GOLDER
MEMBER OF WSP

REPORT

Keddleston Groundwater Study - Phase 2

Electoral Area C, Regional District of North Okanagan, BC

Submitted to:

Regional District of North Okanagan
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Executive Summary

As requested by the Regional District of North Okanagan (RDNO), Golder Associates Ltd. (Golder), a member of WSP, conducted the next phase of groundwater study for the Keddleston area (hereafter referred to as the "Phase 2 Groundwater Study"). Building on a water balance study that Golder (2020) completed for the Keddleston area, the purpose of the Phase 2 Groundwater Study was to assess the groundwater supply potential in two key areas where potential future residential development may occur; specifically, the central portion of the Keddleston area, where Aquifer 349 (confined sand and gravel aquifer) and Aquifer 351 (bedrock aquifer) overlap, and the western portion of the Keddleston area that is underlain by Aquifer 351, herein referred to as "the Study Area". The overall objective of the Phase 2 Groundwater Study was to support the RDNO in making informed decisions regarding sustainable development in the Keddleston area with respect to groundwater supply.

The scope of work for the Phase 2 Groundwater Study included:

- a well survey to assess the water supply wells in the Keddleston area and the associated groundwater withdrawals from local aquifers
- a field reconnaissance and establishment of a monitoring well network for long-term groundwater level monitoring
- field investigations including: instrumenting monitoring wells and conducting groundwater level monitoring; conducting constant rate pumping tests for two monitoring wells; collecting groundwater samples at select monitoring wells and surveying the x,y coordinates of the monitoring wells
- analysis of the results and preparation of a report presenting a refined understanding of groundwater conditions in the Study Area and providing recommendations for the RDNO to support sustainable development in the Keddleston area

Based on the results of the survey and monitoring program, the groundwater supply potential of bedrock Aquifer 351 is inferred to be limited in the area of Wilson-Jackson-upper Keddleston-Clearview Roads and may be limited at the west (downgradient) and east (upgradient) ends of the Study Area. The bedrock aquifer (Aquifer 351) in these areas is heterogeneous, as reflected by the variability in yields and water level responses of monitored wells, and the cumulative effects of groundwater use (i.e., pumping) is inferred to influence groundwater levels in the western portion of the aquifer.

Golder's 2020 study assessed that Aquifer 349 had a higher relative potential to supply groundwater for future development compared to Aquifer 351; however, the findings of the Phase 2 Groundwater Study show that the potential for a sustainable groundwater supply is limited along the west-central edge of Aquifer 349, where water levels in the aquifer were monitored, and may be limited along the northwest edge of the aquifer, based on survey responses from local residences. Furthermore, the groundwater supply potential of the shallow alluvial deposits associated with drainage areas of the tributaries of BX Creek may be limited; these deposits were not included in the water balance in Golder's 2020 study and water levels in these deposits were not monitored during the Phase 2 Groundwater Study.

Golder recommends that the groundwater level and water quality program is continued for the existing monitoring well network, augmented with additional wells completed in the shallow alluvial deposits along tributaries of BX Creek, to establish baseline conditions and provide the basis to assess seasonal patterns and long-term trends in water levels and water quality. The data from the monitoring program can then be used to enable a more thorough assessment of water level responses relative to seasonal recharge of precipitation, groundwater use and aquifer properties. Development of a numerical flow model will provide the technical basis to assess current and potential future groundwater use in the Study Area, along with the potential implications of climate change. Due to the uncertainty regarding groundwater availability in the Study Area, it is recommended that the additional groundwater monitoring is conducted and the numerical model is developed before the RDNO considers accepting new applications for development.

The RDNO should assess regulatory options to manage development potential in the Study Area, including the following:

- The RDNO Subdivision Servicing Bylaw 2600 (RDNO, 2013) and RDNO Building Bylaw 2670 (RDNO, 2015) should be strengthened to require a more comprehensive hydrogeological assessment of aquifer conditions that demonstrates a sustainable potable water supply is available. Hydrogeological assessments should be included pumping tests that are conducted in accordance with the provincial *Guide to Conducting Pumping Tests* (Pumping Test Guide), including minimum durations for pumping tests based on aquifer type and subsequent recovery monitoring, monitoring of at least one observation well that is completed in the same aquifer unit, and conducting tests during part of the year when groundwater levels are lowest.
- Hydrogeological assessments should be signed and stamped by a qualified professional and include, for each well that is proposed to be used for water supply, analysis and interpretation of at least one year of continuous groundwater level monitoring data and a pumping test that satisfies the requirements above.
- Subdivision and development approvals, including existing and future development applications, should consider a phased approach to development to support sustainable development with respect to groundwater supply. Where applications to the RDNO include more than one dwelling (and therefore more than one well) or are for multiphase developments, the pumping tests should be conducted simultaneously for all wells included in the application.
- The RDNO should also consider designating Aquifer Protection Development Permit Areas (DPAs) to control and limit development in areas where groundwater availability issues have been identified; approval of development permits in the DPAs should be contingent upon specific criteria that should include requirements for groundwater monitoring, and implementation of site-specific groundwater protection measures to limit site disturbance and impervious surfaces, preserve natural soils and vegetation, and require water conservation measures.

Non-regulatory groundwater protection measures should also be considered to protect water supplies for existing and future groundwater users as well as environmental flow needs (EFNs) in surface water bodies. Public education and outreach programs can be used to educate existing and new well owners about the importance of groundwater conservation and to provide them with the tools to assess current water use, evaluate potential groundwater conservation opportunities and implement appropriate measures.

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1.0 INTRODUCTION

As requested by the Regional District of North Okanagan (RDNO), Golder Associates Ltd. (Golder), a member of WSP, conducted the next phase of groundwater study for the Keddleston area (hereafter referred to as “Phase 2 Groundwater Study”). The purpose of the Phase 2 Groundwater Study was to assess the groundwater supply potential in two key areas where future residential development may occur; specifically, the central portion of the Keddleston area, where Aquifer 349 (confined sand and gravel aquifer) and Aquifer 351 (bedrock aquifer) overlap, and the western portion of the Keddleston area that is underlain by Aquifer 351. The study included an assessment of aquifer characteristics, an assessment of seasonal changes to groundwater levels including the potential effects of seasonal pumping activities on groundwater levels, and well interference.

Authorization to proceed with this study was provided by Mr. Alec Busby of the RDNO on 30 September 2020.

For the Phase 2 Groundwater Study, a Study Area was defined and included the area encompassed by Aquifer 351, and by the portion of Aquifer 349 that is present north of BX Creek and that overlies Aquifer 351 (as shown on Figure 1, attached).

The Study Area is a semi-rural residential area located immediately northeast of Vernon, BC (Figure 1). The Study Area encompasses portions of Electoral Areas “B” and “C” of the RDNO. Ongoing development of the Study Area has occurred through the subdivision of larger sized lots, resulting in an increased density of domestic water supply wells and an overall increase in groundwater extraction. The overall objective of the Phase 2 Groundwater Study was to support the RDNO in making informed decisions on sustainable development in the Keddleston area with respect to groundwater supply.

2.0 BACKGROUND

2.1 General Comments

Domestic water supply to properties within the Study Area is primarily via individual privately owned water supply wells, except for approximately 28 homes in the Paradise Ridge Community at the east end of the Study Area which are serviced by the Aspen Water Utility. The Aspen Water Utility supplies water via two groundwater wells that are located in the area of Aspen Road and Jackpine Road; one well is inferred to be completed in bedrock Aquifer 351 (this bedrock well was monitored during the Phase 2 Groundwater Study; refer to Section 4.2) and the other in Aquifer 349.

There are reports of property owners (the number of which is not known) with private domestic supplies that have not been able to obtain sufficient water supply from the well on their property, as rate of groundwater use is greater than the rate at which the well can be pumped. In response, some property owners have installed large cisterns to store water when the demand is less than supply from the well, while others import water via water truck either to supplement their existing groundwater supply or to provide 100% of their water supply (RDNO personnel, pers. comm., October 2021).

Hydrogeological assessments completed by various consultants since circa 2010 for single lot developments in the Keddleston area report that wells that have been completed in Aquifers 349 and 351, and in other shallow, water-bearing alluvial deposits within drainage courses of the tributaries of BX Creek, generally meet the RDNO's proof of water requirements of 6.55 m^3/day (RDNO 2013; RDNO, 2015). It is understood that this proof of water requirement is intended to provide assurance that adequate water is available for residential properties at the time of development and is higher than the anticipated water use.

2.2 Hydrogeological Setting

A detailed description of the hydrogeology of the Keddleston area is described in Golder (2020). Select information relevant to the Phase 2 Groundwater Study is presented below:

- The Study Area is located east of the Swan Lake valley bottom, along the western flank of Silver Star Mountain. BX Creek flows from the east, from its origin in Silver Star Provincial Park, within a relatively narrow, steep-sided valley along the south side of the Study Area. BX Creek exits to the southwest of the Study Area into the Swan Lake valley bottom and ultimately into Swan Lake (Figure 1). Within the Study Area, several smaller creeks flow from the north and join BX Creek, including Keddleston and Abbott Creeks. Other unnamed creeks are present in the northwest portion of the Study Area; these generally drain to the west, towards the Swan Lake valley bottom.
- The catchment area that is inferred to receive precipitation upstream of, and within, the Study Area and provide recharge to the aquifers within the Study Area includes the provincially mapped BX Creek topographic catchment as well as a predicted catchment area in the northwest corner of the Study Area (termed "northwest catchment area"; refer to Golder [2020]), as shown on Figure 1.
- Based on the most recent bedrock mapping available for the area, the Study Area is underlain by Proterozoic to Paleozoic undivided metamorphic rocks of the Shuswap Assemblage, with sedimentary rocks of the Nicola Group to the south of the Study Area and intrusive rocks to the north of the Study Area (BCGS 2022) (see Figure A). Based on review of well records for well across the Study Area, the bedrock has been described by drillers as consisting of metamorphic, sedimentary, and/or intrusive (granitic) rocks. Faults have been mapped east and west of the Study Area.

- The bedrock in the Study Area is blanketed by a layer of unconsolidated glacial deposits comprising mostly till with some water-bearing sand, gravel and silt layers, including a confined water-bearing sand and gravel unit between the base of the till unit and the top of bedrock surface. Alluvial deposits are inferred to be present within drainage courses of tributaries of BX Creek and smaller streams within the Study Area.
- Where the unconsolidated and confined sand and gravel deposits overly bedrock, groundwater resources may be found in the sand and gravel deposits (Aquifer 349; registered water wells in Aquifer 349 are shown as green on Figure 2) and/or in bedrock fractures within the underlying bedrock mass (Aquifer 351; registered water wells in Aquifer 351 are shown as purple on Figure 2). Groundwater resources may also be found in shallow (unconfined) alluvial deposits associated with tributaries of BX Creek and smaller streams within the Study Area. Groundwater levels and/or quality in the alluvial deposits were not monitored during the Phase 2 Groundwater Study.
- Natural recharge to the Aquifer 349 is inferred to be predominantly from infiltration of precipitation and snowmelt along the edges of the aquifer on the sides of the valley, with some recharge contribution from bedrock inflows and stream leakage of BX Creek and its tributaries. Natural recharge to Aquifer 351 is inferred to be predominantly from infiltration of precipitation and snowmelt at upstream areas within the catchment, with some recharge contribution from leakage of the groundwater from the overlying unconsolidated aquifer (where Aquifer 349 overlies Aquifer 351) and stream leakage.

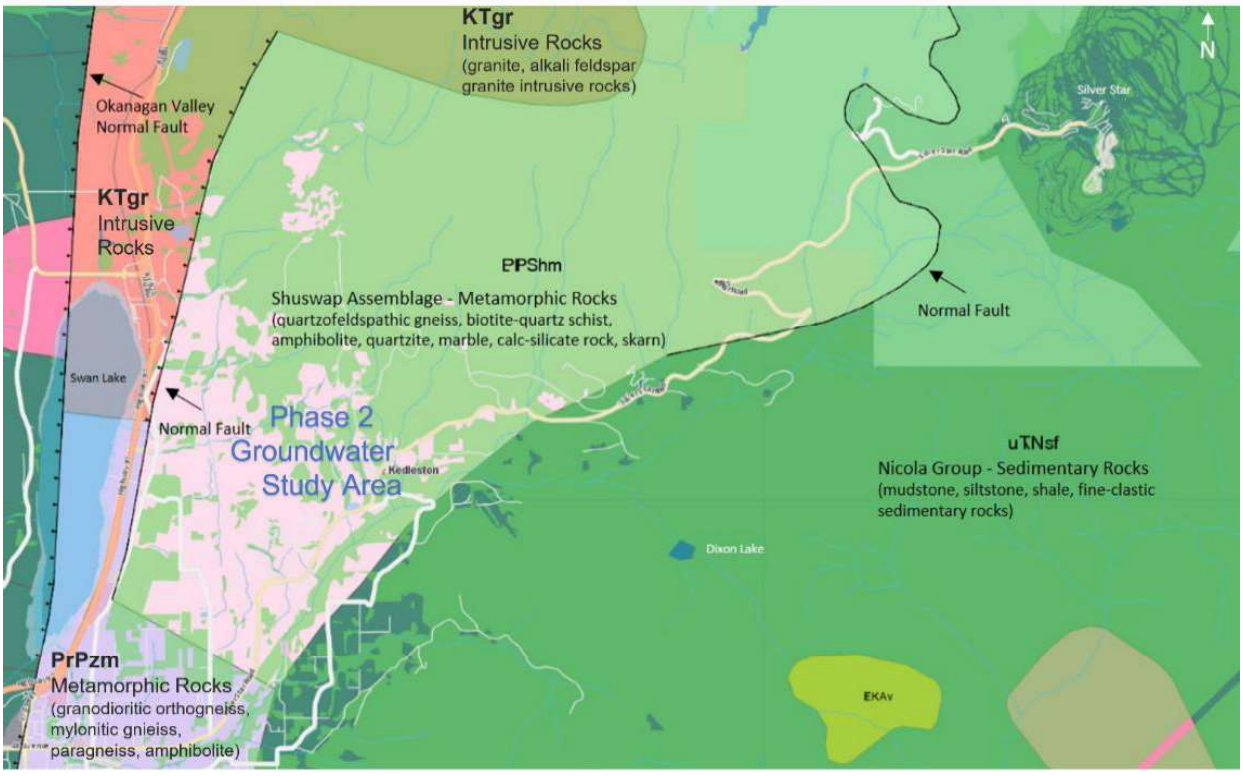

Figure A: Bedrock Geology of Study Area (BCGS 2022).

2.3 Golder's 2007 Study

In March 2007, Golder completed a groundwater availability study as part of a larger water supply strategic plan for the RDNO (Associated Engineering 2007), hereafter referred to as "Golder's 2007 study". Golder's 2007 study focused on Aquifer 349 and a portion of Aquifer 351. At the time of Golder's 2007 study, anecdotal reports from residents in the Keddleston area suggested that many of the existing water wells had been chronically or periodically under-performing with respect to sustainable yield and residents with wells in Aquifer 351 reported more concerns with water quantity and quality than did residents with wells in Aquifer 349. Golder's 2007 study predicted that Aquifers 349 and 351 had limited capacity for further groundwater development, based on estimated water balance parameters (groundwater recharge and extraction) applied at the time of the 2007 study. As relatively low yields were reported for wells that were completed in these aquifers, it was inferred that development of a large capacity well, or well field, would not be feasible in either aquifer for the purpose of a community water supply.

2.4 Golder's 2020 Study

In 2020, Golder completed a hydrogeological assessment for the Keddleston area for the purpose of updating the previous (2007) conceptual hydrogeological model for the Keddleston Area, updating the previous annual water balance assessment, and assessing the groundwater availability and development potential of the Keddleston area from the perspective of a water balance (hereafter referred to as "Golder's 2020 study"). Golder's 2020 study was intended to provide the RDNO with information regarding future sustainable groundwater development that would support sustainable growth in the area, including the feasibility of future individual wells and/or a community water system. The study did not consider environmental flow needs (EFNs) in surface water bodies. Golder's 2020 study included a study area that encompassed the full extents of Aquifers 349 and 351, and bedrock Aquifer 350.

Based on the results of Golder's 2020 study, the following interpretations were made:

Aquifer 349

- Based on the water balance estimates, the confined sand and gravel Aquifer 349 was assigned a low to medium risk with respect to groundwater availability (i.e., current predicted groundwater withdrawals were less than half of the estimated recharge to the aquifer under lower- and upper-bound scenarios[1]), and groundwater availability was interpreted to be relatively higher in Aquifer 349 than in Aquifer 351 and 350; however, the results were general and did not reflect local scale factors.
- The potential for additional groundwater development of Aquifer 349 with individual domestic wells was generally considered to be feasible throughout the aquifer; but thought to be limited by aquifer thickness and/or absence of the aquifer deposits in some locations.

[1] In Golder's 2020 study, lower-bound scenarios considered average water use and irrigation of half of the Agricultural Land Reserve (ALR)-zoned lands, and upper-bound scenarios considered the RDNO proof-of-water water use (i.e., 6.55 m^3/day) and irrigation of all the ALR-zoned lands. Average water use was estimated to be 1.76 m3/day, based on an average indoor residential use of 0.15 m3/day and a year-round average outdoor residential landscaping use of 0.525 m3/day/person (OBWB 2009) and assuming an average number of persons per household of 2.6 (Census 2016; North Okanagan Electoral Area C). Irrigation rates were estimated using the online BC Agriculture water calculator (http://www.bcagriculturewatercalculator.ca/), assuming a forage crop, loam soils and sprinkler irrigation system, and an irrigation period of 140 days per year.

Aquifer 351

- Based on the water balance estimates, bedrock Aquifer 351 was assigned a medium to high risk with respect to groundwater availability; however, this was dependent on the residential water use and extent of irrigation on lands overlying Aquifer 351. When the lower-bound estimates of residential water use and irrigation use were applied to the water balance for Aquifer 351, approximately 49% and 60% of water was predicted to be withdrawn from the aquifer relative to groundwater recharge, based on the current scale of development and full buildout, respectively. However, when the upper-bound estimates of residential water use and irrigation use were applied, approximately 147% and 188% of water was predicted to be withdrawn from the aquifer relative to groundwater recharge, based on the current scale of development and full buildout, respectively. The results indicated that at the higher extraction rates more water is withdrawn from the aquifer than is being recharged.
- The potential for additional groundwater development of Aquifer 351 was generally considered to be limited, with areas at the downgradient (west) end of the aquifer having potential to supply groundwater to future developments in that part of the Study Area.

Aquifer 350

- Based on the water balance estimates, bedrock Aquifer 350 was assigned a high risk with respect to groundwater availability under both the lower- and upper-bound scenarios. When the lower-bound estimates of residential water use and irrigation use were applied to the water balance in Aquifer 350, approximately 77% and 87% of water was predicted to be withdrawn from the aquifer relative to groundwater recharge, based on the current scale of development and full buildout, respectively. However, when the upper-bound estimates of residential water use and irrigation use are applied, approximately 217% and 256% of water is predicted to be withdrawn from the aquifer relative to groundwater recharge, based on the current scale of development and full buildout, respectively; indicative that more water is withdrawn from the aquifer than is being recharged.
- Bedrock Aquifer 350 was considered to have limited to no capacity for groundwater development, except potentially in the areas of Dixon Dam Road along the south-central boundary of the 2020 study area, and Ranch Road at the south end of the Study Area. Based on the predicted limited to no capacity, Aquifer 350 was not included as part of this Phase 2 Groundwater Study and is not discussed further in this report.

The water balance in Golder's 2020 study did not partition available water into shallow, water-bearing alluvial deposits that are present within drainage courses of the tributaries of BX Creek and smaller streams within the Study Area and that have not been mapped as aquifers by the province. When considering recharge to these alluvial deposits, the groundwater availability in Aquifer 349 and Aquifer 351 is anticipated to be less than estimated in Golder's 2020 study.

Golder's 2020 study was intended to assess overall groundwater development potential at the regional scale and to identify which aquifer, if any, could support future development through individual wells and/or a community water system. While the water balance estimates indicated that Aquifer 349 had a higher relative potential to supply future development to individual properties (through individual wells) compared to Aquifer 351, it was noted that a detailed hydrogeological assessment with appropriately designed pumping tests would be required on a lot-by-lot basis to confirm groundwater availability, sustainability and potential well interference between neighbouring well users, and to assess EFNs in nearby surface water bodies.

3.0 SCOPE OF WORK

The scope of work for the Phase 2 Groundwater Study consisted of a well survey, field reconnaissance, field investigations and reporting. These tasks are described in detail below:

3.1 Well Survey

A well survey was conducted for the following purposes:

- to confirm the number of groundwater well users in the Keddleston area and the distribution of the current water supply wells within the Keddleston aquifers
- to gain a better understanding of groundwater use from individual wells and the potential groundwater withdrawals from each aquifer
- to establish a monitoring well network for long-term monitoring of groundwater levels

3.2 Field Reconnaissance

A field reconnaissance was conducted by a Golder field technician and an RDNO technician to confirm that the water wells selected based on the results of the well survey were suitable for groundwater monitoring and/or testing.

3.3 Field Investigations

Field investigations were conducted throughout 2021 and included the following tasks:

- instrumenting selected water wells for long-term monitoring of water levels
- obtaining manual water level measurements at the monitored water wells on a quarterly basis
- conducting constant rate pumping tests at two water wells
- collecting groundwater samples at selected water wells
- surveying the x,y coordinates and elevation of each water well to allow for groundwater level measurements to be converted to groundwater elevations for spatial comparison

3.4 Reporting

Following the field investigations, Golder prepared this report summarizing the collected groundwater level data, pumping test results and water quality data in the context of groundwater supply potential within the two key areas. The report provides the following:

- a summary of the field methods used to complete the field investigations and the QA/QC methods incorporated into the work
- a summary and interpretation of groundwater levels with respect to seasonal precipitation and seasonal pumping activities, pumping test analyses, including well interference, and groundwater quality results

- map(s) showing the locations of the monitoring wells and inferred groundwater flow directions
- map(s) showing updated aquifer productivity areas and areas of groundwater supply potential
- refinement of the existing conceptual site model for the Keddleston area (Golder, 2020), including an update to groundwater conditions and aquifer characteristics, and an assessment of groundwater supply potential for the two key areas
- recommendations for further assessment of groundwater conditions in the Keddleston area

4.0 METHODS

The following sections describe the methods used to complete the well survey and the field portions of the work.

4.1 Well Survey

A well survey form was developed by Golder in conjunction with RDNO Project personnel. The RDNO sent the well survey form to a total of 306 properties in the Phase 2 Groundwater Study Area. A copy of the well survey form is provided in Appendix A.

A total of fifty-six (56) properties, or approximately 18% of the 306 properties that received the survey, provided responses to RDNO. The locations of these properties are illustrated on Figure 3.

4.2 Field Reconnaissance and Instrumentation

Following review of the survey responses, and corroboration of the survey responses with a well record obtained from either the provincial database or the well owner, twenty (20) properties were identified for potential instrumentation of the water well for long-term groundwater level monitoring. A site reconnaissance was conducted by Golder and RDNO personnel on 24 and 25 March 2021 and on 23 June 2021 to view these properties and to assess the wells and identify potential wellhead constraints or site access issues that could influence installation of instrumentation.

Based on the findings of the site reconnaissance, a shortlist of fifteen (15) properties was developed for subsequent instrumentation of water wells for the Phase 2 Groundwater Study. Fourteen (14) of the properties contained one water well that was available for monitoring and one property contained two water wells available for monitoring, for a total of sixteen (16) water wells. The locations of the 16 wells are listed in Table 1 of Section 4.3.2 and shown on Figure 4. The well records for the 16 wells are provided in Appendix B. The wells selected for instrumentation provided spatial and altitudinal representation of locations across the Study Area and allowed for assessment of groundwater levels at varying depths within two broad geological units (confined sand and gravel Aquifer 349, and bedrock Aquifer 351) and within different bedrock types (inferred based on bedrock descriptions in the well records).

The instrumentation consisted of the following:

- In wells with existing pumps, a 2-inch (0.05 m) diameter PVC drop tube was manually placed and secured in each well, where the bottom of the drop tube was placed above the well pump. A datalogger was suspended in each drop tube using a wire cable.
- In wells with no pump, a datalogger was suspended with a wire cable in the well casing at a depth close to the bottom of the well.

The instrumentation was installed with the assistance of Monashee Aquifer Testing and Well Pump Services (Monashee), as summarized in Section 4.3.2. The datalogger network is discussed in detail in Table 1, Section 4.3.2.

4.3 Water Level Monitoring

4.3.1 Manual Water Elevations

Water levels were measured manually by Golder and/or RDNO field personnel at the 16 water wells during quarterly monitoring events conducted on the following dates:

- Q2 2021: 18 May, 1 and 2 June, and 23 June
- Q3 2021: 23 July, and 11 and 12 August
- Q4 2021: 5 October, and 6 and 7 December

Water level measurements were taken using a handheld water level probe and read from the top of the well casing at each location.

4.3.2 Datalogger Installations

Solinst Levelogger® Edge Model 3001 dataloggers were deployed in the 16 water wells. The datalogger network is summarized in Table 1. A Barologger® Edge Model 3001 barologger was hung outside of a secure building in the east portion of the Study Area. During water level monitoring events in May though December 2021 (Section 4.3.1), data from the dataloggers and the barologger were downloaded. During subsequent data processing, datalogger data were corrected for barometric pressure and calibrated with manual water level measurements.

As of writing of this report, all dataloggers listed in Table 1 are currently in place in the noted water wells, except the datalogger in well 845. This datalogger was removed from the well on 2 December 2021 and sent for repair.

Table 1: Datalogger Installation Summary

Project Water Well ID	Approximate Location	Inferred Material Screened	Approximate Elevation* of Wellhead	Pumping Status**	Date Datalogger Installed	Datalogger ID
845	Hitchcock Road	Bedrock Aquifer 351	715.6 masl	Inactive	18/05/2021	2137023
896-50394	McLennan Road	Bedrock Aquifer 351	728.1 masl	Inactive	18/05/2021	2135181
896-62006	McLennan Road	Bedrock Aquifer 351	691.1 masl	Inactive	18/05/2021	2135178
840	Wilson-Jackson Road	Bedrock Aquifer 351	931.2 masl	Inactive	01/06/2021	2137016
704	Keddleston Road	Bedrock Aquifer 351	873.3 masl	Active	01/06/2021	2127187
180	Keddleston Road	Bedrock Aquifer 351	856.9 masl	Active	01/06/2021	2137018
731	Jackpine Road	Bedrock Aquifer 351	959.5 masl	Active	01/06/2021	2136999
412	Rogers Road	Bedrock Aquifer 351	1019.2 masl	Active	01/06/2021	2137010
021	Keddleston Road	Confined sand, gravel Aquifer 349	767.5 masl	Active	02/06/2021	2137940
189	Mountridge Road	Bedrock Aquifer 351	611.1 masl	Active	02/06/2021	2137941
000	Clearview Road	Bedrock Aquifer 351		Active	02/06/2021	2137002
120	McLennan Road	Bedrock Aquifer 351	576.6 masl	Active	02/06/2021	2137131
746	Cary Road	Confined sand, gravel Aquifer 349	763.9 masl	Active	02/06/2021	2137124
233	McLennan Road	Bedrock Aquifer 351	769.3 masl	Inactive	23/06/2021	2137014
726	Wilson-Jackson Road	Bedrock Aquifer 351	914.5 masl	Active	12/07/2021	2128465
026	Wilson-Jackson Road	Bedrock Aquifer 351	930.8 masl	Active	12/07/2021	2137008

* Elevations are in metres above sea level (masl)
**"Active" denotes pumping well; "Inactive" denotes non-pumping well

4.4 Pumping Tests

Two pumping tests were completed to assist in understanding the hydraulic properties (hydraulic conductivity) of bedrock Aquifer 351. These data were supplemented with transmissivity and hydraulic conductivity estimates obtained from Carmichael et al. (2009), as discussed in Section 4.8.1. Details of the pumping tests are outlined below. Testing was conducted by Monashee and was supervised by Golder field personnel at the start of, and near the end of, the testing.

Bedrock Well 726 – Wilson-Jackson Road

A test pump and the existing drop tube and datalogger were lowered into well 726 and the well was subsequently chlorinated with chlorine powder on the morning of 24 January 2022. The constant rate pumping test commenced at 12:00 PM on 24 January 2022 and continued until 12:00 PM on 26 January 2022, for a total of 2 days (48 hours, or 2,880 minutes). The static water level prior to the commencement of the pumping test was 19.8 m below top of casing (btoc).

The well was pumped at a flow rate of 0.75 US gpm (0.047 L/s) for the duration of the 48-hour pumping test. A bucket and stopwatch were used throughout the pumping test to confirm flow rate. During the constant rate pumping test, manual drawdown measurements were collected by Monashee at the well, in accordance with the frequency noted in the provincial *Guide to Conducting Pumping Tests* (Pumping Test Guide). Manual measurements of the water level recovery were collected by Monashee for a duration of 3 hours (180 minutes) following the end of the pumping test and prior to removing the drop tube and datalogger, and the test pump.

It is noted that a pumping test was initially conducted by Monashee at well 726 between 3:00 PM on 15 November 2021 and 3:00 PM on 18 November 2021, for a total of 3 days (72 hours, or 4,320 minutes). The well was pumped at a flow rate of 0.5 US gpm (0.032 L/s) for the first 24 hours; the pumping rate was then increased to 0.75 US gpm (0.047 L/s) for the remainder of the 72-hour pumping test. At approximately 3,300 minutes into the pumping test, Monashee's water level probe became lodged in the drop tube and Monashee was no longer able to take manual water level measurements. The pumping test was continued for the remainder of the 72 hours as a datalogger had been installed in the drop tube; however, upon completion of the testing, it was found that the datalogger had stopped recording during the testing period. The pumping test at well 180 was therefore redone on in January 2022 (as described in the preceding paragraphs).

Bedrock Well 180 – Keddleston Road

The existing pump at well 180 was removed by Monashee; a test pump and the existing drop tube and datalogger were lowered into the well and the well was subsequently chlorinated with chlorine powder at 12:45 PM on 29 November 2021. The constant rate pumping test commenced at 2:00 PM on 29 November 2021 and continued until 2:00 PM on 2 December 2021, for a total of 3 days (72 hours, or 4,320 minutes). The static water level prior to commencement of the pumping test was 31.3 mbtoc.

The well was pumped at a flow rate of 1 USgpm (0.063 L/s) for the first 18 hours, then increased to 2 USgpm (0.130 L/s) for 9 hours, and to 3 US gpm (0.190 L/s) for the remainder of the 72-hour pumping test. A bucket and stopwatch were used throughout the pumping test to confirm flow rate. During the constant rate pumping test, manual drawdown measurements were collected by Monashee at the well, in accordance with the frequency

noted in the provincial Pumping Test Guide. Manual measurements of the water level recovery were collected by Monashee for a duration of 2 hours (120 minutes) following the end of the pumping test and prior to removing the drop tube and datalogger and test pump.

Pumping test data from bedrock wells 726 and 180 were analyzed and hydraulic conductivity values estimated using AQTESOLV®, a commercially available software package for aquifer test analysis.

4.5 Groundwater Sampling

Groundwater samples were collected by Golder field personnel from eight of the monitored water wells, as follows.

- **Wells 120 and 412**: Groundwater samples at wells 120 and 412 were collected from yard hydrants on 18 November 2021. The yard hydrant at each location was located between the water well and the residence. At each hydrant, a clean garden hose connection (hose provided by Golder) and the hydrant tap were disinfected using 70% isopropanol alcohol, and the hose was connected to the hydrant tap. Water from the tap was allowed to flow for approximately 30 minutes (at well 120) to 40 minutes (at well 412) to remove any water that had been sitting in the distribution network. Discharge water was directed away from the residence into a vegetated area. The hose was then removed from the hydrant and groundwater samples were collected directly from the hydrant.
- **Well 000**. The groundwater sample at well 000 was collected on 18 November 2021 from a hose provided by the homeowner that was connected to a tap in a shed northwest of the well and north of the residence. The tap and hose connection were disinfected using 70% isopropanol alcohol. Water from the tap was allowed to flow into a vegetated area for approximately 35 minutes to remove any water that had been sitting in the distribution network. The groundwater sample was collected directly from the end of the hose.
- **Wells 021 and 840**. Groundwater samples at wells 021 and 840 were collected on 18 November 2021 and 16 December 2021, respectively, from pipes that discharged well water directly into reservoirs. During sample collection, groundwater from the pipe outflow was collected in a clean laboratory-supplied sample container and subsequently transferred into the designated laboratory bottles. At well 021, the homeowner manually turned the pump on so that a sample could be collected; at well 840, a sample container was placed below the pump when the pump turned on (the pump was on a timer that turned on hourly).
- **Well 026**. The groundwater sample at well 026 was collected on 2 December 2021 from a tap (prior to water flowing into a cistern). The tap was disinfected using 70% isopropanol alcohol, and water was allowed to flow into a floor drain for approximately 30 minutes to remove any water that had been sitting in the distribution network. The groundwater sample was collected directly from the tap. It is noted that this property contains two wells, and the groundwater sample was collected from the well that is not instrumented with the datalogger. It is assumed that as the wells draw water from the same aquifer fracture(s) as they are completed at the same depth.
- **Wells 726 and 180**. Groundwater samples at wells 726 and 180 were collected from the pumped discharge water near the end of the pumping tests on 18 November 2021 and 2 December 2021, respectively.

During sample collection, routine field water quality indicator parameters (pH, temperature, conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity) were measured immediately before sampling using a YSI meter and turbidity meter. Calibration of the YSI and turbidity meters was completed in advance of the sampling, as per the manufacturer's instructions and a record of the calibrations was maintained.

Groundwater samples were collected in pre-cleaned, laboratory-supplied sample bottles provided by CARO Analytical Services. When required, samples were preserved with chemicals supplied by the laboratory. Samples were appropriately labelled and stored in coolers filled with ice packs for same-day transport to CARO's analytical laboratory in Kelowna, BC, accompanied by appropriately completed chain-of-custody forms.

