is based on domestic well density and general knowledge of well use and land use in the area. Demand assumes that the reported well capacity is the amount of water used, which can be misleading. The reported well capacity is often higher than actual use.*

Statistical Summary of Well Data for Aquifer # 936

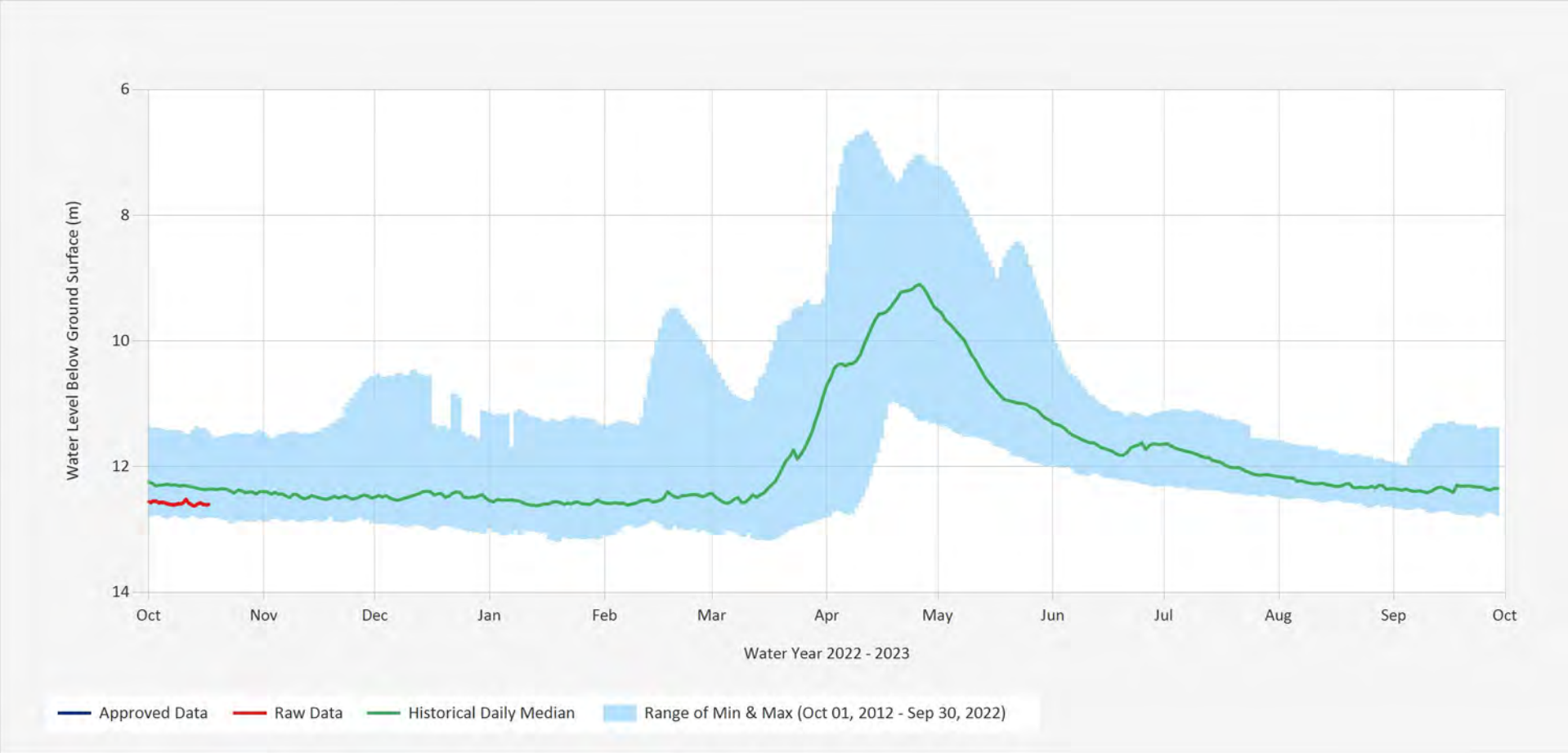
Total number of wells available for statistical analysis:

	Depth to Bedrock (m bgs)	Well Depth (m bgs)	Depth to Water (m bgs)	Reported Est. Well Yield (L/s)	Est. Thickness of Confining Materials (m)
Number of Wells	150	161	12	157	100
Minimum	0.00	12.19	Artesian	0.03	0.91
Maximum	57.30	262.13	60.96	9.57	52.73
Median	10.06	152.40	11.43	1.26	7.32
Average	13.29	147.70	16.76	1.78	10.06
Geometric Mean	7.32	134.88	11.50	1.20	6.58

Groundwater Level Statistics Chart

Groundwater.OW402.Groundwater Level Statistics Chart

Source Data: SGWL.Working@OW402
Location: OBS WELL 402 - OSOYOOS (ANARCHIST MTN SUMMIT), Latitude: 49.030404, Longitude: -119.347269, Elevation: : 0 m



The statistics (median/min/max) are based on the previous 10 years of available data prior to the current Water Year

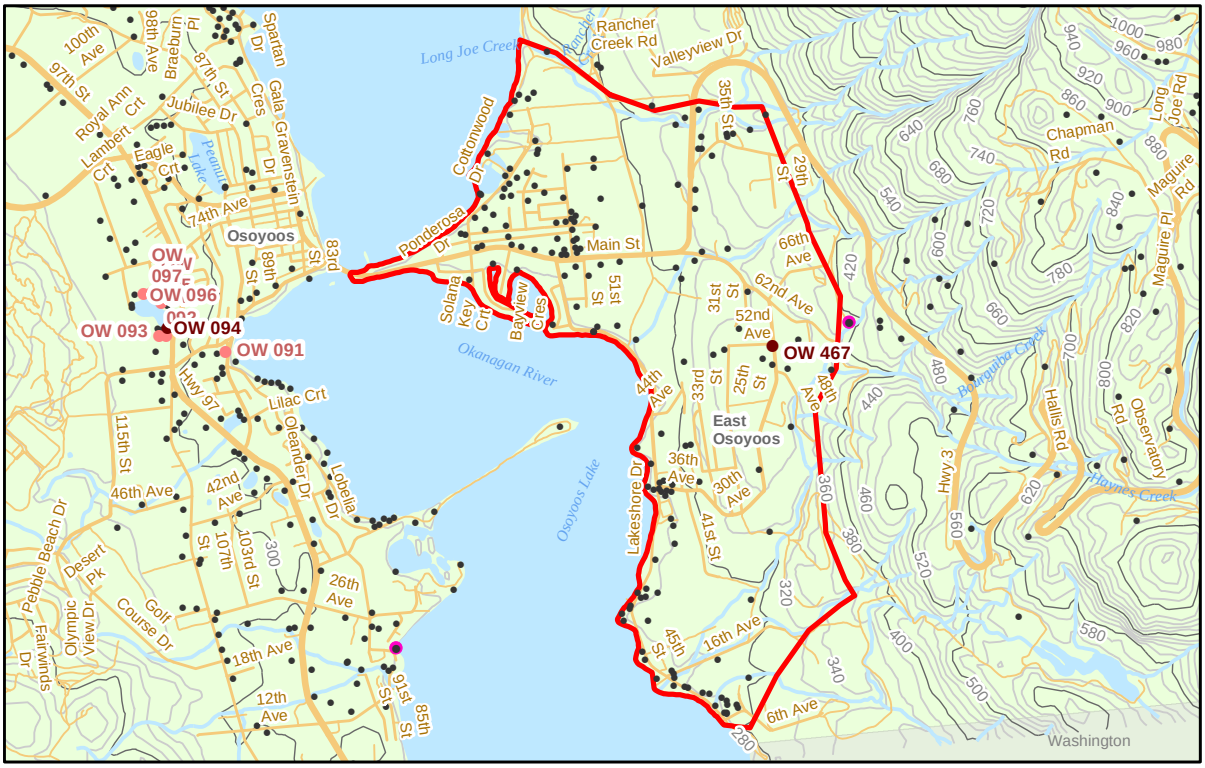
The statistics (median/min/max) are only displayed for wells with at least two years of data

The Groundwater Level Statistics Chart is only available for Active Wells

Data last appended: October 17, 2022 04:00 UTC+00:00

Status: Active

Aquifer #194



Legend

- Registered Water Well - Artesian
- Registered Water Well
- Active Observation Well
- Inactive Observation Well
- Aquifer Boundary

0 0.55 1.1 km

N

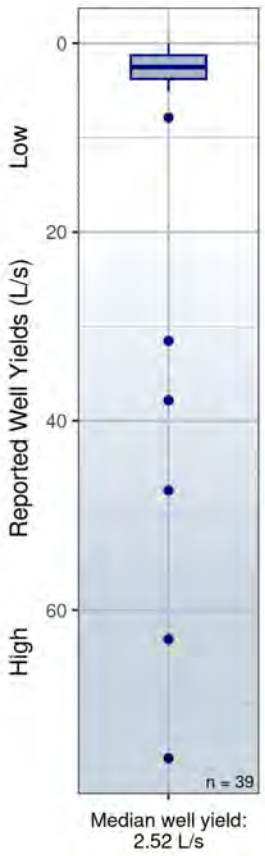
Aquifer Description (Mapping Report - 2012): Unconfined glacio-fluvial outwash or ice contact sand and gravel aquifers generally formed near or at the end of the last period of glaciation (sub-type = 4a).

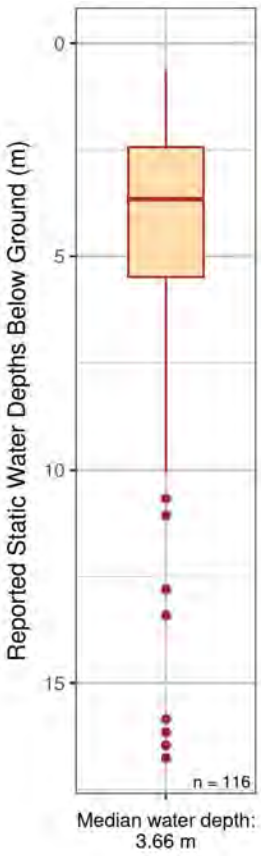
Aquifer Details

Region	Thompson-Okanagan
Water District	Penticton
Aquifer Area	5.3 km^2
No. Wells Correlated	129
Vulnerability to Contamination	High
Productivity	Moderate
Aquifer Classification	IIA
Hydraulic Conductivity *	Unknown
Transmissivity *	Unknown
Storativity *	Unknown
No. Water Licences Issued to Wells	2
Observation Wells (**Active**, Inactive)	**467**

* min - max

For Hydraulic Connection see guidance document

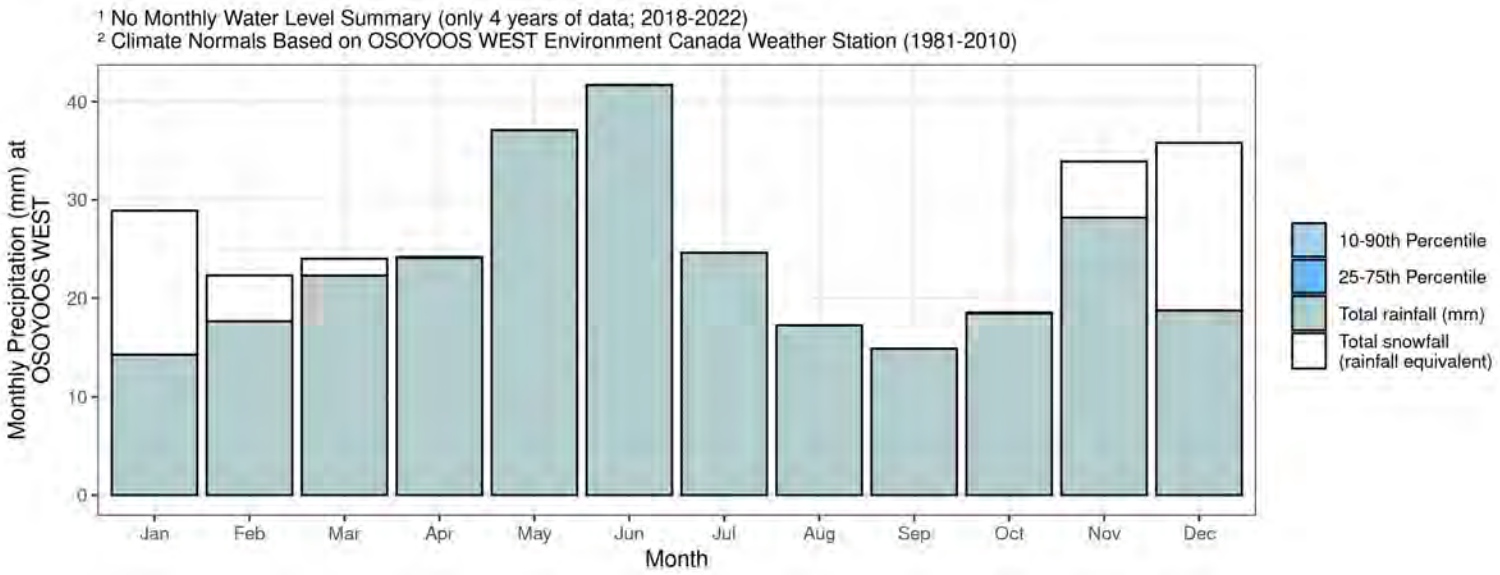




Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf).

Factsheet generated: 2022-07-27. Aquifers online: https://apps.nrs.gov.bc.ca/gwells/aquifers.

Monthly Groundwater Level[1] with Precipitation from Climate Normals[2]



Groundwater Levels and Long-term Trend

Graph not available
(Not enough data)

For more information regarding trends in groundwater levels see Environmental Reporting BC

Piper Plot

No summary at this point

Graph not available
(insufficient chemistry data)

AQUIFER CLASSIFICATION WORKSHEET

DATE:	28-Feb-12
AQUIFER REFERENCE NUMBER:	194
DESCRIPTIVE LOCATION OF AQUIFER:	East Osoyoos
NTS MAP SHEET:	082E03 and 082E04
BCGS MAP SHEET:	082E003

CLASSIFICATION: IIA **RANKING: 15**

Aquifer Size: 5.21 km^2

Aquifer Boundaries:

Osoyoos Lake was used to define the western aquifer boundary. The eastern aquifer boundary was determined using available quarternary geology information which generally coincides with the base of mountain slopes. A solid line has been used along the western and eastern aquifer boundaries and corresponds to a high degree of certainty. The northern and southern aquifer boundaries were delineated using topographic divides and represent the probably extent of local aquifer recharge. Dashed lines were used and indicate a lesser degree of certainty.