The groundwater samples were analysed for speciated alkalinity, hardness, total dissolved solids (TDS), total suspended solids (TSS), turbidity, pH, conductivity, nutrients (ammonia, nitrate, nitrite), anions (bromide, chloride, fluoride, sulfate), bacteriological parameters (total and fecal coliforms, E. coli), isotopes of water (^{18}O and ^{2}H), dissolved metals parameters, and total metals parameters.

4.6 GPS Survey

The locations and top of casing elevations of the 16 water wells were surveyed by Golder personnel on 11 and 12 August 2021 using a Total Station and Trimble Recon/ProXH GPS receiver.

4.7 Quality Assurance/Quality Control

A quality assurance and quality control (QA/QC) program was implemented during the field program to confirm that sampling and analytical data were interpretable, meaningful and reproducible. This involved using QA/QC measures in both the collection (field program) and analysis (laboratory program) of groundwater samples. A summary of the QC measures that were implemented during the field program and during our review of the data, as well as the QA/QC measures implemented by the analytical laboratory, are discussed below.

4.7.1 Field QC Program

The QC measures used in the collection, preservation and shipment of samples included the following:

- Sampling methods were consistent with established industry protocols and provincial/federal requirements.
- Field notes were recorded during the field studies.
- Geographic locations were accurately reported to allow for revisiting of sample locations.
- Samples were stored in coolers and chilled with ice or ice packs during transport to the laboratory.
- Samples were transported and submitted to the laboratory using chain of custody procedures.

4.7.2 Laboratory QA/QC Program

The analytical laboratory (CARO) incorporated and reported the results of internal checks which were used to assess the reliability, accuracy and reproducibility of the data.

The following data quality objectives (DQOs) were established for the laboratory analytical program:

- The laboratory that was used has achieved proficiency certification by the Canadian Association for Laboratory Accreditation Inc. (CALA) for the analyses conducted.
- In addition to the field samples and blind field duplicates, each analysis batch included at least one laboratory duplicate sample, one analytical (method) blank, and one reference sample (a certified reference standard, spike or control standard).

The following criteria were considered acceptable for laboratory QA/QC samples:

- Laboratory paired analyses results should be within laboratory-applied certified values for inorganic elements and organic compounds.
- Analytical recovery results for reference materials or spiked standards should be within laboratory-applied certified values for inorganic elements and organic compounds.
- Analytical (method) blanks should be below the reporting limits used for the specific analysis.
- Reports were to be reviewed internally by the laboratory prior to submission to Golder. If internal QA/QC problems were encountered, the field samples and internal QA/QC samples were to be re-analyzed.

Based on review of the laboratory QA/QC analyses, the quality of the samples and the reproducibility of the data is deemed to be satisfactory.

5.0 SUPPLEMENTARY INFORMATION USED IN PHASE 2 GROUNDWATER STUDY

5.1.1 Aquifer 351 Transmissivity Data

Transmissivity and hydraulic conductivity values were available for 11 bedrock wells completed in Aquifer 351 within the Study Area (refer to Figure C in Section 5.4.1 for the locations of these 11 bedrock wells). The transmissivity and hydraulic conductivity values were based on previous pumping test data that was re-analyzed by Carmichael et al. (2009) using the derivative method.

5.1.2 Water Quality Data – McLennan Road

An owner of water wells located on a property on McLennan Road provided Golder with laboratory analytical reports for groundwater samples collected in 2014 at three bedrock wells on the property (WTN 109892, WTN 109891 and WTN 109890) and for groundwater samples collected in 2020 at four other bedrock wells on the property (WPID 38544, WPID 62012, WPID 50395 and WPID 62008). A report containing water quality data for groundwater samples collected in 2017 at an additional three bedrock wells on the property (WPID 47646, WPID 47647 and WPID 47648; WWAL, 2017) was provided to Golder by the RDNO. The groundwater quality data for these 10 bedrock wells were evaluated by Golder for water types and general water quality together with the groundwater quality data collected as part of the Phase 2 Groundwater Study.

5.1.3 Reports for Other Properties Within Study Area

Hydrogeological reports completed for other properties within the Study Area were provided to Golder by the RDNO. These reports were reviewed; relevant hydrogeological information was evaluated as part of the Phase 2 Groundwater Study and referenced as applicable.

6.0 INVESTIGATION FINDINGS

6.1 Well Survey

6.1.1 Well Survey Responses

A total of fifty-six (56) properties in the Phase 2 Groundwater Study Area provided responses to RDNO (approximately 18% of the 306 properties that received the survey). The approximate locations of these 56 properties are shown on Figure 3, with the well symbol shaded purple to denote wells completed in bedrock and green to denote wells completed in an overlying sand and gravel unit. A summary of the relevant findings of the survey responses is provided below:

- Six of the 56 properties reported that a well was not present on their property (it is likely that they import water); these six properties are located on Silver Star Road, Jackpine Road and Aspen Road.
- Two of the 56 properties reported drilling dry wells, one was drilled to depth of 91.5 m (300 feet) below ground surface (bgs), and another to a depth of 259.1 m (850 feet) bgs.
- The remaining 48 properties reported a single operational well; three of these properties reported having a second operational well (information was provided for the additional operations wells by the property owners) and one property reported having an additional three operational wells (information was not provided for the additional wells by the property owner, and therefore not discussed below).
- Thirty-one (31) wells were reported (or are inferred) to be completed in bedrock at depths ranging from 18.1 m (59.5 feet) to 219.5 m (720 feet) bgs, with an average depth of 101.7 m (333.4 feet) bgs. Of the wells completed in bedrock, eight (8) wells were reported to experience water shortage issues throughout the year, particularly in the summer months. Two properties indicated that they drilled a deeper well because of water availability issues with their original (shallower) well. The approximate areas where water shortages have been reported in bedrock wells are shown on Figure 3. Water quality concerns reported by well owners included hard water, elevated iron and fluoride concentrations and turbidity, and minor sulphur odour.
- Twenty (20) wells were reported (or are inferred) to be completed in a sand and gravel unit at depths ranging from 1.5 m (5.0 feet) to 88.4 m (290 feet), with an average depth of 22.1 m (72.4 feet) bgs. Of the wells completed in sand and gravel, eight (8) wells experienced water shortage issues in the summer and/or fall months. Five of the eight wells are inferred to be completed in shallow alluvial deposits, possibly in hydraulic connection with a nearby stream (based on reported well completion depths of 1.5 m [5 feet] to 7.6 m [25 feet]), and the remaining three wells are inferred to be completed in deeper, confined sand and gravel deposits (based on reported well completion depths of 27.4 m [90 feet] to 42.1 m [138 feet]). The approximate areas where water shortages have been reported in wells completed in sand and gravel are shown on Figure 3. Water quality concerns reported by well owners include hard water and elevated iron concentrations, with minor turbidity and sulphur odour.

6.1.2 Supplemental Well Information

In October 2021, the RDNO provided Golder with a list of properties that had reported groundwater shortages over the summer and fall of 2021. The approximate locations of these properties are shown on Figure 3. A summary of the groundwater availability concerns is provided as follows:

- A property owner on Silver Star Road reported that the primary source of water for their property is a shallow groundwater well in the Meakins Creek drainage and that the well has gone dry.
- Two other properties on Jordashe Road, within the Meakins Creek drainage, reported dry water wells.
- A property owner on Jordashe Road reported a dry water well.
- The property owner on Chew Road indicated that a seasonal creek near Chew Road had gone dry and that the water level in their shallow dug well was low.
- A resident on Silver Star Road, near Chew Road, indicated that their well had gone dry.
- Several residents on Wilson-Jackson Road indicated that they had been without groundwater since prior to the high temperatures that occurred in the Okanagan in June 2021.
- A resident on Aspen Road, near Jackpine Road, indicated that their drilled well had gone dry.

During the pumping test at the property on Wilson-Jackson Road in November 2021 (refer to Section 4.4), the property owner reported that several small creeks/drainages in the Wilson-Jackson Road area had gone dry in the summer of 2021.

The groundwater availability issues reported in these areas may be a result of limited recharge to the shallow (unconfined) alluvial deposits associated with Meakins Creek (a tributary of BX Creek) in early spring 2021, particularly from reduced precipitation falling at lower elevations (refer to Figure B), followed by dry late spring and summer conditions. Additional pumping for irrigation purposes during the summer months may have intensified the already declining water levels.

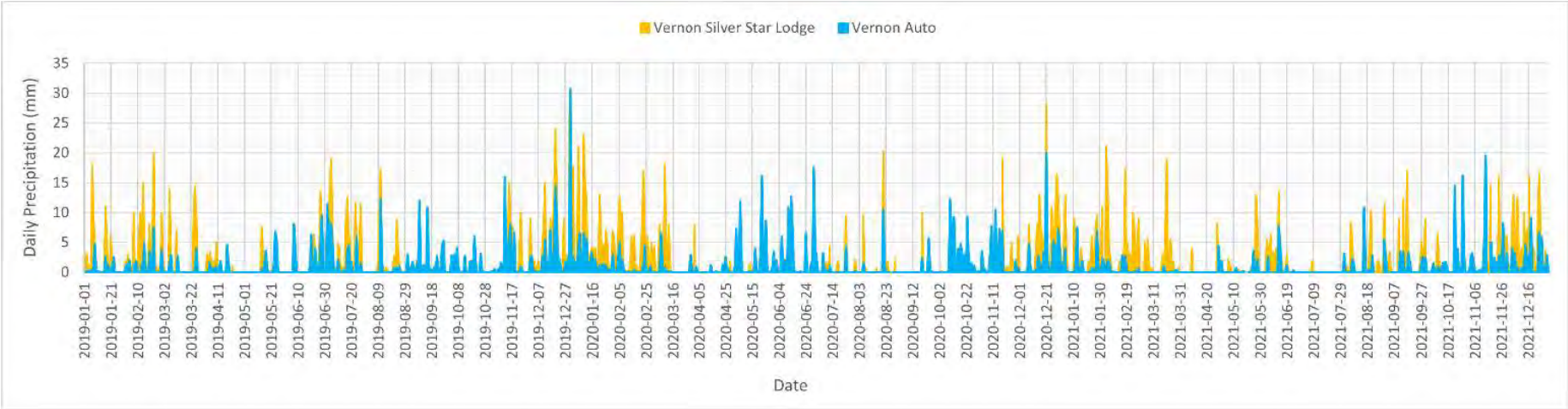

Figure B: Daily precipitation for the lower elevation Vernon Auto weather station (blue line) and higher elevation Vernon Silver Star Lodge weather station between 2019 and 2021 (Government of Canada, 2022).

6.2 Water Level Trends

Manual water level measurements obtained in 2021 at the 16 water wells, and the associated calculated groundwater elevations, are provided in Table 2. The calculated groundwater elevations (from manual measurements) along with groundwater elevations obtained from the dataloggers between 18 May and 7 December 2021 are plotted with time on one combined plot for the 16 water wells (refer to Figure C1 in Appendix C) and for each individual water well (refer to charts for each well in Appendix C, following Figure C1). Daily precipitation data obtained from the Vernon and Silver Star Lodge weather stations (Government of Canada, 2022) and groundwater elevations from provincial Observation Well 311 (Keddleston Road) are also included on the combined plot (Figure C1). Groundwater elevations are also shown on the stratigraphic cross-sections (Figures 5 and 6, with cross-section line orientations shown on Figure 3).

In general, the following observations were made with respect to the groundwater elevation data collected at the Study Area between 18 May and 7 December 2021:

- Static (non-pumping) groundwater elevations were discernable from groundwater elevations during pumping (i.e., groundwater levels returned to static, or near-static, conditions after the pump was turned off), except at water wells 840 (bedrock), 704 (bedrock) and 021 (confined sand and gravel), and also at well 026 (bedrock) during the summer of 2021. Groundwater elevations at wells 840, 704 and 021 and at well 026 during the summer of 2021 exhibited an oscillating pattern, making it difficult to identify a static groundwater level. The oscillating pattern is inferred to be due to the pump in the well turning off and then on prior to levels reaching static, or near static, conditions. At the three bedrock wells 840, 704 and 026 (summer 2021 only), the pumping and non-pumping water levels appear to be below the depths of the bedrock fractures that are reported on the respective well records.
- For the water wells that did not show an oscillating response, static groundwater elevations generally decreased between the start of the monitoring period in May/June 2021 until early September 2021, inferred to correspond to a decrease in seasonal precipitation and an increased use in groundwater, and then gradually increased for the duration of the monitoring period (i.e., until early December 2021), inferred to correspond to an increase in precipitation coupled with a decrease in water use. Exceptions to this trend in water levels were observed at the following wells:
  - At bedrock wells 731, 726, 180 and 845, water levels continued to decrease after early September 2021 and were lowest in December 2021. In addition to a decrease in seasonal precipitation and an increased use in groundwater over the summer months, there is likely also a delay in recharge to these wells, which would suggest that the fracture network(s) at these wells may not be directly connected to surface recharge from local fall rain events and may be recharged to a larger extent by higher elevation precipitation (snowmelt).
  - At bedrock well 233, the water level decreased between the start of the monitoring period in June 2021 until mid-November 2021 and then gradually increased for the duration of the monitoring period (i.e., until early December 2021). This well is in a sparsely developed area at the north end of the Study Area and is currently not in use. The approximate two-month delay in the seasonal increase in water levels may reflect a delay in recharge to this well from the early fall rains, suggestive that the fracture network at this well may not be directly connected to surface recharge from local rain events.
  - The collection of at least one year of groundwater level data (i.e., up to at least mid-2022, including freshet) is required to better understand the patterns that reflect seasonal recharge and groundwater use.

- The static water levels at bedrock wells 896-50394, 120 and 026, and at well 746 (confined sand and gravel), were higher in December 2021 than initially measured in mid 2021. The static water levels at the remaining wells were lower in December 2021 than initially measured in mid 2021 (but higher than in early September 2021). The higher static water levels at bedrock wells 896-50394, 120, 026 and 746 in December 2021 relative to those measure in mid 2021 may reflect additional groundwater use in these areas prior to, and near the start of, the monitoring program; however, as above, additional water level data collected to at least mid-2022 (including freshet) is required to better understand the patterns that reflect seasonal recharge and groundwater use.
- During the monitoring period, the difference in seasonal static groundwater elevations at most bedrock wells ranged from 1.4 m to 2.7 m, where static water levels were measurable; however, seasonal variations at the two most downgradient bedrock wells located at the west end of the Study Area (pumping wells 120 and 189) and at the bedrock well located at the north end of the Study Area (non-pumping well 233) ranged from 5.3 m (at well 233) to 16 m (at well 120). The larger differences in seasonal groundwater elevations at these three wells may be influenced by higher groundwater use in these areas during the summer months, as corroborated by the relatively higher number of residential properties in the area of McLennan Road and Mountridge Road relative to other parts of the Study Area.
- In wells that were actively pumping during the monitoring period, water level drawdowns during pumping activities between mid 2021 and early September 2021 ranged from <1 m (at well 189) to approximately 65 m (at well 726), as follows:
  - drawdowns on the order of 60 m were observed at bedrock wells in the Wilson-Jackson Road area (wells 840 and 726)
  - drawdowns on the order of 10 to 20 m were observed at the western-most bedrock well on McLennan Road (well 120), the eastern-most bedrock well on Rogers Road (well 412), a bedrock well at the north end of Keddleston Road (well 180) and confined sand and gravel wells 746 and 021. It is noted that the confined sand and gravel well 021 was dry when measured on 5 October 2021
  - drawdowns of up to 6 m were observed in the bedrock wells on Mountridge Road (well 189), Clearview Road (well 000), Jackpine Road (well 731) and the north end of Keddleston Road (well 704).

  The magnitude of water level drawdowns during pumping activities generally decreased after early September 2021, that is inferred to correspond to the end of the irrigation season.
- The groundwater elevations in the non-pumping bedrock wells did not fluctuate in a manner that would suggest influence from nearby pumping activities.
- Groundwater (non-pumping and pumping) elevations are shown on the charts for each well relative to the inferred (approximate) depth to the bottom of the well, or where the bottom depth of the well was not known, the depth to the top of pump (refer to Charts in Appendix C). The depths of bedrock fractures, well liner and/or liner perforations, where reported on well records, are indicated on the respective charts. For many wells, the depths of the fractures and liner perforations and/or presence of liner are not known. The following observations were made:
  - At the pumping wells completed in bedrock, the vertical distance between the lowest pumping groundwater elevation and the depth of the well bottom (or top of pump) ranged from approximately 5 m (at well 731) to 70 m (at well 840). At the two bedrock wells that exhibited the largest seasonal variations (i.e., pumping wells 120 and 189 at the west end of the Study Area), the vertical distance between the lowest pumping groundwater elevation and the depth of the well bottom was 10 m and 19 m, respectively.

- At the non-pumping wells completed in bedrock, the vertical distance between the lowest seasonal groundwater elevation and the depth of the well bottom (or top of pump) ranged from approximately 51 m (at well 896-50394) to 110 m (at well 726).
- There was little to no separation between the lowest pumping groundwater elevation and the approximate depth to the bottom of the well at the confined sand and gravel well 021 (0 m; dry well) and well 746 (approximately 2 m of separation).

The vertical distances between groundwater elevations and the depth to the bottom of the well (or top of pump) are presented herein to show the variability in the relative amount of water in the wells monitored as part of this Phase 2 Groundwater Study during pumping and non-pumping conditions. The distances shown or discussed herein are not equivalent to the available drawdown, or safe available drawdown, in the well; they do not account for the presence of fractures; nor do they consider the well's sustainable yield. When considering the safe available drawdown and the sustainable yield of a bedrock well, the water level should not be pumped below the upper-most water-bearing fracture that is supplying groundwater to the well.

6.3 Groundwater Flow Directions and Hydraulic Gradients

6.3.1 Regional Keddleston Area

On a regional scale, groundwater flow across the Keddleston area is inferred to be towards the west-southwest, from the bedrock dominated upland areas near Silver Star Resort towards the Swan Lake valley bottom.

6.3.2 Study Area

Based on water levels monitored during the Phase 2 Groundwater Study, non-pumping groundwater elevations were highest at the water wells located at the east (upgradient) end of the Study Area and lowest at the water wells located at the west (downgradient) end of the Study Area (refer to the cross-sections on Figures 5 and 6).

In general, the overall direction of groundwater flow in bedrock Aquifer 351 is inferred to be to the west-southwest under a horizontal hydraulic gradient of approximately 0.06 m/m at the upgradient end of the Study Area to approximately 0.18 m/m at the downgradient end of the Study Area, as shown on the attached groundwater contour figures for groundwater elevations measured on 15 and 19 July 2021 (Figure 7) and on 6 and 7 December 2021 (Figure 8). As shown on the groundwater contour figures, the change in the horizontal hydraulic gradient across the Study Area between July and December was minimal, indicative of relatively small seasonal changes in the slope of the groundwater surface across the Study Area. The direction of groundwater flow in the confined sand and gravel aquifer (Aquifer 349) north of BX Creek could not be confirmed with the two water wells that were monitored during the Phase 2 Groundwater Study; however, based on available water levels reported on well logs, the groundwater flow direction in Aquifer 349 north of BX Creek is inferred to be south to southwest, towards BX Creek, under a horizontal hydraulic gradient of approximately 0.08 m/m (Golder 2020).

Groundwater elevations at bedrock well 000 were relatively lower than the neighbouring water levels (as indicated by the flattening of the contour interval near well 000 on Figures 7 and 8). Well 000 is completed at relatively similar elevations to the neighbouring wells; however, the water level is generally lower than in neighbouring wells (refer to the cross-sections on Figures 5 and 6). The lower water levels may be related to relatively lower groundwater pressures in the fracture(s) within the upper portion of the bedrock aquifer at this location, possibly due to a relatively more conductive fracture(s) at this location.

6.4 Aquifer Characteristics

6.4.1 Hydraulic Conductivity

The results of the pumping test analysis at bedrock wells 726 and 180 (AQTESOLV® plots) are presented in Appendix D. The hydraulic conductivity value of the bedrock was estimated using the Cooper Jacob (1946) solution for a pumping test in a confined aquifer and checked with a solution specific to bedrock fractures (Gringarten-Ramey-Raghavan (1974) solution for a pumping test in a fractured aquifer with a single vertical fracture that is intersected by a pumped well). The hydraulic conductivity value of the bedrock was estimated to be 2.2E-9 m/s (at well 726) and 3.5E-7 m/s (at well 180).

Hydraulic conductivity values from the 11 bedrock wells that were re-analyzed by Carmichael et. al. (2009) ranged from 0.0014 m/d to 0.35 m/d (9.7E-7 m/s to 2.4E-4 m/s); corresponding transmissivity values ranged from 0.01 m^2/d to 1.1 m^2/d (6.9E-6 m/s to 7.6E-4 m/s).

Of the bedrock wells with available hydraulic conductivity and transmissivity data, it appears that wells within the central portion of the Study Area, along the north end of Keddleston Road and on Wilson-Jackson and Aspen Roads (highlighted red and orange on Figure C), including bedrock wells 726 and 180, exhibited lower hydraulic conductivity values (on the order of E-7 to E-9 m/s) and corresponding lower transmissivity values. These relatively low values suggest that wells completed in this portion of the bedrock aquifer are generally likely to have lower yields; however, flow in bedrock is variable. Bedrock wells closer to the northern boundary of the Study Area (highlighted green on Figure C) exhibited relatively higher hydraulic conductivity and transmissivity values. Hydraulic conductivity and transmissivity data were not available for wells at the west (downgradient) end of the Study Area.

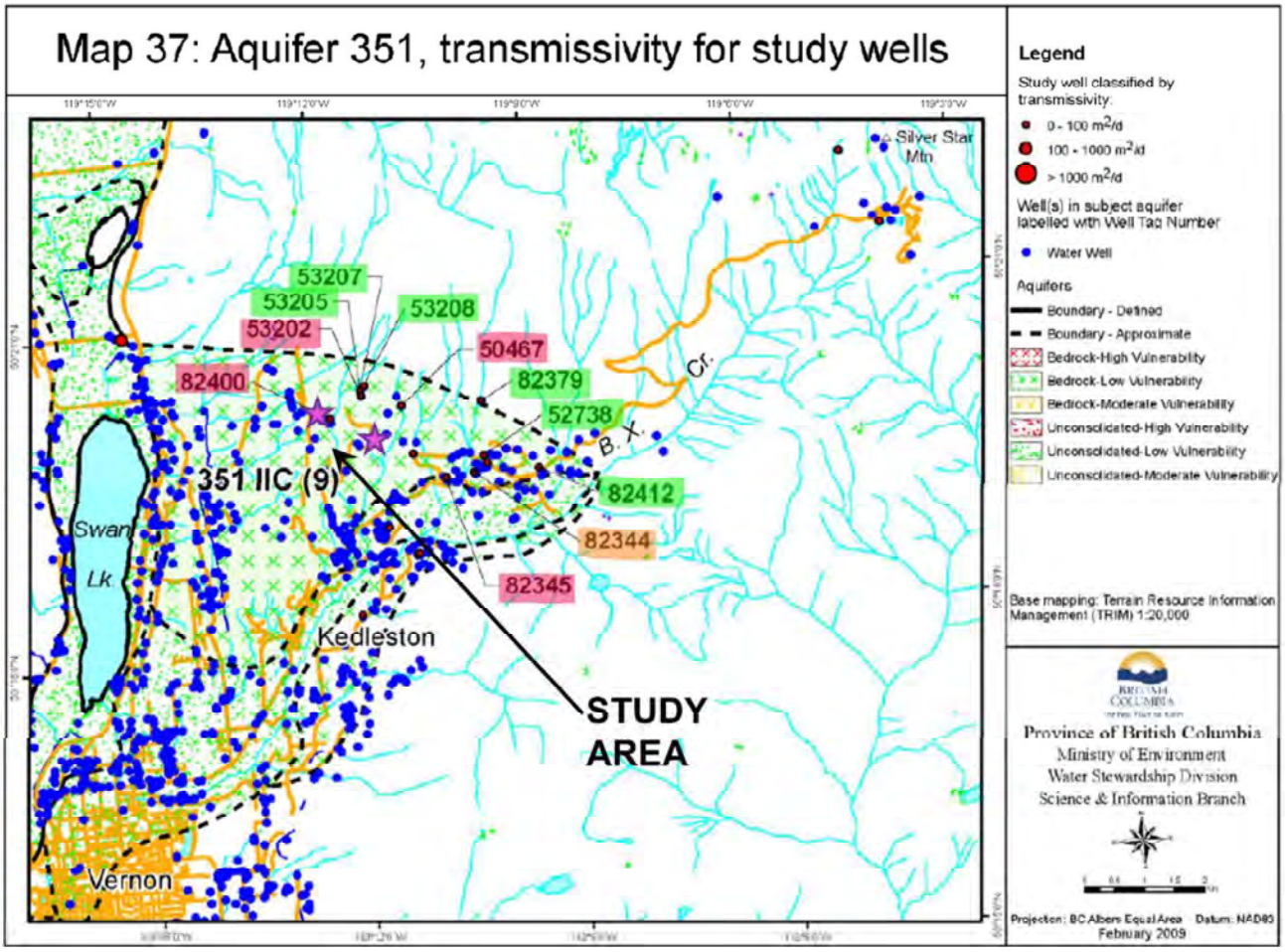

Figure C: Map taken from Carmichael et al. (2009) showing 11 bedrock wells (red dot with label) completed in Aquifer 351 where hydraulic conductivity and transmissivity values were estimated based on pumping test data re-analyzed by Carmichael et al. (2009). Well label (i.e., 82400) is the WTN for each of the 11 bedrock wells; shading of WTNs is discussed in report. Stars represent the two bedrock wells tested as part of this Phase 2 Groundwater Study.

6.4.2 Hydraulic Connectivity and Well Interference

Water level drawdowns for wells that were located closest to each other were compared to assess the potential for well interference, based on the location and accessibility of wells in the area. It is noted that in most cases, the wells are not on adjacent properties but rather separated by several rural properties, with distances between wells ranging from approximately 50 m to over 600 m.

- **Wells 026, 840 and 726 on Wilson-Jackson Road**. No direct correlation between the water levels at these three neighbouring wells was apparent during the monitoring period (Figure D). During the pumping test at well 726 between 15 and 18 November 2021, the water levels at wells 026 and 840 did not appear to respond to the pumping activities.

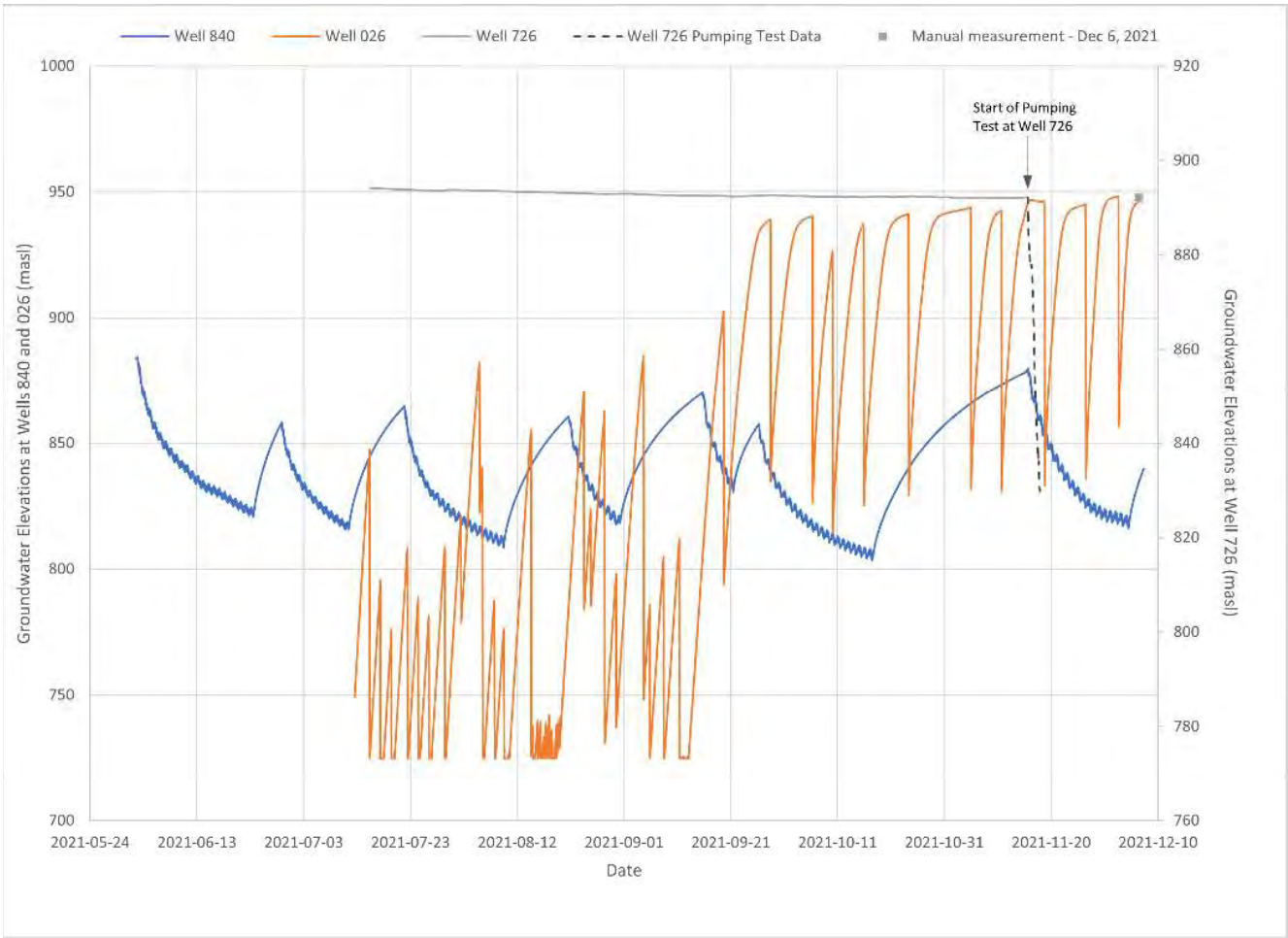

Figure D: Groundwater elevations at bedrock wells 026, 840 and 726 on Wilson-Jackson Road during the monitoring period, including during the pumping test conducted at well 726.

- **Wells 704 and 180 on Keddleston Road and Well 000 on Clearview Road**. There was no apparent correlation between the water levels at wells 704, 180 and 000 during the monitoring period (Figure E).. During the pumping test at well 180 between 29 November and 2 December 2021, it appears that well 704 continued with its characteristic oscillating pumping schedule for the duration of the pumping test and for four days after the pumping test (at which time the datalogger was removed from wells 704 and 180 as part of the December 2021 datalogger download event).

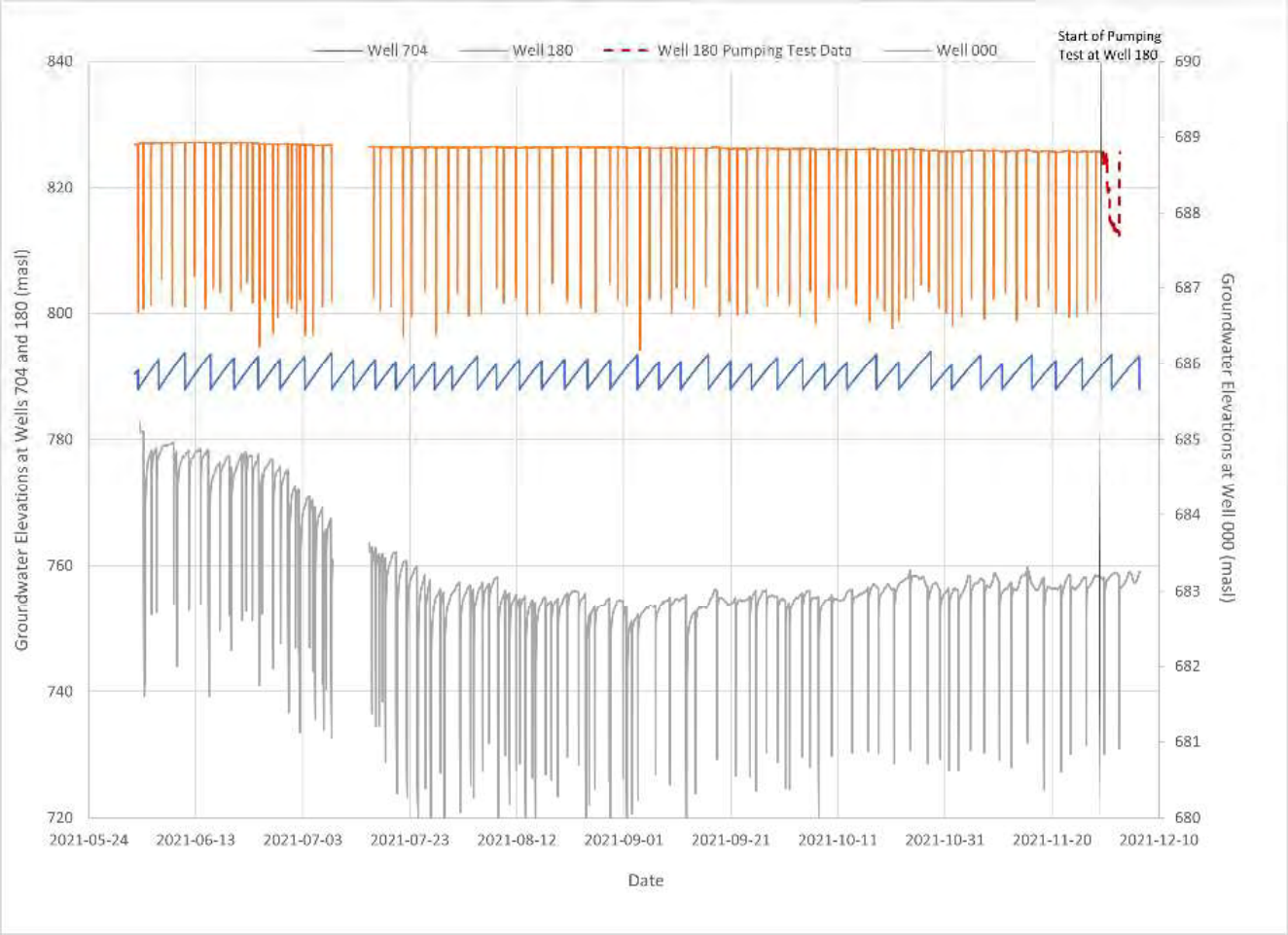

Figure E: Groundwater elevations at bedrock wells 704, 180 and 000 during the monitoring period, including during the pumping test conducted at well 180.