Aquifer Sub-type: 4a

Characterized as unconfined glaciofluvial outwash or ice contact sand and gravel aquifers, generally formed near or at the end of the last period of glaciation.

Aquifer Priority Rating for Observation Wells: 73.57

Geologic Formation (overlying materials):

Recent alluvium and glacial drift (Bostock, 1940). Well records indicate overlying material ranges from fine sand to coarse gravel inferred to be deposited by melt-water streams.

Geologic Formation (aquifer): Sand and Gravel

Predominantly sand and gravel deposits with some areas having fine sand material.

Confined/Partially Confined/Unconfined: Partially Confined

Confined over parts of the area and unconfined over others. The confining layer is generally encountered along the lake shoreline. The area along the southern half of the shoreline was

previously defined a separate aquifer (Aquifer No. 195); however, given the limited vertical extent and potential connection to the upgradient unconfined areas the two areas were lumped into a single aquifer. Some areas are confined by semi-pervious sediments that do not completely protect the aquifer from potential surface contamination. A deeper confined aquifer may exist based on a few deep wells with yield, but this was not investigated further due to the lack of information.

Vulnerability: High - A

Aquifer vulnerability is considered high. Unconfined conditions exists where "windows" provide a potential pathway for contaminants to reach the aquifer. Where present, the predominant confining material consists of sand and fines which are considered medium permeability sediments. The confining layer thickness is relatively thin based on an average thickness of 4.57 m using lithology information from 25 well records. The average water depth is 4.43 m below ground surface based on 116 well records and is considered to be shallow.

Productivity: Moderate - 2.81 L/s

Reported well yields show a wide range between 0.09 to 75.71 L/s based on 37 records. A median of 2.52 L/s and a geometric mean of 2.81 L/s was calculated based on the available well yield information. High capacity wells are generally located near the lake. Although some areas of the aquifer appear to be highly productive, a moderate productivity was assigned to be conservative given the geometric well yield value of less than 3.0 L/s.

Depth to Water: Shallow – Average 4.43 m

The depth to water ranged from free flowing to 16.76 m with a median of 3.66 m and an average of 4.43 m based on 116 records. One well (Well Tag Number 16263) was noted as being artesian and is located near the base of the mountain slope.

Direction of Groundwater Flow:

Likely east to west from inland at higher elevation towards Osoyoos Lake.

Recharge:

Recharge to the aquifer is from direct infiltration of precipitation and irrigation water. It is noted that the aquifer is located in a dry climatic setting with an average annual precipitation of approximately 300 mm. High capacity wells near Osoyoos Lake are recharged by the lake.

Domestic Well Density: Moderate – 23 wells/km^2

The level of density was calculated at 23 wells/km^2 using wells identified for domestic and unknown uses. It is believed that many of the wells located inland are abandoned or used for garden use only since owners have chosen to hook up to a water supply system; therefore, the domestic well density is considered to be moderate. It is understood that a majority of the residents located along the Osoyoos lake shoreline, however, still utilize their dug wells for domestic purposes.

Type of Water Use: Multiple Uses

Primarily private domestic use but groundwater is also used for municipal water systems (i.e., Town of Osoyoos), commercial (i.e., campgrounds, local resorts, motel) and irrigation purposes.

Reliance on Source:

Local source of drinking water supply for individual domestic and municipal systems. Also used for irrigation and commercial purposes.

Conflicts between Users:

None documented.

Quantity Concerns:

None documented. Groundwater levels do not show any long term declining trends, indicating good potential for further groundwater development (Groundwater Resources of British Columbia).

Quality Concerns:

Reported groundwater concerns include high nitrate levels (>10 mg/L) possibly from septic tank effluent or fertilizer application (Groundwater Resources of British Columbia). Nitrate studies in the area have been ongoing since 1985. Two well records also indicate high levels of iron.

Comments:

References:

Bernardinucci J. and K Ronneseth, 2002. Guide to Using the BC Aquifer Classification Maps for the Protection and Management of Groundwater. BC Ministry of Water, Land and Air Protection, Water Air and Climate Change Branch, Water Protection Section.

British Columbia Ministry of Environment. Ground Water Resources of British Columbia. http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/gwbc/index.html accessed on February 29, 2012.

Bostock, H.S. 1940. Surficial Geology, Keremeos Similkameen District, British Columbia, Geological Survey of Canada, Map 341A.

AQUIFER CLASSIFICATION AND RANKING

AQUIFER LOCATION: East Osoyoos

AQUIFER REFERENCE NUMBER: 194

AQUIFER SUB-TYPE: 4a

AQUIFER PRIORITY RATING FOR OBSERVATION: 73.57

CLASSIFICATION: IIA RANKING: 15

Classification Component:

Level of Development: Moderate level of development in relation to aquifer productivity.

Level of Vulnerability: High level of vulnerability to surface contamination.

Ranking Component:	*Ranking Value:*
Productivity:	2
Vulnerability:	3
Size:	2
Demand*:	2
Type Of Use:	3
Quality:	3
Quantity:	
Total:	**15**

** Demand has been assessed subjectively. Demand is based on domestic well density, presence of several municipal supply wells with yields up to 75 L/s, and general knowledge of well use and land use in the area. Demand assumes that the reported well capacity is the amount of water used, which can be misleading. The reported well capacity is often higher than actual use.*

Statistical Summary of Well Data for Aquifer # 194

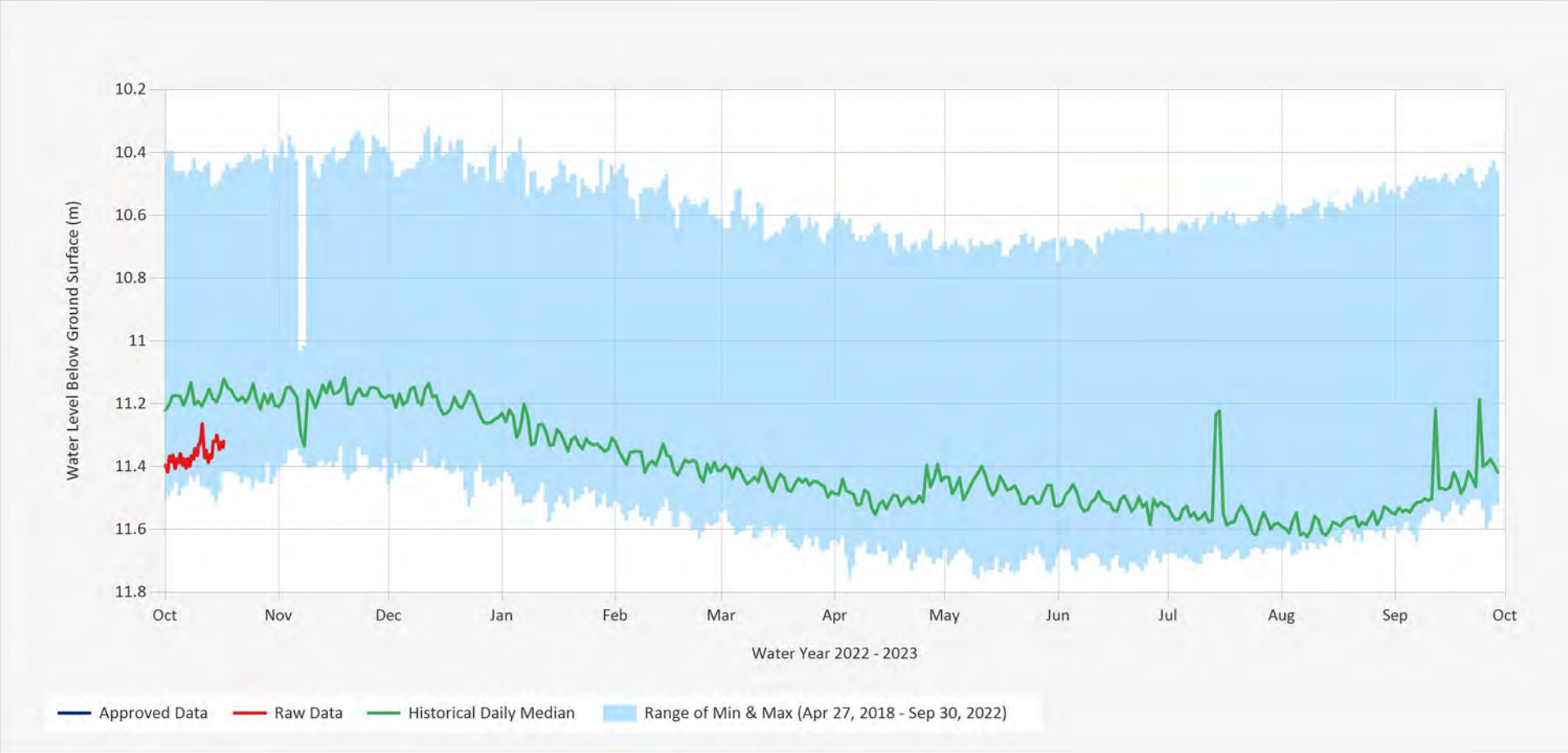
Total number of wells available for statistical analysis:

	Depth to Bedrock (m bgs)	Well Depth (m bgs)	Depth to Water (m bgs)	Reported Est. Well Yield (L/s)	Est. Thickness of Confining Materials (m)
Number of Wells	0	130	116	37	25
Minimum	-	1.83	Artesian	0.09	1.22
Maximum	-	29.26	16.76	75.71	13.71
Median	-	7.77	3.66	2.52	3.05
Average	-	8.71	4.43	10.57	4.57
Geometric Mean	-	7.38	3.53	2.81	3.59

Groundwater Level Statistics Chart

Groundwater.OW467.Groundwater Level Statistics Chart

Source Data: SGWL.Working@OW467
Location: OBS WELL 467 - OSOYOOS EAST (52ND AVE AND 25TH ST), Latitude: 49.022315, Longitude: -119.425509, Elevation: : 347.54 m



The statistics (median/min/max) are based on the previous 10 years of available data prior to the current Water Year

The statistics (median/min/max) are only displayed for wells with at least two years of data

The Groundwater Level Statistics Chart is only available for Active Wells

Data last appended: October 16, 2022 23:00 UTC+00:00

Status: Active

WTN 124408

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Environment

☑ Well Construction Report
☐ Well Closure Report
☐ Well Alteration Report

Stamp company name/address/ phone/fax/email here, if desired.

Ministry Well ID Plate Number: 62040
Ministry Well Tag Number: _____
☐ Confirmation/alternative specs. attached
☐ Original well construction report attached

Red lettering indicates minimum mandatory information. See reverse for notes & definitions of abbreviations.

Owner name: Steinar Johnsen.

Mailing address: 103 - 2450 Radio Tower Rd Town Olive Prov. BC. Postal Code V0H 1T1.

Well Location (see note 2): Address: Street no. _____ Street name _____ Town _____

(or) **Legal description:** Lot _____ Plan _____ D.L. _____ Block _____ Sec. _____ Twp. _____ Rg. _____ Land District _____

(or) **PID:** 002 165 451 (and) **Description of well location (attach sketch, if nec.):** _____

NAD 83: Zone: Nad 83 (see note 3) (and) **UTM Easting:** 119° 24. 644m m **UTM Northing:** 49° 01. 486m m (or) **Latitude (see note 4):** _____ **Longitude:** _____

Method of drilling: ☑ air rotary ☐ dual rotary ☐ cable tool ☐ mud rotary ☐ auger ☐ driving ☐ jetting ☐ other (specify): _____

Orientation of well: ☑ vertical ☐ horizontal Ground elevation: 1895 ft (asl) Method (see note 5): GPS.

Class of well (see note 6): Water Supply **Sub-class of well:** Domestic.

Water supply wells: indicate intended water use: ☑ private domestic ☐ water supply system ☐ irrigation ☐ commercial or industrial ☐ other (specify): _____

Lithologic description (see notes 8-13) or closure description (see notes 14 and 15)

From ft (bgl)	To ft (bgl)	Surficial Material: Clay	Silt	Till	Sand with clay/silt	Sand, fine-med	Sand, med-coarse	Sand with gravel	Bedrock Material: Siltstone/shale	Sandstone	Conglomerate	Limestone	Basalt	Volcanic	Cyrstalline	Other Surficial/ Bedrock	Colour: Red	Orange	Brown	Tan	Light Grey	Blue	Green	Dark Grey	Hardness: Very Hard	Hard	Dense/Stiff	Loose	Water Content: Dry	Moist	Wet	High Production	Lost circulation	Not Available	Observations (e.g. other geological materials (e.g. boulders), est. water bearing flow (USgpm), or closure details)
0	18		●																●									●	●						+ Boulders.
18	40														●												●								weathered/slabs.
40	180														●																				Black whits/with
																																			Voids
180	400														●																				Black and white,
																																			100' Trace water
																																			120' 36PM
																																			180 3½ GPM.

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole (see note 17)	Wall Thickness in	Drive Shoe
0	40	6	Steel	.219	✓

Surface seal: Type: Bentonite Depth: 40 ft
Method of installation: ☑ Poured ☐ Pumped Thickness: 2. in
Backfill: Type: _____ Depth: _____ ft
Liner: ☑ PVC ☐ Other (specify): _____
Diameter: 4 in Thickness: .250 in
From: 0 ft (bgl) To: 400 ft (bgl) Perforated: From: 360 ft (bgl) To: 400 ft (bgl)

Screen details

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size

Intake: ☐ Screen ☐ Open bottom ☐ Uncased hole
Screen type: ☐ Telescope ☐ Pipe size
Screen material: ☐ Stainless steel ☐ Plastic ☐ Other (specify): _____
Screen opening: ☐ Continuous slot ☐ Slotted ☐ Perforated pipe
Screen bottom: ☐ Bail ☐ Plug ☐ Plate ☐ Other (specify): _____
Filter pack: From: _____ ft To: _____ ft Thickness: _____ in
Type and size of material: _____

Developed by:

☑ Air lifting ☐ Surging ☐ Jetting ☐ Pumping ☐ Bailing
Other (specify): _____ Total duration: 1 hrs
Notes: _____

Well yield estimated by:

☐ Pumping ☑ Air lifting ☐ Bailing ☐ Other (specify): _____
Rate: _____ USgpm Duration: 1 hrs
SWL before test: _____ ft (btoc) Pumping water level: _____ ft (btoc)

Obvious water quality characteristics:

☑ Fresh ☐ Salty ☑ Clear ☐ Cloudy ☐ Sediment ☐ Gas

Final well completion data:

Total depth drilled: 400 ft Finished well depth: 400 ft (bgl)
Final stick up: 15 feet Depth to bedrock: 18 ft (bgl)
SWL: 40 ft (btoc) Estimated well yield: 3½. USgpm
Artesian flow: _____ USgpm, or Artesian pressure: _____ ft
Type of well cap: Vented Well disinfected: ☑ Yes ☐ No
Where well ID plate is attached: To Casing

Well closure information:

Reason for closure: _____
Method of closure: ☐ Poured ☐ Pumped

100' Trace water
120' 3 GPM
180 3½ GPM.