- **Wells 120 (McLennan Road) and 189 (Mountridge Road)**. Seasonal trends in water levels were generally similar at wells 120 and 189 during the monitoring period, declining from May through the end of August (Figure F); however, the level in well 189 shows a slight delay (approximately two weeks) in recharge relative to well 120. In August, the frequency of pumping (i.e., pump turning on and off) in well 120 was greatest and the groundwater levels were lowest. Increases in the static water level in well 120 in early September and mid November are inferred to reflect reduction in pumping from the well, whereas the increase observed in early December may reflect broader recharge to the aquifer. Although no direct correlation of the water levels was apparent with respect to specific pumping events at wells 120 and 189 (Figure F), pumping from the individual wells may have had an influence on static groundwater levels in the general area.

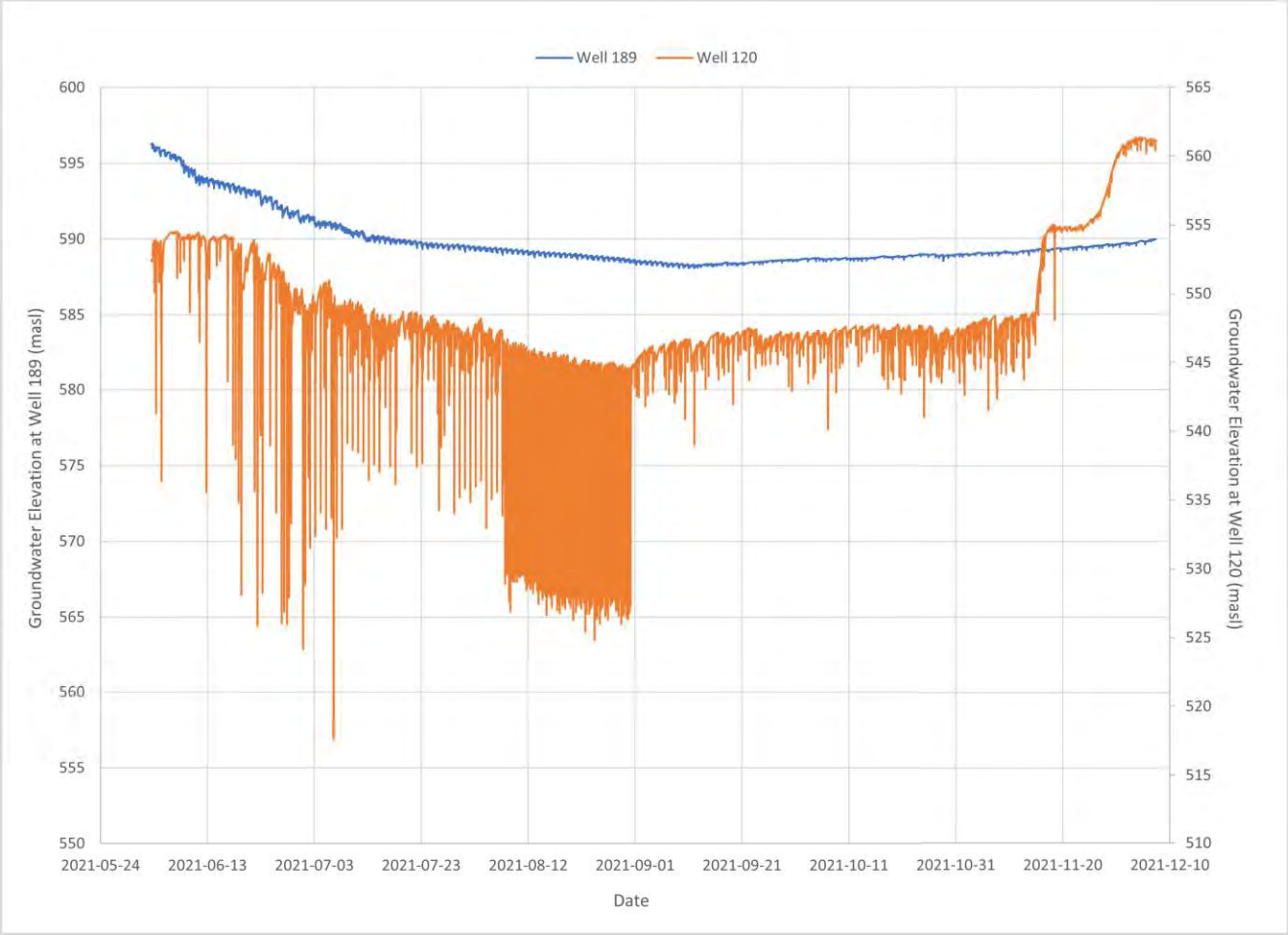

Figure F: Groundwater elevations at bedrock wells 120 and 189 during the monitoring period.

- **Wells 896-50394 (McLennan Road) and 000 (Clearview Road), and wells 896-50394 and 120 (McLennan Road)**. During the monitoring period, seasonal trends in water levels were generally consistent between inactive well 895-50394 and pumping well 000, located upgradient (east) of well 896-50394, and between inactive well 895-50394 and pumping well 120 located downgradient (west) of well 896-50394 (Figure G). There was no apparent correlation of the water levels at inactive well 896-50394 with pumping activities at wells 000 and 120.

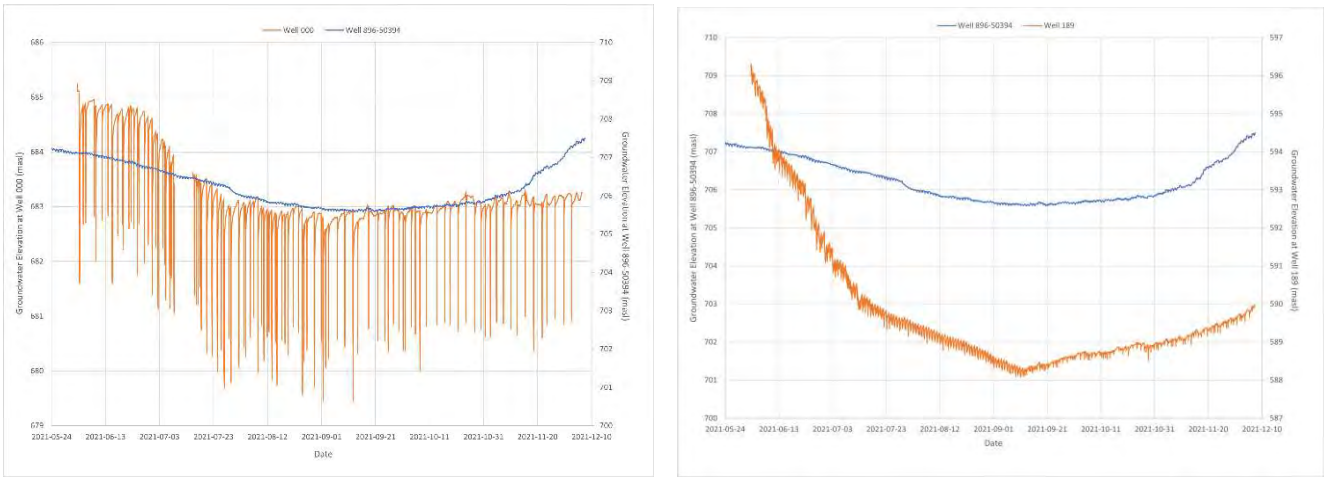

Figure G: Groundwater elevations at bedrock wells 896-50394 and well 000 (left plot) and bedrock wells 896-50394 and well 120 (right plot) during the monitoring period.

- **Wells 021 (Keddleston Road) and 746 (Cary Road)**. There was no apparent correlation of the water levels with respect to pumping activities at the confined sand and gravel wells 021 and 746 (Figure H).

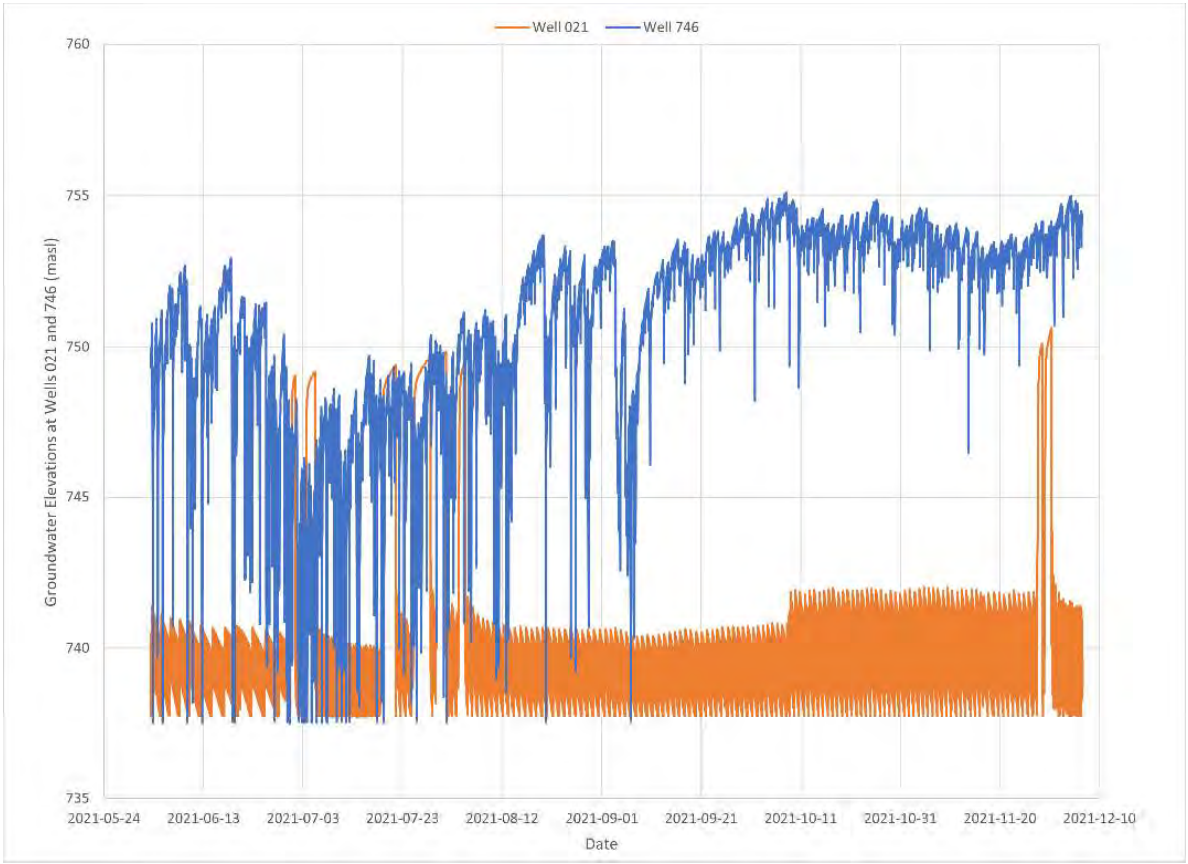

Figure H: Groundwater elevations at confined sand and gravel wells 021 and 746 during the monitoring period.

6.5 Groundwater Quality

6.5.1 General Water Chemistry

Tabulated analytical groundwater results are presented in Table 3 – Analytical Groundwater Quality Results and in Table 4 – Analytical Groundwater Isotope Results. Copies of the laboratory Certificates of Analysis are provided in Appendix E.

For characterisation purposes and to assess general water quality, the data were tabulated and, where applicable, compared to the Health Canada Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada 2020) maximum acceptable concentration (MAC) and aesthetic objective (AO) criteria.

6.5.1.1 Water Types

Groundwater quality data from the eight wells sampled by Golder in November and December 2021 and the 10 wells sampled by others at the property on McLennan Road are presented on a Piper diagram (Figure E). The groundwater samples are grouped into the following water types based on their position on the Piper diagram (Figure I):

- Calcium bicarbonate (Ca-HCO_3) to magnesium bicarbonate (Mg-HCO_3) type waters, characterized by groundwaters at bedrock wells 412 (at the east [upgradient] end of the Study Area), 120 (at the west [downgradient] end of the Study Area), 180 (in central portion of Study Area on Keddleston Road) and the 10 bedrock wells at the property on McLennan Road (at the west end of the Study Area).
- Calcium sulphate (Ca-SO_4) type waters, characterized by groundwater at the confined sand and gravel well 021.
- Sodium sulphate (Na-SO_4) type waters, characterized by groundwater at bedrock well 000.
- Sodium bicarbonate (Na-HCO_3) type waters, characterized by groundwaters at bedrock wells 026, 726 and 840.

Groundwater samples collected at wells 412, 120 and 180, and at the 10 bedrock wells across the property on McLennan Road, plot in a region in the piper diagram that is indicative of fresh water (i.e., precipitation). Groundwater at these wells is inferred to be recharged by precipitation, with relatively little bedrock interaction at well 412 and some degree of bedrock interaction at well 180 and at the 10 bedrock wells across the property on McLennan Road. Based on the nitrate and chloride concentrations in groundwater at well 120 (Table 3), the groundwater at well 120 may be influenced by surface processes (i.e., septic system discharge, road salting).

The Ca-SO_4 and Na-SO_4 type waters at wells 021 and 000, respectively, suggest that these groundwaters have undergone some degree of bedrock interaction resulting in a higher sulphate content. Groundwaters at bedrock wells 026, 726 and 840 are indicative of deeper groundwaters that have undergone geochemical change (i.e., ion exchange [calcium to sodium]).

Based on preliminary observations of this limited dataset, the different water types may be representative of the interaction of groundwater with different bedrock types and/or may represent groundwater flow within shallow and deep bedrock fracture networks, where the calcium- and magnesium-dominant waters are representative of a shallow groundwater flow system and the sodium-dominant waters are representative of a deeper groundwater flow system; however, additional water quality data across the Study Area would be required to confirm these preliminary observations.

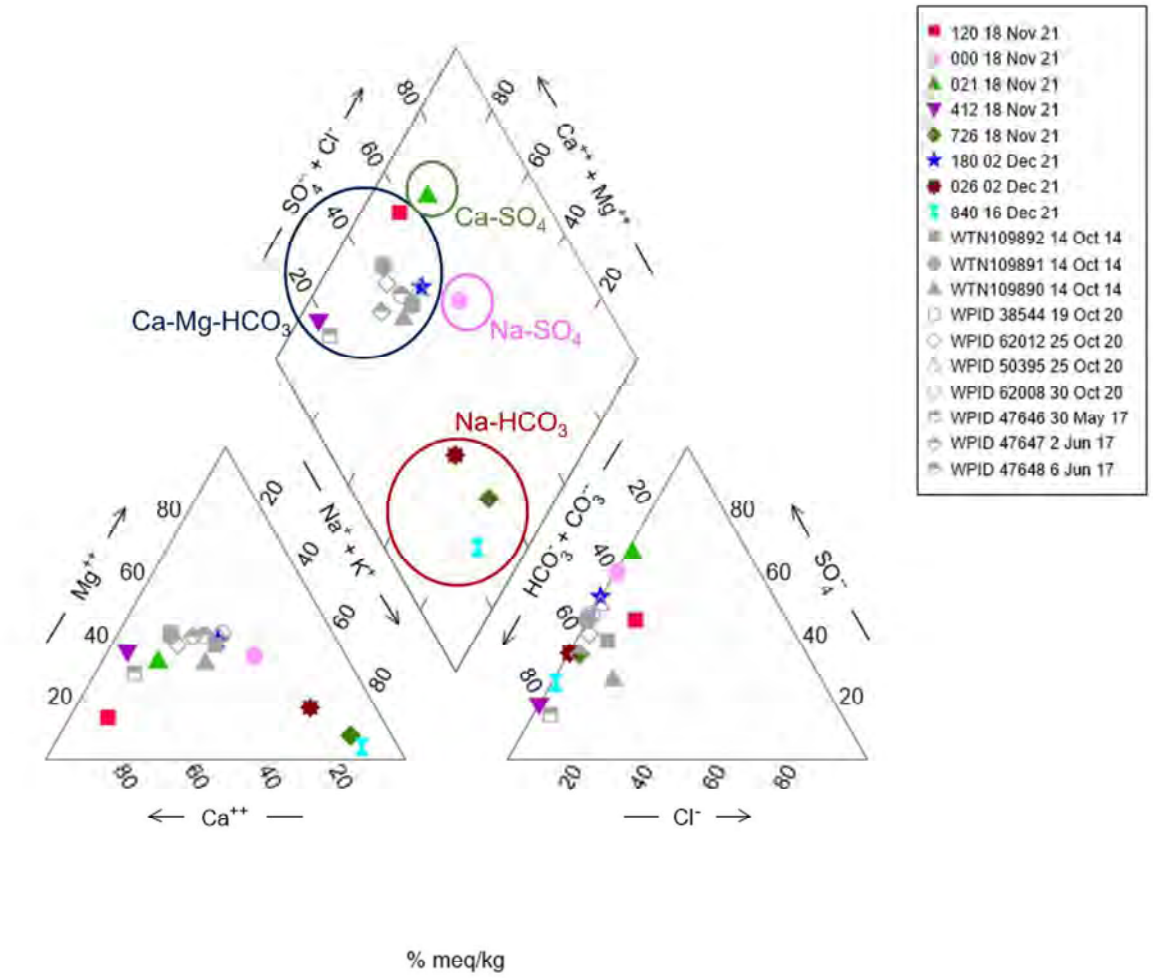

Figure I: Piper diagram showing water types for groundwater samples collected by Golder as part of the Phase 2 Groundwater Study (coloured symbols) and samples collected by a property owner at their wells on McLennan Road (grey symbols).

6.5.1.2 Comparison to CDWQG

Based on the comparison of water quality data to the criteria in Health Canada's GCDWQ, the following natural exceedances of criteria were identified. As the GCDWQ criteria for metals are for total metals and not dissolved metals, only the exceedances of total metals criteria are shown in Table 3 and discussed below.

- TDS in the groundwater samples collected at wells 120, 000, 021, 726, 180, 026 and 840 were greater than the GCDWQ AO of ≤500 mg/L.
- Total coliforms in the groundwater samples collected at wells 120, 000, 021 and 412 were greater than the GCDWQ MAC of "none detectable per 100 mL". As per Health Canada (2020), the presence of total coliforms in non-disinfected groundwater may indicate that the system is vulnerable to contamination, a sign of bacterial regrowth, or that the sample came into contact with a surface with bacteria. At this time, it is not known

whether the detectable total coliforms were present along the sampling equipment train (i.e., hose, hose connections), at the outflow tap/piping, in the well casing and/or associated distribution piping, or in the groundwater. The highest total coliforms count was measured at well 021, where the groundwater sample was collected directly from the pipe outflow and had no contact with the sampling equipment. For groundwater samples collected at wells 120, 000 and 412, it is assumed that the hose, hose connections and outflow taps did not contribute to the total coliforms count, as these points were disinfected during sampling and groundwater was purged for at least 30 minutes prior to sampling.

- Fluoride concentrations in the groundwater samples collected at the three bedrock wells on Wilson-Jackson Road (wells 726, 026 and 840) were greater than the GCDWQ MAC of 1.5 mg/L.
- Sulphate concentrations in the groundwater samples collected at bedrock well 000 and the confined sand and gravel well 021 were greater than the GCDWQ AO of ≤500 mg/L.
- Total iron concentrations in the groundwater samples collected at bedrock wells 726 and 180 were greater than the GCDWQ AO of ≤0.3 mg/L.
- Total lead concentrations in the groundwater samples collected at bedrock wells 726 and 026 were greater than the GCDWQ MAC of 0.005 mg/L.
- Total manganese concentrations in the groundwater samples collected at bedrock wells 000, 412, 726 and 180 were greater than the GCDWQ AO of <0.02 mg/L. The total manganese concentrations in the groundwater samples collected at wells 726 and 180 were also greater than the GCDWQ MAC of 0.12 mg/L.
- Total sodium concentrations in the groundwater samples collected at bedrock wells 000 and 726 were greater than the GCDWQ AO of ≤200 mg/L.
- The total uranium concentration in the groundwater samples collected at bedrock well 120 was greater than the GCDWQ MAC of 0.02 mg/L.

6.5.2 Isotopes of Water

Within the water molecule, there are two stable isotopes of hydrogen: ^{2}H and ^{1}H, and three stable isotopes of oxygen: ^{16}O, ^{17}O and ^{18}O. These stable isotopes are conservative groundwater tracers and often carry a signature that indicates the source of groundwater recharge and relative residence times of groundwater in the subsurface.

The stable isotopes of hydrogen and oxygen are measured as the ratio of the two most abundant isotopes of a given element (for oxygen, these are ^{16}O and ^{18}O) (Clark and Fritz 1997). Water isotope results are reported relative to Vienna Standard Mean Ocean Water (VSMOW)-Standard Light Antarctic Precipitation (SLAP), and expressed in the δ(‰) (“del”) notation (Clark and Fritz 1997), as follows for $\delta^{18}O$:

$$\partial^{18}O = \left(\frac{(^{18}O/^{16}O)_{sample} - (^{18}O/^{16}O)_{smow}}{(^{18}O/^{16}O)_{smow}} \right) x1000$$

where:

$(^{18}O/^{16}O)_{sample}$ = light to heavy isotope ratio for the oxygen in the sample

$(^{18}O/^{16}O)_{smow}$ = light to heavy isotope ratio for the oxygen in the standard.

The δ^2H and $\delta^{18}O$ values of groundwaters analysed across the Study Area are presented in Table 4, and on Figure J along with the Global Meteoric Water Line (GMWL) (Craig 1961) and a local meteoric water line developed for the Okanagan (Okanagan Meteoric Water Line; OMWL) (Wassenaar et al., 2009). The meteoric water lines show the linear relationship between the δ^2H and $\delta^{18}O$ values of precipitation globally (GMWL) and within the Okanagan (OMWL). The δ^2H values of groundwaters analysed across the Study Area are presented on Figure K. The accuracy in the reported values was ±2.0‰ for δ^2H and ±0.2‰ for $\delta^{18}O$.

The δ^2H and $\delta^{18}O$ values of groundwaters analysed at the Study Area plot in a relatively straight line near the GMWL and OMWL (Figure J), indicative that groundwaters are recharged predominantly by regional precipitation. The groundwater samples that plot at the bottom left-hand corner of the plot (i.e., samples collected in the central portion of the Study Area at wells 840, 726, 000, 026 and 180) exhibit strongly depleted isotopic signatures (i.e., more negative δ^2H and $\delta^{18}O$ values), indicative that the groundwaters are recharged by the infiltration of precipitation originating at higher elevations in the catchment and at colder temperatures (i.e., snow and/or early spring rains) and that, upon snowmelt, travels along deeper bedrock fractures. The groundwater samples that plot above and to the right of the strongly depleted samples (i.e., samples collected at the east, south and west ends of the Study Area at wells 412, 021 and 120, respectively) are relatively more enriched (i.e., less negative δ^2H and $\delta^{18}O$ values), indicative of recharge from snow and spring/fall rains that has fallen at lower elevations in the catchment(s) and travels into relatively shallower bedrock fractures and the confined sand and gravel aquifer.

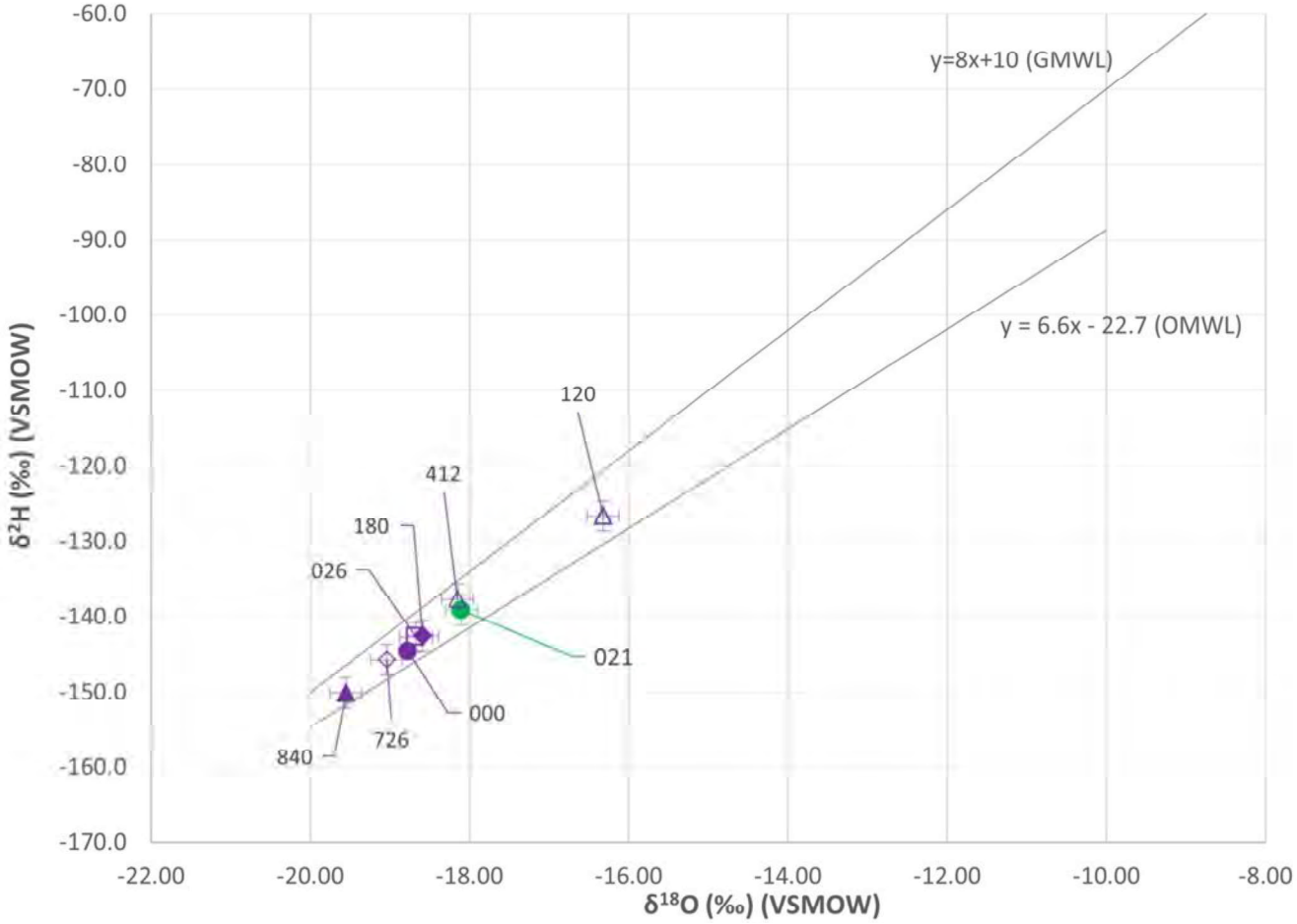

Figure J: d2H - d18O cross plot showing the isotopic compositions of groundwater samples collected during the Phase 2 Groundwater Study.

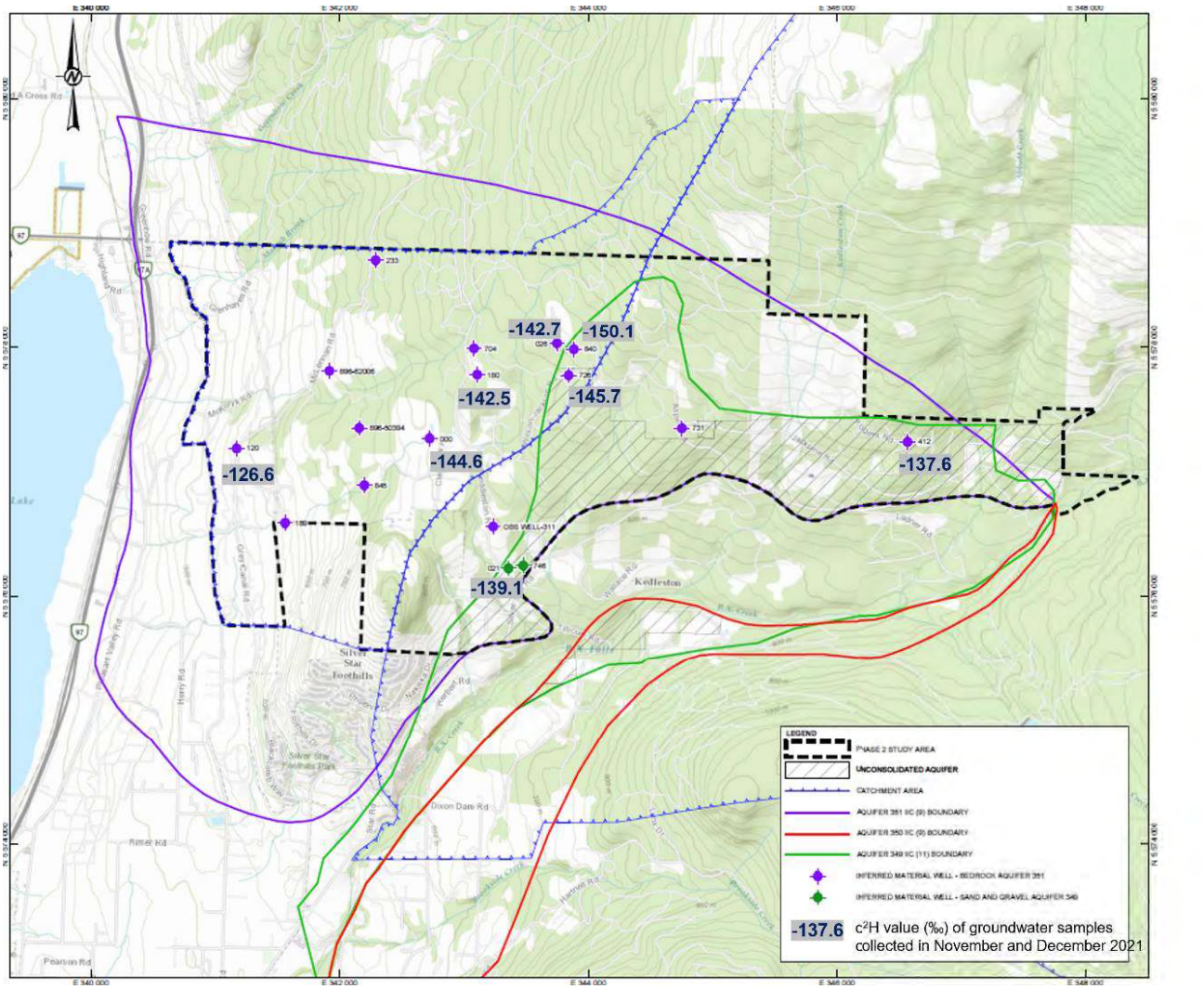

Figure K:Site plan showing the distribution of δ^2H values (‰) of groundwater samples collected across the Study Area during the Phase 2 Groundwater Study.

7.0 DISCUSSION OF GROUNDWATER CONDITIONS

7.1 General Groundwater Conditions

Groundwater levels collected at the 16 wells as part of the Phase 2 Groundwater Study showed varying seasonal responses during the monitoring period. The static groundwater elevations at the most upgradient (east) bedrock well (well 412), the most downgradient (west) bedrock wells (wells 000, 896-50394, 896 62006, 189 and 120), and confined sand and gravel well 746 generally decreased between the start of the monitoring period in May/June 2021 until early September 2021 and then gradually increased for the duration of the monitoring period (i.e., until early December 2021), consistent with the seasonal water level response typically observed in the Okanagan over the early summer and late fall. In the Okanagan, in most water wells the lowest water levels are observed in August or September after the relatively dry summer period. Water levels increase slightly in October and November from fall rains, and peak in June or early July as snowmelt and spring rains recharge the aquifer and water is added into storage. Water levels decline over the summer as groundwater is removed from the aquifers by pumping, and little precipitation infiltrates and recharges the aquifer system. Groundwater flows from storage into streams or lakes, and as a result, groundwater levels decrease, reaching the lowest levels again in August or September. At bedrock well 233 (north end of Study Area), water levels did not start to increase until November 2021; while the water levels at bedrock wells (from east to west) 731, 726, 180 and 845 continued to decrease after early September 2021 and were lowest in December 2021. As the water level dataset is limited, the reason for the pattern in water levels at bedrock wells 233, 731, 726, 180 and 845 is not clear; however, it may represent a delay in recharge to these wells, where the fracture network(s) at these wells may not be directly connected to surface recharge from local fall rain events and may be recharged to a larger extent by higher elevation precipitation (snowmelt). Additional long-term water level data would be required at the 16 monitored wells to confirm if the water levels recover to a consistent level annually after spring freshet.

The groundwater levels at the 10 actively pumping wells showed varying responses to pumping (Figure L), including oscillatory responses at wells 840, 704 and 021 and at well 026 during the summer of 2021, and large drawdowns at some wells, including drawdowns on the order of 60 m at bedrock wells in the Wilson-Jackson Road area (wells 840 and 726). The varying responses to pumping are inferred to be related to groundwater use and to the heterogeneity of the bedrock, where the bedrock fractures at some locations are less conductive (as supported by the relatively low hydraulic conductivity values estimated from the pumping tests at wells 726 and 180) and bedrock fractures at other locations relatively more conductive (as inferred by water levels at wells 000 and 189). The larger groundwater fluctuations in some areas are also inferred to reflect a lower storage capacity of the aquifer materials in those areas.