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole (see note 17)	Wall Thickness in	Drive Shoe
0	40	6	Steel	.219	✓

Surface seal: Type: Bentonite Depth: 40 ft
Method of installation: ☒ Poured ☐ Pumped Thickness: 2. in
Backfill: Type: ______ Depth: ______ ft
Liner: ☒ PVC ☐ Other (specify): ______
Diameter: 4 in Thickness: .250 in
From: 0 ft (bgl) To: 400 ft (bgl) Perforated: From 360 ft (bgl) To 400 ft (bgl)

Screen details

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size

Intake: ☐ Screen ☐ Open bottom ☐ Uncased hole
Screen type: ☐ Telescope ☐ Pipe size
Screen material: ☐ Stainless steel ☐ Plastic ☐ Other (specify): ______
Screen opening: ☐ Continuous slot ☐ Slotted ☐ Perforated pipe
Screen bottom: ☐ Bail ☐ Plug ☐ Plate ☐ Other (specify): ______
Filter pack: From: ____ ft To: ____ ft Thickness: ______ in
Type and size of material: ______

Developed by:

☒ Air lifting ☐ Surging ☐ Jetting ☐ Pumping ☐ Bailing
Other (specify): ______ Total duration: 1 hrs
Notes: ______

Well yield estimated by:

☐ Pumping ☒ Air lifting ☐ Bailing ☐ Other (specify): ______
Rate: ______ USgpm Duration: 1 hrs
SWL before test: ______ ft (btoc) Pumping water level: ______ ft (btoc)

Obvious water quality characteristics:

☒ Fresh ☐ Salty ☒ Clear ☐ Cloudy ☐ Sediment ☐ Gas
Colour/odour: ______ Water sample collected: ☐

Well driller (print clearly):

Name (first, last) (see note 19): Walter Howe
Registration no. (see note 20): 05081001
Consultant (if applicable; name and company): ______

Final well completion data:

Total depth drilled: 400 ft Finished well depth: 400 ft (bgl)
Final stick up: 15 feet Depth to bedrock: 18 ft (bgl)
SWL: 40 ft (btoc) Estimated well yield: 3½ USgpm
Artesian flow: ______ USgpm, or Artesian pressure: ______ ft
Type of well cap: Vented Well disinfected: ☒ Yes ☐ No
Where well ID plate is attached: To Casing

Well closure information:

Reason for closure: ______
Method of closure: ☐ Poured ☐ Pumped
Sealant material: ______ Backfill material: ______
Details of closure (see note 16): ______

Date of work (YYYY/MM/DD):

Started: 20210426 Completed: 20210430
Comments: ______

DECLARATION: Well construction, well alteration or well closure, as the case may be, has been done in accordance with the requirements in the Water Act and the Ground Water Protection Regulation.

Signature of Driller Responsible [signature]

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy
pink: Ministry copy

Sheet ____ of ____

WTN 69157

WELL LOG CONSTRUCTION RECORD

OWNER Mr. Albert Mouz

Address RR #1 Site #52 Comp. #18 Osoyoos B.C. V0H 1V0

Well Location 1½ Km. east of Osoyoos (up paved driveway on left.)

Date Started May 18/95 Date Completed May 22/95

Drilling Method Air rotary

Driller Don Ramsey Helper Rob Crampton

File _____ Folio _____

Signed by Don Ramsey

QUALITY WELL DRILLING LTD.
P.O. BOX 589
OKANAGAN FALLS, B.C. V0H 1R0
PH: (604) 497-5777

LOG OF FORMATIONS

Depth		Descriptions
0	to 5'	Fine sand and silt.
5'	to 8'	Boulder
8'	to 11'4½"	Cased and cemented bedrock.
11'4½"	to 510	6" open bedrock borehole
	to	
	to	
	to	
	to *	This well was not lined.

CASING RECORD

Dia. 6 ins. Wt. 22 #/ft. From 0 to 11'4½"

Dia. ____ ins. Wt. ____ #/ft. From ____ to ____

Dia. ____ ins. Wt. ____ #/ft. From ____ to ____

Shoe ✓ Welded ✓ Cemented ✓

SCREEN RECORD

Make _____ Material _____

Slot opening _____ Length _____

Top _____ ft. Bottom _____ ft.

Fittings Top _____ Fittings Bottom _____

Gravel Pack _____ Natural _____

Development Method Air lift.

ROCK WELL DATA

Open Bore Hole _____ Dia. 6" ins.

From 11'4½" ft. to 510" ft.

PRODUCTION DATA

Static Level _____ ft.

Measured from Ground

Pumping Level _____ ft. at _____ GPM

Total air lift ft. at 2-2½ GPM

Bail Test _____ ft. at _____ GPH

_____ ft. at _____ GPH

Recommended Pump Setting 490' ft.

Recommended Max. Pump Output 2 GPM ~~GPH~~

Duration of Test 2 Hrs.

GENERAL REMARKS

This well was left with a 2 ft. stick up.

Area 17 Schl 14 Juris 714 Assessment # 06748.306

Lot 15, Plan 21789, Subsid, Lot 2, District Lot 2709, Similkameen Div of Yak Land District

PID # 002-165-481

Albert A MAUZ 45.4 acre

Karin H MAUZ

Site 52 comp 18

RR 1

Osoyoos. BC V0H 1V0

Location of property

Hwy 3

Phone to check if its Lot 15 or 14?

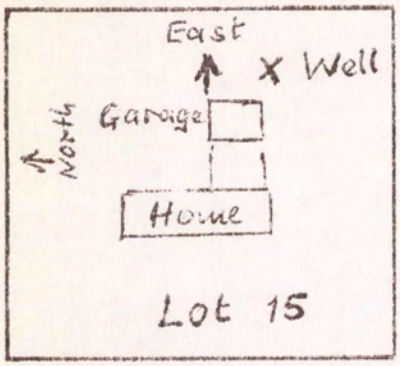
Maiked

To Be Filled and Return in Envelope Provided

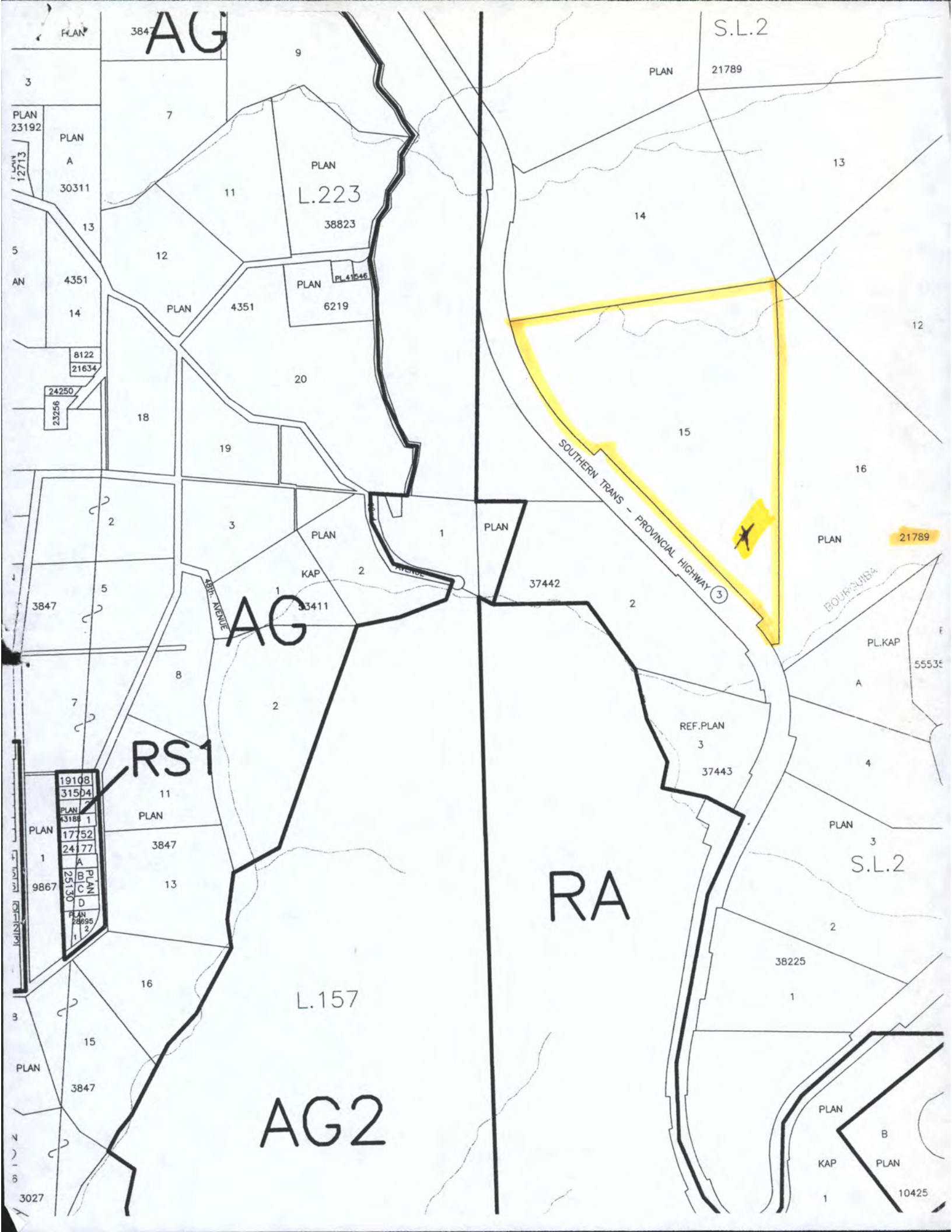
Well Owners Name: Albert & Karin Mauz

Address: Highway 3 East, RR#1, Site 52 Comp.18
Osoyoos, B.C.

Phone #: 250-495-6085



Well Location: Well is approximately 40 feet South-East of home.


AG
AG
AG2
RA
RS1
S.L.2
S.L.2
L.223
L.157
SOUTHERN TRANS - PROVINCIAL HIGHWAY (3)
48th. AVENUE
PLAN
21789
PLAN
37442
PLAN
33411
PLAN
38823
PLAN
6219
PLAN
4351
PLAN
A
30311
PLAN
23192
PLAN
12713
PLAN
PL.41546
PLAN
KAP
PLAN
37443
REF.PLAN
3
PLAN
PL.KAP
A
PLAN
38225
PLAN
B
KAP
PLAN
10425
PLAN
43188
PLAN
25130
PLAN
28695
19108
31504
17752
24177
8122
21634
24250
23256
3847
9867
3027

'A and C' Schedule 1

BCGS MAP 082E•003•2•2•4 WTN 69157 ✓ WELL NO. 007

WATER WELL RECORD PID:002-165-481

MINISTRY OF ENVIRONMENT WATER MANAGEMENT DIVISION VICTORIA, BRITISH COLUMBIA

LEGAL DESCRIPTION: LOT 15 SEC. 2 SUBLOT TP. ____ R. ____ D.L 2709 LAND DISTRICT SOYD PLAN 21789

DESCRIPTIVE LOCATION OSOYOOS LICENCE NO. ____ DATE ____

Z ____ WELL NO. ____

____ E

____ N

Z X Y NO.

NAT. TOPO. SHEET NO. ____

OWNER'S NAME MR. ALBERT MAUZ ADDRESS HWY 3 EAST, RR#1, SITE 52, COMP 18, OSOYOOS

DRILLER'S NAME QUALITY ADDRESS ____ DATE COMPLETED 95/05/27

DEPTH 510 ELEVATION OF ____ ☐ ESTIMATED ☐ SURVEYED CASING DIAM. ____ LENGTH ____

METHOD OF CONSTRUCTION ____ CASING DIAM ____ LENGTH ____

SCREEN LOCATION ____ SCREEN ☐ SIZE ____ LENGTH ____ TYPE ____

SANITARY SEAL YES ☐ NO ☐ SCREEN ☐ SIZE ____ LENGTH ____ TYPE ____

PERFORATED CASING ☐ LENGTH ____ PERFORATIONS FROM ____ TO ____

GRAVEL PACK ☐ LENGTH ____ DIAM. ____ SIZE GRAVEL, ETC. ____

DISTANCE TO WATER ____ ☐ ESTIMATED WATER LEVEL

FROM ____ ☐ MEASURED ELEVATION ____ ARTESIAN PRESSURE ____

DATE OF WATER LEVEL MEASUREMENT ____ WATER USE ____

PRODUCTION TEST SUMMARY

DATE ____

TEST BY ____

BAIL TEST ☐ PUMP TEST ☐ DURATION OF TEST ____

RATE ____ DRAWDOWN ____

WATER LEVEL AT COMPLETION OF TEST ____

AVAILABLE DRAWDOWN ____ SPECIFIC CAPACITY ____

PERMEABILITY ____ STORAGE COEFF. ____

TRANSMISSIVITY ____

ESTIMATED WELL YIELD ____

RECOMMENDED PUMPING RATE ____

RECOMMENDED PUMP SETTING ____

CHEMISTRY

TEST BY ____ DATE ____

TOTAL DISSOLVED SOLIDS ____ mg/l TEMPERATURE ____ °C pH ____ SILICA (SiO_2) ____ mg/l

CONDUCTANCE ____ μmhos/cm AT 25°C TOTAL IRON (Fe) ____ mg/l TOTAL HARDNESS ($CaCO_3$) ____ mg/l

TOTAL ALKALINITY ($CaCO_3$) ____ mg/l PHEN. ALKALINITY ($Ca\ CO_3$) ____ mg/l MANGANESE (Mn) ____ mg/l

COLOUR ____ ODOUR ____ TURBIDITY ____

ANIONS	mg/l	epm	CATIONS	mg/l	epm
CARBONATE (CO_3)			CALCIUM (Ca)		
BICARBONATE (HCO_3)			MAGNESIUM (Mg)		
SULPHATE (SO_4)			SODIUM (Na)		
CHLORIDE (Cl)			POTASSIUM (K)		
$NO_2 + NO_3$ (NITROGEN)			IRON (DISSOLVED)		
• TKN. (NITROGEN)					
PHOSPHORUS (P)					

• TKN = TOTAL KJELDAHL NITROGEN CHEMISTRY SITE NO. ____

NO_2 = NITRITE NO_3 = NITRATE

CHEMISTRY FIELD TESTS

TEST BY ____ DATE ____ EQUIPMENT USED ____

LITHOLOGY

FROM	TO	DESCRIPTION

CONTENTS OF FOLDER

☐ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER ____

SOURCES OF INFORMATION ____

NORTH

WEST

EAST

SOUTH

CARD BY_____ DATE_____

ADDITIONAL DATA ADDED BY_____

REMARKS

13126

ENV 1995

WTN 84786

Province of British Columbia — BC Environment — Water Management Division

WATER WELL RECORD

Date 2005 03 30 (YR MO DY)

NTS MAP ____ WELL No. ____ ELEV ____ Location Accuracy ____

UTM Z ____ ____ E ____ ____ N ____ UTM Date 19__ Well Type ____

Owners Name & Address: Albert + Karin Mauz

Legal Description & Address: Lot 15 Plan 21789 Subsidy Lot 2 Dist lot 2709 S.O.Y.D.