In general, additional monitoring of the water levels across the Study Area would be required to evaluate the long-term trends in water levels and to better understand how precipitation (recharge) and groundwater use (pumping) influence aquifer levels temporally and spatially within the Study Area, and the potential for cumulative increases in pumping.

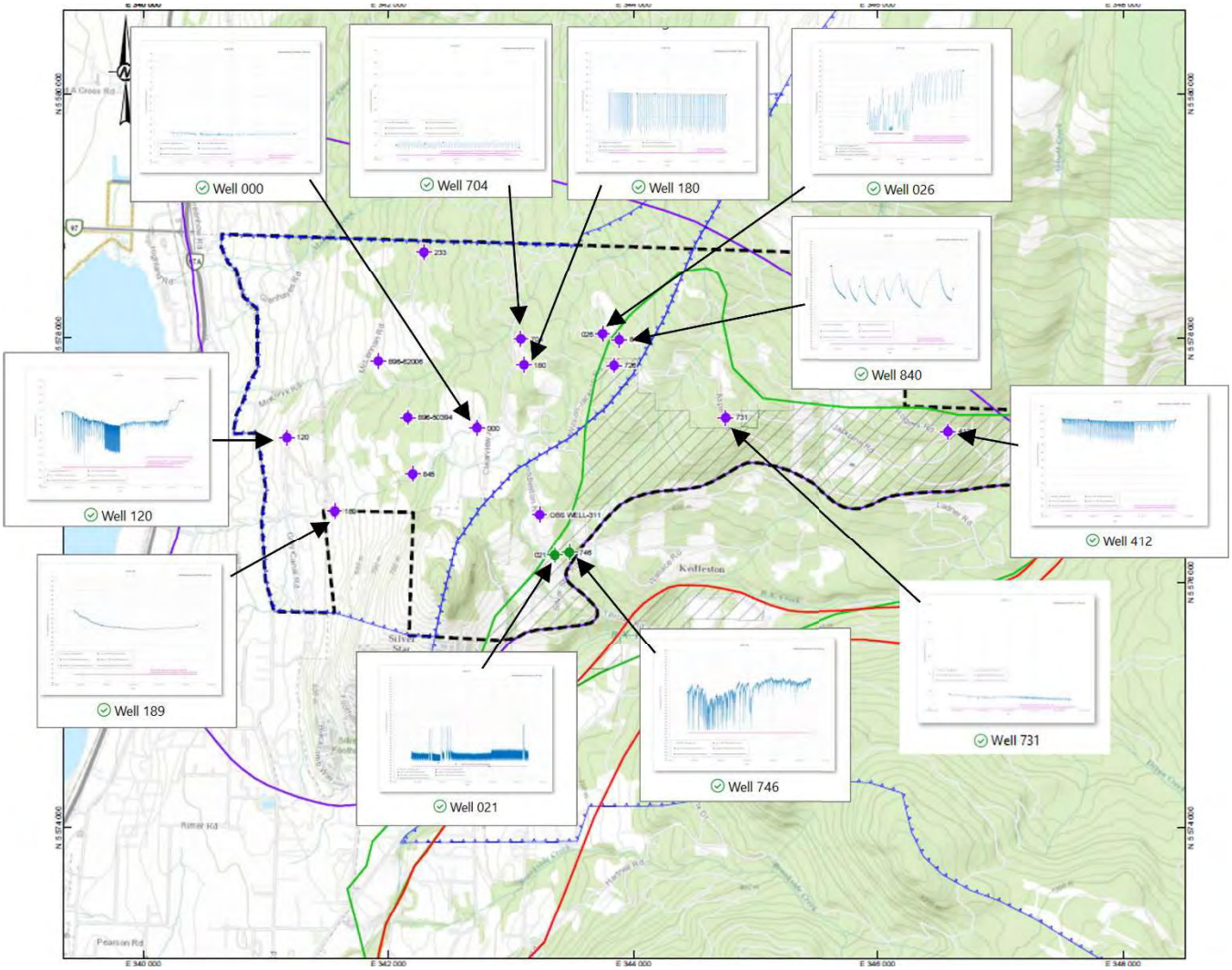

Figure L: Plan showing water level trends at monitored wells that were actively pumping during the Phase 2 Groundwater Study. Refer to each individual chart in Appendix C for further details.

The water isotope data suggest that groundwater flow across the Study Area occurs within shallow and deep groundwater flow systems. The shallow groundwater flow system is recharged by snow and spring/fall rains that fall at lower elevations in the catchment(s) and travel into relatively shallower bedrock fractures and the confined sand and gravel aquifer. The deeper groundwater flow system is recharged by the infiltration of precipitation originating at higher elevations in the catchment and at colder temperatures (i.e., snow and/or early spring rains) and that, upon snowmelt, travels along deeper bedrock fractures. While the water quality data (water types) are generally consistent with this model, the different water types at some wells may be representative of the interaction of groundwater with different flow paths and/or bedrock types.

7.2 Groundwater Supply Potential

Based on the results of the well survey and Golder's assessment of groundwater levels collected at the 16 wells during the monitoring period, five areas have been identified across the Study Area where groundwater availability issues exist and where the groundwater supply potential is inferred to be limited are:

- Wilson-Jackson Road-upper Keddleston-Clearview Roads
- within the drainage areas of the tributaries of BX Creek
- confined sand and gravel aquifer at the south end of Study Area
- west (downgradient) end of Study Area
- east (upgradient) end of Study Area

7.2.1 Wilson-Jackson Road, Upper Keddleston Road and Clearview Road

Water wells monitored on Wilson-Jackson, upper Keddleston and Clearview Roads include bedrock wells 840, 026, 726, 704, 180 and 000. Based on the findings of the Phase 2 Groundwater Study, water levels and water quality in bedrock Aquifer 351 were variable and the variability is inferred to be a result of the location and rate of seasonal precipitation recharge, groundwater use and the heterogenous nature of the bedrock aquifer and fracture network(s). The following groundwater issues were identified:

- low hydraulic conductivity of the bedrock in the area of Wilson-Jackson Road and upper Keddleston Road (as supported by the pumping tests at wells 726 and 180 by Golder, and the pumping test analyses conducted by Carmichael et al. [2009])
- large water level drawdowns observed during pumping at wells 840, 026 and 180
- two of the monitored wells (wells 804 and 704) exhibited drawdown of water levels below the reported depths of water-bearing fractures.
- while well 000 on Clearview Road itself does not appear to exhibit groundwater availability or well supply issues, two properties on Clearview Road reported dry wells to drilled depths of approximately 90 m bgs and 260 m bgs (RDNO personnel, pers. comm., October 2021). Information provided by the RDNO to Golder indicates that additional water well users on Clearview Road have also experienced groundwater availability issues (RDNO personnel, pers. comm., October 2021); however, these issues are inferred to be related to the shallow alluvial aquifers and are discussed below.

Based on the well survey responses received for wells completed in this area, four of the 12 bedrock well owners reported that they had not experienced groundwater availability issues.

Based on the overall findings, it appears that the groundwater supply potential in bedrock Aquifer 351 in this area is limited (Figure M).

The results of the well survey also identified a groundwater availability issue at a well completed in the confined sand and gravel Aquifer 349 on Wilson-Jackson Road (well 607; Figure M). Based on the approximate extents of Aquifer 349, it appears that this well may be completed at the northwest (upgradient) extent of Aquifer 349. The addition of long-term monitoring wells at locations along the west-northwest edge of the confined sand and gravel aquifer would be required to confirm the findings of the well survey, and to assess the groundwater supply potential in this area.

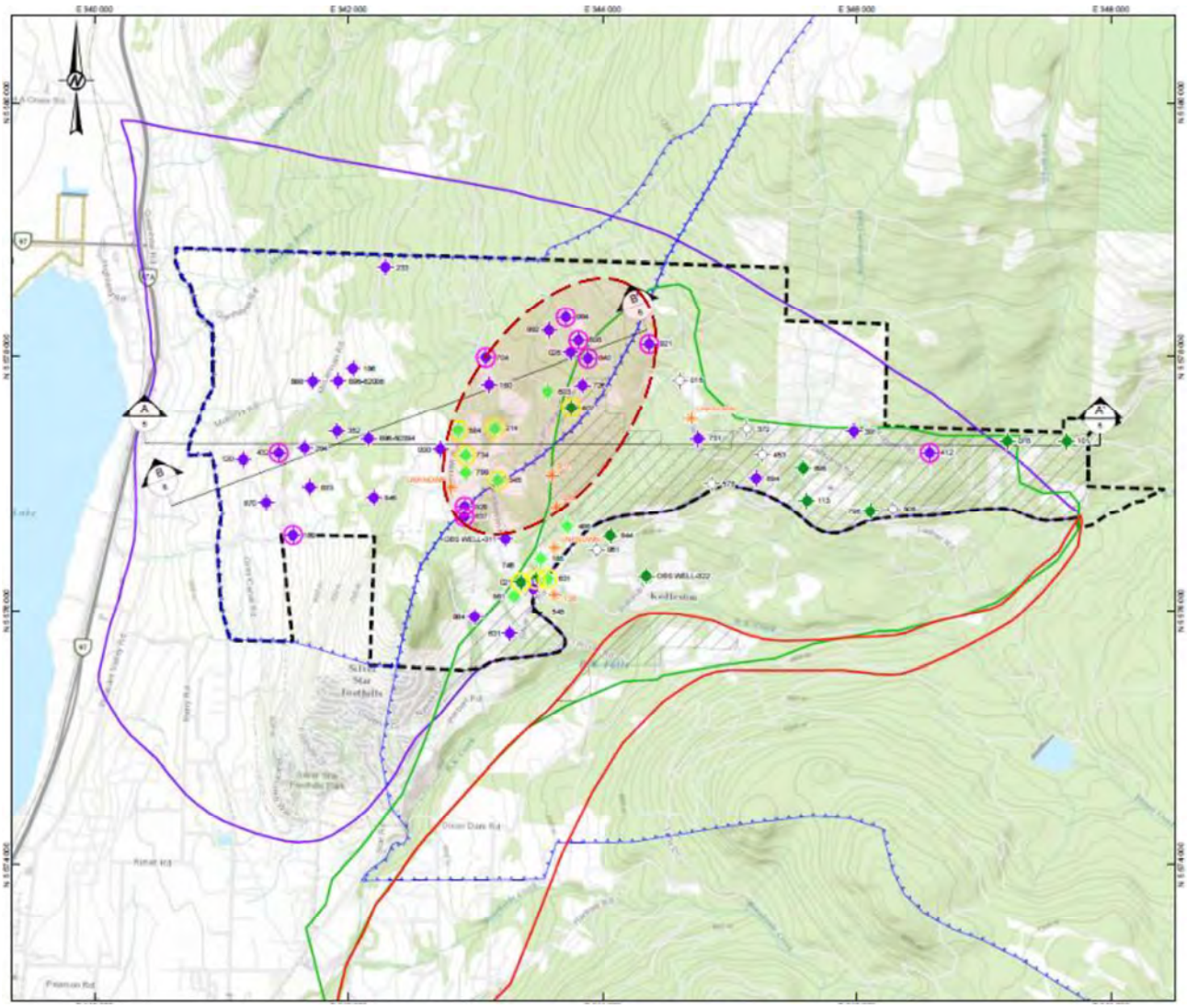

Figure M: Red circle is the approximate area of Wilson-Jackson Road, upper Keddleston Road and Clearview Road where groundwater availability or well supply issues were noted by Golder during this Phase 2 Groundwater Study or were reported to the RDNO.

7.2.2 Drainage Areas Along Tributaries of BX Creek

Based on the well survey, groundwater availability issues in the Clearview Road area were reported at wells completed in shallow, unconfined alluvial deposits within the drainage areas of the tributaries of BX Creek (and not associated with Aquifer 349) (Figure N). The RDNO subsequently reported to Golder that all but one property on Clearview Road now uses a cistern for water storage (RDNO personnel, pers. comm., October 2021). It is noted that water levels and water quality in the shallow alluvial deposits were not monitored by Golder during the Phase 2 Groundwater Study.

Based on the information provided by the RDNO to Golder and/or communicated to Golder by area residents, there were reports of a lack of (to no) groundwater in wells over the summer and fall of 2021 in the Chew Road and Jordashe Road area (Meakins Creek drainage) and Wilson-Jackson Road area (Figure N). In addition, it was reported that small creek beds in these areas had also dried up at this time. The groundwater in these wells (and, correspondingly, the inferred baseflow for the small creeks) is inferred to be associated with shallow, unconfined alluvial deposits that are present within the drainage areas of the tributaries of BX Creek (and not associated with Aquifer 349). It is possible that less precipitation at lower elevations in the winter of 2020/2021 followed by dry climate conditions in the late spring/summer of 2021, possibly coupled with increased pumping for irrigation purposes during the summer months, limited recharge to these shallow, alluvial deposits. Past pumping tests in these water-bearing deposits have shown “sufficient” groundwater; and it is understood that RDNO proof of water bylaw requirements would have been met at the time of development.

These results suggest that groundwater availability is relatively low in the alluvial deposits within the central portion of the Keddleston area (Figure N), and a sustainable groundwater source may be limited in this area, particularly during drier years. The addition of long-term monitoring wells in these alluvial deposits would be required to assess seasonal water level patterns, particularly during drier periods, and to confirm the findings of the well survey.

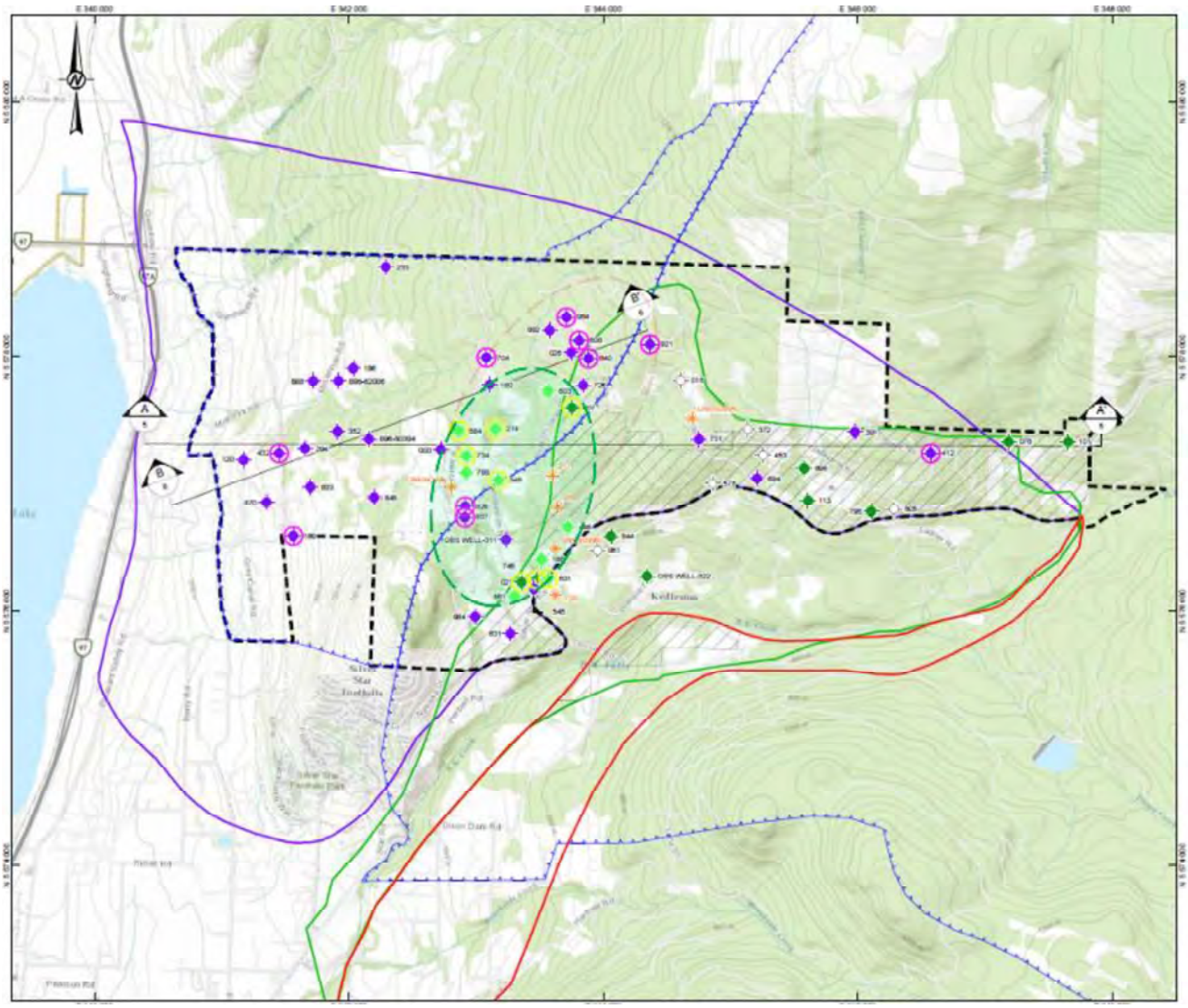

Figure N: Light green circle is the approximate area of Chew Road, Jordashe Road, Wilson-Jackson Road and Clearview Road where groundwater availability and groundwater sustainability issues were reported to the RDNO.

7.2.3 Confined Aquifer 349 at South End of Study Area

Relatively large drawdowns were noted during pumping at the two wells completed in the confined sand and gravel aquifer at the south end of Study Area (wells 746 and 021) (Figure O). During the monitoring period, the available pumping levels approached the inferred well bottom depth at well 746 and groundwater was not present at well 021 during the October 2021 monitoring event.

The findings of this Phase 2 Groundwater Study at wells 746 and 021 do not support the general statement made in Golder's 2020 study that "….within the Study Area extents, sand and gravel Aquifer 349 is considered to have a higher relative potential to supply future development to individual properties compared to Aquifer 351". While productive wells are present in Aquifer 349; the findings of this Phase 2 Groundwater Study show that there is variability in the groundwater potential of Aquifer 349, and the potential for a sustainable groundwater supply is limited along the west-central edge of Aquifer 349, where water levels in the aquifer were monitored (Figure O).

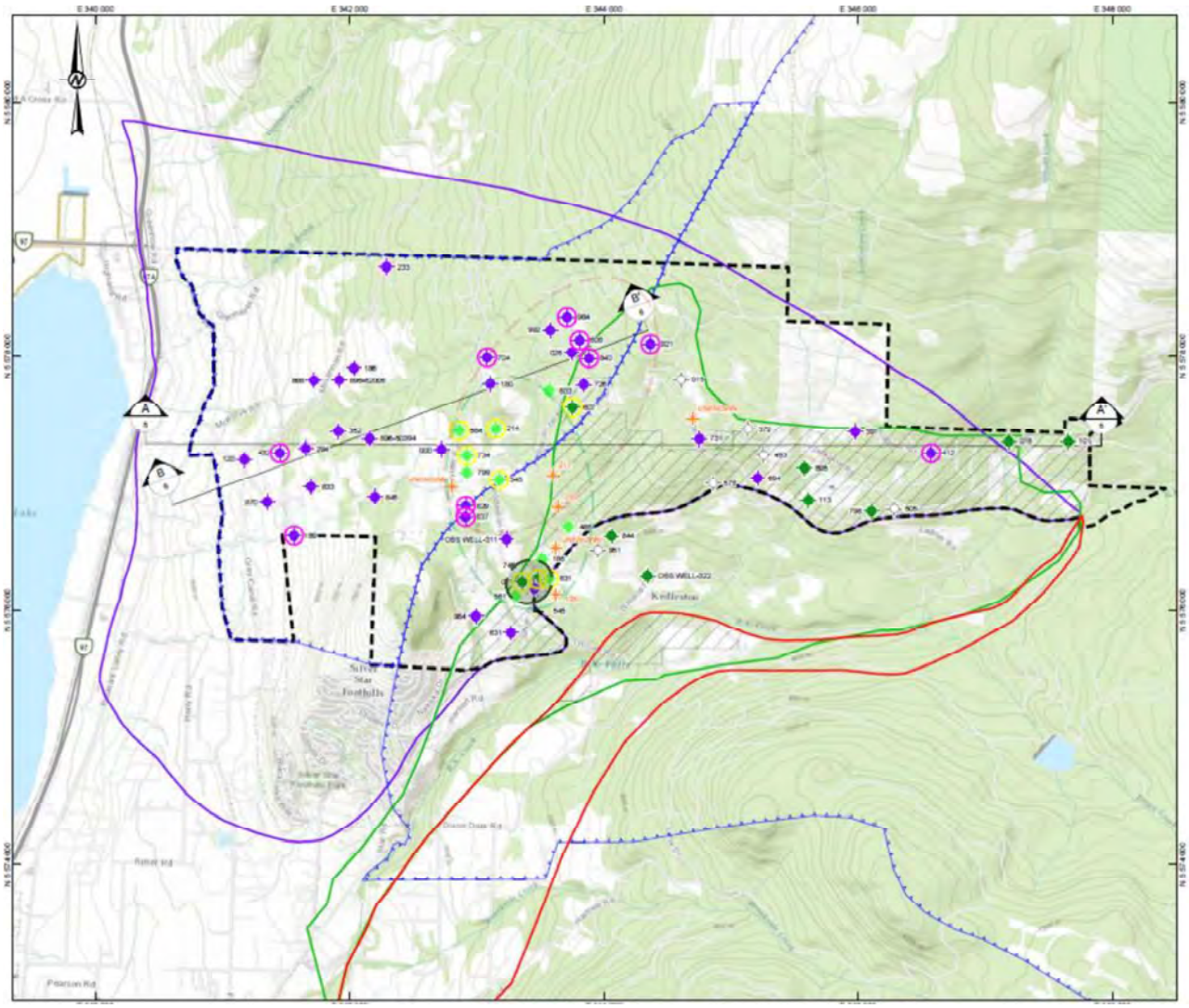

Figure O: Dark green circle is the approximate area at the west central edge of Aquifer 349 where groundwater availability issues were noted by Golder during this Phase 2 Groundwater Study.

7.2.4 West (Downgradient) End of Study Area

Based on the well survey, two wells on McLennan Road at the west (downgradient) end of the Study Area have experienced groundwater availability issues: well 189 was reportedly deepened as the original well had gone dry, and well 432, an approximate 49 m deep well, experiences water shortages in the summer months.

Based on the findings of this Phase 2 Groundwater Study, wells 120 and 189 at the western most (downgradient) end of the Study Area exhibited the largest seasonal variations during the monitoring period (16 m and 8 m of seasonal water level variations, respectively), as did bedrock well 233, a non-pumping well at the north end of McLennan Road (5 m of seasonal water level variations). The larger differences in seasonal groundwater elevations at these three wells may be influenced by higher groundwater use in this area during the summer months, as corroborated by the relatively higher number of residential properties in the area of McLennan Road

and Mountridge Road relative to other parts of the Study Area. Pumping activities at well 120 resulted in additional water level drawdowns on the order of 10 to 20 m; and the vertical distance between the lowest pumping groundwater elevation and the depth of the well bottom was 10 m.

Based on the overall findings, it appears that the groundwater supply potential in bedrock Aquifer 351 at the west end of the Study Area may be limited (Figure P) and will require future proof of water assessments for subdivision or development approvals in this area to characterize the groundwater supply potential sufficiently, and groundwater protection and conservation measures should be considered. It is further noted that this area is downgradient of Wilson-Jackson, upper Keddleston and Clearview Roads, an area that has also exhibited groundwater availability issues (refer to Section 7.2.1). Groundwater use (i.e., pumping) in these upgradient areas where the hydraulic conductivity of the bedrock is interpreted to be relatively lower may limit regional groundwater flow (i.e., supply) to the west end of the Study Area.

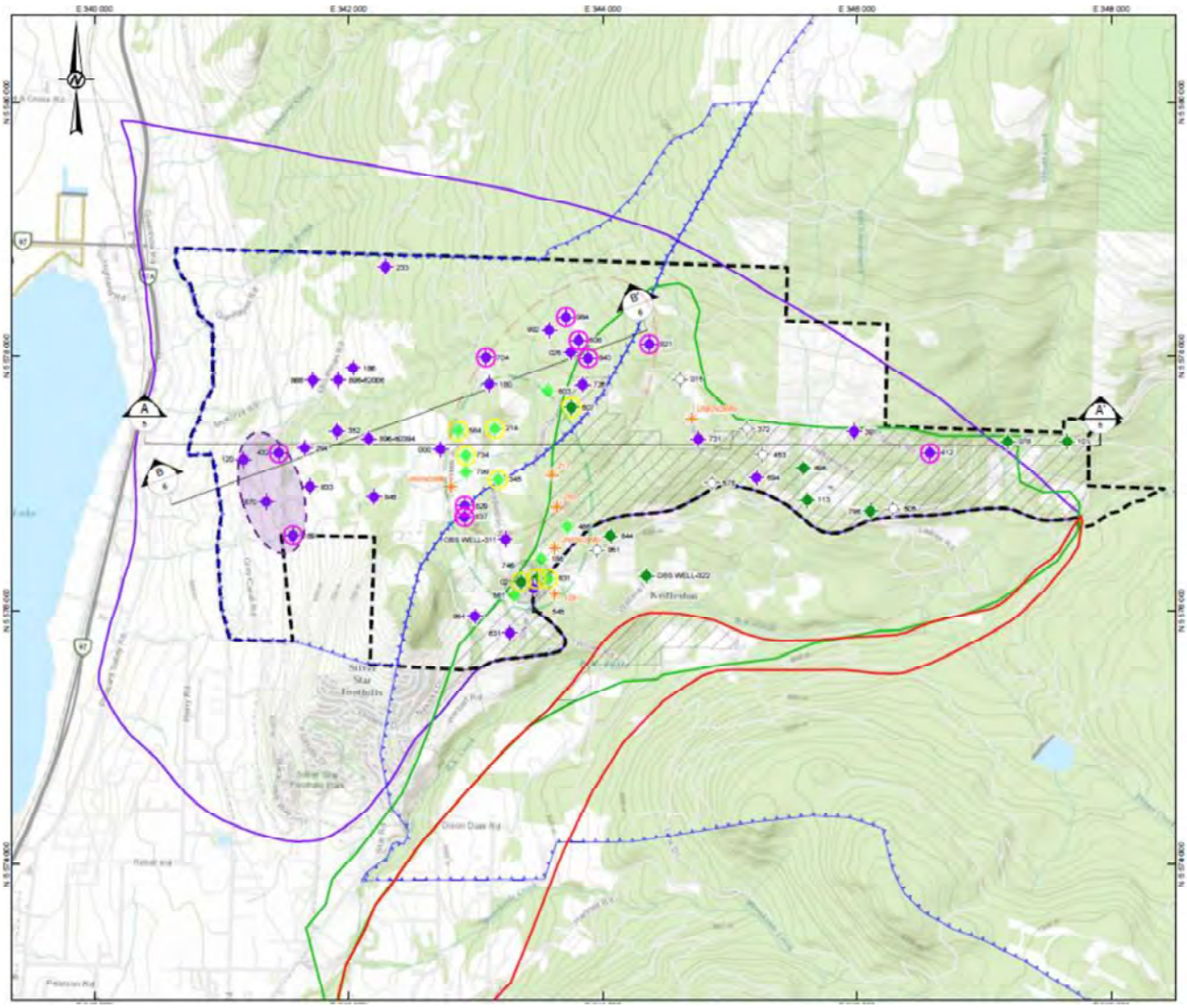

Figure P: Purple circle is the approximate area at the west (downgradient) end of the Study Area where groundwater availability issues were noted by Golder during this Phase 2 Groundwater Study.

7.2.5 East (Upgradient) End of Study Area

The well survey responses for wells completed at the east (upgradient) end of the Study Area did not report groundwater availability issues. Based on the well survey, the well owner of well 412 reported that the current well was deepened in 2004, as the well yield of the original shallower well had decreased by an order of magnitude following the drought and fires in 2002 and 2003. The well has not experienced groundwater availability issues since it was deepened. At well 731, the vertical distance between the lowest pumping groundwater elevation and the depth of the well bottom was approximately 5 m, and the water levels continued to decrease after early September 2021 and were lowest in December 2021. In spite of these observations, the owner of well 731 did not report groundwater availability issues during the monitoring period.

Based on the overall findings, while groundwater availability issues were not reported at the east (upgradient) end of the Study Area, groundwater supply potential in bedrock Aquifer 351 in this area may be limited, particularly if future proof of water assessments for subdivision or development approvals in this area have not thoroughly and appropriately characterized the groundwater supply and groundwater protection measures have not been considered (Figure Q).

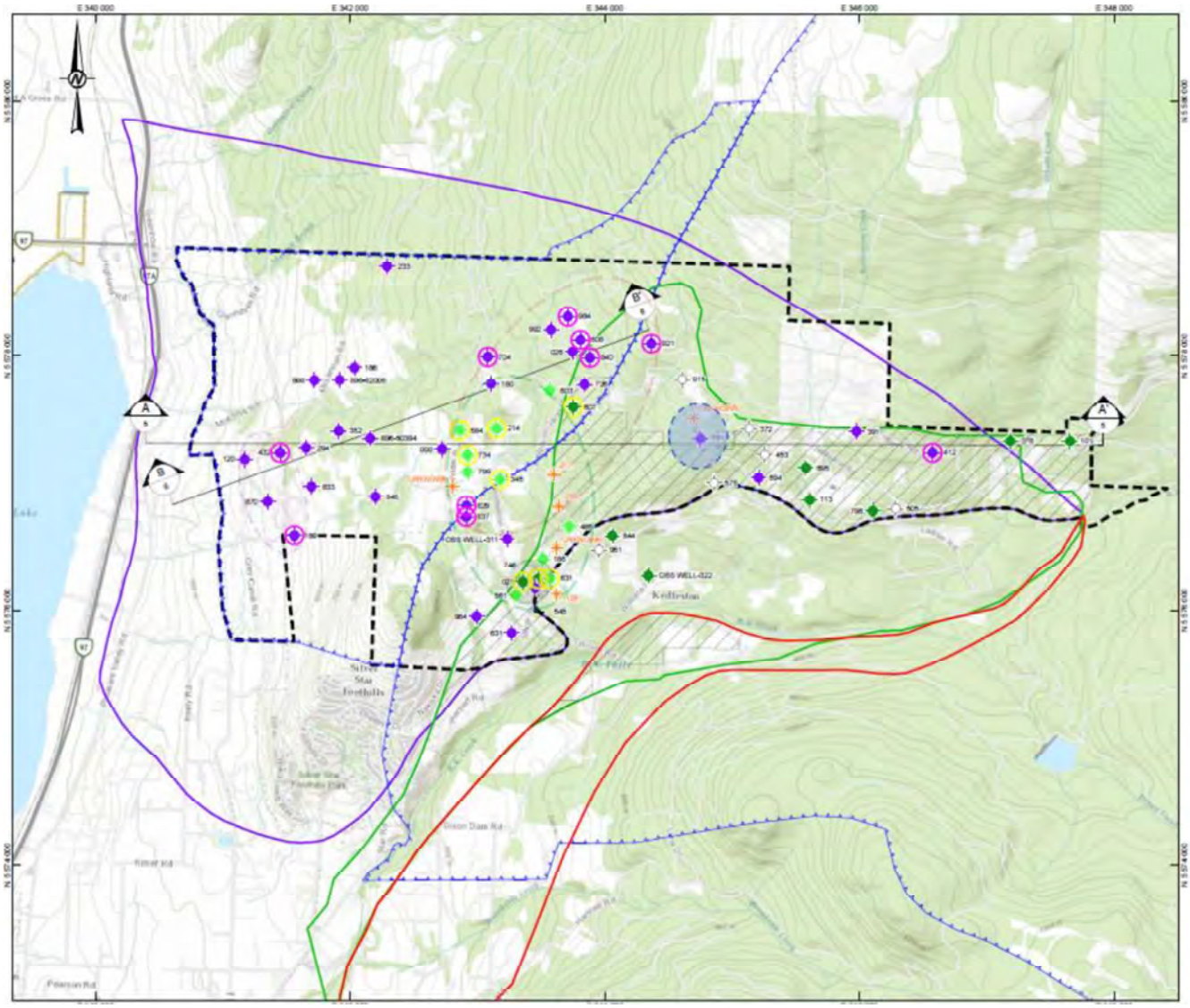

Figure Q: Blue circle is the approximate area at the east (upgradient) end of the Study Area where groundwater availability or well supply issues were noted by Golder during this Phase 2 Groundwater Study or were reported to the RDNO.

8.0 CONCLUSIONS

Based on the water level trends at wells monitored by Golder as part of the Phase 2 Groundwater Study, groundwater concerns were identified for wells completed in bedrock Aquifer 351 in the area of Wilson-Jackson-upper Keddleston-Clearview Roads, and at the west (downgradient) and east (upgradient) ends of the Study Area. Concerns were also identified for two wells completed in confined sand and gravel deposits of Aquifer 349, at the south end of the Study Area. Groundwater concerns identified for Aquifer 351 and 349 included relatively large seasonal fluctuations in water levels, large drawdowns during pumping and/or little separation between the lowest pumping elevations and the approximate depth to bottom of the well. Groundwater concerns in shallow alluvial deposits associated with drainage areas of the tributaries of BX Creek were also reported by residences to the RDNO.

The Phase 2 Groundwater Study assessed that the groundwater supply potential of bedrock Aquifer 351 is limited in the area of Wilson-Jackson-upper Keddleston-Clearview Roads and may be limited at the west (downgradient) and east (upgradient) ends of the Study Area, particularly with the addition of future pumping wells in these areas. These findings are consistent with Golder's 2020 study where it was assessed that the potential for additional groundwater development of Aquifer 351 was generally considered to be limited. Golder's 2020 study indicated that areas at the downgradient (west) end of the aquifer had potential to supply groundwater to future developments in that part of the Study Area; however, based on the findings of the current Phase 2 Groundwater Study, groundwater availability issues were identified at the downgradient (west) end of the aquifer. Although no direct correlation was apparent between the water levels in the monitored wells, the cumulative effects of groundwater use (i.e., pumping) is inferred to influence groundwater levels in the western portion of Aquifer 351, and over-pumping may result in further impacts to the groundwater supplies of existing groundwater users. The current Phase 2 Groundwater Study also demonstrates the heterogeneity of bedrock Aquifer 351, as reflected by the variability in the yields and water level responses observed for wells completed in this aquifer.