Descriptive Location: 1806 Hwy 3E OSOYOOS B.C. 5 Kms from city Centre

1. TYPE OF WORK 1 ☑ New Well 2 ☐ Reconditioned 3 ☐ Deepened 4 ☐ Abandoned

2. WORK METHOD 1 ☐ Cable tool 2 ☐ Bored 3 ☐ Jetted 4 ☑ Rotary a ☐ mud b ☐ air c ☐ reverse ☐ Other with Casing Hammer

3. WATER WELL USE 1 ☑ Domestic 2 ☐ Municipal 3 ☐ Irrigation 4 ☐ Comm. & Ind. ☐ Other ____

4. DRILLING ADDITIVES Rock oil

5. MEASUREMENTS from 1 ☑ ground level 2 ☐ top of casing

casing height above ground level 2 ft. ____ ft.

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	3½ ft	Sandy Brown clay w Gravel + Cobbles	
3½'	6" ft	Broken + shatered Rock w some Sandy Brown Clay	
6ft	134'	Soild Black + white Granite Bedrock	
17½ ft		6" steel Casing stopped Cemented in to 8" x 17 ft surface hole	
134'	145'	Black + white w some Brown Granite Bedrock	
145'	166'	Hard Black + white Granite Bedrock	
166'	168'	softer Black, White + Brown Granite Bedrock	
168'	177'	Soft Brown + Tan " "	
177'	194'	Very soft Brown + Tan " "	
194	458	Hard Black + white Granite Bedrock	
458	468'	Dark Green + white " "	
468'	520	Very Hard Black + white " "	
520'		Stopped Drilling	
		Soft spots + fractures at.	
		151', 168', 177', 194', 242', 246', 275', 285' 296*	
		387, 436* 478	
		Water Bearing Fractures at	
		296 ft, 436'	

7. CONSULTANT ____

Address ____

8. WELL LOCATION SKETCH

9. CASING: Materials 1 ☑ Steel 2 ☐ Galvanized 3 ☐ Wood 4 ☐ Plastic 5 ☐ Concrete ☐ Other ____

							units
Hole Diameter	steel		PVC liner				ins
Diameter	6 5/8		4"				ins
from	0		6 ft				ft
to	17½ ft		520'				ft
Thickness	.250		sch 40				ins
Weight	16 lbs ft						lb/ft

Pitless unit ____ ft 1 ☐ above 2 ☐ below ground level

1 ☑ Welded 2 ☐ Cemented 3 ☐ Threaded | 1 ☑ New 2 ☐ Used

Perforations: 4" PVC liner with Skill Saw Perforations at 480 to 500, 420 to 460, 380 to 400 260 to 280 shake trap 200'

Shoe(s): Yes weld on Driven with Casing Hammer

Open hole, from 17½ ft to 520' ft Diameter 6" ins

Grout: 6" Casing Pounded in to 8" x 17' 8" surface hole + Cemented in with Cement + Bentonite

10. SCREEN: 1 ☐ Nominal (Telescope) 2 ☐ Pipe Size

Type 1 ☐ Continuous Slot 2 ☐ Perforated 3 ☐ Louvre ☐ Other ____

Material 1 ☐ Stainless Steel 2 ☐ Plastic ☐ Other ____

Set from ____ to ____ ft below ground level

RISER, SCREEN & BLANKS						units
Length						ft
Diam. I D						ins
Slot Size						ins
from						ft
to						ft

Fittings, top ____ bottom ____

Gravel Pack ____

11. DEVELOPED BY: 1 ☐ Surging 2 ☐ Jetting 3 ☑ Air 4 ☐ Bailing 5 ☐ Pumping ☐ Other ____

12. TEST 1 ☐ Pump 2 ☐ Bail 3 ☑ Air Date 2005 03 30 (YR MO DY)

Rate 2 USgpm Temp ____ °C SWL before test 180 ft

Water Level 180 ft after test of 1 hrs Dev.

☐ DRAWDOWN in ft				☐ RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
Sub.	500 ft ft	2 USgpm

14. WATER TYPE: 1 ☑ fresh 2 ☐ salty 3 ☑ clear 4 ☐ cloudy

colour ____ smell ____ ; gas 1 ☐ yes 2 ☑ no

15. WATER ANALYSIS: 1 Hardness ____ mg/L 2 Iron ____ mg/L 3 Chloride ____ mg/L 4 pH ____

Field Date 2005 03 30

Lab Date 2005 03 30 (YR MO DY)

SITE I D No ____

16. FINAL WELL COMPLETION DATA

Well Depth 520 ft in 14hrs Well Yield 2 US gpm

Static Water Level 180 ft Artesian Flow ____ US gpm Pressure Head ____ ft

Back filled ____

Well Head Completion Steel Cap welded to Casing

17. DRILLER PLEASE PRINT — SURNAME GENEREUX FIRST NAME JIM

Signature ____

18. CONTRACTOR, Address Cyclone Drilling Ltd. Kelowna B.C. 768-7462

Member, BCWWDA ☐ yes ☑ no ; ____

39

WTN 84786

BCGS MAP 082E.043.2.2.4 WTN 84786 WELL NO. 12

WATER WELL RECORD

PID 002 165 481

Subs. 1 of Lot 2

MINISTRY OF WATER, LAND AND AIR PROTECTION — VICTORIA, BRITISH COLUMBIA

LEGAL DESCRIPTION: LOT 15 SEC. ____ TP. ____ R. ____ D.L. 2709 LAND DISTRICT S.D.Y.D. PLAN 21789

DESCRIPTIVE LOCATION 1806 - Hwy 3E 050400S B.C. 5 Kms From City Centre LICENCE NO. ____ DATE ____

OWNER'S NAME ALBERT + KARIN MAUZ ADDRESS ____

DRILLER'S NAME Cyclone Drilling ADDRESS ____ DATE COMPLETED 05/03/30

DEPTH 520 ELEVATION OF ____ ☐ ESTIMATED ☐ SURVEYED CASING DIAM. ____ LENGTH ____

METHOD OF CONSTRUCTION ____ CASING DIAM ____ LENGTH ____

SCREEN LOCATION ____ SCREEN ☐ SIZE ____ LENGTH ____ TYPE ____

SANITARY SEAL YES ☐ NO ☐ SCREEN ☐ SIZE ____ LENGTH ____ TYPE ____

PERFORATED CASING ☐ LENGTH ____ PERFORATIONS FROM ____ TO ____

GRAVEL PACK ☐ LENGTH ____ DIAM. ____ SIZE GRAVEL, ETC. ____

DISTANCE TO WATER 180 ☐ ESTIMATED WATER LEVEL

FROM ____ ☐ MEASURED ELEVATION ____ ARTESIAN PRESSURE ____

DATE OF WATER LEVEL MEASUREMENT ____ WATER USE ____

Z 11 WELL NO. ____

E 323648

N 5432888

Z X Y NO.

NAT. TOPO. SHEET NO. ____

PRODUCTION TEST SUMMARY

DATE ____

TEST BY ____

BAIL TEST ☐ PUMP TEST ☐ DURATION OF TEST ____

RATE ____ DRAWDOWN ____

WATER LEVEL AT COMPLETION OF TEST ____

AVAILABLE DRAWDOWN ____ SPECIFIC CAPACITY ____

PERMEABILITY ____ STORAGE COEFF. ____

TRANSMISSIVITY ____

ESTIMATED WELL YIELD 2 usgpm

RECOMMENDED PUMPING RATE ____

RECOMMENDED PUMP SETTING ____

CHEMISTRY

TEST BY ____ DATE ____

TOTAL DISSOLVED SOLIDS ____ mg/l TEMPERATURE ____ °C pH ____ SILICA (SiO_2) ____ mg/l

CONDUCTANCE ____ μmhos/cm AT 25°C TOTAL IRON (Fe) ____ mg/l TOTAL HARDNESS ($CaCO_3$) ____ mg/l

TOTAL ALKALINITY ($CaCO_3$) ____ mg/l PHEN. ALKALINITY ($Ca\ CO_3$) ____ mg/l MANGANESE (Mn) ____ mg/l

COLOUR ____ ODOUR ____ TURBIDITY ____

ANIONS	mg/l	epm	CATIONS	mg/l	epm
CARBONATE (CO_3)			CALCIUM (Ca)		
BICARBONATE (HCO_3)			MAGNESIUM (Mg)		
SULPHATE (SO_4)			SODIUM (Na)		
CHLORIDE (Cl)			POTASSIUM (K)		
$NO_2 + NO_3$ (NITROGEN)			IRON (DISSOLVED)		
* TKN. (NITROGEN)					
PHOSPHORUS (P)					

* TKN = TOTAL KJELDAHL NITROGEN CHEMISTRY SITE NO. ____

NO_2 = NITRITE NO_3 = NITRATE

CHEMISTRY FIELD TESTS

TEST BY ____ DATE ____ EQUIPMENT USED ____

LITHOLOGY

FROM	TO	DESCRIPTION

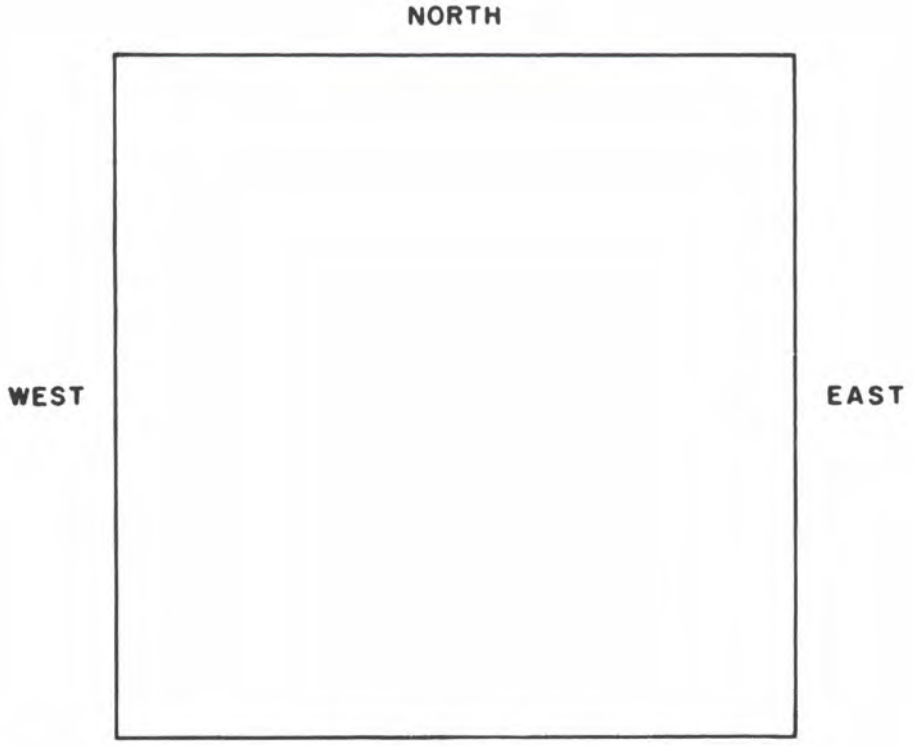
CONTENTS OF FOLDER

☐ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER ____

SOURCES OF INFORMATION ____



CARD BY_____ DATE_____

ADDITIONAL DATA ADDED BY_____

REMARKS

97941

ENV 1995

082E 003 224

ECOCAT

BRITISH COLUMBIA The Best Place on Earth

Ministry of Environment

☑ **Well Construction Report** ☐ **Well Closure Report** ☐ **Well Alteration Report**

Cyclone Drilling Ltd. Keremeos BC
Stamp company name/address/phone/fax/email here, if desired.
250-768-7462

Ministry Well ID Plate Number: 27891
Ministry Well Tag Number: 105407
☐ Confirmation/alternative specs. attached
☐ Original well construction report attached

Red lettering indicates minimum mandatory information. See reverse for notes & definitions of abbreviations.

Owner name: Albert & Karin Mauz

Mailing address: 1806 Hwy 3 E. Town Osoyoos Prov. BC Postal Code V0H 1V6

Well Location (see note 2): Address: Street no. 1806 Street name Hwy 3 E Town Osoyoos

(or) **Legal description:** Lot 15 Plan 21789 D.L. 2709 Block ____ Sec. ____ Twp. ____ Rg. ____ Land District SDYD

(or) **PID:** ____ (and) **Description of well location (attach sketch, if nec.):** ½ km passed 1806 heading east. on left side of hwy.