When using a water balance approach, Golder's 2020 study assessed that Aquifer 349 had a higher relative potential to supply groundwater for future development compared to Aquifer 351; however, the findings of this current Phase 2 Groundwater Study show that the potential for a sustainable groundwater supply is limited along the west-central edge of Aquifer 349, where water levels in the aquifer were monitored, and may be limited along the northwest edge of the aquifer, based on reports by residences to the RDNO.

The Phase 2 Groundwater Study assessed that the groundwater supply potential of the shallow alluvial deposits associated with drainage areas of the tributaries of BX Creek may be limited, based on reports by residences to the RDNO; these deposits were not included in the water balance in Golder's 2020 study and water levels were not monitored at wells completed in these deposits during this Phase 2 Groundwater Study.

9.0 RECOMMENDATIONS

As indicated above, additional monitoring of groundwater levels across the Study Area would be required to evaluate long-term trends in water levels, better understand how precipitation (recharge) and groundwater use (pumping) influence aquifer levels temporally and spatially within the Study Area, evaluate whether water levels are fully recharged to seasonal high levels, and to evaluate the potential implications from future development (i.e., increases in groundwater use). Therefore, it is recommended that groundwater levels and water quality at the existing monitoring well network is continued to establish baseline conditions and provide the basis to assess seasonal patterns and long-term trends in water levels and water quality. The data from the monitoring program can then be used to corroborate the findings of this Phase 2 Groundwater Study and to enable a more thorough assessment of water level responses relative to seasonal recharge of precipitation, groundwater use and aquifer properties. Consideration should be given to augmenting the existing monitoring well network with additional wells in Aquifer 349 and with wells in the shallow alluvial deposits, including along the Meakins Creek drainage and other drainage areas identified within the area shown in light green on Figure N. Development of a numerical flow model will provide the technical basis to assess current and potential future groundwater use in the Study Area, along with the potential implications of climate change. It is recommended that the additional groundwater monitoring is conducted and the numerical model is developed before the RDNO consider accepting new applications for development.

The RDNO should consider regulatory approaches to support sustainable development in the Keddleston area with respect to groundwater supply. Hydrogeological assessments that are required to demonstrate evidence of potable water supply should be strengthened to require a pumping test that is conducted in accordance with the provincial Pumping Test Guide to demonstrate the sustainable well yield.

Non-regulatory groundwater protection measures should also be considered to protect water supplies for existing and future groundwater users as well as EFNs in surface water bodies. These recommendations are discussed below.

9.1 Long-Term Monitoring and Refined Water Balance Analyses

The recommendations for long-term monitoring at the Study Area include the following:

- Water wells that are instrumented with dataloggers should continue to be monitored, with dataloggers downloaded on a quarterly basis and corroborated with manual water level measurements. The quarterly data should be reviewed by a qualified professional hydrogeologist and used to augment the findings of this Phase 2 Groundwater Study.
- The existing monitoring well network should be augmented with additional water wells, including water wells completed in Aquifer 349 and the shallow alluvial deposits along tributaries of BX Creek.
- Groundwater samples should be collected at all monitored wells and used in conjunction with the long-term water levels to confirm sources of recharge; it is recommended that the groundwater quality monitoring event be conducted in the late summer when groundwater levels in the Study Area aquifers are, for the most part, at their lowest.
- Golder's 2020 water balance should be updated to include the alluvial aquifer deposits in the estimate of groundwater availability across the Study Area, and to refine the water balance estimates for Aquifers 351 and 349.

Following review and analysis of the data from the long-term monitoring program, it is recommended that a numerical groundwater flow model be developed for the Study Area to conduct quantitative water budgets and to predict cumulative water level drawdowns in key areas of the aquifers under future development and climate change scenarios. The numerical model, which would include the alluvial aquifer deposits, would provide a technical basis to support decision-making regarding the sustainability of additional development in different portions of the Study Area, including the potential implications of developing the additional 350 to 400 residences that could potentially be developed under current zoning. The RDNO should assess regulatory options to manage development potential in the Study Area, as discussed in the following sections.

9.2 Groundwater Protection and Management Measures

9.2.1 Regulatory Considerations

9.2.1.1 Revisions to Evidence of Potable Water Supply Requirements in Bylaws

It is recommended that the evidence of potable water supply requirements for wells be strengthened in the RDNO Subdivision Servicing Bylaw 2600 (RDNO, 2013) and RDNO Building Bylaw 2670 (RDNO, 2015) to require a more comprehensive assessment of aquifer conditions that demonstrates a sustainable potable water supply is available. Evidence of sustainable potable water supply for wells should include the following:

- Assessment must include a pumping test that is consistent with the provincial Pumping Test Guide and at least 72-hours in duration for bedrock aquifers and 48-hours in duration for unconfined aquifers. The long-term sustainable yield of a well, which will be estimated based on the results of the pumping test, cannot be greater than the rate that was applied for the pumping test. A well yield test, defined in RDNO (2013) as "*a test using bailing or air lifting methods to determine a rough estimate of how much water a groundwater well can produce*" should not be used to demonstrate sustainable well yield and a driller's estimate should not be used as a proxy for an estimate of the long-term sustainable well yield that is based on a pumping test.
- The static water level in the pumping well and observation well(s) should be monitored for a minimum of one week prior to the pumping test to assess pre-test trends and to provide the basis to estimate what the static water level is expected to be at the end of the testing period (i.e., projected to the end of the testing period to account for an increasing or decreasing trend).
- Water level recovery must be monitored in general accordance with the provincial Pumping Test Guide and for a recovery period not less than the pumping period. Wells that have not achieved 100% recovery relative to what static is projected to be at the end of the test (based on the pre-test monitoring data described above) must be further assessed by the qualified professional. Water that is pumped out of a bedrock well comes from storage in the fracture network, and as the fracture(s) that store and transmit groundwater are drained, they can take a relatively long time to recharge, resulting in low recovery rates. In such cases, interpretation of the data from the pumping test only (i.e., not including the recovery data) could result in an overestimation of the sustainable yield of the well, and the pumping rate at which the well was tested may not be sustainable in the long term.
- At least one observation well that is completed in the same aquifer and within the same fracture network, must be monitored during the pumping test and recovery period. Observation wells should be located on the same property as the pumping well or on adjacent property(ies), and within 100 m of the pumping well. Monitoring wells that are part of the monitoring well network established as part of this Phase 2 Groundwater Study may be used as observation wells, if they meet the above criteria.

- Pumping tests are to be conducted in the dry part of the year when groundwater levels are lowest. Based on the water level trends assessed in this Phase 2 Groundwater Study, this period is generally in late summer; however, at some wells, the lowest water levels were measured in early winter (December 2021). The long-term water level data from this Phase 2 Groundwater Study will guide the timing of pumping tests in different parts of the Study Area; however, the RDNO should consider requesting that proponents obtain water level monitoring data for a minimum of one year to demonstrate when seasonal low water levels occur and the appropriate time of year to conduct a pumping test.
- Well capacity tests must be supervised by qualified professionals, and only a report that is signed and sealed by a qualified professional will be accepted by the RDNO as evidence of a well being capable of providing a potable water supply.
- A pumping test must be conducted for each well that is proposed for use. Where applications to the RDNO include more than one dwelling (and therefore more than one well) or are for multiphase developments, the pumping tests should be conducted simultaneously at all wells included in the application. For example, if a subdivision application is for three properties, where each property would consist of one dwelling and one potable water well, the pumping test program should be designed such that the three water wells are pumped at the same time, for the same duration, and each at a pumping rate that is at least the minimum required rate.

The above requirements could be outlined in a schedule that the qualified professional completes and signs to document that key requirements have been satisfied.

The RDNO should also consider an arrangement where an independent qualified hydrogeologist is retained to conduct a third party review of hydrogeological assessments.

9.2.1.2 Phased Approach to New Groundwater Use

Based on the results of this Phase 2 Groundwater Study, it is recommended that more information be obtained to support decision-making regarding the sustainability of water supply in the Study Area and the potential for future development. As discussed in Section 9.1, additional groundwater monitoring is required to evaluate seasonal patterns and long-term trends, and a numerical groundwater flow model would provide the technical basis to quantitatively assess current groundwater conditions and predict the potential influence of future development. It is recommended that these tools be put in place before the RDNO consider accepting new applications for development. For existing development applications, it is recommended that the RDNO require, at a minimum, a hydrogeological assessment that is signed and stamped by a qualified professional and includes, for each well that is proposed to be used for water supply, analysis and interpretation of at least one year of continuous groundwater level monitoring data and a pumping test that satisfies the requirements in the preceding section.

Subdivision and development approvals, including existing and future development applications, should consider a phased approach to development to support sustainable development with respect to groundwater supply. For subdivision and development applications requiring multiple wells, the RDNO should only approve the number of properties that would support sustainable development with respect to groundwater supply (this may be less than the proponent's requested number of dwellings). Approvals would be considered on a site-specific basis and would be based on the detailed hydrogeological assessment report prepared by a qualified professional and provided to the RDNO. Further approvals would be contingent upon provision of satisfactory groundwater monitoring data during buildout of the approved number of dwellings.

To inform the planning process, the RDNO could consider conducting pilot pumping tests in key areas of Keddleston where future developments are expected to occur. On condition of approval by the well owners, existing water wells would be tested simultaneously, as described in Section 9.2.1.1. This would provide the RDNO with a baseline of conditions with which to base future approvals.

9.2.1.3 Development Permit Areas

The RDNO should consider designating Aquifer Protection Development Permit Areas (DPAs) to control and limit development in areas where groundwater availability issues have been identified, as described in Section 7.2 above. For these DPAs, approval of development permits would be contingent upon specific criteria that should include requirements for groundwater monitoring during initial phases of buildout and prior to approvals of subsequent phases, and implementation of site-specific groundwater protection measures such as limiting site disturbance and impervious surfaces, preserving natural soils and vegetation, and requiring low- to no-water use landscaping designs and alternative water sources such as rainwater harvesting.

9.2.2 Non-Regulatory Considerations

Public education and outreach programs can be used to educate existing and new well owners about the importance of groundwater conservation and to provide them with the tools to assess current water use, evaluate potential groundwater conservation opportunities and implement appropriate measures. It is recommended that the RDNO develop a conservation strategy that advocates for implementation of a household audit program and landscape planning and irrigation initiatives to reduce groundwater demand and encourage the use of alternative water supplies for non-potable uses.

10.0 LIMITATIONS

This report was prepared for the exclusive use of the Regional District of North Okanagan. The assessment was performed according to current professional standards and practices in the groundwater field and has been made using historical and technical data obtained from the sources noted within this report. Except where specifically stated to the contrary, the information contained in this report (including reports, information and data) was provided to Golder Associates Ltd. (Golder) by others and has not been independently verified or otherwise examined by Golder to determine its accuracy or completeness. Golder has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the report as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation. We accept no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

The services performed as described in this report were conducted in a manner consistent with the level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. Hydrogeological investigations and the development of conceptual site models are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological-hydrogeological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that subsurface conditions are not known between the specific investigation locations, and there is invariably a lack of complete information both spatially and temporally about the geological and hydrogeological conditions. The validity and accuracy of the conceptual model depends on the amount of data available relative to the degree of complexity of the geologic formations, the study area hydrogeology, and on the quality and degree of accuracy of the data entered. Therefore, every conceptual model is a simplification of reality and the model described in this report is not an exception.

The content of this report is based on information collected during the study, our present understanding of site conditions, the assumptions stated in this report, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and, therefore, no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

The findings and conclusions of this report are valid only as of the date of the report. If new information is discovered in future work, or if the assumptions stated in this report are not met, Golder should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

Any use which third parties make of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder Associates Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

11.0 CLOSURE

We trust that this report provides you with the information you require at this time. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

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https://golderassociates.sharepoint.com/sites/127973/project files/6 deliverables/3.0_issued/20144760-004-r-rev1/20144760-004-r-rev1-keddleston phase 2 gw study 29jun_22.docx

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Location	120		233		189		746		896-62006		896-50394		845		840		726		704		180		000		026		021		412		731	
Material Screened	Bedrock		Bedrock		Bedrock		Sand/Gravel		Bedrock		Bedrock		Bedrock		Bedrock		Bedrock		Bedrock		Bedrock		Bedrock		Bedrock		Sand/Gravel		Bedrock		Bedrock	
Standpipe Elevation (1)	576.6		769.3		611.1		763.9		691.1		728.1		715.6		931.2		914.5		873.3		856.9		794.0		930.8		767.5		1019.2		959.5	
Bottom of Well Elevation (2)	517.1 a		677.8		568.4		736.5		593.5		654.9		572.3		736.1		783.4		781.8		784.6		647.7		748.8		735.8		952.1		900.0	
Date	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)
18-May-21									11.00	**680.072**	21.12	**706.955**	30.6	**684.976**											144.7	**786.139**						
1-Jun-21															47.8	**883.374**			83.13	**790.181**	22.4	**834.503**							7.42	**1011.74**	51.15	**908.33**
2-Jun-21	24.03	**552.536**			14.78	**596.330**	13.79	**750.156**															108.9	**685.127**			28.73	**738.82**				
23-Jun-21			2.03	**767.271**																												
15-Jul-21			2.474	**766.827**	20.951	**590.159**	15.188	**748.758**							86.387	**844.787**	20.185	**894.334**	81.806	**791.505**	30.363	**826.540**	110.493	**683.534**			30.409	**737.14**	7.892	**1011.27**	53.81	**905.67**
19-Jul-21									12.679	**678.393**	21.761	**706.314**	33.212	**682.364**																		
23-Jul-21	29.197	**547.369**																														
11-Aug-21	30.843	**545.723**	3.92	**765.381**	21.883	**589.227**	17.118	**746.828**	12.774	**678.298**	22.225	**705.850**	33.23	**682.346**	104.165	**827.009**																
12-Aug-21																			80.767	**792.544**	30.458	**826.445**	111.035	**682.992**			30.936	**736.61**	8.715	**1010.45**	52.734	**906.75**
5-Oct-21					22.342	**588.768**											21.912	**892.607**			30.65	**826.253**					Dry					
15-Nov-21																	22.311	**892.208**														
29-Nov-21																					31.215	**825.688**										
6-Dec-21							9.51	**754.436**									22.415	**892.104**	85.33	**787.981**	46.85	**810.053**	110.75	**683.277**			27.86	**739.69**	8.24	**1010.92**		
7-Dec-21	15.545	**561.021**	4.290	**765.011**	21.12	**589.990**			11.635	**679.437**	20.600	**707.475**	34.385	**681.191**	91.235	**839.939**															54.62	**904.86**
10-Feb-22																	22.943	**891.576**			32.205	**824.698**										

Table 3: Analytical Groundwater Quality Results
Phase 2 Groundwater Study, Keddleston, BC

Station			120	000	021	412	726	180	026	840
Sample Control Number		Health Canada GCDWQ	21K2544-01	21K2544-02	21K2544-03	21K2544-04	21K2544-05	21L0506-01	21L0506-02	21L2571-01
Laboratory Sample ID			21K2544-01	21K2544-02	21K2544-03	21K2544-04	21K2544-05	21L0506-01	21L0506-02	21L2571-01
Sample Date			2021-11-18	2021-11-18	2021-11-18	2021-11-18	2021-11-18	2021-12-02	2021-12-02	2021-12-16
Certificate of Analysis			21K2544	21K2544	21K2544	21K2544	21K2544	21L0506	21L0506	21L2571
Field Measured	**Units**									
pH	-	7.0-10.5	7.13	7.79	8.15	7.96	8.42	7.68	8.22	8.41
Conductivity, field measured	uS/cm	-	1,244	1,823	1,455	702	1,040	2,574	944	512
Redox potential	mV	-	281.7	376.9	401.4	397.7	402.2	104.7	51.4	214.6
Temperature	°C	≤15 (AO)	11.0	9.7	11.1	7.1	10.1	11.0	10.7	5.1
Turbidity	NTU	See Note 1	-	1.51	1.46	0.45	83.20	-	-	-
General Parameters										
Alkalinity, Total (as CaCO3)	mg/L	N/A	276	439	259	352	353	394	320	349
Alkalinity, Phenolphthalein (as CaCO3)	mg/L	N/A	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.6
Alkalinity, Bicarbonate (as CaCO3)	mg/L	N/A	276	439	259	352	353	394	320	344
Calculated as HCO3	mg/L		336	535	316	429	430	480	390	419
Alkalinity, Carbonate (as CaCO3)	mg/L	N/A	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.1
Alkalinity, Hydroxide (as CaCO3)	mg/L	N/A	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ammonia, Total (as N)	mg/L	See Note 2	<0.050	<0.050	<0.050	<0.050	0.057	0.056	<0.050	<0.050
Nitrogen, Total Kjeldahl	mg/L	N/A	0.553	<0.050	0.157	<0.050	0.059	0.155	0.09	<0.050
Solids, Total Dissolved	mg/L	≤500 (AO)	**806**	**1210**	**965**	438	**679**	**981**	**558**	**548**
Solids, Total Suspended	mg/L	N/A	<2.0	<2.0	<2.0	<2.0	151	0.72	0.55	-
pH	pH units	7.0-10.5	7.23	7.58	7.67	7.41	8.16	7.78	7.95	8.33
Conductivity (EC)	uS/cm	N/A	1230	1860	1320	710	1040	1340	837	896
Microbiological Parameters										
Coliforms, Total	MPN/100 mL	None detectable/100 mL	**16**	**5**	**276**	**43**	<1	<1	<1	<1
Coliforms, Fecal	MPN/100 mL	-	<1	<1	<1	<1	<1	<1	<1	<1
E. coli	MPN/100 mL	None detectable/100 mL	<1	<1	<1	<1	<1	<1	<1	<1
Anions										
Bromide	mg/L	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride	mg/L	≤250 (AO)	62.5	5.96	11.3	1.09	15	1.35	2.9	5.01
Fluoride	mg/L	1.5	0.14	1.43	0.23	0.12	**7.5**	1.19	**3.39**	**8.17**
Nitrate (as N)	mg/L	10	9.2	0.025	0.082	<0.010	<0.010	<0.010	<0.010	0.024
Nitrite (as N)	mg/L	1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sulfate	mg/L	≤500 (AO)	278	**635**	**518**	72.3	176	410	157	107
Calculated Parameters										
Hardness, Total (as CaCO3)	mg/L	-	610	600	659	385	105	620	171	64.4
Nitrate+Nitrite (as N)	mg/L	-	9.2	0.0252	0.0824	<0.0100	<0.0100	<0.0100	<0.0100	0.0243
Nitrogen, Total	mg/L	-	9.75	<0.0500	0.239	<0.0500	0.059	0.155	0.09	<0.0500
Total Metals										
Aluminum	mg/L	-	0.0443	<0.0050	<0.0050	<0.0050	4.18	0.0219	0.0062	0.0171
Antimony	mg/L	0.006	<0.00020	<0.00020	<0.00020	<0.00020	0.00026	<0.00020	<0.00020	<0.00020
Arsenic	mg/L	0.010	<0.00050	<0.00050	0.00076	<0.00050	0.00054	<0.00050	<0.00050	<0.00050
Barium	mg/L	2.0	0.0106	0.0086	0.0265	0.029	0.0613	0.0155	0.0236	0.0146
Beryllium	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	0.00037	<0.00010	<0.00010	<0.00010
Bismuth	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Boron	mg/L	5	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Cadmium	mg/L	0.007	0.000044	0.000048	<0.000010	0.000023	0.000194	0.000027	0.000172	0.00008
Calcium	mg/L	-	227	127	185	112	32	106	37.7	20.3
Chromium	mg/L	0.05 [VI]	0.00145	0.00055	<0.00050	<0.00050	0.0108	<0.00050	<0.00050	<0.00050
Cobalt	mg/L	-	0.00014	0.00052	<0.00010	0.00015	0.00291	0.00067	<0.00010	<0.00010
Copper	mg/L	2 (AO: 1)	0.01	0.00441	0.00121	0.00243	0.0228	0.0012	0.0234	0.00093
Iron	mg/L	≤0.3 (AO)	0.07	0.172	<0.010	0.122	16.7	0.306	0.058	0.026
Lead	mg/L	0.005	0.00075	0.00035	<0.00020	<0.00020	0.00552	0.0004	0.0082	0.00254
Lithium	mg/L	-	0.0195	0.585	0.0218	0.0229	0.0452	0.242	0.0831	0.0193
Magnesium	mg/L	-	22.7	90.5	61.2	35.5	12	72.6	20.6	3.99
Manganese	mg/L	0.12 (AO: <0.02)	0.00261	0.0376	0.0162	0.0591	**0.191**	**0.135**	0.00496	0.00032
Mercury	mg/L	0.001	<0.000040	<0.000040	<0.000040	0.000101	<0.000040	<0.000040	<0.000040	<0.000040
Molybdenum	mg/L	-	0.00072	0.00295	0.00966	0.00473	0.011	0.00338	0.00473	0.00383
Nickel	mg/L	-	0.00243	0.00658	0.00042	0.00141	0.00626	0.00301	0.00366	0.00044
Phosphorous	mg/L	-	<0.050	<0.050	<0.050	<0.050	0.095	<0.050	<0.050	<0.050
Potassium	mg/L	-	3.66	13.6	6.39	4.2	4.54	12.9	1.44	1.41
Selenium	mg/L	0.05	0.00222	<0.00050	<0.00050	<0.00050	0.00174	0.00092	0.00076	<0.00050
Silicon	mg/L	-	12.8	19.4	9.2	10.5	15.9	10.2	7.4	6.5
Silver	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium	mg/L	≤200 (AO)	34.3	213	54.9	9.1	223	107	156	190
Strontium	mg/L	7.0	0.641	3.33	2.2	0.971	0.6	3.66	1.89	0.29
Sulfur	mg/L	-	103	240	187	27.2	68.5	158	63.6	31.8
Tellurium	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	<0.00050
Thallium	mg/L	-	<0.000020	0.000033	<0.000020	<0.000020	0.000085	<0.000020	<0.000020	<0.000020
Thorium	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	0.00111	<0.00010	<0.00010	<0.00010
Tin	mg/L	-	<0.00020	0.00332	<0.00020	<0.00020	0.00038	<0.00020	0.00033	<0.00020
Titanium	mg/L	-	<0.0050	<0.0050	<0.0050	<0.0050	0.0546	<0.0050	<0.0050	<0.0050
Tungsten	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010
Uranium	mg/L	0.02	0.0214	0.00143	0.015	0.00584	0.007	0.00508	0.000922	0.00214
Vanadium	mg/L		0.0011	<0.0010	<0.0010	<0.0010	0.0096	<0.0010	<0.0010	<0.0010
Zinc	mg/L	≤5.0 (AO)	0.0453	0.955	<0.0040	0.0279	0.0361	0.0243	1.47	0.387
Zirconium	mg/L	-	0.00015	<0.00010	<0.00010	<0.00010	0.00452	<0.00010	<0.00010	0.0001

Station		Health Canada GCDWQ	120	000	021	412	726	180	026	840
Sample Control Number			21K2544-01	21K2544-02	21K2544-03	21K2544-04	21K2544-05	21L0506-01	21L0506-02	21L2571-01
Laboratory Sample ID			21K2544-01	21K2544-02	21K2544-03	21K2544-04	21K2544-05	21L0506-01	21L0506-02	21L2571-01
Sample Date			2021-11-18	2021-11-18	2021-11-18	2021-11-18	2021-11-18	2021-12-02	2021-12-02	2021-12-16
Certificate of Analysis			21K2544	21K2544	21K2544	21K2544	21K2544	21L0506	21L0506	21L2571
Dissolved Metals										
Aluminum	mg/L	-	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	0.0055
Antimony	mg/L	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic	mg/L	-	<0.00050	<0.00050	0.00076	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Barium	mg/L	-	0.0097	0.0073	0.0251	0.0265	0.0199	0.015	0.0212	0.0139
Beryllium	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Boron	mg/L	-	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Cadmium	mg/L	-	0.000038	0.000019	<0.000010	0.000022	0.000012	0.000041	0.00013	0.000022
Calcium	mg/L	-	209	105	166	97.8	25.9	115	36.3	19.3
Chromium	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	mg/L	-	<0.00010	0.00043	<0.00010	0.00013	0.00016	0.00071	<0.00010	<0.00010
Copper	mg/L	-	0.021	0.00363	0.0018	0.00266	0.00292	0.00201	0.00287	<0.00040
Iron	mg/L	-	<0.010	0.016	<0.010	0.017	<0.010	0.098	<0.010	<0.010
Lead	mg/L	-	0.00064	<0.00020	<0.00020	<0.00020	<0.00020	0.00025	0.00345	0.00181
Lithium	mg/L	-	0.01510	0.42300	0.01710	0.01850	0.03390	0.23800	0.07400	0.0191
Magnesium	mg/L	-	21.30	81.90	59.40	34.20	9.76	80.90	19.50	3.89
Manganese	mg/L	-	0.00046	0.0305	0.0145	0.05	0.0108	0.128	0.00466	0.00056
Mercury	mg/L	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	mg/L	-	0.00053	0.00239	0.00921	0.00429	0.00896	0.00332	0.00413	0.00345
Nickel	mg/L	-	0.00129	0.00495	<0.00040	0.00095	0.00116	0.00326	0.0032	<0.00040
Phosphorous	mg/L	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium	mg/L	-	3.1	11	5.63	3.59	1.95	12.2	1.25	1.41
Selenium	mg/L	-	0.00261	<0.00050	<0.00050	<0.00050	0.00094	<0.00050	<0.00050	0.00052
Silicon	mg/L	-	12.3	16.8	9.2	9.5	6.4	9.8	6.4	6.2
Silver	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium	mg/L	-	33.3	192	53.8	8.48	213	110	149	185
Strontium	mg/L	-	0.61	2.80	2.17	0.89	0.52	3.54	1.76	0.285
Sulfur	mg/L	-	88.4	189	161	22.1	56.3	187	67	32.7
Tellurium	mg/L	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium	mg/L	-	<0.000020	0.000023	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Thorium	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin	mg/L	-	<0.00020	0.0104	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium	mg/L	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium	mg/L	-	0.0193	0.00119	0.0139	0.00498	0.0054	0.0047	0.000737	0.00234
Vanadium	mg/L	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	mg/L	-	0.0651	0.816	<0.0040	0.0351	<0.0040	0.0362	1.79	0.244
Zirconium	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Notes for Table 2.1

Groundwater criteria are from Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ), prepared by the Federal-Provincial-Territorial Committee on Health and the Environment (September 2020).

Health Canada's GCDWQ criteria are maximum acceptable concentrations (MAC), with the expection of those marked as aesthetic objectives (AO).

Note 1. Health Canada's turbidity guideline of <1.0 NTU is applicable to groundwater entering the drinking water distribution system.

Note 2. Health Canada recommends that excess free ammonia entering the distribution system should be limited to below 0.1 mg/L (as N), and preferably below 0.05 mg/L (as N), to help prevent nitrification.

Exceedences of the GCDWQ criteria are shown with the formatting below:

806	Concentration is greater than GCDWQ MAC or AO (cell is light grey), where only one criteria is available; or greater than the GCDWQ AO where both criteria are available.
0.0376	Concentration is greater than GCDWQ MAC (and the AO) (cell is light grey, value is bold and underlined), where both MAC and AO criteria are available.

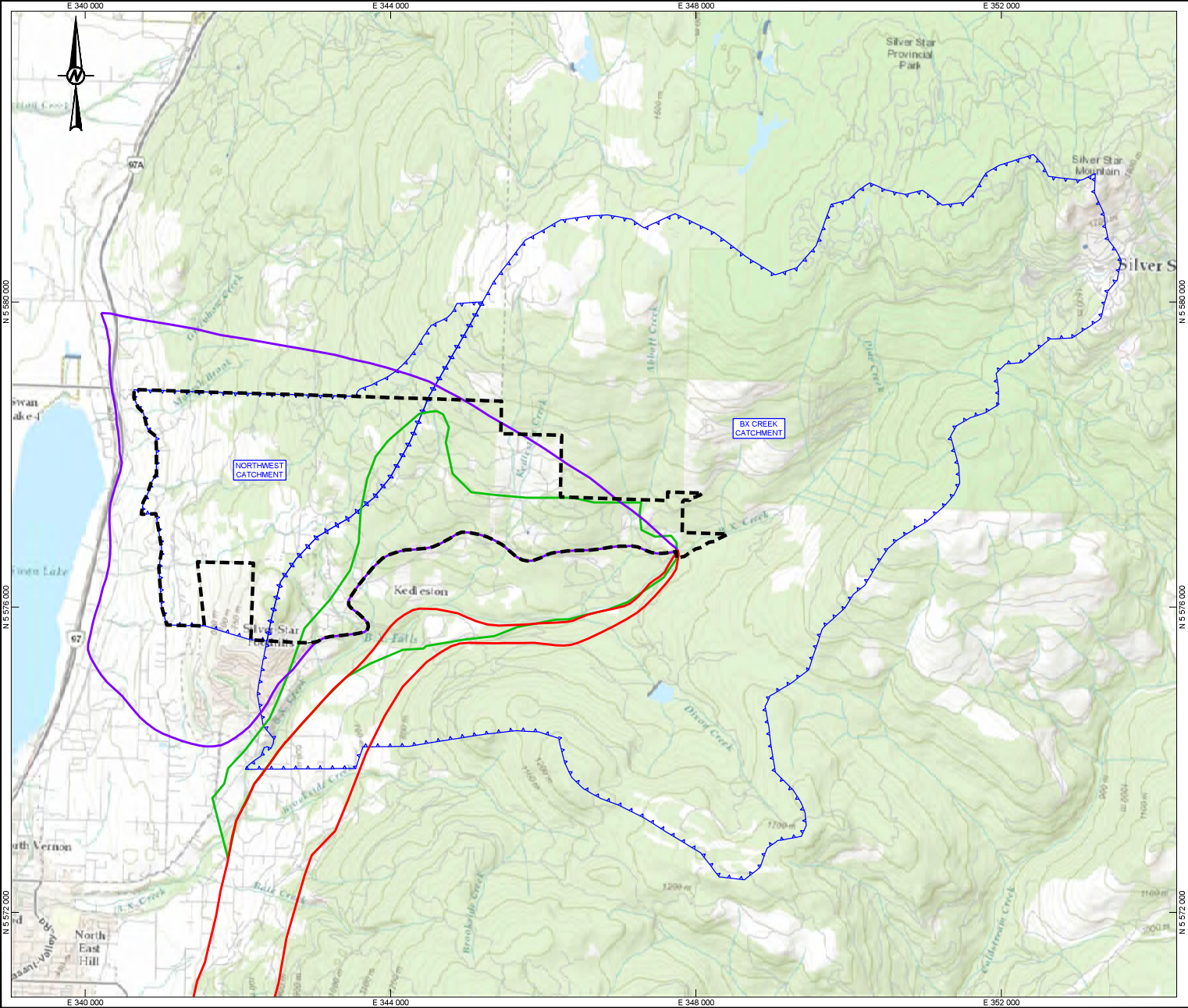
Table 4 - Analytical Groundwater Isotope Results
Phase 2 Groundwater Study, Keddleston, BC

Location	Tap Sampling							
	120	**000**	**021**	**412**	**726**	**180**	**026**	**840**
SCN	12399-01	12399-02	12399-03	12399-04	12399-05	12406-01	12406-02	12411-01
Laboratory Sample ID	21K2544-01	21K2544-02	21K2544-03	21K2544-04	21K2544-05	21L0506-01	21L0506-02	21L2571-01
Date Sampled	18-Nov-21	18-Nov-21	18-Nov-21	18-Nov-21	18-Nov-21	2-Dec-21	2-Dec-21	16-Dec-21
Water Type	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Isotopes								
Oxygen-18 (‰)	-16.32	-18.77	-18.10	-18.15	-19.04	-18.59	-18.67	-19.55
Deuterium (‰)	-126.6	-144.6	-139.1	-137.6	-145.7	-142.5	-142.7	-150.1

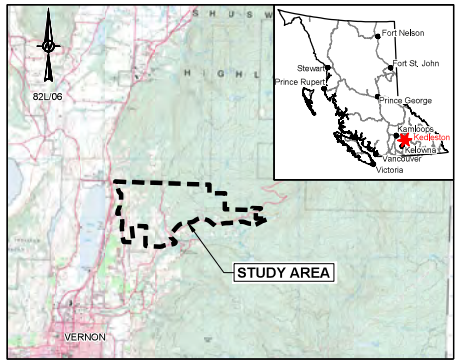
Notes:

All results are in comparison to Vienna Standard Mean Ocean Water (VSMOW).

SCN = sample control number



KEY MAP - NOT TO SCALE



LEGEND

- PHASE 2 STUDY AREA
- CATCHMENT AREA
- AQUIFER 351 IIC (9) BOUNDARY
- AQUIFER 350 IIC (9) BOUNDARY
- AQUIFER 349 IIC (11) BOUNDARY

REFERENCE(S)

1. BACGROUND SOURCE Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
2. KEY PLAN BACKGROUND AND BASE MAPPING FROM CANMATRIX 1: 50000 NTS - 82L/02
3. AQUIFERS AND CATCHMENTS OBTAINED UNDER OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA
4. DATUM: NAD83, PROJECTION: UTM ZONE 11

0 1,000 2,000
1:50,000 METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

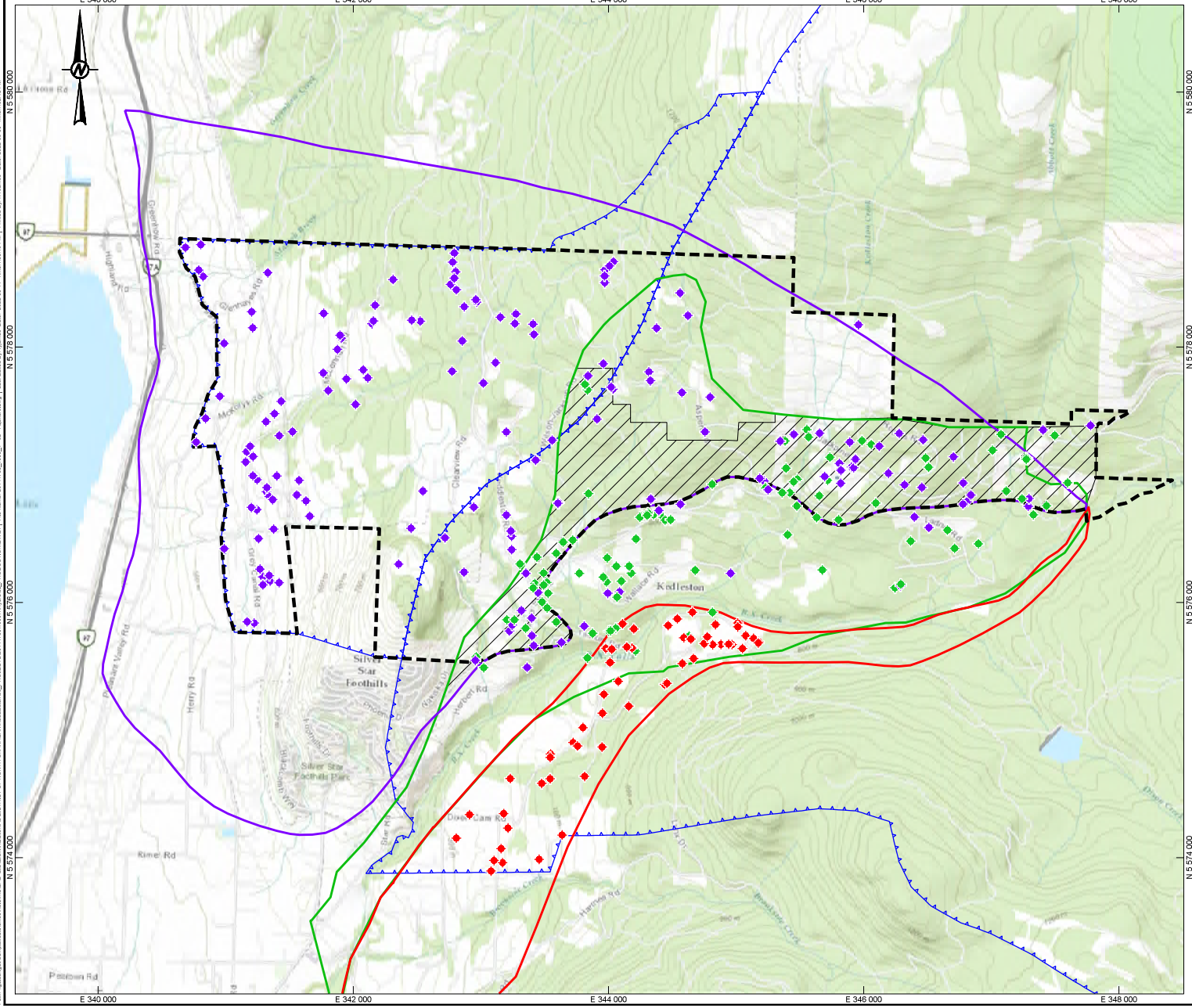
PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

TITLE
SITE PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	1



LEGEND

- PHASE 2 STUDY AREA
- INFERRED AREAS WHERE UNCONSOLIDATED AND CONFINED AQUIFER OVERLIES BEDROCK AQUIFER
- CATCHMENT AREA
- AQUIFER 351 IIC (9) BOUNDARY
- AQUIFER 350 IIC (9) BOUNDARY
- AQUIFER 349 IIC (11) BOUNDARY
- AQUIFER 351 IIC (9) WELL
- AQUIFER 350 IIC (9) WELL
- AQUIFER 349 IIC (11) WELL

REFERENCE(S)

1. BACGROUND SOURCE Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
2. KEY PLAN BACKGROUND AND BASE MAPPING FROM CANMATRIX 1: 50000 NTS - 82L/02
3. AQUIFERS AND CATCHMENTS OBTAINED UNDER OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA
4. DATUM: NAD83, PROJECTION: UTM ZONE 11

0 500 1,000
1:30,000 METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

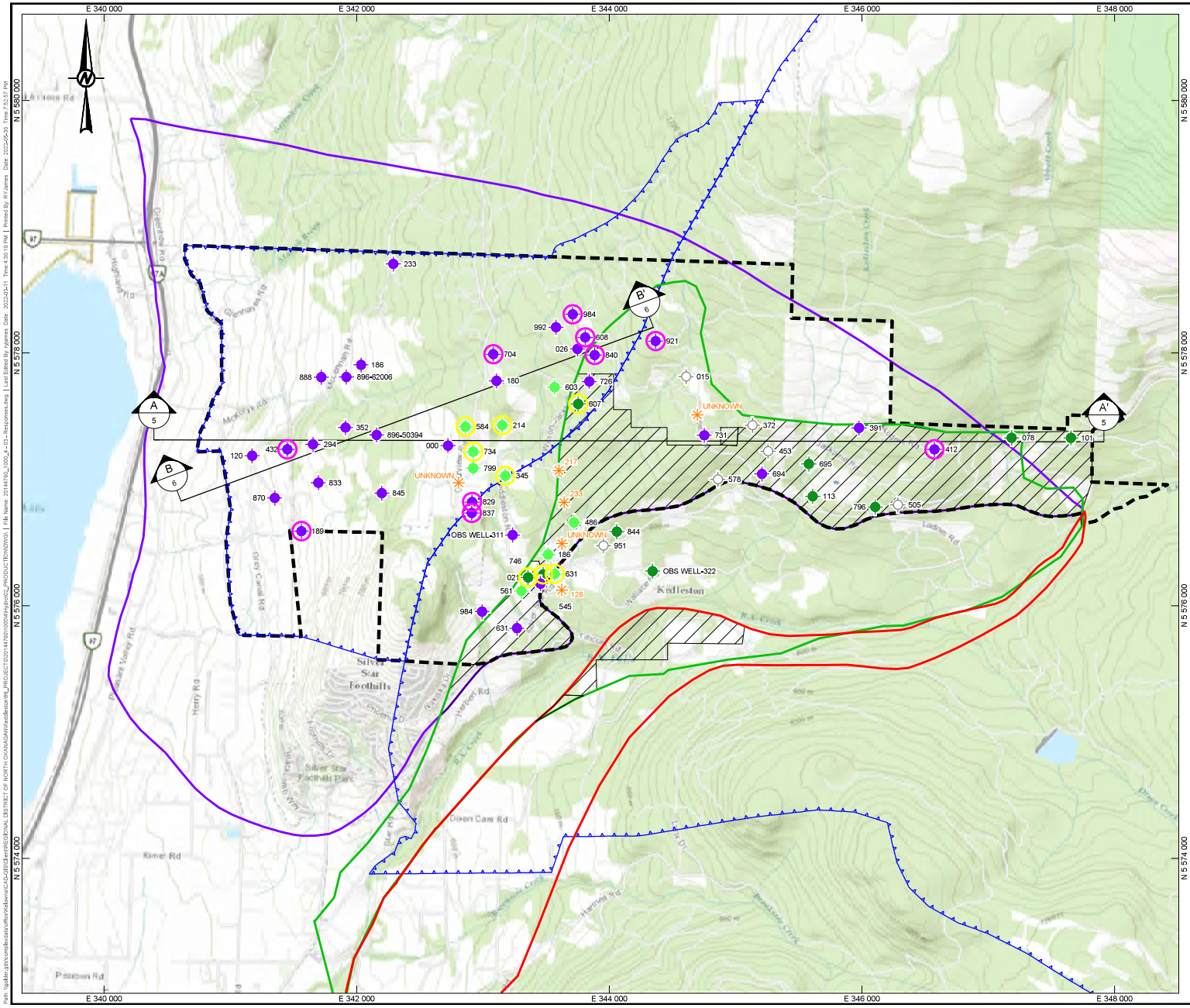
TITLE
REGISTERED WATER WELLS CLASSIFIED BY AQUIFER

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

- PHASE 2 STUDY AREA
- INFERRED AREAS WHERE UNCONSOLIDATED AND CONFINED AQUIFER OVERLIES BEDROCK AQUIFER
- CATCHMENT AREA
- AQUIFER 351 IIC (9) BOUNDARY
- AQUIFER 350 IIC (9) BOUNDARY
- AQUIFER 349 IIC (11) BOUNDARY
- WELL INFERRED TO BE INSTALLED IN BEDROCK AQUIFER 351
- WELL INFERRED TO BE INSTALLED IN SAND AND GRAVEL AQUIFER 349
- WELL INFERRED TO BE INSTALLED IN ALLUVIUM DEPOSITS
- NO WELL REPORTED
- BEDROCK WELL OWNERS REPORTED GROUNDWATER AVAILABILITY ISSUES
- OVERBURDEN WELL OWNERS REPORTED GROUNDWATER AVAILABILITY ISSUES
- WELL OWNERS REPORTED GROUNDWATER AVAILABILITY ISSUE (SUBSEQUENT TO WELL SURVEY)

NOTES

1. TEXT ATTACHED TO WELL REPRESENTS WELL ID USED IN REPORT

REFERENCE(S)

1. BACGROUND SOURCE Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
2. KEY PLAN BACKGROUND AND BASE MAPPING FROM CANMATRIX 1: 50000 NTS - 82L/02
3. AQUIFERS AND CATCHMENTS OBTAINED UNDER OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA
4. DATUM: NAD83, PROJECTION: UTM ZONE 11

0 500 1,000
1:30,000 METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

TITLE
WATER WELL SURVEY RESPONSES

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	3

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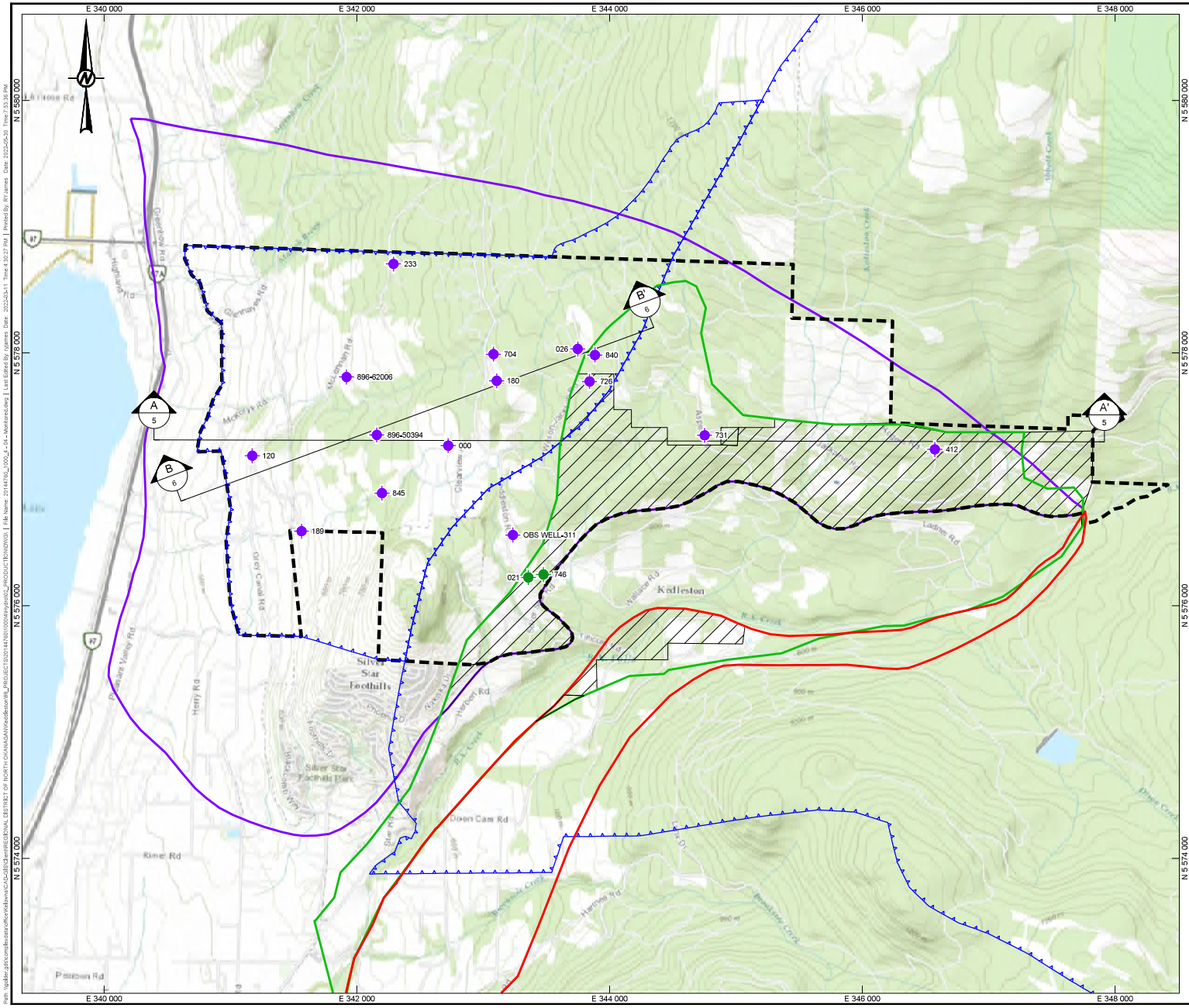


LEGEND

- PHASE 2 STUDY AREA
- INFERRED AREAS WHERE UNCONSOLIDATED AND CONFINED AQUIFER OVERLIES BEDROCK AQUIFER
- CATCHMENT AREA
- AQUIFER 351 IIC (9) BOUNDARY
- AQUIFER 350 IIC (9) BOUNDARY
- AQUIFER 349 IIC (11) BOUNDARY
- INFERRED MATERIAL WELL - BEDROCK AQUIFER 351
- INFERRED MATERIAL WELL - SAND AND GRAVEL AQUIFER 349

REFERENCE(S)

1. BACGROUND SOURCE Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
2. KEY PLAN BACKGROUND AND BASE MAPPING FROM CANMATRIX 1: 50000 NTS - 82L/02
3. AQUIFERS AND CATCHMENTS OBTAINED UNDER OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA
4. DATUM: NAD83, PROJECTION: UTM ZONE 11

0 500 1,000
1:30,000 METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

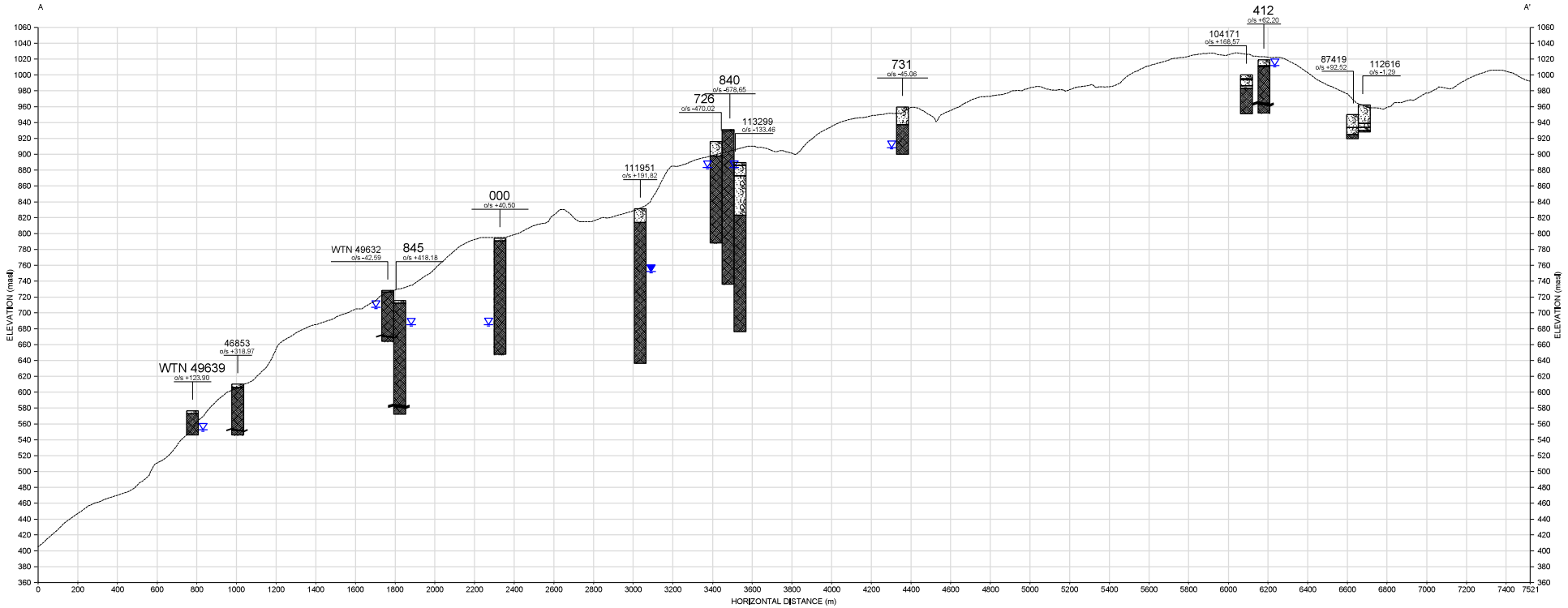
TITLE
MONITORED LOCATIONS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



HORZ SCALE 1:20000
VERT SCALE 1:5000

A 3/4 CROSS-SECTION A-A'

1:5,000 (VERTICAL) METRES

1:20,000 (HORIZONTAL) METRES

LEGEND

- APPROXIMATE GROUND SURFACE
- SOIL STRATIGRAPHY
- LOCATION OFFSET (o/s)
- APPROXIMATE GROUNDWATER ELEVATION BASED ON STATIC WATER LEVEL REPORTED ON DRILLER'S WELL RECORD AT TIME OF DRILLING (WHERE AVAILABLE)
- 2021 WATER LEVEL
- APPROXIMATE FRACTURE DEPTH, WHERE REPORTED ON DRILLER'S WELL RECORD

TEST HOLE GRAPHICS

BEDROCK, SAND, GRAVEL, TILL

NOTE

1. GROUND SURFACE IS APPROXIMATE (BASED ON REGIONAL DISTRICT OF THE NORTH OKANAGAN CONTOUR DATA)

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

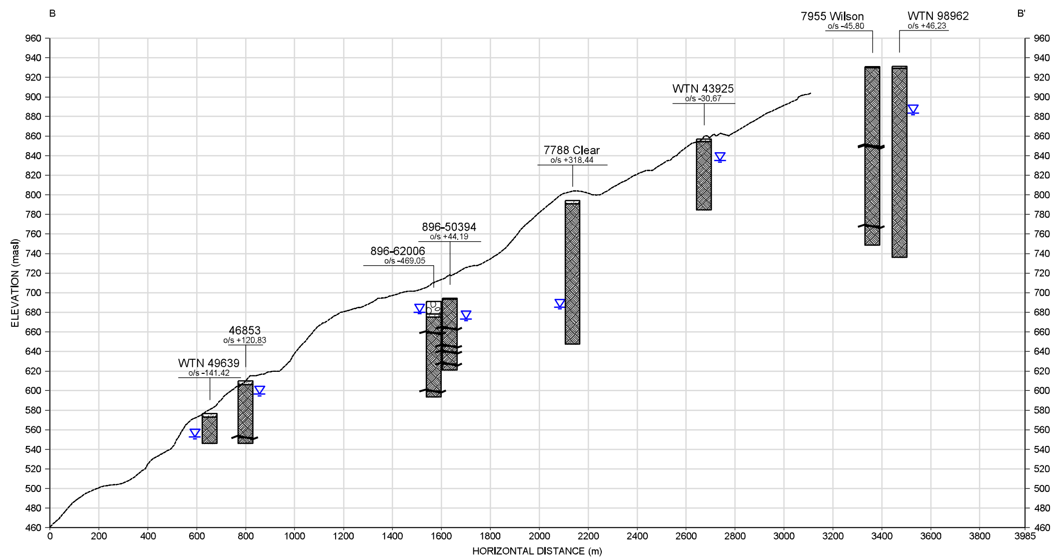
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

TITLE
CROSS-SECTION A-A'

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	5



HORZ SCALE 1:20000
VERT SCALE 1:5000
B 3/4 CROSS-SECTION B-B'

LEGEND

APPROXIMATE GROUND SURFACE

LOCATION OFFSET (o/s)

SOIL STRATIGRAPHY

2021 WATER LEVEL

APPROXIMATE FRACTURE DEPTH, WHERE REPORTED ON DRILLER'S WELL RECORD

TEST HOLE GRAPHICS

BEDROCK

SAND

GRAVEL

TILL

NOTE

1. GROUND SURFACE IS APPROXIMATE (BASED ON REGIONAL DISTRICT OF THE NORTH OKANAGAN CONTOUR DATA)

0 100 200
1:5,000 (VERTICAL) METRES

0 500 1,000
1:20,000 (HORIZONTAL) METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

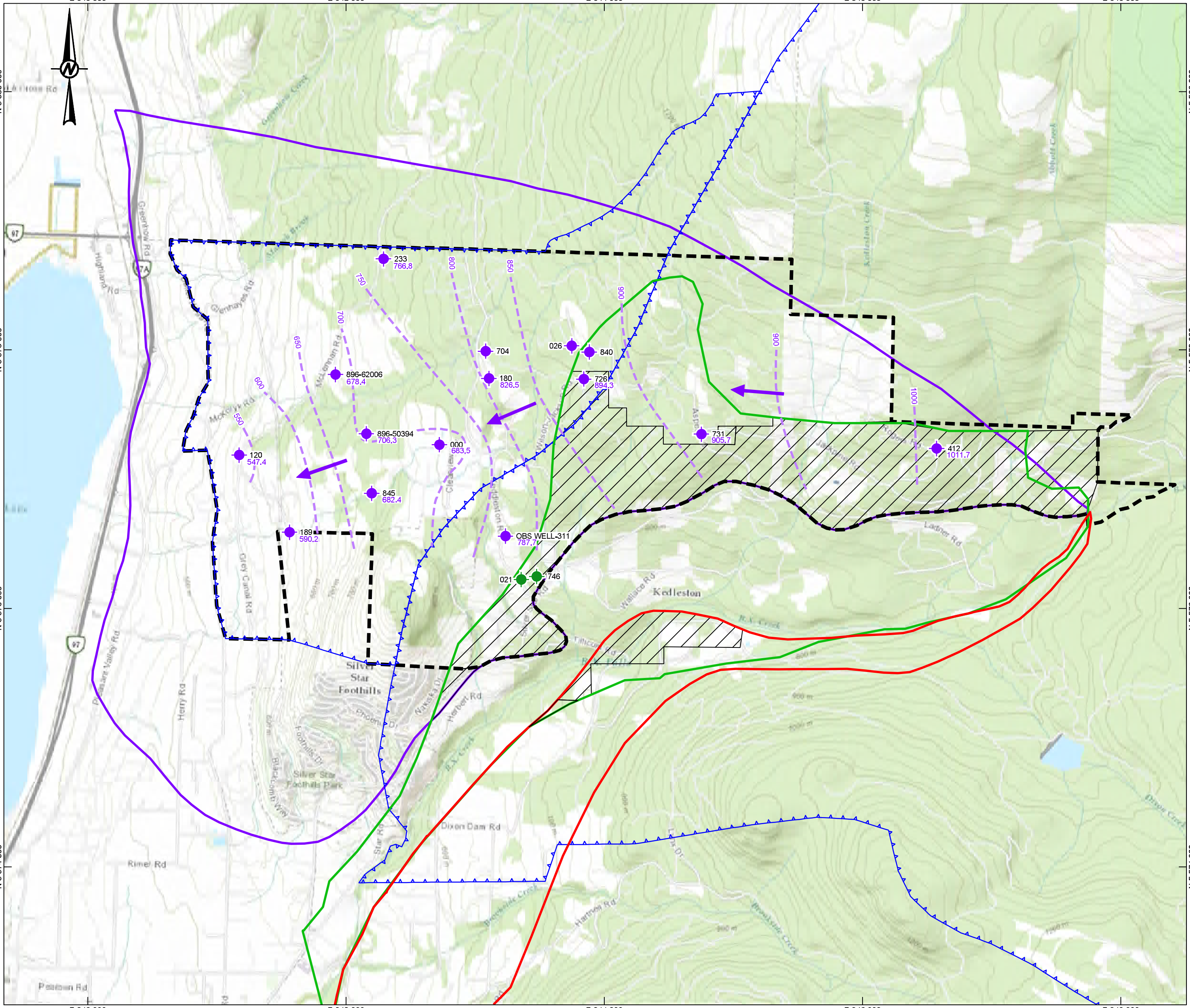
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

TITLE
CROSS-SECTION B-B'

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	6



LEGEND

PHASE 2 STUDY AREA

INFERRED AREAS WHERE UNCONSOLIDATED AND CONFINED AQUIFER OVERLIES BEDROCK AQUIFER

CATCHMENT AREA

AQUIFER 351 IIC (9) BOUNDARY

AQUIFER 350 IIC (9) BOUNDARY

AQUIFER 349 IIC (11) BOUNDARY

GROUNDWATER CONTOUR (50 m INTERVAL)

INFERRED DIRECTION OF GROUNDWATER FLOW

1011.7 GROUNDWATER ELEVATION JULY 15/19, 2021 (masl)

INFERRED MATERIAL WELL - BEDROCK AQUIFER 351

INFERRED MATERIAL WELL - SAND AND GRAVEL AQUIFER 349

REFERENCE(S)

1. BACGROUND SOURCE Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
2. KEY PLAN BACKGROUND AND BASE MAPPING FROM CANMATRIX 1: 50000 NTS - 82L/02
3. AQUIFERS AND CATCHMENTS OBTAINED UNDER OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA
4. DATUM: NAD83, PROJECTION: UTM ZONE 11

0 500 1,000
1:30,000 METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

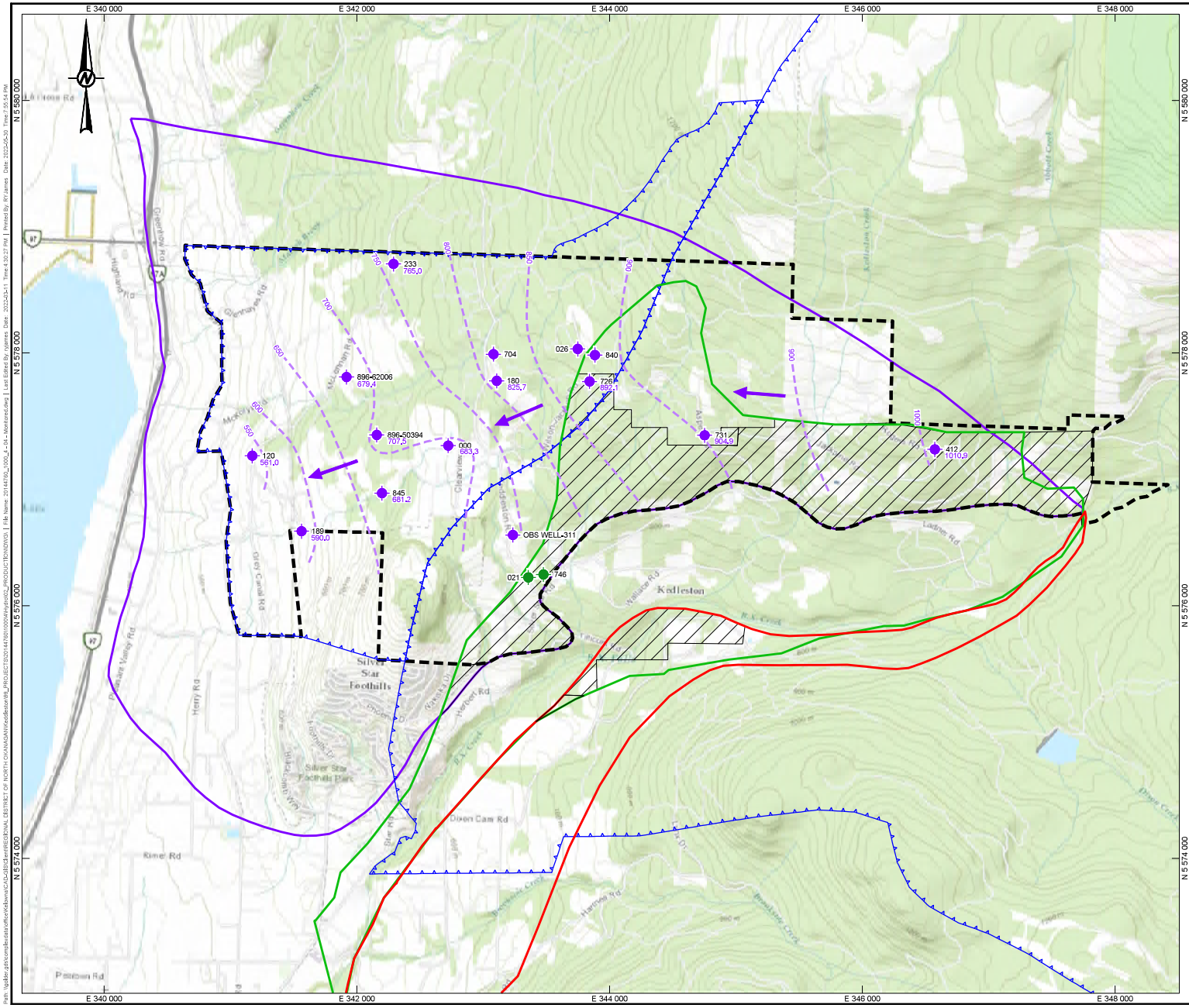
PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

TITLE
INFERRED GROUNDWATER FLOW DIRECTION AQUIFER 351 - JULY 2021

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	7



LEGEND

- PHASE 2 STUDY AREA
- INFERRED AREAS WHERE UNCONSOLIDATED AND CONFINED AQUIFER OVERLIES BEDROCK AQUIFER
- CATCHMENT AREA
- AQUIFER 351 IIC (9) BOUNDARY
- AQUIFER 350 IIC (9) BOUNDARY
- AQUIFER 349 IIC (11) BOUNDARY
- GROUNDWATER CONTOUR (50 m INTERVAL)
- INFERRED DIRECTION OF GROUNDWATER FLOW
- 1011.7 GROUNDWATER ELEVATION DECEMBER 6/7, 2021 (masl)
- INFERRED MATERIAL WELL - BEDROCK AQUIFER 351
- INFERRED MATERIAL WELL - SAND AND GRAVEL AQUIFER 349

REFERENCE(S)

1. BACGROUND SOURCE Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
2. KEY PLAN BACKGROUND AND BASE MAPPING FROM CANMATRIX 1 : 50000 NTS - 82L/02
3. AQUIFERS AND CATCHMENTS OBTAINED UNDER OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA
4. DATUM: NAD83, PROJECTION: UTM ZONE 11

0 500 1,000
1:30,000 METRES

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

TITLE
INFERRED GROUNDWATER FLOW DIRECTION AQUIFER 351 - DECEMBER 2021

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

PROJECT NO.	PHASE	REV.	FIGURE
20144760	4.0	0	8

APPENDIX A

Well Survey

REGIONAL DISTRICT NORTH OKANAGAN

KEDDLESTON WATER WELL QUESTIONNAIRE

Greater Vernon Water

To gain a better understanding of the overall groundwater/aquifer health and usage in the Keddleston area, the Regional District of North Okanagan (RDNO) is in the process of identifying private well water users within the study area aquifers. In order to obtain this information, the RDNO is requesting that you, as a property owner, complete the below questionnaire **to the best of your knowledge.**

Name:	Phone:
Address:	

1. Do you have a water well on your property that is **in use**?

   ☐ **YES (1 well)** ☐ **More than 1** (please specify) _____ ☐ **NO** (no active well on property)

2. Do you have a water well on your property that is **not in use**?

   ☐ **YES (1 well)** ☐ **More than 1** (please specify) _____ ☐ **NO** (no inactive well on property)

   If more than 1 well on property, please complete a separate Water Well Questionnaire for each additional well.

3. Briefly describe where the well is located on your property (provide a sketch of the well location in the space provided at the bottom of questionnaire)

   _____

   _____

   _____

4. Well Depth _____ft Well Diameter _____inches Estimated Water Depth _____ft

5. Pump Depth _____ft Pump Capacity (US gallons per minute [USgpm]) _____

6. Pumping Rate (approximate rate at which you pump your well) _____(USgpm)

7. Well Yield (sustainable rate of flow that well can draw continuously over an extended period) _____(USgpm)

REGIONAL DISTRICT OF NORTH OKANAGAN
9848 Aberdeen Road, Coldstream, BC V1B 2K9
Phone: 250 550-3700 Fax: 250 550-3701
www.rdno.ca

8. Is a Well ID plate attached to your well? ☐ **YES** ☐ **NO**

   If **YES**, indicate Well ID plate number _____

9. Do you have the original well log from when the well was drilled? ☐ **YES** ☐ **NO**

   If **YES**, would you be willing to provide a copy to the RDNO for this study? ☐ **YES** ☐ **NO**

10. What is your well completed in? ☐ **Bedrock** ☐ **Sand / Gravel**

    ☐ **Other** (please state) _____

11. Is your well used for domestic (i.e., household) purposes? ☐ **YES** ☐ **NO**

12. Is your well used for irrigation of cultivated land (hay fields, crops, other) or pasture?

    ☐ **YES** ☐ **NO**

    If **YES**, what do you irrigate?_____

13. How long during the year do you irrigate (months)? _____

    Approximate irrigated area? _____

14. What is your approximate irrigation water demand (annual or monthly)? _____

15. Describe any water shortage problems with your well (including time of year)

    _____

    _____

    _____

16. Describe any water quality problems with your well

    _____

    _____

    _____

17. Describe any other known problems with your well

    _____

    _____

    _____

REGIONAL DISTRICT OF NORTH OKANAGAN
9848 Aberdeen Road, Coldstream, BC V1B 2K9
Phone: 250 550-3700 Fax: 250 550-3701
www.rdno.ca

18. The RDNO will be selecting water wells within the Keddleston area that are suitable for groundwater monitoring and/or testing.