NAD 83: Zone: 11 (see note 3) (and) **UTM Easting:** 323841E m (or) **Latitude (see note 4):** ____

UTM Northing: 5432436N m **Longitude:** ____

Method of drilling: ☑ air rotary ☐ dual rotary ☐ cable tool ☐ mud rotary ☐ auger ☐ driving ☐ jetting ☐ other (specify): ____

Orientation of well: ☑ vertical ☐ horizontal Ground elevation: 1657 ft (asl) Method (see note 5): ____

Class of well (see note 6): Water Supply **Sub-class of well:** Domestic

Water supply wells: indicate intended water use: ☑ private domestic ☐ water supply system ☐ irrigation ☐ commercial or industrial ☐ other (specify): ____

Lithologic description (see notes 8-13) or closure description (see notes 14 and 15)

From ft (bgl)	To ft (bgl)	Surficial Material: Clay	Silt	Till	Sand with clay/silt	Sand, fine-med	Sand, med-coarse	Sand with gravel	Bedrock Material: Siltstone/shale	Sandstone	Conglomerate	Limestone	Basalt	Volcanic	Crystalline	Other Surficial/Bedrock	Colour: Red	Orange	Brown	Tan	Light Grey	Blue	Green	Dark Grey	Hardness: Very Hard	Hard	Dense/Stiff	Loose	Water Content: Dry	Moist	Wet	High Production	Lost circulation	Not Available	Observations (e.g. other geological materials (e.g. boulders), est. water bearing flow (USgpm), or closure details)
0	30					✓														✓								✓								Boulders & Cobbles
30	145														✓									✓						✓					1.5 GPM @ 85'
145	155														✓									✓							✓				
155	180														✓									✓							✓				155' - 10 GPM

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole (see note 17)	Wall Thickness in	Drive Shoe
0	15	8	Casing Pulled	.250	No
+2	33	6 5/8	Steel	.250	Yes

Surface seal: Type: Bentonite Depth: 15 ft

Method of installation: ☑ Poured ☐ Pumped Thickness: 1 in

Backfill: Type: Bentonite Depth: 3 ft

Liner: ☑ PVC ☐ Other (specify): ____

Diameter: 4 in Thickness: .250 in

From: 180 ft (bgl) To: 6 ft (bgl) Perforated: From: 170 ft (bgl) To: 60 ft (bgl)

Screen details

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size

Intake: ☐ Screen ☐ Open bottom ☐ Uncased hole

Screen type: ☐ Telescope ☐ Pipe size

Screen material: ☐ Stainless steel ☐ Plastic ☐ Other (specify): ____

Screen opening: ☐ Continuous slot ☐ Slotted ☐ Perforated pipe

Screen bottom: ☐ Bail ☐ Plug ☐ Plate ☐ Other (specify): ____

Filter pack: From: ____ ft To: ____ ft Thickness: ____ in

Type and size of material: ____

Developed by:

☑ Air lifting ☐ Surging ☐ Jetting ☐ Pumping ☐ Bailing

Other (specify): ____ Total duration: 2 hrs

Notes: Very Clean

Well yield estimated by:

☐ Pumping ☑ Air lifting ☐ Bailing ☐ Other (specify): ____

Rate: 10 USgpm Duration: 20 hrs

SWL before test: 72 ft (btoc) Pumping water level: ____ ft (btoc)

Obvious water quality characteristics:

☑ Fresh ☐ Salty ☑ Clear ☐ Cloudy ☐ Sediment ☐ Gas

Colour/odour: Nem Water sample collected: ☐

Well driller (print clearly):

Name (first, last) (see note 19): Mark Webb

Registration no. (see note 20): GWDT 2008-146

Consultant (if applicable; name and company): ____

DECLARATION: Well construction, well alteration or well closure, as the case may be, has been done in accordance with the requirements in the Water Act and the Ground Water Protection Regulation.

Signature of Driller Responsible Mark Webb

Final well completion data:

Total depth drilled: 180 ft Finished well depth: 180 ft (bgl)

Final stick up: 24 in Depth to bedrock: 33 ft (bgl)

SWL: 72 ft (btoc) Estimated well yield: 10 USgpm

Artesian flow: ____ USgpm, or Artesian pressure: ____ ft

Type of well cap: Welded Well disinfected: ☐ Yes ☐ No

Where well ID plate is attached: On Casing w/hoseclamp

Well closure information:

Reason for closure: ____

Method of closure: ☐ Poured ☐ Pumped

Sealant material: ____ Backfill material: ____

Details of closure (see note 16): ____

Date of work (YYYY/MM/DD):

Started: 090626 **Completed:** 090630

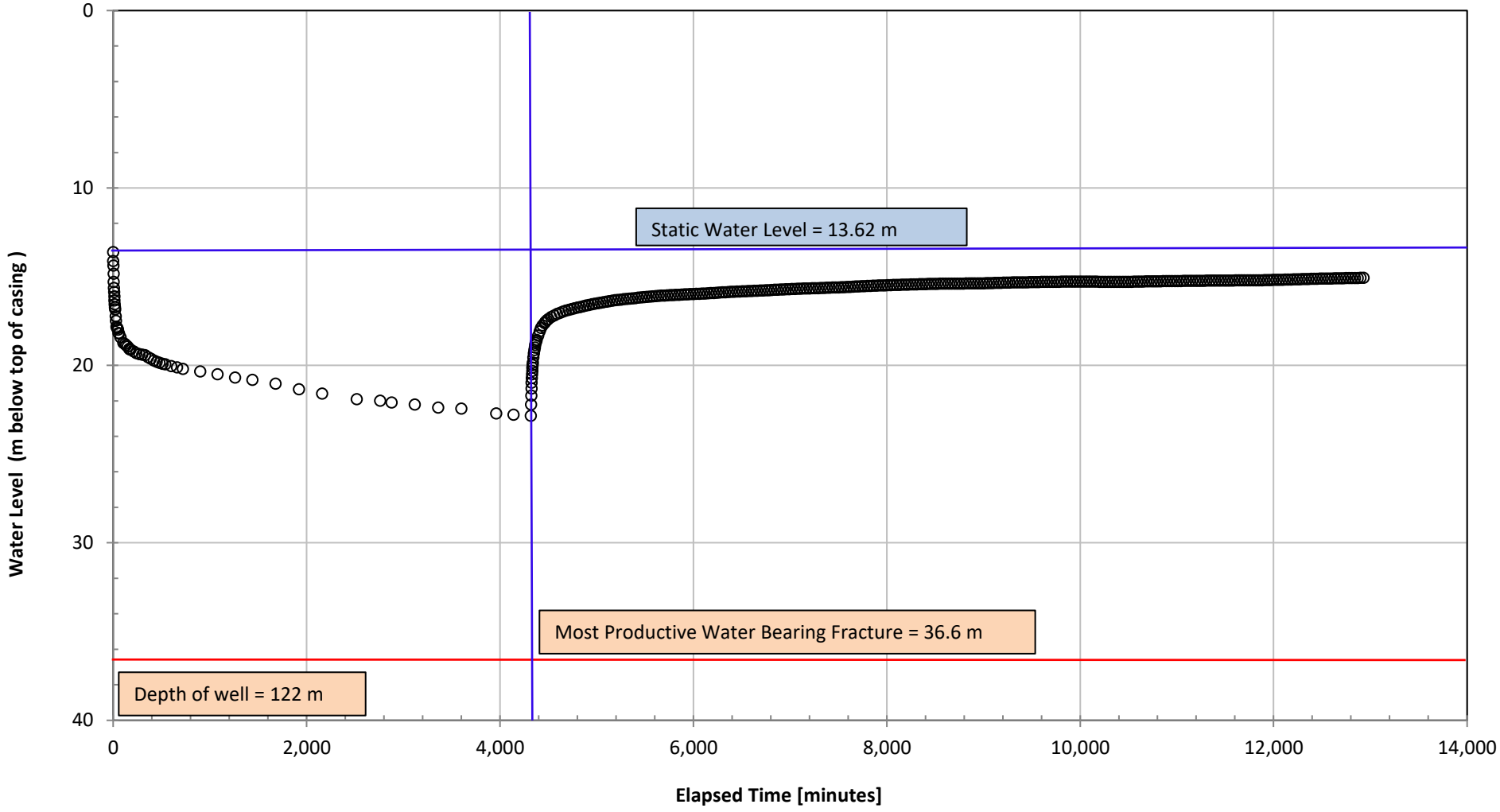
Comments: Great Water Well

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy
pink: Ministry copy

Appendix B

Pumping Test Data and Graphs



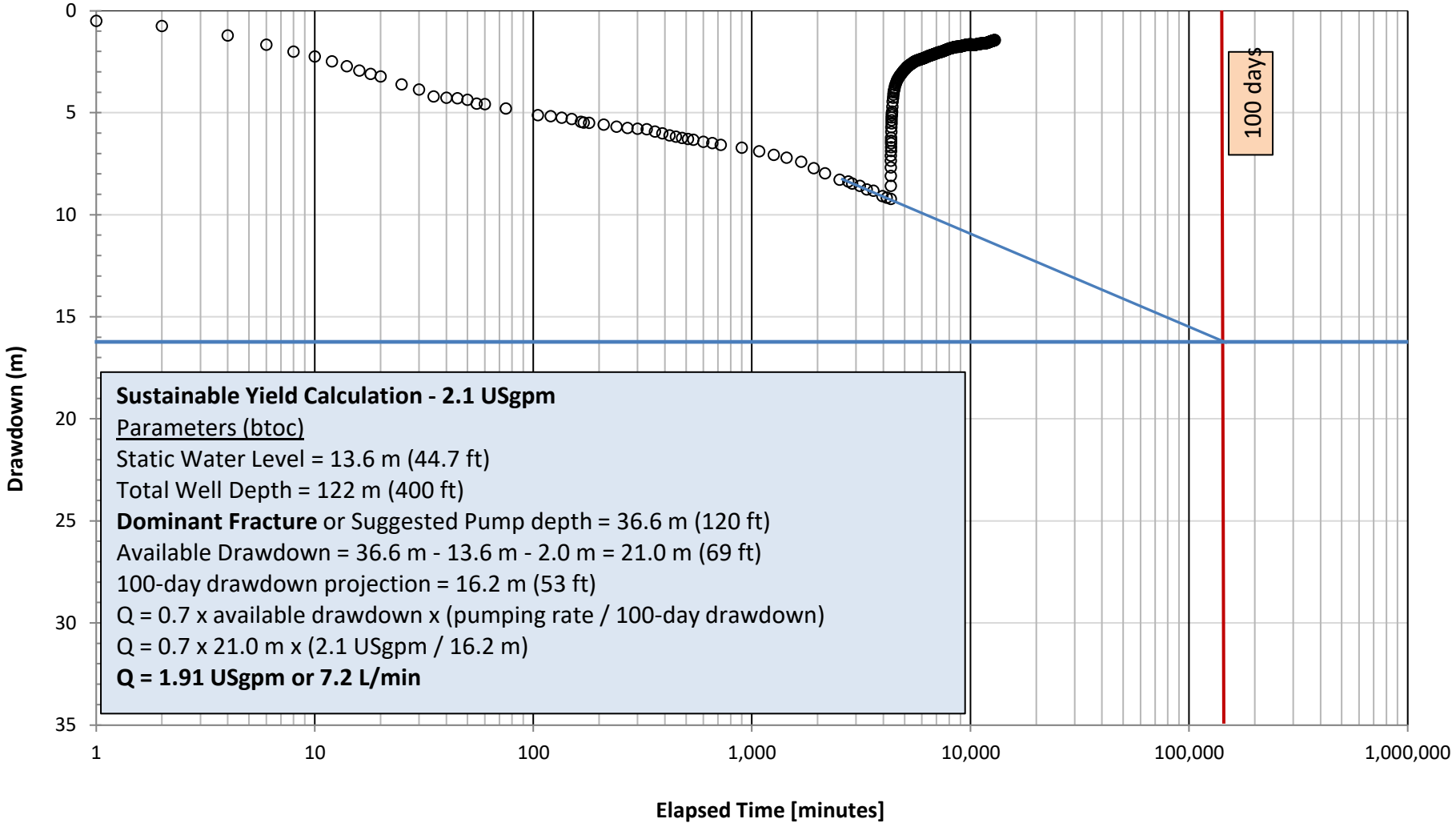
Steinar Johnsen GW Feasibility
WTN 124408

western water ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

TITLE

Figure B1 - Constant Rate Test Hydrograph, 2.1 US gpm

DRAWN	LM	DATE	September 14 - 23, 2022	JOB NO.	21-090-01VR
CHECKED	CDH	SCALE	n/a	DWG. NO.	n/a
REVIEWED		FILE NO.		FIGURE NO.	B1



Steinar Johnsen GW Feasibility WTN 124408	TITLE **Figure B2 - Semi Log Plot - Constant Rate Pumping Test, 2.1 US gpm**		
western water ASSOCIATES LTD Consultants in Hydrogeology and Water Resources Management	DRAWN LM	DATE September 14 - 23, 2022	JOB NO. 21-090-01VR
	CHECKED CDH	SCALE n/a	DWG. NO. n/a
	REVIEWED	FILE NO.	FIGURE NO. B2

Project No: 21-090-01VR, Table B1: Constant Rate Test - Steinar Johnsen GW Feasibility Osoyoos - WTN 124408 (WPID 62040)											
Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
STATIC	2022-09-14 12:00	0	13.620	44.7	--	0.00	0.00	0.00	0	--	--
14-Sep-22	2022-09-14 12:01	1	14.120	46.3	0.50	1.64	0.50	0.13	2.1	0.26	1.28
	2022-09-14 12:02	2	14.370	47.1	0.25	2.46	0.75	0.13	2.1	0.18	0.85
	2022-09-14 12:04	4	14.840	48.7	0.47	4.00	1.22	0.13	2.1	0.11	0.52
	2022-09-14 12:06	6	15.290	50.2	0.45	5.48	1.67	0.13	2.1	0.08	0.38
	2022-09-14 12:08	8	15.630	51.3	0.34	6.59	2.01	0.13	2.1	0.07	0.32
	2022-09-14 12:10	10	15.870	52.1	0.24	7.38	2.25	0.13	2.1	0.06	0.28
	2022-09-14 12:12	12	16.110	52.9	0.24	8.17	2.49	0.13	2.1	0.05	0.26
	2022-09-14 12:14	14	16.340	53.6	0.23	8.92	2.72	0.13	2.1	0.05	0.24
	2022-09-14 12:16	16	16.560	54.3	0.22	9.65	2.94	0.13	2.1	0.05	0.22
	2022-09-14 12:18	18	16.720	54.9	0.16	10.17	3.10	0.13	2.1	0.04	0.21
	2022-09-14 12:20	20	16.840	55.3	0.12	10.56	3.22	0.13	2.1	0.04	0.20
	2022-09-14 12:25	25	17.230	56.5	0.39	11.84	3.61	0.13	2.1	0.04	0.18
	2022-09-14 12:30	30	17.490	57.4	0.26	12.70	3.87	0.13	2.1	0.03	0.17
	2022-09-14 12:35	35	17.820	58.5	0.33	13.78	4.20	0.13	2.1	0.03	0.15
	2022-09-14 12:40	40	17.890	58.7	0.07	14.01	4.27	0.13	2.1	0.03	0.15
	2022-09-14 12:45	45	17.910	58.8	0.02	14.08	4.29	0.13	2.1	0.03	0.15
	2022-09-14 12:50	50	17.990	59.0	0.08	14.34	4.37	0.13	2.1	0.03	0.15
	2022-09-14 12:55	55	18.180	59.6	0.19	14.96	4.56	0.13	2.1	0.03	0.14
	2022-09-14 13:00	60	18.200	59.7	0.02	15.03	4.58	0.13	2.1	0.03	0.14
	2022-09-14 13:15	75	18.420	60.4	0.22	15.75	4.80	0.13	2.1	0.03	0.13
	2022-09-14 13:45	105	18.740	61.5	0.32	16.80	5.12	0.13	2.1	0.03	0.13
	2022-09-14 14:00	120	18.790	61.6	0.05	16.96	5.17	0.13	2.1	0.03	0.12
	2022-09-14 14:15	135	18.870	61.9	0.08	17.23	5.25	0.13	2.1	0.03	0.12
	2022-09-14 14:30	150	18.930	62.1	0.06	17.42	5.31	0.13	2.1	0.02	0.12
	2022-09-14 14:45	165	19.070	62.6	0.14	17.88	5.45	0.13	2.1	0.02	0.12
	2022-09-14 14:50	170	19.100	62.7	0.03	17.98	5.48	0.13	2.1	0.02	0.12
	2022-09-14 15:00	180	19.115	62.7	0.01	18.03	5.50	0.13	2.1	0.02	0.12
	2022-09-14 15:30	210	19.210	63.0	0.10	18.34	5.59	0.13	2.1	0.02	0.11
	2022-09-14 16:00	240	19.310	63.4	0.10	18.67	5.69	0.13	2.1	0.02	0.11
	2022-09-14 16:30	270	19.370	63.6	0.06	18.87	5.75	0.13	2.1	0.02	0.11
	2022-09-14 17:00	300	19.400	63.7	0.03	18.96	5.78	0.13	2.1	0.02	0.11
	2022-09-14 17:30	330	19.430	63.7	0.03	19.06	5.81	0.13	2.1	0.02	0.11
	2022-09-14 18:00	360	19.540	64.1	0.11	19.42	5.92	0.13	2.1	0.02	0.11
	2022-09-14 18:30	390	19.630	64.4	0.09	19.72	6.01	0.13	2.1	0.02	0.11
	2022-09-14 19:00	420	19.730	64.7	0.10	20.05	6.11	0.13	2.1	0.02	0.10
	2022-09-14 19:30	450	19.800	65.0	0.07	20.28	6.18	0.13	2.1	0.02	0.10
	2022-09-14 20:00	480	19.860	65.2	0.06	20.47	6.24	0.13	2.1	0.02	0.10
	2022-09-14 20:30	510	19.905	65.3	0.05	20.62	6.29	0.13	2.1	0.02	0.10
	2022-09-14 21:00	540	19.940	65.4	0.04	20.74	6.32	0.13	2.1	0.02	0.10
	2022-09-14 22:00	600	20.040	65.8	0.10	21.06	6.42	0.13	2.1	0.02	0.10
	2022-09-14 23:00	660	20.110	66.0	0.07	21.29	6.49	0.13	2.1	0.02	0.10
15-Sep-22	2022-09-15 0:00	720	20.195	66.3	0.09	21.57	6.58	0.13	2.1	0.02	0.10
	2022-09-15 3:00	900	20.340	66.7	0.15	22.05	6.72	0.13	2.1	0.02	0.10
	2022-09-15 6:00	1080	20.505	67.3	0.16	22.59	6.89	0.13	2.1	0.02	0.09
	2022-09-15 9:00	1260	20.680	67.9	0.18	23.16	7.06	0.13	2.1	0.02	0.09
24h	2022-09-15 12:00	1440	20.820	68.3	0.14	23.62	7.20	0.13	2.1	0.02	0.09
	2022-09-15 16:00	1680	21.030	69.0	0.21	24.31	7.41	0.13	2.1	0.02	0.09
	2022-09-15 20:00	1920	21.340	70.0	0.31	25.33	7.72	0.13	2.1	0.02	0.08
16-Sep-22	2022-09-16 0:00	2160	21.595	70.9	0.25	26.17	7.98	0.13	2.1	0.02	0.08
	2022-09-16 6:00	2520	21.900	71.9	0.31	27.17	8.28	0.13	2.1	0.02	0.08
	2022-09-16 10:00	2760	21.990	72.1	0.09	27.46	8.37	0.13	2.1	0.02	0.08
48h	2022-09-16 12:00	2880	22.090	72.5	0.10	27.79	8.47	0.13	2.1	0.02	0.08
	2022-09-16 16:00	3120	22.210	72.9	0.12	28.18	8.59	0.13	2.1	0.02	0.07
	2022-09-16 20:00	3360	22.380	73.4	0.17	28.74	8.76	0.13	2.1	0.02	0.07
60h - 17-Sep-22	2022-09-17 0:00	3600	22.440	73.6	0.06	28.94	8.82	0.13	2.1	0.02	0.07

Project No: 21-090-01VR, Table B1: Constant Rate Test - Steinar Johnsen GW Feasibility Osoyoos - WTN 124408 (WPID 62040)

Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
	2022-09-17 6:00	3960	22.710	74.5	0.27	29.82	9.09	0.13	2.1	0.01	0.07
	2022-09-17 9:00	4140	22.780	74.7	0.07	30.05	9.16	0.13	2.1	0.01	0.07
72h	2022-09-17 12:00	4320	22.840	74.9	0.06	30.25	9.22	0.13	2.1	0.01	0.07
Recovery	2022-09-17 12:02	4322	22.210	72.9	-0.63	28.18	8.59	-	-	-	-
17-Sep-22	2022-09-17 12:04	4324	21.710	71.2	-0.50	26.54	8.09	-	-	-	-
	2022-09-17 12:06	4326	21.300	69.9	-0.41	25.20	7.68	-	-	-	-
	2022-09-17 12:08	4328	20.980	68.8	-0.32	24.15	7.36	-	-	-	-
	2022-09-17 12:10	4330	20.720	68.0	-0.26	23.30	7.10	-	-	-	-
	2022-09-17 12:12	4332	20.500	67.3	-0.22	22.57	6.88	-	-	-	-
	2022-09-17 12:14	4334	20.310	66.6	-0.19	21.95	6.69	-	-	-	-
	2022-09-17 12:16	4336	20.120	66.0	-0.19	21.33	6.50	-	-	-	-
	2022-09-17 12:18	4338	19.990	65.6	-0.13	20.90	6.37	-	-	-	-
	2022-09-17 12:20	4340	19.840	65.1	-0.15	20.41	6.22	-	-	-	-
	2022-09-17 12:25	4345	19.550	64.1	-0.29	19.46	5.93	-	-	-	-
	2022-09-17 12:30	4350	19.330	63.4	-0.22	18.73	5.71	-	-	-	-
	2022-09-17 12:35	4355	19.140	62.8	-0.19	18.11	5.52	-	-	-	-
	2022-09-17 12:40	4360	18.990	62.3	-0.15	17.62	5.37	-	-	-	-
	2022-09-17 12:45	4365	18.850	61.8	-0.14	17.16	5.23	-	-	-	-
	2022-09-17 12:50	4370	18.740	61.5	-0.11	16.80	5.12	-	-	-	-
	2022-09-17 12:55	4375	18.650	61.2	-0.09	16.50	5.03	-	-	-	-
	2022-09-17 13:00	4380	18.570	60.9	-0.08	16.24	4.95	-	-	-	-
	2022-09-17 13:15	4395	18.320	60.1	-0.25	15.42	4.70	-	-	-	-
	2022-09-17 13:30	4410	18.080	59.3	-0.24	14.63	4.46	-	-	-	-
	2022-09-17 13:45	4425	17.890	58.7	-0.19	14.01	4.27	-	-	-	-
	2022-09-17 14:00	4440	17.740	58.2	-0.15	13.52	4.12	-	-	-	-
	2022-09-17 14:20	4460	17.620	57.8	-0.12	13.12	4.00	-	-	-	-
	2022-09-17 14:30	4470	17.540	57.5	-0.08	12.86	3.92	-	-	-	-
	2022-09-17 14:45	4485	17.460	57.3	-0.08	12.60	3.84	-	-	-	-
	2022-09-17 15:00	4500	17.390	57.1	-0.07	12.37	3.77	-	-	-	-
	2022-09-17 15:30	4530	17.270	56.7	-0.12	11.98	3.65	-	-	-	-
manual readings end	2022-09-17 16:00	4560	17.180	56.4	-0.09	11.68	3.56	-	-	-	-
datalogger data begins	2022-09-17 16:30	4590	17.105	56.1	-0.07	11.43	3.49	-	-	-	-
	2022-09-17 17:00	4620	17.036	55.9	-0.07	11.21	3.42	-	-	-	-
	2022-09-17 17:30	4650	16.973	55.7	-0.06	11.00	3.35	-	-	-	-
	2022-09-17 18:00	4680	16.918	55.5	-0.05	10.82	3.30	-	-	-	-
	2022-09-17 18:30	4710	16.869	55.3	-0.05	10.66	3.25	-	-	-	-
	2022-09-17 19:00	4740	16.824	55.2	-0.04	10.51	3.20	-	-	-	-
	2022-09-17 19:30	4770	16.781	55.1	-0.04	10.37	3.16	-	-	-	-
	2022-09-17 20:00	4800	16.742	54.9	-0.04	10.24	3.12	-	-	-	-
	2022-09-17 20:30	4830	16.706	54.8	-0.04	10.12	3.09	-	-	-	-
	2022-09-17 21:00	4860	16.667	54.7	-0.04	10.00	3.05	-	-	-	-
	2022-09-17 21:30	4890	16.627	54.6	-0.04	9.87	3.01	-	-	-	-
	2022-09-17 22:00	4920	16.592	54.4	-0.04	9.75	2.97	-	-	-	-
	2022-09-17 22:30	4950	16.558	54.3	-0.03	9.64	2.94	-	-	-	-
	2022-09-17 23:00	4980	16.527	54.2	-0.03	9.54	2.91	-	-	-	-
	2022-09-17 23:30	5010	16.498	54.1	-0.03	9.44	2.88	-	-	-	-
18-Sep-22	2022-09-18 0:00	5040	16.469	54.0	-0.03	9.35	2.85	-	-	-	-
	2022-09-18 0:30	5070	16.441	53.9	-0.03	9.25	2.82	-	-	-	-
	2022-09-18 1:00	5100	16.412	53.8	-0.03	9.16	2.79	-	-	-	-
	2022-09-18 1:30	5130	16.382	53.7	-0.03	9.06	2.76	-	-	-	-
	2022-09-18 2:00	5160	16.356	53.7	-0.03	8.98	2.74	-	-	-	-
	2022-09-18 2:30	5190	16.332	53.6	-0.02	8.90	2.71	-	-	-	-
	2022-09-18 3:00	5220	16.312	53.5	-0.02	8.83	2.69	-	-	-	-
	2022-09-18 3:30	5250	16.292	53.5	-0.02	8.77	2.67	-	-	-	-
	2022-09-18 4:00	5280	16.272	53.4	-0.02	8.70	2.65	-	-	-	-
	2022-09-18 4:30	5310	16.255	53.3	-0.02	8.64	2.63	-	-	-	-
	2022-09-18 5:00	5340	16.239	53.3	-0.02	8.59	2.62	-	-	-	-

Project No: 21-090-01VR, Table B1: Constant Rate Test - Steinar Johnsen GW Feasibility Osoyoos - WTN 124408 (WPID 62040)											
Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
	2022-09-18 5:30	5370	16.223	53.2	-0.02	8.54	2.60	-	-	-	-
	2022-09-18 6:00	5400	16.207	53.2	-0.02	8.49	2.59	-	-	-	-
	2022-09-18 6:30	5430	16.189	53.1	-0.02	8.43	2.57	-	-	-	-
	2022-09-18 7:00	5460	16.171	53.1	-0.02	8.37	2.55	-	-	-	-
	2022-09-18 7:30	5490	16.152	53.0	-0.02	8.31	2.53	-	-	-	-
	2022-09-18 8:00	5520	16.135	52.9	-0.02	8.25	2.52	-	-	-	-
	2022-09-18 8:30	5550	16.119	52.9	-0.02	8.20	2.50	-	-	-	-
	2022-09-18 9:00	5580	16.103	52.8	-0.02	8.15	2.48	-	-	-	-
	2022-09-18 9:30	5610	16.091	52.8	-0.01	8.11	2.47	-	-	-	-
	2022-09-18 10:00	5640	16.080	52.8	-0.01	8.07	2.46	-	-	-	-
	2022-09-18 10:30	5670	16.071	52.7	-0.01	8.04	2.45	-	-	-	-
	2022-09-18 11:00	5700	16.062	52.7	-0.01	8.01	2.44	-	-	-	-
	2022-09-18 11:30	5730	16.051	52.7	-0.01	7.98	2.43	-	-	-	-
	2022-09-18 12:00	5760	16.041	52.6	-0.01	7.94	2.42	-	-	-	-
	2022-09-18 12:30	5790	16.033	52.6	-0.01	7.92	2.41	-	-	-	-
	2022-09-18 13:00	5820	16.024	52.6	-0.01	7.89	2.40	-	-	-	-
	2022-09-18 13:30	5850	16.017	52.6	-0.01	7.86	2.40	-	-	-	-
	2022-09-18 14:00	5880	16.010	52.5	-0.01	7.84	2.39	-	-	-	-
	2022-09-18 14:30	5910	16.002	52.5	-0.01	7.81	2.38	-	-	-	-
	2022-09-18 15:00	5940	15.993	52.5	-0.01	7.79	2.37	-	-	-	-
	2022-09-18 15:30	5970	15.985	52.4	-0.01	7.76	2.37	-	-	-	-
	2022-09-18 16:00	6000	15.979	52.4	-0.01	7.74	2.36	-	-	-	-
	2022-09-18 16:30	6030	15.972	52.4	-0.01	7.72	2.35	-	-	-	-
	2022-09-18 17:00	6060	15.964	52.4	-0.01	7.69	2.34	-	-	-	-
	2022-09-18 17:30	6090	15.955	52.3	-0.01	7.66	2.34	-	-	-	-
	2022-09-18 18:00	6120	15.946	52.3	-0.01	7.63	2.33	-	-	-	-
	2022-09-18 18:30	6150	15.938	52.3	-0.01	7.60	2.32	-	-	-	-
	2022-09-18 19:00	6180	15.928	52.3	-0.01	7.57	2.31	-	-	-	-
	2022-09-18 19:30	6210	15.920	52.2	-0.01	7.54	2.30	-	-	-	-
	2022-09-18 20:00	6240	15.908	52.2	-0.01	7.51	2.29	-	-	-	-
	2022-09-18 20:30	6270	15.897	52.2	-0.01	7.47	2.28	-	-	-	-
	2022-09-18 21:00	6300	15.887	52.1	-0.01	7.44	2.27	-	-	-	-
	2022-09-18 21:30	6330	15.877	52.1	-0.01	7.40	2.26	-	-	-	-
	2022-09-18 22:00	6360	15.866	52.1	-0.01	7.37	2.25	-	-	-	-
	2022-09-18 22:30	6390	15.858	52.0	-0.01	7.34	2.24	-	-	-	-
	2022-09-18 23:00	6420	15.849	52.0	-0.01	7.31	2.23	-	-	-	-
	2022-09-18 23:30	6450	15.842	52.0	-0.01	7.29	2.22	-	-	-	-
19-Sep-22	2022-09-19 0:00	6480	15.834	52.0	-0.01	7.27	2.21	-	-	-	-
	2022-09-19 0:30	6510	15.827	51.9	-0.01	7.24	2.21	-	-	-	-
	2022-09-19 1:00	6540	15.820	51.9	-0.01	7.22	2.20	-	-	-	-
	2022-09-19 1:30	6570	15.812	51.9	-0.01	7.19	2.19	-	-	-	-
	2022-09-19 2:00	6600	15.803	51.9	-0.01	7.16	2.18	-	-	-	-
	2022-09-19 2:30	6630	15.796	51.8	-0.01	7.14	2.18	-	-	-	-
	2022-09-19 3:00	6660	15.788	51.8	-0.01	7.11	2.17	-	-	-	-
	2022-09-19 3:30	6690	15.780	51.8	-0.01	7.09	2.16	-	-	-	-
	2022-09-19 4:00	6720	15.774	51.8	-0.01	7.07	2.15	-	-	-	-
	2022-09-19 4:30	6750	15.766	51.7	-0.01	7.04	2.15	-	-	-	-
	2022-09-19 5:00	6780	15.759	51.7	-0.01	7.02	2.14	-	-	-	-
	2022-09-19 5:30	6810	15.750	51.7	-0.01	6.99	2.13	-	-	-	-
	2022-09-19 6:00	6840	15.744	51.7	-0.01	6.97	2.12	-	-	-	-
	2022-09-19 6:30	6870	15.735	51.6	-0.01	6.94	2.11	-	-	-	-
	2022-09-19 7:00	6900	15.727	51.6	-0.01	6.91	2.11	-	-	-	-
	2022-09-19 7:30	6930	15.719	51.6	-0.01	6.89	2.10	-	-	-	-
	2022-09-19 8:00	6960	15.711	51.5	-0.01	6.86	2.09	-	-	-	-
	2022-09-19 8:30	6990	15.705	51.5	-0.01	6.84	2.08	-	-	-	-
	2022-09-19 9:00	7020	15.697	51.5	-0.01	6.81	2.08	-	-	-	-
	2022-09-19 9:30	7050	15.690	51.5	-0.01	6.79	2.07	-	-	-	-
	2022-09-19 10:00	7080	15.683	51.5	-0.01	6.77	2.06	-	-	-	-
	2022-09-19 10:30	7110	15.677	51.4	-0.01	6.75	2.06	-	-	-	-