    Are you willing to allow your well to be used for field monitoring purposes (i.e., water quality testing, water level measurements, pumping test)? ☐ **YES** ☐ **NO**

    Additional Comments

    _____

    _____

    _____

19. Sketch of well location on your property

Your participation in the questionnaire is appreciated. If you have any questions, please contact **Sarah Graham** at **250-550-3681** or **sarah.graham@rdno.ca.**

Please return the completed questionnaire to **utilities@rdno.ca** or mail to/drop off at the RDNO office: 9848 Aberdeen Rd, Coldstream, BC V1B 2K9 by **November 2, 2020.**

RESET FORM

REGIONAL DISTRICT OF NORTH OKANAGAN
9848 Aberdeen Road, Coldstream, BC V1B 2K9
Phone: 250 550-3700 Fax: 250 550-3701
www.rdno.ca

APPENDIX B

Well Records

McHARG DRILLING LTD.

SITE 20, COMP. 23, R.R. 3 ☐ SALMON ARM, B.C. ☐ V1E 4M3
TELEPHONE 832-3264

Date July 24/93 Telephone 545-9399

Owner's Name Clint Lee.

Address RR#3 S.11 C.193

Location Rogers Rd Hole No. 1

0-25 boulders

25-30 fractured bedrock

30-70 bedrock

Total Depth ~~72~~ 70 ft

1. Casing Size 6 5/8 Type steel Set From 0 To 30ft

1. Screen ____ Length ____ Slot ____

Set plastic liner From ~~27~~ ft To 72 ft

Air-lift Tested (approx.) 10 GPM* ____ Draw Down 70ft

Recommended Pumping Rate 6 to 9 GPM

Static Water Level 18 ft. Recommended Pump set at 50 ft. ft.

Drilling and Casing	26.00/ft x 30 ft	$ 780.00
Bed rock drilling Screen(s)	~~&~~ ~~liner~~ 20.00/ft x 40ft	$ 800.00
Drive Shoe	1 at	$ 85.00
~~K-Packer and Riser~~	liner 50ft x 5.00/ft	$ 250.00
Other	1 well cap	$ 20.00
	Reaming hole to 8in	$ 300.00
	mobe & demobe.	$ 350.00
		$
		$
		$
Cost of Well	Paid in full.	$ ~~2585~~ 2585.00
G.S.T. R103594495	G.S.T.	$ 180.95
	TOTAL	$ ~~2872.95~~ 2765.95

McHARG DRILLING LTD.

Per Mike, Darrell

Terms: Cash. 2% per month or 24% per annum charged on overdue accounts.

No 283 *ESTIMATE ONLY — For accuracy, a pump test is required.

WANGLER DRILLING LTD.

7938 Cambie Road • Salmon Arm B.C. V1E 2Y6 • Ph: 832-3264 • Toll Free: 1-800-624-7417 • Fax: 832-0563

Date Oct 7/8 04 Telephone 545 9379

Owner's Name Clint Lee Fax

Address RR#3 S11 C193

Location Rogers Rd Postal Code

Formation & Remarks

0-25 boulders
25-30 fractured bedrock
30-70 bedrock - 1½ GPM
70-180 bedrock no change in flow
180-185 10 GPM
185-220 no change in flow

WELL COMPLETION INFO

Total Depth 220 ft. *Air Lift (approx.) 12 G.P.M.

Recommended Run 5-7 G.P.M. Series Pump

Static Level 2:18 ft. Recommended Pump Setting @ 200 ft.

Casing Size 6⅝ Type Steel Set From 0 to 30 ft.

~~Screen~~ Liner Size 4½ Type PVC well csg From 20 to 220 ft.

COSTS 1 + 1

Equipment Travel & Rigging	2	hrs.	200	per hr.	400.00
Drilling overburden	150	ft.	20	per ft.	3000.00
Drilling bedrock		ft.		per ft.	
Develop well (Pull liner & Run res liner)	1½	hrs.	200	per hr.	300.00
Pressure frac		hrs.		per hr.	
Materials installed in well					
Steel casing		ft.		per ft.	
PVC casing	200m	ft.	5.40 6.00	per ft.	~~1200.00~~ 1080
Screens		X		ea.	
K packer with Riser		X		ea.	

Additional remarks and/or costs Paid in full Thank you

Pull liner @
Deepen well frm 70-220 ft
Run liner.
no charge for developing hole clean before running liner ½ hr x 280 = $140
no charge for moving rods, irrigation etc.

Drive shoe	
Well cap	
Screen bottom	
Well Cost	~~4900.00~~ 4780.00
GST	~~343.00~~ 334.60
TOTAL	~~5243.00~~ 5114.60

TERMS: Payment due upon receipt of this invoice

NOTE: Interest charged on overdue accounts

Customer Signature

Wangler Drilling SAm, Adam

GST #R 103 594 495

* Estimate only. For accuracy a pump test is required

Popular Print Ltd. • 832-3253

McHARG DRILLING LTD.

SITE 20, COMP. 23, R.R. 3 ☐ SALMON ARM, B.C. ☐ V1E 4M3
TELEPHONE 832-3264

Date July 17/91 Telephone 542-4301

Owner's Name Trigon

Address Box 1164 Vernon

Location Madenson Rd Hole No. 1

0 - 3 ft gravels & boulders
3 - 100 ft hard black basalt
100-105 fractured
140-160 ½ gpm
160-220 white
225-233 soft white ½ gpm
280-290 1 gpm
290-300 black

Total Depth 300 ft

1. Casing Size 6 5/8 Type steel Set From 0 To 9½
2. Casing Size ____ Type ____ Set From ____ To ____
1. Screen ____ Length ____ Slot ____
2. Sreen ____ Length ____ Slot ____
Set ____ From ____ To ____
Air-lift Tested (approx.) 5 after pressure frack. GPM* 1 gpm before frack. Draw Down 300 ft.
Recommended Pumping Rate 4 gpm to 4 GPM
Static Water Level 53 ft Recommended Pump set at 270 ft.

Drilling	8" ft x 24" Ht	$ 19200
Casing	292 ft x 18"/ft	$ 5256
Screen(s)	N/A	$
Drive Shoe	N/A	$
K-Packer	N/A	$
Developing	1½ hrs N/C	$
Other	R10359449	$ 5448
	GST	$ 381 36
1 gpm before frack, 5 gpm after frack		$
Total Cost of Well		$ 5829 36
Amount Paid		$ 5829 36
Balance	Due upon receipt.	$ 0

Owner's Signature

McHARG DRILLING LTD.

Per Darrell Vaughan

Terms: Cash. 2% per month or 24% per annum charged on overdue accounts.
*ESTIMATE ONLY — For accuracy, a pump test is required.

Lingo
PUMP SERVICE

Owned & Operated by
Lingo Waterworks Ltd.
Certificate No. 100-15011

Head Office:
#6, 740 WADDINGTON DRIVE
VERNON, B.C. V1T 9E9
TELEPHONE: (604) 542-5012
TELEPHONE: (604) 861-6633
FAX: (604) 542-5510

Neil Campbell
Lot #1, Mclennan Rd.,
Vernon, B.C.
Ph: 492-7542

January 6,1994

Dear Sir,

On January 5, 1994, Lingo Waterworks Ltd. performed a brief pump test on your 6" X 301' water well located at the above address at your request, and the results are as follows:
The well was pumped at a rate of 4 us gpm for a period of 2 hours because the water was very dirty, filled with what we refer to as 'rock flour'. This is usually a result of the drilling procedure and tends to diminish as the well is used. It can however plug a pump and too much at once can block the fissures in the rock that the water flows into the well through, so slow pumping is generally the procedure we follow until this condition starts to clear up. During this period of time the water level in the well dropped from it's original static of 24.1 ft to 131 ft.
As there is about 1.4 gallons/ft of 6" casing there is around 150 gallons stored in that portion of the bore hole. During the two hours of pumping we pumped a total of about 480 gallons. The difference between the two figure is about 330 gallons. This translates to a recharge rate of almost 2 gallons/minute. This figure is an indicator only.
We then proceeded to empty the bore hole as quickly as possible and then let the well recover. The amount of recovery time allowed was 10 minutes exactly. The well was then re-emptied at a rate of 7 us gpm, and it took another 13 minutes to empty the bore hole. This indicates that the well recharged at a rate of about 3 gpm. (This rate is expected to be slightly greater than the first measured rate because we had removed the weight of the column of water in the well by some two hundred feet.)
It was during this last pump cycle that a water sample was taken and the results and discussion concerning them are attached hereto.
At the present time, this well appears to produce not more than 3 gallons per minute.
Thank you for using Lingo Waterworks Ltd., and if we may be of further service to you when you are ready to install your permanent water system, please don't hesitate to call.
Yours truly,

LINGO WATERWORKS LTD.
per Don Byrne

KAL WATER PRODUCTS
#6-740 Waddington Dr., Vernon,B.C., V1T-9E9

Mr. Neil Campbell
Lot #1,
McLennan Rd.
Vernon, B.C.

Jan.6,1994

Dear Neil;

On January 5,1994, Lingo Waterworks Ltd. conducted a short pump test on your well on McLennan Rd. as per your directions. At the completion of the pumping segment of that test a water sample was taken for quality analysis. The results of that sampling are as follows:

TOTAL DISSOLVED SOLIDS	- 610 parts/million
HARDNESS	- 16 grains/gallon (273.6 parts/million)
IRON	- <.01 parts/million
PH	- 8.2
NITRATE	- 0 parts/million
NITRITE	- 0 parts/million
H2S	- none detected
TURBIDITY	- cloudy
COLIFORM/FECAL COUNT	- NOT TESTED

CONCLUSION

This water appears to be acceptable in quality for domestic application however, the hardness level will present some difficulty and the trace of iron will present staining over an extended period of time. As mentioned above, Coliform and Fecal matter testing has not been performed and no judgement has been made in that regard.

SUGGESTION

We would suggest that a 32,000 grain softener equipped with a turbulator be installed to accomplish complete removal of the hardness and the iron.

We would also suggest that a 10 inch prefilter be installed to remove the cloudiness from the water prior to softening. The cloudiness found will probably decrease as the well is used, however, a filter of this nature will provide continuous protection should the condition persist.

We thank you for the opportunity of assisting you in your well evaluation and we would be pleased to offer competitive pricing on the required water treatment systems when the need arises.

Yours truly

Terry Reed 604-545-2760
KAL WATER PRODUCTS/LINGO WATERWORKS LTD.

www.dangaredrilling.ca
B.C. Toll Free 1-888-549-3130
(250) 546-3480
1199 Mountain View Road
Armstrong, B.C. V0E 1B8

Harmony Homes Ltd.
4875 248th St.
Aldergrove, BC V4W 1C8

Phone: 604-377-6537

INVOICE

 # 1010-11

Date: July 6, 2011

Drilling Site: Clearview Road, Vernon

GST # 133108282

Description	Unit Price	Quantity	TOTAL
Set-up fee	250.00	1	250.00
Rig time -cleaning out existing well	285.00	2	570.00
PVC well liner installed	6.00	480	2,880.00
		Subtotal	3,700.00
		GST 12%	444.00
		TOTAL	**$4,144.00**

Payment is due on receipt of invoice.

Interest at 24% per annum after 10 days.

THANK YOU FOR YOUR BUSINESS!

ATTENTION
DON KASSA

BRITISH COLUMBIA

BC Environment — Water Management Division

WATER WELL RECORD

Date 01 09 12 71 (YR MO DY)

Owners Name & Address: Herman Aikema

Legal Description & Address: Remainder Part of S½ of SW¼ Sec 30 Twp 5 ODYD

Descriptive Location: Roll # 722-00202.000 (315)

1. TYPE OF WORK: [x] New Well [ ] Deepened [ ] Reconditioned [ ] Abandoned

2. WORK METHOD: [ ] Cable tool [ ] Bored [ ] Jetted [x] Rotary [ ] Mud [x] Air [ ] Reverse [ ] Other

3. WATER WELL USE: [x] Domestic [ ] Municipal [ ] Irrigation [ ] Comm. & Ind. [ ] Other

4. DRILLING ADDITIVES: None

5. MEASUREMENTS from: [x] Ground level [ ] Top of casing — casing height above ground level 2 ft.

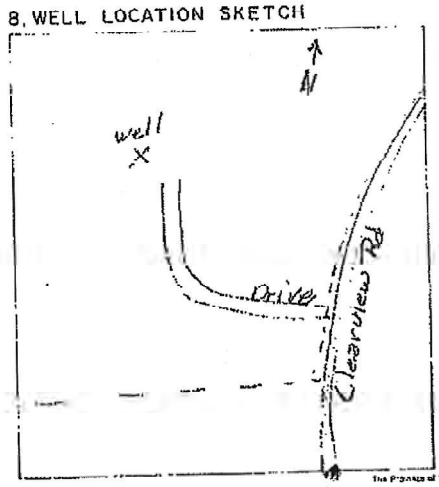
FROM	TO	6. WELL LOG DESCRIPTION	SWL ft
0	11	Clay & rocks	
11	480	Bedrock	

We recommend immediate installation of a 4" PVC water pipe liner in this well

7. CONSULTANT: None

Address:

8. WELL LOCATION SKETCH



9. CASING: Materials [x] Steel [ ] Galvanized [ ] Wood [ ] Plastic [ ] Concrete [ ] Other

Hole Diameter	6			ins
Diameter	6⅝			ins
from	+2			ft
to	12			ft
Thickness	.188			ins
Weight	12.92			lbs/ft

Pitless unit: ... ft [ ] above [ ] below ground level

[x] Welded [ ] Cemented [ ] Threaded [x] New [ ] Used

Perforations: n/a

Shoe(s): Steel

Open hole, from 12 to 480 ft Diameter 6 ins

Grout: Natural

10. SCREEN: [ ] Nominal (Telescope) [ ] Pipe Size

Type [ ] Continuous Slot [ ] Perforated [ ] Louvre [ ] Other

Material [ ] Stainless Steel [ ] 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: [ ] Surging [ ] Jetting [x] Air [ ] Bailing [ ] Pumping [ ] Other

12. TEST: [ ] Pump [ ] Bail [x] Air Date 01 09 12 71 (YR MO DY)

Rate 12 USgpm Temp ... °C SWL before test ... ft

Water Level ... ft after test of ... hrs

[ ] DRAWDOWN in ft / [ ] RECOVERY in ft

mins	WL	mins	WL	mins	WL	mins	WL

13. RECOMMENDED PUMP TYPE: Submersible — RECOMMENDED PUMP SETTING: 460 ft — RECOMMENDED PUMPING RATE: 4-6 USgpm

14. WATER TYPE: [x] Fresh [ ] Salty [x] Clear [ ] Cloudy

colour: no — smell: no — gas: [ ] yes [x] no

15. WATER ANALYSIS: Hardness ... mg/L; Iron ... mg/L; Chloride ... mg/L; pH ...

Field Date ...

Lab Date ... (YR MO DY)

16. FINAL WELL COMPLETION DATA

Well Depth 480 ft — Well Yield 12 USgpm

Static Water Level 330 ft — Artesian Flow ... US gpm — Pressure Head ... ft

Back filled: Bedrock chips

Well Head Completion: Cap

17. DRILLER (PLEASE PRINT) SURNAME: McGladdery — FIRST NAME: Dan

Signature: Dan McGladdery

18. CONTRACTOR: Dan-Gare Drilling Ltd

Address: Box 1565, Vernon BC V1T 8C8

250-549-3130

Member, BCWWDA [x] yes [ ] no

BUD'S WATER WELLS LTD.

P.O. BOX 3276 — KAMLOOPS, BRITISH COLUMBIA — V2C 6B8
BUS. PHONE (604) 573-3000 — RES. PHONE (604) 545-6348

Date Oct 17 /95

Owner's Name Jens Hubert.

Address Silver Star Mt. - JACKSON WILSON Road

Location _____ Hole No. 5 Lots

0-3 OB.
3-597 Bedrock | 535' possible water frac.
FRACTURES @ 265+269 Water Bearing

Total Depth 597'

1. Casing Size Steel Type 6 5/8" Set From 0 To 7'
2. Casing Size _____ Type _____ Set From _____ To _____
1. Screen _____ Length _____ Slot _____
2. Screen _____ Length _____ Slot _____
Set _____ From _____ To _____
Pump Tested 1.6 *GPM _____ Draw Down _____
Recommended Pumping Rate _____
Static Water Level 535' ft. Recommended Pump set at 570 ft.

Drilling	597' @ 18.00	$ 10,746.00
Casing		$
Screen(s)		$
Drive Shoe	1 @ 75.00	$ 75.00
K-Packer and Riser		$
Developing	3 hrs N.C.	$
Other	FRACING N.C.	$
		$
		$
Total Cost of Well		$ 10,821
	G.S.T.	$ 757.47
	TOTAL	$ 11,578.00

Amount Paid 11,578.00 $ _____
Balance 11,578.00 $ _____

Owner's Signature _____

BUD'S WATER WELLS LTD.
Per D Bockel

Terms: Cash. 2% per month or 24% per annum charged on overdue accounts.
*ESTIMATE ONLY — For accuracy, a pump test is required.
G.S.T. No. R133534693

BUDSWATERWELLS

#2083 P.001 /001

17:36 2506798423

SIERRA
WELL & PUMP INC.

4519 McLeery Road
Armstrong, B.C.
V0E 1B3
Tel: 250-546-9992

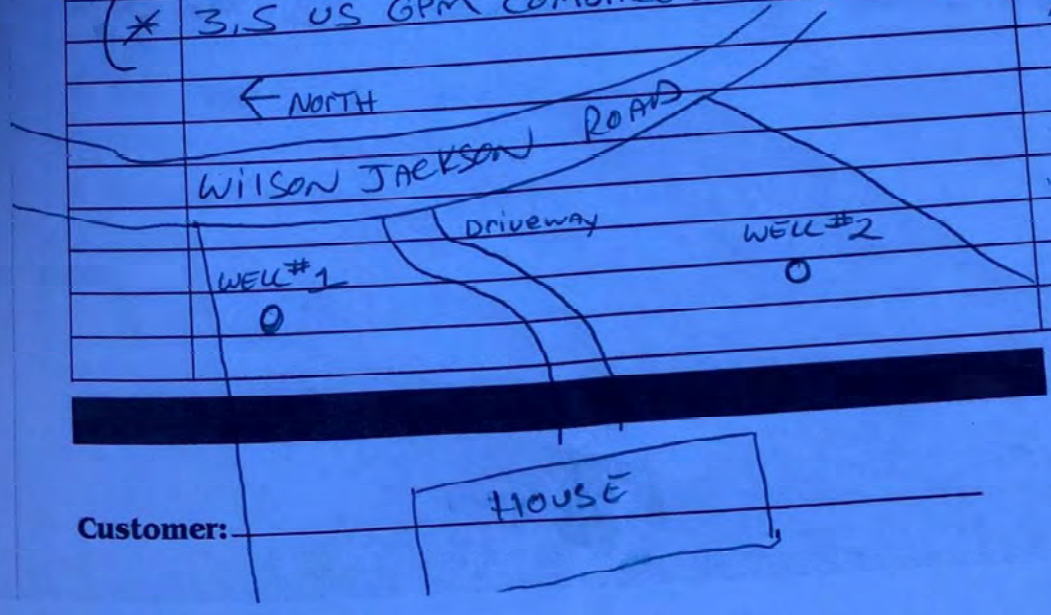
QUOTATION

ROB MOORE
WATER SYSTEM
SOLUTIONS

Customer: STEVE MARIN
Address: 7955 WILSON JACKSON RD.
VERNON B.C.

Date: JUNE 20/2011
Phone No: (403) 251-0577
Fax No:
Job No:

Quantity	Description	Unit Price	Total Price
	I, ROB MOORE, TICKETED & QUALIFIED WELL PUMP INSTALLER HAVE PERFORMED FLOW RATE TESTS ON 2 WELLS APPROX. 150' APART AT 7955 WILSON JACKSON ROAD VERNON B.C.		
*	WELL #1 PUMPED FOR 9 HRS AND FOUND .7 GPM US SUSTAINABLE INCOMING WATER FLOW RATE. THE OTHER WELL #2 WAS NOT AFFECTED AT ALL BY THE COMPLETE DRAW DOWN OF WELL #1		
*	(BOTH WELLS ARE DRILLED 6" x 400'-500' APPROX DEPTH) WELL #2 HAS BEEN PUMPED FOR 8 HRS AT WHICH TIME WE FOUND IT TO HAVE A CONSTANT FLOW RATE OF 2.8 US GPM AND THIS WELL PUMPING HAD NO INTERFERENCE TO WELL #1 AT THE TIME.		
(*	3.5 US GPM Combined WATER FLOW RATE)		



SUB TOTAL
LABOUR
G.S.T.
TOTAL PRICE

Customer:

Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 36463
Well Identification Plate Number: 53119
Owner Name: PARADISE RIDGE WATER UTILITY SOCIETY
Intended Water Use: Water Supply System
Artesian Condition: No

Well Status: Alteration
Well Class: Water Supply
Well Subclass: Not Applicable

Aquifer Number: 350

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:

Alternative specs submitted: No

Licensing Information

Licensed Status: Licensed

Licence Number: 503100

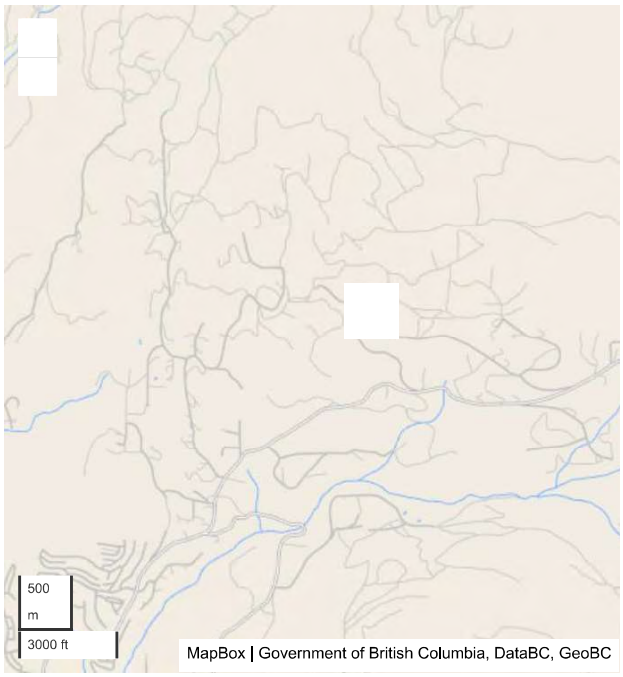
Location Information

Street Address: SW FLANK OF SILVER STAR MTN
Town/City: VERNON

Legal Description:

Lot	1
Plan	31551
District Lot	
Block	
Section	29
Township	5
Range	
Land District	41
Property Identification Description (PID)	003786731

Description of Well Location:



Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 50.32765
Longitude: -119.18114
UTM Easting: 344756
UTM Northing: 5577336
Zone: 11
Coordinate Acquisition Code: (10 m accuracy) ICF cadastre and good location sketch

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1974-08-16	1974-08-16	Pacific Water Wells	August 13th 2003 at 3:20 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1974-08-16	1974-08-16	1985-11-01	1985-11-01		

Well Completion Data

Total Depth Drilled:
Finished Well Depth: 148 ft bgl
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Estimated Well Yield: 5 USgpm
Well Cap:
Well Disinfected Status: Not Disinfected
Drilling Method: Other
Method of determining elevation: Unknown

Static Water Level (BTOC): 138 feet btoc
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	73	TILL, BOULDERS						
73	148	BEDROCK						
148	195	BEDROCK						

Casing Details

From (ft bgl)	To (ft bgl)	Casing Type	Casing Material	Diameter (in)	Wall Thickness (in)	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:

Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner from:

Liner Thickness:
Liner to:

Liner perforations

From (ft bgl)	To (ft bgl)
There are no records to show	

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From (ft bgl)	To (ft bgl)	Diameter (in)	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:

Development Total Duration:

Well Yield

Estimation Method:
Static Water Level Before Test:
Hydrofracturing Performed: No

Estimation Rate:
Drawdown:
Increase in Yield Due to Hydrofracturing:

Estimation Duration:

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:

Method of Decommission:
Backfill Material:

Comments

FERGO WELL PREVIOUSLY ASPEN UTILITIES, Original Owner = RAY FERGUSON. Well x-ref'd and associated w/ GW licence app METHOD OF DRILLING = DRILLED. WELL RECONSTRUCTED IN 1983 & AGAIN IN NOV/85. 1983 A 4.5" ID STEEL LINER SLOTTED @ BOTTOM 20' WAS INSTALLED TO 146.5'. 1985 WELL DEEPENED TO 195' THEN COMPLETED WITH 4" ID SLOTTED LINER TO 177'.

Alternative Specs Submitted: Yes

Documents

- WTN 36463_Pumping Test info.xlsx

Disclaimer

33657

WELL LOG CONSTRUCTION RECORD

OWNER Mervin McCreight

Address 1301 Patten's Rd. Vernon B.C.

Well Location Grand Rd off Silver Star

Date Started Oct 6 Date Completed 10/15

PACIFIC WATER WELLS (1969) LTD.
22314 FRASER HIGHWAY
LANGLEY, B.C. V3A 4H6
Phone - - - 534-8581

Drilling Method Cable tool

Driller J Thomas Helper C J Thomas

File OK-North Folio

Signed By

LOG OF FORMATIONS

Depth		Descriptions
0	to 25'	gravel gabbi Boulders
	to	
25'	to 89	Till
89	to 91	water Bearing gravel
	to	
91	to 92	Bedrock.

OCT 17 1975

GENERAL REMARKS

CASING RECORD

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

Dia. ins. Wt #/ft. From to

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

Shoe Welded Cemented

SCREEN RECORD

Make Johnson Material S Steel

Slot opening 40 Length 4'

Top 87 ft. Bottom 91 ft.

Fittings Top Cap Fittings Bottom 0

Gravel Pack Natural ✓

Development Method

ROCK WELL DATA

Open Bore Hole Dia. ins.

From ft. to ft.

PRODUCTION DATA

Static Level 10' ft.

Measured from Surface

Pumping Level ft. at GPM

ft. at GPM

Bail Test 80 ft. at 10 GPM

ft. at GPH

Recommended Pump Setting 80 ft.

Recommended Max. Pump Output 10 GPM GPH

Duration of Test 1 Hrs.

PUMP DATA

Make Type

Model Serial No.

Size HP Drop Pipe ins.

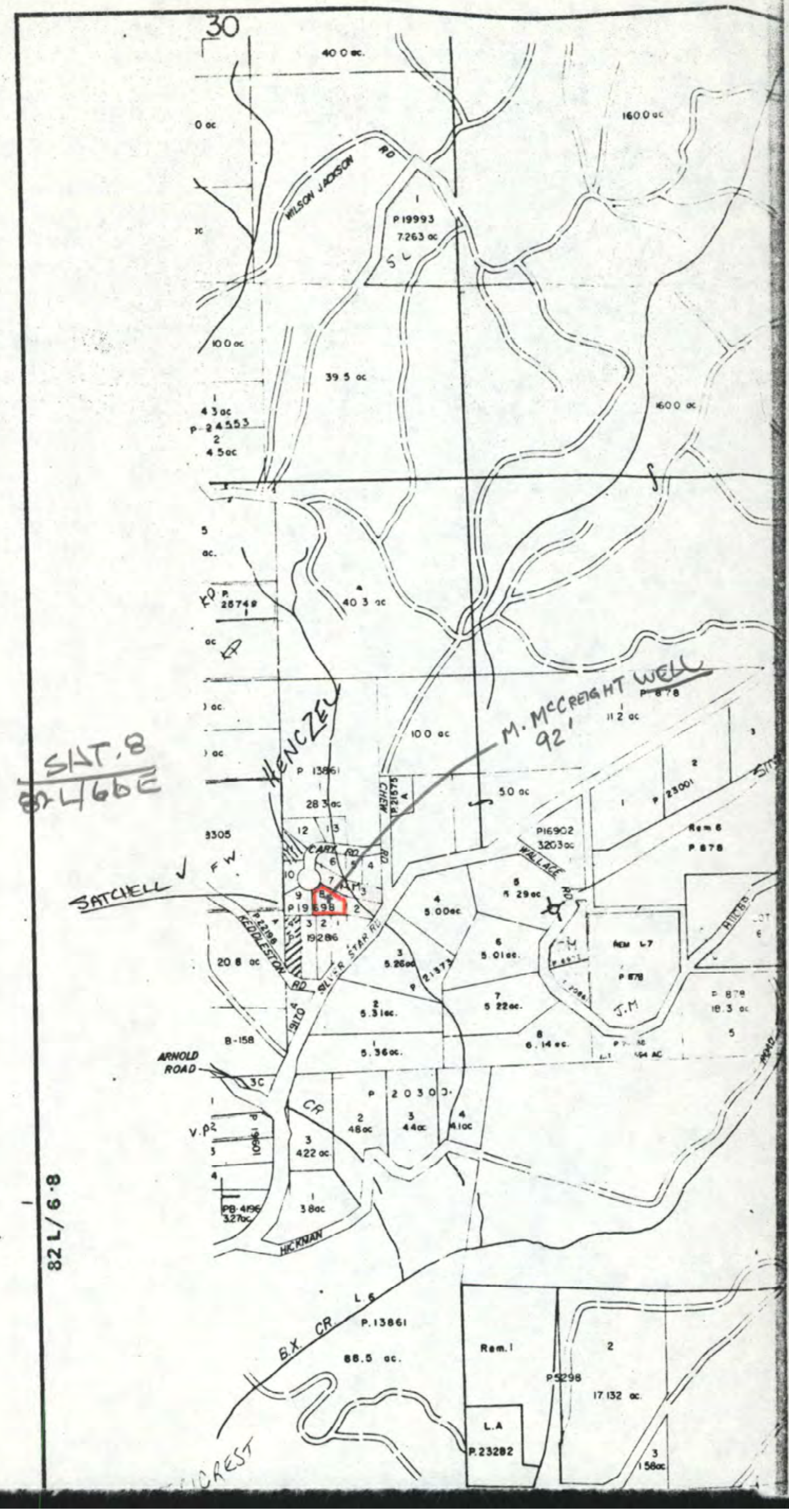
GPM Head ft. RPM

Motor Volts PH

Well Seal

Water Analysis — Hardness PPM

PH Iron PPM


30
40.0 ac.
WILSON JACKSON RD
1
P19993
7.263 ac
160.0 ac
10.0 ac
39.5 ac
4.3 ac
P-24553
2
4.5 ac
160.0 ac
5
ac.
P.
28749
40.3 ac
M. McCREIGHT WELL
92'
P 878
11.2 ac
10.0 ac
SHT. 8
82L/6bE
HENCZEL
P 13861
28.3 ac
CHEW RD
5.0 ac
P23001
Rem 6
P 878
P16902
3203 ac
WALLACE
3305
CART RD
SATCHELL
P19698
19286
HEDDLESTON RD
SILVER STAR RD
5.00 ac
5.29 ac
5.26 ac
5.01 ac.
REM L7
P 878
20.8 ac
5.31 ac.
5.22 ac.
18.3 ac
5.36 ac.
6.14 ac.
B-158
ARNOLD ROAD
P 20303
CR
48 ac
44 ac
4.1 ac
V.P2
422 ac
3.8 ac
PB 4196
3.27 ac
HICKMAN
82 L / 6·8
L 6
P. 13861
B.X. CR.
88.5 ac.
Rem. 1
P5298
17.132 ac.
L.A
P.23282
1.58 ac

82L.035.1.1.3

WTN:33657

WATER WELL RECORD

DEPT. OF ENVIRONMENT, WATER RESOURCES SERVICE, WATER INVESTIGATIONS BRANCH VICTORIA, BRITISH COLUMBIA

LEGAL DESCRIPTION: LOT 8 SEC. 19 TP. 5 R. ____ D.L. ____ LAND DISTRICT 0504005 PLAN 19698

DESCRIPTIVE LOCATION CARY RD OF SILVER STAR LICENCE NO. ____ DATE ____

Z ____ WELL NO. 21

____ E

____ N

Z 10 X 7 Y 35 NO. 15 BE

NAT. TOPO. SHEET NO. 82L/6.9 0504005 SHT 8.

OWNER'S NAME MERIUM MC CREIGHT (345-5883) ADDRESS 1301 PATENS RD VERNON

DRILLER'S NAME PACIFIC ADDRESS ____ DATE COMPLETED 10/10/75

DEPTH 92 ELEVATION OF (108) ☐ ESTIMATED ☐ SURVEYED CASING DIAM. ____ LENGTH ____

METHOD OF CONSTRUCTION CABLE TOOL CASING DIAM ____ LENGTH ____

SCREEN LOCATION 87'-91' SCREEN ☒ SIZE 40 slot LENGTH 4' TYPE JOHNSON SS

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

PERFORATED CASING ☐ LENGTH ____ PERFORATIONS FROM ____ TO ____

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

DISTANCE TO WATER 10 ☐ ESTIMATED WATER LEVEL

FROM G.L. ☒ MEASURED ELEVATION ____ ARTESIAN PRESSURE ____

DATE OF WATER LEVEL MEASUREMENT ____ WATER USE ____

PRODUCTION TEST SUMMARY

DATE ____

TEST BY DRILLER

BAIL TEST ☐ PUMP TEST ☐ DURATION OF TEST Inc.