Project No: 21-090-01VR, Table B1: Constant Rate Test - Steinar Johnsen GW Feasibility Osoyoos - WTN 124408 (WPID 62040)

Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
	2022-09-19 11:00	7140	15.671	51.4	-0.01	6.73	2.05	-	-	-	-
	2022-09-19 11:30	7170	15.667	51.4	0.00	6.72	2.05	-	-	-	-
	2022-09-19 12:00	7200	15.660	51.4	-0.01	6.69	2.04	-	-	-	-
	2022-09-19 12:30	7230	15.657	51.4	0.00	6.68	2.04	-	-	-	-
	2022-09-19 13:00	7260	15.651	51.4	-0.01	6.66	2.03	-	-	-	-
	2022-09-19 13:30	7290	15.645	51.3	-0.01	6.64	2.02	-	-	-	-
	2022-09-19 14:00	7320	15.639	51.3	-0.01	6.62	2.02	-	-	-	-
	2022-09-19 14:30	7350	15.632	51.3	-0.01	6.60	2.01	-	-	-	-
	2022-09-19 15:00	7380	15.627	51.3	0.00	6.59	2.01	-	-	-	-
	2022-09-19 15:30	7410	15.622	51.3	-0.01	6.57	2.00	-	-	-	-
	2022-09-19 16:00	7440	15.614	51.2	-0.01	6.54	1.99	-	-	-	-
	2022-09-19 16:30	7470	15.608	51.2	-0.01	6.52	1.99	-	-	-	-
	2022-09-19 17:00	7500	15.602	51.2	-0.01	6.50	1.98	-	-	-	-
	2022-09-19 17:30	7530	15.596	51.2	-0.01	6.48	1.98	-	-	-	-
	2022-09-19 18:00	7560	15.590	51.1	-0.01	6.46	1.97	-	-	-	-
	2022-09-19 18:30	7590	15.581	51.1	-0.01	6.43	1.96	-	-	-	-
	2022-09-19 19:00	7620	15.573	51.1	-0.01	6.41	1.95	-	-	-	-
	2022-09-19 19:30	7650	15.564	51.1	-0.01	6.38	1.94	-	-	-	-
	2022-09-19 20:00	7680	15.555	51.0	-0.01	6.35	1.93	-	-	-	-
	2022-09-19 20:30	7710	15.547	51.0	-0.01	6.32	1.93	-	-	-	-
	2022-09-19 21:00	7740	15.538	51.0	-0.01	6.29	1.92	-	-	-	-
	2022-09-19 21:30	7770	15.531	51.0	-0.01	6.27	1.91	-	-	-	-
	2022-09-19 22:00	7800	15.524	50.9	-0.01	6.25	1.90	-	-	-	-
	2022-09-19 22:30	7830	15.517	50.9	-0.01	6.23	1.90	-	-	-	-
	2022-09-19 23:00	7860	15.512	50.9	-0.01	6.21	1.89	-	-	-	-
	2022-09-19 23:30	7890	15.506	50.9	-0.01	6.19	1.89	-	-	-	-
20-Sep-22	2022-09-20 0:00	7920	15.500	50.9	-0.01	6.17	1.88	-	-	-	-
	2022-09-20 0:30	7950	15.493	50.8	-0.01	6.15	1.87	-	-	-	-
	2022-09-20 1:00	7980	15.488	50.8	-0.01	6.13	1.87	-	-	-	-
	2022-09-20 1:30	8010	15.481	50.8	-0.01	6.11	1.86	-	-	-	-
	2022-09-20 2:00	8040	15.476	50.8	-0.01	6.09	1.86	-	-	-	-
	2022-09-20 2:30	8070	15.470	50.8	-0.01	6.07	1.85	-	-	-	-
	2022-09-20 3:00	8100	15.465	50.7	-0.01	6.05	1.84	-	-	-	-
	2022-09-20 3:30	8130	15.460	50.7	0.00	6.04	1.84	-	-	-	-
	2022-09-20 4:00	8160	15.455	50.7	0.00	6.02	1.83	-	-	-	-
	2022-09-20 4:30	8190	15.451	50.7	0.00	6.01	1.83	-	-	-	-
	2022-09-20 5:00	8220	15.446	50.7	0.00	5.99	1.83	-	-	-	-
	2022-09-20 5:30	8250	15.442	50.7	0.00	5.98	1.82	-	-	-	-
	2022-09-20 6:00	8280	15.437	50.6	-0.01	5.96	1.82	-	-	-	-
	2022-09-20 6:30	8310	15.431	50.6	-0.01	5.94	1.81	-	-	-	-
	2022-09-20 7:00	8340	15.425	50.6	-0.01	5.92	1.81	-	-	-	-
	2022-09-20 7:30	8370	15.420	50.6	-0.01	5.90	1.80	-	-	-	-
	2022-09-20 8:00	8400	15.415	50.6	0.00	5.89	1.80	-	-	-	-
	2022-09-20 8:30	8430	15.411	50.6	0.00	5.88	1.79	-	-	-	-
	2022-09-20 9:00	8460	15.407	50.5	0.00	5.86	1.79	-	-	-	-
	2022-09-20 9:30	8490	15.404	50.5	0.00	5.85	1.78	-	-	-	-
	2022-09-20 10:00	8520	15.401	50.5	0.00	5.84	1.78	-	-	-	-
	2022-09-20 10:30	8550	15.398	50.5	0.00	5.83	1.78	-	-	-	-
	2022-09-20 11:00	8580	15.396	50.5	0.00	5.83	1.78	-	-	-	-
	2022-09-20 11:30	8610	15.394	50.5	0.00	5.82	1.77	-	-	-	-
	2022-09-20 12:00	8640	15.391	50.5	0.00	5.81	1.77	-	-	-	-
	2022-09-20 12:30	8670	15.389	50.5	0.00	5.81	1.77	-	-	-	-
	2022-09-20 13:00	8700	15.389	50.5	0.00	5.80	1.77	-	-	-	-
	2022-09-20 13:30	8730	15.388	50.5	0.00	5.80	1.77	-	-	-	-
	2022-09-20 14:00	8760	15.387	50.5	0.00	5.80	1.77	-	-	-	-
	2022-09-20 14:30	8790	15.386	50.5	0.00	5.79	1.77	-	-	-	-
	2022-09-20 15:00	8820	15.384	50.5	0.00	5.79	1.76	-	-	-	-
	2022-09-20 15:30	8850	15.385	50.5	0.00	5.79	1.76	-	-	-	-
	2022-09-20 16:00	8880	15.382	50.5	0.00	5.78	1.76	-	-	-	-

Project No: 21-090-01VR, Table B1: Constant Rate Test - Steinar Johnsen GW Feasibility Osoyoos - WTN 124408 (WPID 62040)

Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
	2022-09-20 16:30	8910	15.381	50.5	0.00	5.78	1.76	-	-	-	-
	2022-09-20 17:00	8940	15.379	50.5	0.00	5.77	1.76	-	-	-	-
	2022-09-20 17:30	8970	15.377	50.5	0.00	5.76	1.76	-	-	-	-
	2022-09-20 18:00	9000	15.374	50.4	0.00	5.76	1.75	-	-	-	-
	2022-09-20 18:30	9030	15.370	50.4	0.00	5.74	1.75	-	-	-	-
	2022-09-20 19:00	9060	15.365	50.4	-0.01	5.72	1.74	-	-	-	-
	2022-09-20 19:30	9090	15.360	50.4	0.00	5.71	1.74	-	-	-	-
	2022-09-20 20:00	9120	15.355	50.4	-0.01	5.69	1.74	-	-	-	-
	2022-09-20 20:30	9150	15.349	50.4	-0.01	5.67	1.73	-	-	-	-
	2022-09-20 21:00	9180	15.344	50.3	-0.01	5.66	1.72	-	-	-	-
	2022-09-20 21:30	9210	15.339	50.3	-0.01	5.64	1.72	-	-	-	-
	2022-09-20 22:00	9240	15.334	50.3	0.00	5.62	1.71	-	-	-	-
	2022-09-20 22:30	9270	15.330	50.3	0.00	5.61	1.71	-	-	-	-
	2022-09-20 23:00	9300	15.328	50.3	0.00	5.60	1.71	-	-	-	-
	2022-09-20 23:30	9330	15.325	50.3	0.00	5.59	1.71	-	-	-	-
21-Sep-22	2022-09-21 0:00	9360	15.322	50.3	0.00	5.58	1.70	-	-	-	-
	2022-09-21 0:30	9390	15.320	50.3	0.00	5.58	1.70	-	-	-	-
	2022-09-21 1:00	9420	15.317	50.3	0.00	5.57	1.70	-	-	-	-
	2022-09-21 1:30	9450	15.315	50.2	0.00	5.56	1.70	-	-	-	-
	2022-09-21 2:00	9480	15.311	50.2	0.00	5.55	1.69	-	-	-	-
	2022-09-21 2:30	9510	15.307	50.2	0.00	5.53	1.69	-	-	-	-
	2022-09-21 3:00	9540	15.304	50.2	0.00	5.52	1.68	-	-	-	-
	2022-09-21 3:30	9570	15.301	50.2	0.00	5.52	1.68	-	-	-	-
	2022-09-21 4:00	9600	15.299	50.2	0.00	5.51	1.68	-	-	-	-
	2022-09-21 4:30	9630	15.297	50.2	0.00	5.50	1.68	-	-	-	-
	2022-09-21 5:00	9660	15.295	50.2	0.00	5.50	1.68	-	-	-	-
	2022-09-21 5:30	9690	15.293	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 6:00	9720	15.291	50.2	0.00	5.48	1.67	-	-	-	-
	2022-09-21 6:30	9750	15.289	50.2	0.00	5.47	1.67	-	-	-	-
	2022-09-21 7:00	9780	15.286	50.2	0.00	5.47	1.67	-	-	-	-
	2022-09-21 7:30	9810	15.283	50.1	0.00	5.46	1.66	-	-	-	-
	2022-09-21 8:00	9840	15.281	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 8:30	9870	15.282	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 9:00	9900	15.281	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 9:30	9930	15.279	50.1	0.00	5.44	1.66	-	-	-	-
	2022-09-21 10:00	9960	15.280	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 10:30	9990	15.279	50.1	0.00	5.44	1.66	-	-	-	-
	2022-09-21 11:00	10020	15.279	50.1	0.00	5.44	1.66	-	-	-	-
	2022-09-21 11:30	10050	15.280	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 12:00	10080	15.280	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 12:30	10110	15.281	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 13:00	10140	15.283	50.1	0.00	5.46	1.66	-	-	-	-
	2022-09-21 13:30	10170	15.284	50.1	0.00	5.46	1.66	-	-	-	-
	2022-09-21 14:00	10200	15.286	50.2	0.00	5.47	1.67	-	-	-	-
	2022-09-21 14:30	10230	15.288	50.2	0.00	5.47	1.67	-	-	-	-
	2022-09-21 15:00	10260	15.290	50.2	0.00	5.48	1.67	-	-	-	-
	2022-09-21 15:30	10290	15.292	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 16:00	10320	15.294	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 16:30	10350	15.294	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 17:00	10380	15.294	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 17:30	10410	15.294	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 18:00	10440	15.292	50.2	0.00	5.49	1.67	-	-	-	-
	2022-09-21 18:30	10470	15.291	50.2	0.00	5.48	1.67	-	-	-	-
	2022-09-21 19:00	10500	15.289	50.2	0.00	5.48	1.67	-	-	-	-
	2022-09-21 19:30	10530	15.288	50.2	0.00	5.47	1.67	-	-	-	-
	2022-09-21 20:00	10560	15.285	50.1	0.00	5.46	1.66	-	-	-	-
	2022-09-21 20:30	10590	15.282	50.1	0.00	5.45	1.66	-	-	-	-
	2022-09-21 21:00	10620	15.278	50.1	0.00	5.44	1.66	-	-	-	-
	2022-09-21 21:30	10650	15.274	50.1	0.00	5.43	1.65	-	-	-	-

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Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
	2022-09-21 22:00	10680	15.270	50.1	0.00	5.41	1.65	-	-	-	-
	2022-09-21 22:30	10710	15.267	50.1	0.00	5.40	1.65	-	-	-	-
	2022-09-21 23:00	10740	15.265	50.1	0.00	5.40	1.65	-	-	-	-
	2022-09-21 23:30	10770	15.263	50.1	0.00	5.39	1.64	-	-	-	-
22-Sep-22	2022-09-22 0:00	10800	15.263	50.1	0.00	5.39	1.64	-	-	-	-
	2022-09-22 0:30	10830	15.259	50.1	0.00	5.38	1.64	-	-	-	-
	2022-09-22 1:00	10860	15.255	50.1	0.00	5.36	1.64	-	-	-	-
	2022-09-22 1:30	10890	15.253	50.0	0.00	5.36	1.63	-	-	-	-
	2022-09-22 2:00	10920	15.251	50.0	0.00	5.35	1.63	-	-	-	-
	2022-09-22 2:30	10950	15.248	50.0	0.00	5.34	1.63	-	-	-	-
	2022-09-22 3:00	10980	15.245	50.0	0.00	5.33	1.62	-	-	-	-
	2022-09-22 3:30	11010	15.244	50.0	0.00	5.33	1.62	-	-	-	-
	2022-09-22 4:00	11040	15.242	50.0	0.00	5.32	1.62	-	-	-	-
	2022-09-22 4:30	11070	15.241	50.0	0.00	5.32	1.62	-	-	-	-
	2022-09-22 5:00	11100	15.241	50.0	0.00	5.32	1.62	-	-	-	-
	2022-09-22 5:30	11130	15.239	50.0	0.00	5.31	1.62	-	-	-	-
	2022-09-22 6:00	11160	15.238	50.0	0.00	5.31	1.62	-	-	-	-
	2022-09-22 6:30	11190	15.236	50.0	0.00	5.30	1.62	-	-	-	-
	2022-09-22 7:00	11220	15.234	50.0	0.00	5.30	1.61	-	-	-	-
	2022-09-22 7:30	11250	15.231	50.0	0.00	5.29	1.61	-	-	-	-
	2022-09-22 8:00	11280	15.230	50.0	0.00	5.28	1.61	-	-	-	-
	2022-09-22 8:30	11310	15.228	50.0	0.00	5.27	1.61	-	-	-	-
	2022-09-22 9:00	11340	15.224	49.9	0.00	5.26	1.60	-	-	-	-
	2022-09-22 9:30	11370	15.221	49.9	0.00	5.25	1.60	-	-	-	-
	2022-09-22 10:00	11400	15.219	49.9	0.00	5.25	1.60	-	-	-	-
	2022-09-22 10:30	11430	15.217	49.9	0.00	5.24	1.60	-	-	-	-
	2022-09-22 11:00	11460	15.216	49.9	0.00	5.24	1.60	-	-	-	-
	2022-09-22 11:30	11490	15.215	49.9	0.00	5.23	1.59	-	-	-	-
	2022-09-22 12:00	11520	15.214	49.9	0.00	5.23	1.59	-	-	-	-
	2022-09-22 12:30	11550	15.215	49.9	0.00	5.23	1.59	-	-	-	-
	2022-09-22 13:00	11580	15.214	49.9	0.00	5.23	1.59	-	-	-	-
	2022-09-22 13:30	11610	15.212	49.9	0.00	5.22	1.59	-	-	-	-
	2022-09-22 14:00	11640	15.211	49.9	0.00	5.22	1.59	-	-	-	-
	2022-09-22 14:30	11670	15.210	49.9	0.00	5.22	1.59	-	-	-	-
	2022-09-22 15:00	11700	15.209	49.9	0.00	5.21	1.59	-	-	-	-
	2022-09-22 15:30	11730	15.207	49.9	0.00	5.21	1.59	-	-	-	-
	2022-09-22 16:00	11760	15.207	49.9	0.00	5.21	1.59	-	-	-	-
	2022-09-22 16:30	11790	15.205	49.9	0.00	5.20	1.58	-	-	-	-
	2022-09-22 17:00	11820	15.203	49.9	0.00	5.19	1.58	-	-	-	-
	2022-09-22 17:30	11850	15.202	49.9	0.00	5.19	1.58	-	-	-	-
	2022-09-22 18:00	11880	15.199	49.9	0.00	5.18	1.58	-	-	-	-
	2022-09-22 18:30	11910	15.196	49.9	0.00	5.17	1.58	-	-	-	-
	2022-09-22 19:00	11940	15.192	49.8	0.00	5.16	1.57	-	-	-	-
	2022-09-22 19:30	11970	15.189	49.8	0.00	5.15	1.57	-	-	-	-
	2022-09-22 20:00	12000	15.184	49.8	0.00	5.13	1.56	-	-	-	-
	2022-09-22 20:30	12030	15.179	49.8	0.00	5.12	1.56	-	-	-	-
	2022-09-22 21:00	12060	15.175	49.8	0.00	5.10	1.56	-	-	-	-
	2022-09-22 21:30	12090	15.172	49.8	0.00	5.09	1.55	-	-	-	-
	2022-09-22 22:00	12120	15.167	49.8	0.00	5.08	1.55	-	-	-	-
	2022-09-22 22:30	12150	15.163	49.7	0.00	5.06	1.54	-	-	-	-
	2022-09-22 23:00	12180	15.158	49.7	0.00	5.05	1.54	-	-	-	-
	2022-09-22 23:30	12210	15.153	49.7	-0.01	5.03	1.53	-	-	-	-
23-Sep-22	2022-09-23 0:00	12240	15.147	49.7	-0.01	5.01	1.53	-	-	-	-
	2022-09-23 0:30	12270	15.142	49.7	0.00	4.99	1.52	-	-	-	-
	2022-09-23 1:00	12300	15.137	49.7	0.00	4.98	1.52	-	-	-	-
	2022-09-23 1:30	12330	15.133	49.7	0.00	4.96	1.51	-	-	-	-
	2022-09-23 2:00	12360	15.129	49.6	0.00	4.95	1.51	-	-	-	-
	2022-09-23 2:30	12390	15.125	49.6	0.00	4.94	1.50	-	-	-	-
	2022-09-23 3:00	12420	15.121	49.6	0.00	4.93	1.50	-	-	-	-

Project No: 21-090-01VR, Table B1: Constant Rate Test - Steinar Johnsen GW Feasibility Osoyoos - WTN 124408 (WPID 62040)											
Well depth = 400 ft	Well diameter = 6 in			Measurement method = Pail and stopwatch				Pump Depth = 385 ft			
Comments	Real Time	Time since pump started, t (minutes)	Water level measurement (btoc) (m)	Water level measurement (btoc) (ft)	Water level changes (m)	Drawdown (ft)	Drawdown (m)	Pumping Rate (l/s)	Pumping Rate (USgpm)	Specific Capacity	
										L/s/m	Usgpm/ft
	2022-09-23 3:30	12450	15.117	49.6	0.00	4.91	1.50	-	-	-	-
	2022-09-23 4:00	12480	15.112	49.6	0.00	4.90	1.49	-	-	-	-
	2022-09-23 4:30	12510	15.109	49.6	0.00	4.89	1.49	-	-	-	-
	2022-09-23 5:00	12540	15.106	49.6	0.00	4.88	1.49	-	-	-	-
	2022-09-23 5:30	12570	15.104	49.6	0.00	4.87	1.48	-	-	-	-
	2022-09-23 6:00	12600	15.100	49.5	0.00	4.86	1.48	-	-	-	-
	2022-09-23 6:30	12630	15.097	49.5	0.00	4.85	1.48	-	-	-	-
	2022-09-23 7:00	12660	15.094	49.5	0.00	4.84	1.47	-	-	-	-
	2022-09-23 7:30	12690	15.091	49.5	0.00	4.83	1.47	-	-	-	-
	2022-09-23 8:00	12720	15.087	49.5	0.00	4.81	1.47	-	-	-	-
	2022-09-23 8:30	12750	15.082	49.5	0.00	4.80	1.46	-	-	-	-
	2022-09-23 9:00	12780	15.079	49.5	0.00	4.79	1.46	-	-	-	-
	2022-09-23 9:30	12810	15.076	49.5	0.00	4.78	1.46	-	-	-	-
	2022-09-23 10:00	12840	15.074	49.5	0.00	4.77	1.45	-	-	-	-
	2022-09-23 10:30	12870	15.070	49.4	0.00	4.76	1.45	-	-	-	-
	2022-09-23 11:00	12900	15.068	49.4	0.00	4.75	1.45	-	-	-	-
	2022-09-23 11:30	12930	15.066	49.4	0.00	4.74	1.45	-	-	-	-

Appendix C

Laboratory Water Quality Reports

CARO ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

REPORTED TO	Value Contracting P.O. Box 256 Okanagan Falls, BC V0H 1R0		
ATTENTION	Karen Pearce	**WORK ORDER**	22I2201
PO NUMBER	General Potability	**RECEIVED / TEMP**	2022-09-16 12:00 / 13.2°C
PROJECT	Comprehensive Analysis	**REPORTED**	2022-09-22 13:49
PROJECT INFO	Johnsen	**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 TeamCaro@caro.ca

Authorized By:

Team CARO
Client Service Representative

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Value Contracting	**WORK ORDER**	22I2201
PROJECT	Comprehensive Analysis	**REPORTED**	2022-09-22 13:49

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
1750 Highway 3 (22I2201-01) | Matrix: Water | Sampled: 2022-09-15 21:00						
Anions						
Chloride	**12.9**	AO ≤ 250	0.10	mg/L	2022-09-21	
Fluoride	**0.19**	MAC = 1.5	0.10	mg/L	2022-09-21	
Nitrate (as N)	**3.19**	MAC = 10	0.010	mg/L	2022-09-21	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2022-09-21	HT1
Sulfate	**18.6**	AO ≤ 500	1.0	mg/L	2022-09-21	
Calculated Parameters						
Hardness, Total (as CaCO3)	**250**	None Required	0.500	mg/L	N/A	
Langelier Index	**1.0**	N/A	-5.0		2022-09-22	
Solids, Total Dissolved	**335**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**286**	N/A	1.0	mg/L	2022-09-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-21	
Alkalinity, Bicarbonate (as CaCO3)	**286**	N/A	1.0	mg/L	2022-09-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2022-09-21	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2022-09-17	
Conductivity (EC)	**546**	N/A	2.0	µS/cm	2022-09-21	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2022-09-21	
pH	**8.25**	7.0-10.5	0.10	pH units	2022-09-21	HT2
Temperature, at pH	**23.4**	N/A		°C	2022-09-21	HT2
Turbidity	< 0.10	OG < 1	0.10	NTU	2022-09-18	
Microbiological Parameters						
Coliforms, Total	< 1	MAC = 0	1	CFU/100 mL	2022-09-16	
E. coli	< 1	MAC = 0	1	CFU/100 mL	2022-09-16	
Total Metals						
Aluminum, total	**0.0073**	OG < 0.1	0.0050	mg/L	2022-09-20	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2022-09-20	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2022-09-20	
Barium, total	**0.0061**	MAC = 2	0.0050	mg/L	2022-09-20	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2022-09-20	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2022-09-20	
Calcium, total	**74.9**	None Required	0.20	mg/L	2022-09-20	
Chromium, total	**0.00080**	MAC = 0.05	0.00050	mg/L	2022-09-20	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2022-09-20	
Copper, total	**0.00125**	MAC = 2	0.00040	mg/L	2022-09-20	
Iron, total	**0.013**	AO ≤ 0.3	0.010	mg/L	2022-09-20	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2022-09-20	
Magnesium, total	**15.1**	None Required	0.010	mg/L	2022-09-20	
Manganese, total	**0.00050**	MAC = 0.12	0.00020	mg/L	2022-09-20	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2022-09-21	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Value Contracting	**WORK ORDER**	22I2201
PROJECT	Comprehensive Analysis	**REPORTED**	2022-09-22 13:49

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
1750 Highway 3 (22I2201-01) | Matrix: Water | Sampled: 2022-09-15 21:00, Continued						
Total Metals, Continued						
Molybdenum, total	**0.00336**	N/A	0.00010	mg/L	2022-09-20	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2022-09-20	
Potassium, total	**4.47**	N/A	0.10	mg/L	2022-09-20	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2022-09-20	
Sodium, total	**20.2**	AO ≤ 200	0.10	mg/L	2022-09-20	
Strontium, total	**0.329**	MAC = 7	0.0010	mg/L	2022-09-20	
Uranium, total	**0.00999**	MAC = 0.02	0.000020	mg/L	2022-09-20	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2022-09-20	

Sample Qualifiers:

HT1 The sample was prepared and/or analyzed past the recommended holding time.

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

CARO ANALYTICAL SERVICES

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Value Contracting	**WORK ORDER**	22I2201
PROJECT	Comprehensive Analysis	**REPORTED**	2022-09-22 13:49

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	SM 9222* (2017)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Colour, True in Water	SM 2120 C (2017)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2017)	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* (2017)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Hardness in Water	SM 2340 B* (2017)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2017)	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 (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2017)	SM 1030 E (2011)		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 (2017)	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

CARO ANALYTICAL SERVICES

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Value Contracting	**WORK ORDER**	22I2201
PROJECT	Comprehensive Analysis	**REPORTED**	2022-09-22 13:49

General Comments:

The results in this report apply to the 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. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing. 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: TeamCaro@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.

Appendix D

Photographic Documentation

Photographs 1, 2, 3. **Site Visit (September 7, 2022)**

1. View of well casing stick-up on WTN 124408 (WPID 62040). Subsequently cut down to nominally 0.6m above current grade to facilitate test. View looking West.

2. View of Lot 5 with WTN 124408 in upland area east of the landing. View looking East.

3. Photo of wooden well enclosure at southern extent of property. Enclosure houses WTN 105407. View looking South.

Photographs 4, 5 and 6. **Site Visit (September 7, 2022)**

4. View of wellhead of WTN 105407 (WPID 27891) inside wooden well enclosure. Datalogger deployed inside white PVC stilling well during pumping test with WTN 124408. View looking north.

5. View of observation well WTN 84786, Driveway Well on neighbouring property to the west of site. Acoustic sounder used to monitor level. View looking southeast.

6. View of observation well WTN 69157, Goat Paddock Well on neighbouring property to the west of site. Goat Paddock enclosure in background. Acoustic sounder used to monitor level. View looking north.

Photographs 7 and 8. **Site Visit (September 7, 2022)**

7. Pumping test on WTN 124408. Discharge hose ran to the east to discharge at top of bank into unnamed draw along north of site. View looking northeast.

8. Pumping test on WTN 124408. Depiction of new casing stickup (nominally 0.6m above current ground elevation) to facilitate pumping test. View looking south.

Groundwater Supply Development and Management

Source Water Assessment and Protection

Well Monitoring & Maintenance

Environmental & Water Quality Monitoring

Storm & Wastewater Disposal to Ground

Groundwater Modeling

Aquifer Test Design and Analysis

Geothermal / Geoexchange Systems

Policy and Guideline Development

Applied Research

Rural Subdivision Services

Environmental Assessment & Permitting