RATE 10 GPM DRAWDOWN 70'

WATER LEVEL AT COMPLETION OF TEST 80'

AVAILABLE DRAWDOWN ____ SPECIFIC CAPACITY ____

PERMEABILITY ____ STORAGE COEFF. ____

TRANSMISSIVITY ____

RECOMMENDED PUMPING RATE 10 GPM (MAX)

RECOMMENDED PUMP SETTING 80'

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
0	25'	GRAVEL COBBLES BOULDERS
25'	89'	TILL
89'	91'	W.B. GRAVEL
91'	92'	BEDROCK

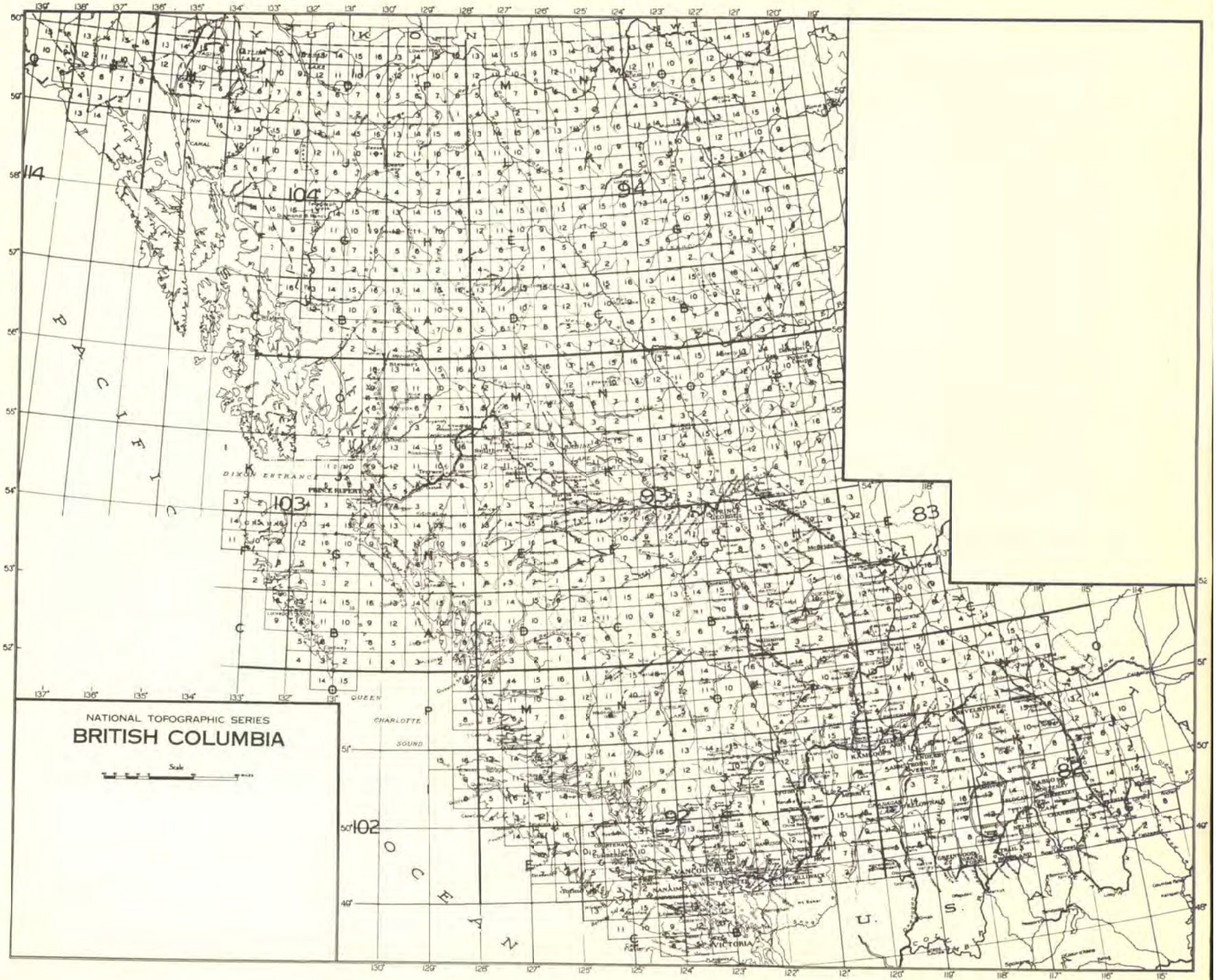
CONTENTS OF FOLDER

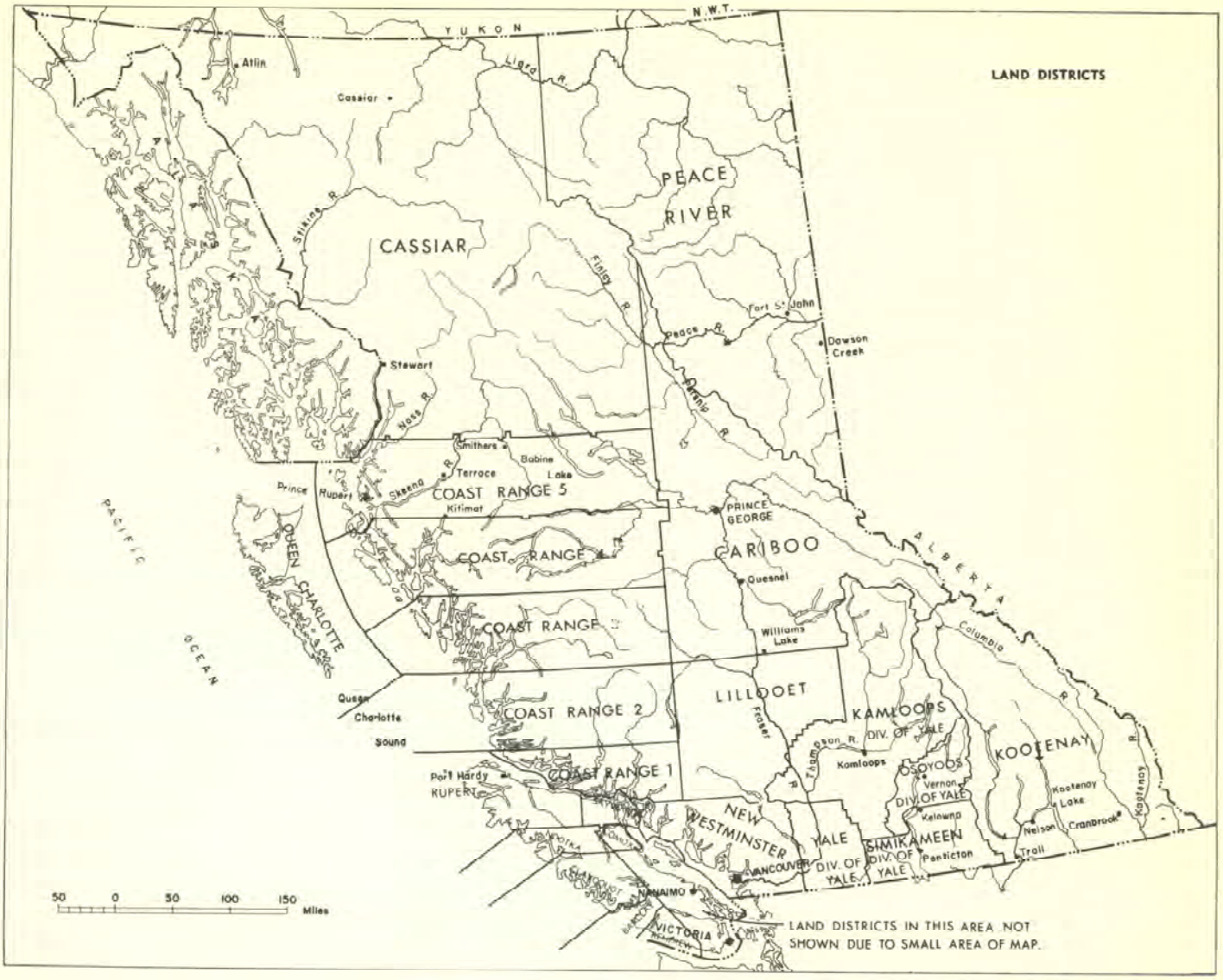
☒ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER ____

SOURCES OF INFORMATION DRILLER


NATIONAL TOPOGRAPHIC SERIES
BRITISH COLUMBIA
Scale
PACIFIC
OCEAN
U.S.
DIXON ENTRANCE
PRINCE RUPERT
QUEEN CHARLOTTE SOUND
VANCOUVER
VICTORIA
KAMLOOPS
PRINCE GEORGE
114
104
94
103
93
83
102
92
82


LAND DISTRICTS
N.W.T.
YUKON
Atlin
Cassiar
Liard R.
PEACE RIVER
CASSIAR
Stikine R.
Finlay R.
Fort St. John
Peace R.
Dawson Creek
Parsnip R.
Stewart
Nass R.
Smithers
Babine Lake
Terrace
Skeena R.
Prince Rupert
COAST RANGE 5
Kitimat
PRINCE GEORGE
CARIBOO
ALBERTA
Quesnel
COAST RANGE 4
COAST RANGE 3
Williams Lake
Columbia R.
PACIFIC OCEAN
QUEEN CHARLOTTE
LILLOOET
Fraser R.
KAMLOOPS
DIV. OF YALE
Queen Charlotte Sound
COAST RANGE 2
Thompson R.
Kamloops
OSOYOOS
Vernon
DIV. OF YALE
KOOTENAY
Port Hardy
KUPERT
COAST RANGE 1
Kelowna
Kootenay Lake
Kootenay R.
NEW WESTMINSTER
YALE
SIMILKAMEEN
DIV. OF YALE
Nelson
Cranbrook
Penticton
Trail
VANCOUVER
DIV. OF YALE
NANAIMO
VICTORIA
50 0 50 100 150 Miles
LAND DISTRICTS IN THIS AREA NOT SHOWN DUE TO SMALL AREA OF MAP.

NORTH

WEST

EAST

SOUTH

CARD BY SM DATE JUN 78

ADDITIONAL DATA ADDED BY

REMARKS

Province of British Columbia Ministry of Environment Water Investigations Branch

WATER WELL RECORD

Date 79/12/30 (YR/MO/DY)

Legal Description & Address

Descriptive Location Keddleston Road - Vernon #1

Owners Name & Address E. M. Meade, Keddleston Rd. Vernon, B.C.

NTS MAP ELEV WELL No.

UTM Z E N UTM Date 19__

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 5 ☐ Other

3. WATER WELL USE 1 ☑ Domestic 2 ☐ Municipal 3 ☐ Irrigation 4 ☐ Commercial & Industrial 5 ☐ Other

4. DRILLING ADDITIVES

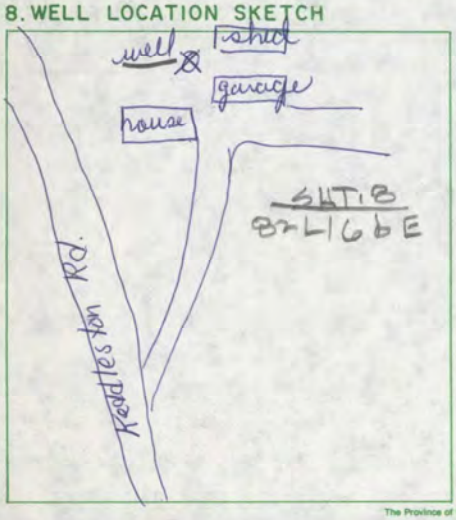
5. MEASUREMENTS from 1 ☑ ground level 2 ☐ top of casing

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	8	rocks & clay	
8	64	limestone	
	64	water - small amount 35	
64	80	sandstone	
80	86	limestone	
86	116	sandstone	

7. CONSULTANT

Address

8. WELL LOCATION SKETCH



9. CASING: Materials 1 ☑ Steel 2 ☐ Galvanized 3 ☐ Wood 4 ☐ Plastic 5 ☐ Concrete 6 ☐ Other

Hole Diameter							units
Diameter	6"				4"		ins
from	2' above ground				7'		ft
to	11				116		ft
Thickness	.280				.188		ins
Weight							lb/ft

Pitless unit 4 ft 1 ☐ above 2 ☑ below ground level

1 ☑ Welded 2 ☐ Cemented 3 ☑ Threaded 4 ☐ New 5 ☐ Used

Perforations:

Shoe(s): 6"

Open hole, from to ft Diameter ins

Grout:

10. SCREEN: 1 ☐ Nominal 2 ☐ Pipe Size

Type 1 ☐ Continuous Slot 2 ☐ Perforated 3 ☐ Louvre 4 ☐ Other

Material 1 ☐ Stainless Steel 2 ☐ Plastic 3 ☐ Other

Set from to ft below ground level

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 6 ☐ Other

12. TEST 1 ☐ Pump 2 ☑ Bail Date 79/12/20 (YR/MO/DY)

Rate 40 USgpm hour Temp °C SWL before test 35 ft

ft after test of hrs mins

TIME in mins & DRAWDOWN in ft				TIME in mins & RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
Submersible	115 ft	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

SITE I D No Lab Date (YR/MO/DY)

16. FINAL WELL COMPLETION DATA

Well Depth 116 ft Water Flowing US gpm

Static Water Level 35 ft Pressure Head ft

Back filled

Well Head Completion pitless adaptor & vented well cap

liquid level control installed in well

17. DRILLER PLEASE PRINT SURNAME SCHIBLI FIRST NAME MAX

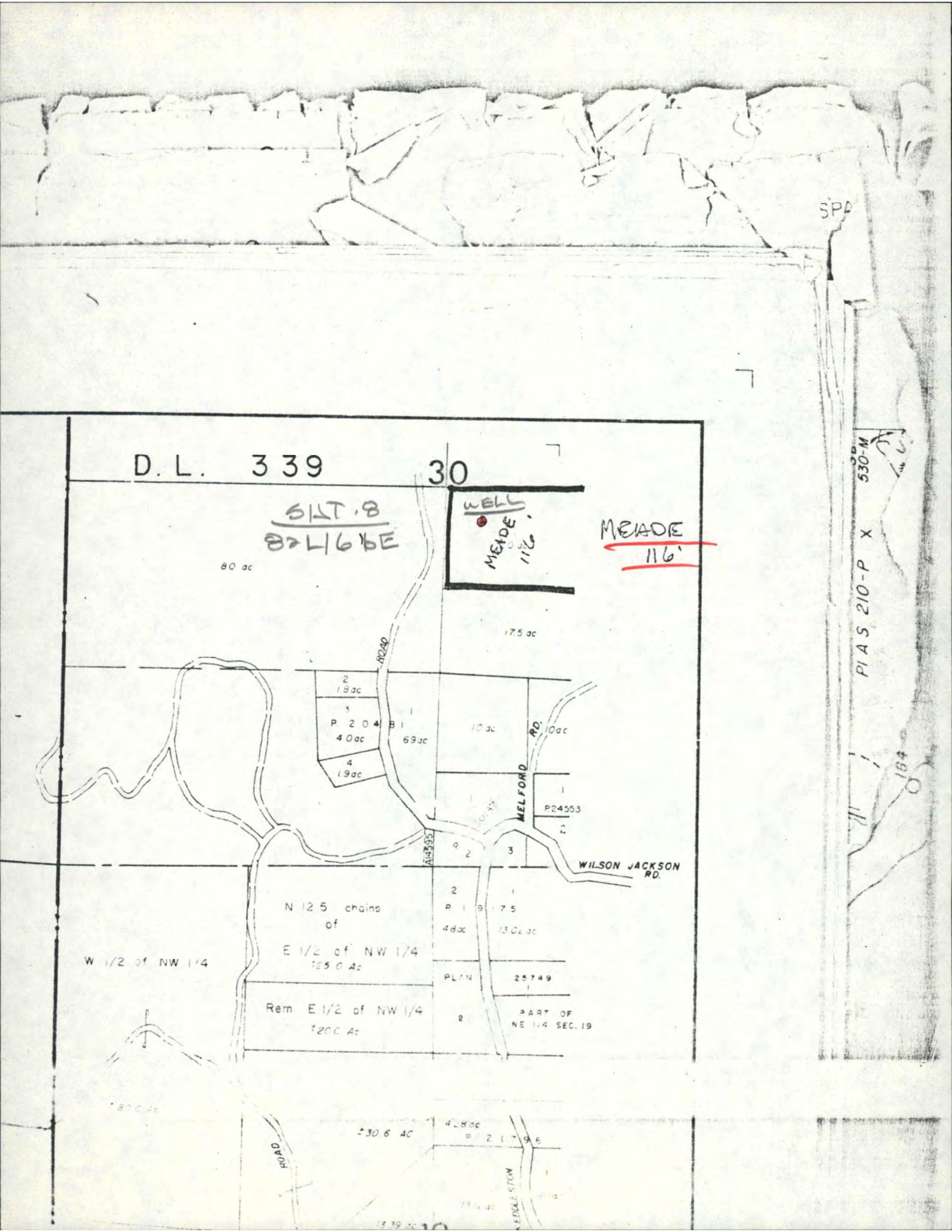
Signature Max Schibli

18. CONTRACTOR, Address

SCHIBLI WATER WELLS

LUMBY, B.C. PH. 547-6189

Member, BCWWDA ☑ yes ☐ no ;


D. L. 339
30
WELL
MEADE
SLT. 8
8 7 L/6 bE
MEADE
116'
80 ac
17.5 ac
ROAD
2
1.8ac
3
P 2 0 4 8 1
4.0ac
6.9ac
4
1.9ac
10 ac
10ac
RD.
MELFORD
P24553
A14535
WILSON JACKSON RD.
N 12.5 chains
of
E 1/2 of NW 1/4
125.0 Ac
W 1/2 of NW 1/4
P 1 9 1 7 5
4.8ac
13.0 ac
PLAN
25749
Rem E 1/2 of NW 1/4
120 Ac
PART OF
NE 1/4 SEC. 19
530-M
PLAS 210-P
164
30.6 AC
4.8ac
ROAD
EDDLESTON

824.034.2.4.2 WTN: 43925 3

WATER WELL RECORD

DEPT. OF ENVIRONMENT, WATER RESOURCES SERVICE, WATER INVESTIGATIONS BRANCH — VICTORIA, BRITISH COLUMBIA

Z ☐ WELL NO. ☐ E ☐ N ☐

LEGAL DESCRIPTION: Frac. N1/2 of Frac. N1/2 of SE 1/4 LOT ___ SEC. 30 TP. 5 R. ___ D.L. ___ LAND DISTRICT OSOYOOS PLAN ___

DESCRIPTIVE LOCATION KEDDLESTON RD. VERNON LICENCE NO. ___ DATE ___

Z 10 X 7 Y 34 NO. 1

NAT. TOPO. SHEET NO. 82L/6bE
OSOYOOS SHEET 8

OWNER'S NAME E.M. MEADE ADDRESS SAME

DRILLER'S NAME M. SCHIBLI ADDRESS LUMBY DATE COMPLETED DEC. 79

DEPTH 116' ELEVATION OF ___ (093) ☐ ESTIMATED ☐ SURVEYED CASING DIAM. 4" LENGTH 7' - 116'

METHOD OF CONSTRUCTION CABLE TOOL CASING DIAM 6" LENGTH +2' - 11'

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 35' ☐ ESTIMATED WATER LEVEL

FROM G.L. ☐ 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 40 G.P.HOUR DRAWDOWN ___

WATER LEVEL AT COMPLETION OF TEST ___

AVAILABLE DRAWDOWN ___ SPECIFIC CAPACITY ___

PERMEABILITY ___ STORAGE COEFF. ___

TRANSMISSIVITY ___

RECOMMENDED PUMPING RATE ___

RECOMMENDED PUMP SETTING 115'

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 ($CaCO_3$) ___ mg/l MANGANESE (Mn) ___ mg/l

COLOUR ___ ODOUR ___ TURBIDITY ___

ANIONS	mg/l	epm
CARBONATE (CO_3)		
BICARBONATE (HCO_3)		
SULPHATE (SO_4)		
CHLORIDE (Cl)		
$NO_2 + NO_3$ (NITROGEN)		
* TKN. (NITROGEN)		
PHOSPHORUS (P)		

CATIONS	mg/l	epm
CALCIUM (Ca)		
MAGNESIUM (Mg)		
SODIUM (Na)		
POTASSIUM (K)		
IRON (DISSOLVED)		

* 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
0	8'	ROCKS & CLAY
8'	64'	LIMESTONE - SMALL AMOUNT OF WATER AT 35'.
64'	80'	SANDSTONE
80'	86'	LIMESTONE
86'	116'	SANDSTONE.
(B)		PITLESS ADAPTOR & VENTED WELL CAP. LIQUID LEVEL CONTROL INSTALLED IN WELL.
		SKETCH INSIDE
MFR	80	ANRO 3D22 JUD 629
		OO2OS OOO
		FRAC OF NORTH 1/2 of FRACTION NORTH 1/2 of SE 1/4 except E. 20 chains LOW SEC 30 TP 5 200 ACRES LTD FI7792F

CONTENTS OF FOLDER

☒ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER ___

SOURCES OF INFORMATION DRILLER

NORTH

WEST

EAST

SOUTH

CARD BY R.J.W. DATE Feb. 20, 1980.

ADDITIONAL DATA ADDED BY _____

REMARKS

Province of British Columbia Ministry of Environment Water Management Branch

WATER WELL RECORD

Date 81/11/12 (YR/MO/DY)

Legal Description & Address

Descriptive Location Meeteken Rd. Vernon B.C.

Owners Name & Address D.R.D. Holding Inc. RR6 Gateway Vernon B.C.

NTS MAP | ELEV | WELL No. 7 ~~[illegible]~~

UTM Z | E | N | UTM Date 19__ Remainder Lot 2 Pl 2558

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 5 ☐ Other

3. WATER WELL USE 1 ☒ Domestic 2 ☐ Municipal 3 ☐ Irrigation 4 ☐ Commercial & Industrial 5 ☐ Other

4. DRILLING ADDITIVES

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

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	6	Brown Till + Rock. Gravel.	
6	14	Dark. Blue Rock. very Cracked.	
14	40	Dark Blue with Hard White Layers	
40	90	Green Rock. with White Layers	
90	130	Cracked Brown Rock. With Green Layers	
130	160	Dark. Blue Rock. with clay Layers.	
160	190	Green + Blue Rock.	
190	210	Bad ly Cracked White + Brown Rock.	
		10 ft. Of 6" Cassing.	
		3 g.p.m AT 100 FT. 75 g.p.m. 150 FT.	
		Pumping 75 g.p.m. By Air Lift.	
		Cleaned + Developed.	
		Flowing 10 g.p.m.	

7. CONSULTANT

Address

8. WELL LOCATION SKETCH

9. CASING: Materials 1 ☐ Steel 2 ☐ Galvanized 3 ☐ Wood 4 ☐ Plastic 5 ☐ Concrete 6 ☐ Other

							units
Hole Diameter							ins
Diameter	6"						ins
from							ft
to							ft
Thickness							ins
Weight							lb/ft

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

1 ☐ Welded 2 ☐ Cemented 3 ☐ Threaded 4 ☐ New 5 ☐ Used

Perforations:

Shoe(s):

Open hole, from ____ to ____ ft Diameter ____ ins

Grout:

10. SCREEN: 1 ☐ Nominal 2 ☐ Pipe Size

Type 1 ☐ Continuous Slot 2 ☐ Perforated 3 ☐ Louvre 4 ☐ Other

Material 1 ☐ Stainless Steel 2 ☐ Plastic 3 ☐ Other

Set from ____ to ____ ft below ground level

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 6 ☐ Other

12. TEST 1 ☐ Pump 2 ☐ Bail Date (YR/MO/DY)

Rate 75 USgpm Temp ____ °C SWL before test ____ ft

____ ft after test of ____ hrs ____ mins

TIME in mins & DRAWDOWN in ft				TIME in mins & RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
	100 ft	50 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 ____ Lab Date (YR/MO/DY)

SITE I D No 7

16. FINAL WELL COMPLETION DATA

Well Depth 210 ft Water Flowing 10 US gpm

Static Water Level Flowing ft Pressure Head ____ ft

Back filled

Well Head Completion

17. DRILLER PLEASE PRINT SURNAME Young FIRST NAME Rick

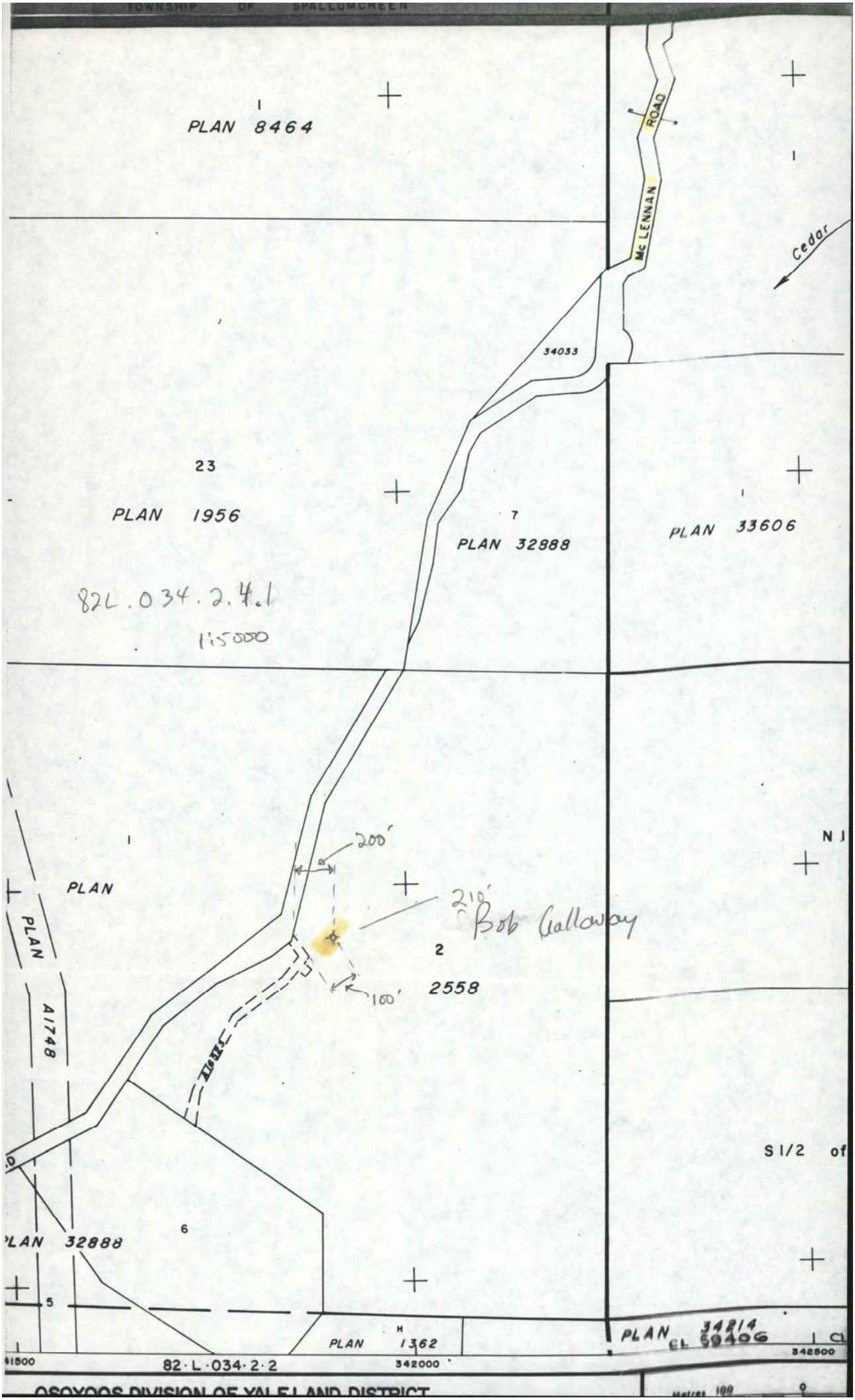
Signature [illegible]

18. CONTRACTOR, Address

K. + W. Drilling LTD

3905 - 17 th Ave Vernon B.C.

Member, BCWWDA ☐ yes ☒ no ;


TOWNSHIP OF SPALLUMCHEEN
PLAN 8464
McLENNAN ROAD
Cedar
34033
23
PLAN 1956
7
PLAN 32888
PLAN 33606
82L.034.2.4.1
1:5000
200'
210'
Bob Galloway
2
2558
100'
PLAN
PLAN A1748
6
PLAN 32888
5
PLAN 1362
PLAN 34214
EL 59406
S1/2 of
82·L·034·2·2
342000
342500

82L·034·2·4·2 WTN 49632 #19

WATER WELL RECORD

DEPT. OF ENVIRONMENT, WATER RESOURCES SERVICE, WATER INVESTIGATIONS BRANCH VICTORIA, BRITISH COLUMBIA

Z WELL NO.

LEGAL DESCRIPTION: Kem. of LOT 2 SEC 24&25 TP. 8 R. D.L. LAND DISTRICT OD YD PLAN 2558

DESCRIPTIVE LOCATION MacLENNAN RD VERNON ~~ECP~~ LICENCE NO. DATE

Z 10 X 7 Y 34 NO.

OWNER'S NAME DBD HOLDINGS - BOB GALLOWAY ADDRESS VERNON

DRILLER'S NAME K & W DRILLING ADDRESS RR4 SITE 15 COMP 52 VERNON DATE COMPLETED 81/12

NAT. TOPO. SHEET NO. SHEET 8

DEPTH 210' ELEVATION OF (074) ☐ ESTIMATED ☐ SURVEYED CASING DIAM. LENGTH

METHOD OF CONSTRUCTION AIR ROTARY CASING DIAM 6" LENGTH 10'

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 OVERFLOW ☐ ESTIMATED WATER LEVEL

FROM GROUND ☐ MEASURED ELEVATION ARTESIAN PRESSURE 10 GPM

DATE OF WATER LEVEL MEASUREMENT WATER USE DOMESTIC

PRODUCTION TEST SUMMARY

DATE

TEST BY DRILLER

BAIL TEST ☐ PUMP TEST ☐ DURATION OF TEST

RATE 75 GPM DRAWDOWN

WATER LEVEL AT COMPLETION OF TEST

AVAILABLE DRAWDOWN SPECIFIC CAPACITY

PERMEABILITY STORAGE COEFF.

TRANSMISSIVITY

RECOMMENDED PUMPING RATE 50 GPM

RECOMMENDED PUMP SETTING 100'

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
0	6'	BROWN TILL & ROCK GRAVEL
6'	14'	DARK BLUE ROCK - VERY CRACKED
14'	40'	DARK BLUE WITH HARD WHITE LAYERS
40'	90'	GREEN ROCK WITH WHITE LAYERS
90'	130'	CRACKED BROWN ROCK WITH GREEN LAYERS
130'	160'	DARK BLUE ROCK WITH CLAY LAYERS
160'	190'	GREEN & BLUE ROCK
190'	210'	BADLY CRACKED WHITE & BROWN ROCK
		80 acres
		(B)
		HIT WATER AT
		100' 3 GPM
		190' 75 GPM
		545-1166

CONTENTS OF FOLDER

☒ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER

SOURCES OF INFORMATION DRILLER

NORTH

WEST

EAST

SOUTH

CARD BY_____ DATE_____

ADDITIONAL DATA ADDED BY_____

REMARKS

located by phone
with Dot Galloway

Province of British Columbia Ministry of Environment Water Management Branch

WATER WELL RECORD

Date YR MO DY

Legal Description & Address

Descriptive Location Mackenzie Rd. McLean Rd. Vernon.

Owners Name & Address D.B.O. Holding Inc. Vernon B.C. Bob Galloway

NTS MAP ELEV WELL No. 1 Lot 1

UTM Z E N UTM Date 19

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 5 ☐ Other

3. WATER WELL USE 1 ☒ Domestic 2 ☐ Municipal 3 ☐ Irrigation 4 ☐ Commercial & Industrial 5 ☐ Other

4. DRILLING ADDITIVES Soap

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

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	12	Brown Till + Rock.	
12	~~400~~	Blue Rock micka	
40	65'	" " White layers	
65'	95'	Cracked Green Rock. Some Blue	
95'	115'	White & Blue Rock. Cracked	
115'	120	White Rock.	
		16 ft. of 6" surface Cassing	
		3/4 g.p.m. at 45 ft.	
		4 1/4 g.p.m. at. 105 ft.	
		Well Cleaned & Developed.	
		Bottom of Well 120'	

7. CONSULTANT

Address

8. WELL LOCATION SKETCH

9. CASING: Materials 1 ☒ Steel 2 ☐ Galvanized 3 ☐ Wood 4 ☐ Plastic 5 ☐ Concrete 6 ☐ Other

							units
Hole Diameter							ins
Diameter	6"						ins
from							ft
to							ft
Thickness							ins
Weight							lb/ft

Pitless unit ft 1 ☐ above 2 ☐ below ground level

1 ☐ Welded 2 ☐ Cemented 3 ☐ Threaded 4 ☐ New 5 ☐ Used

Perforations:

Shoe(s):

Open hole, from 1 to 120 ft Diameter 6 ins

Grout:

10. SCREEN: 1 ☐ Nominal 2 ☐ Pipe Size

Type 1 ☐ Continuous Slot 2 ☐ Perforated 3 ☐ Louvre 4 ☐ Other Bed Rock.

Material 1 ☐ Stainless Steel 2 ☐ Plastic 3 ☐ Other

Set from to ft below ground level

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 6 ☐ Other

12. TEST 1 ☐ Pump 2 ☐ Bail Date YR 8 MO 11 DY 4

Rate 5 USgpm Temp °C SWL before test ft

ft after test of hrs mins

TIME in mins & DRAWDOWN in ft				TIME in mins & RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
	100 ft	5 g.p.m. 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

SITE I D No Lab Date YR MO DY

16. FINAL WELL COMPLETION DATA

Well Depth 120 ft Water Flowing US gpm

Static Water Level ft Pressure Head ft

Back filled

Well Head Completion

17. DRILLER PLEASE PRINT SURNAME Young FIRST NAME Rick

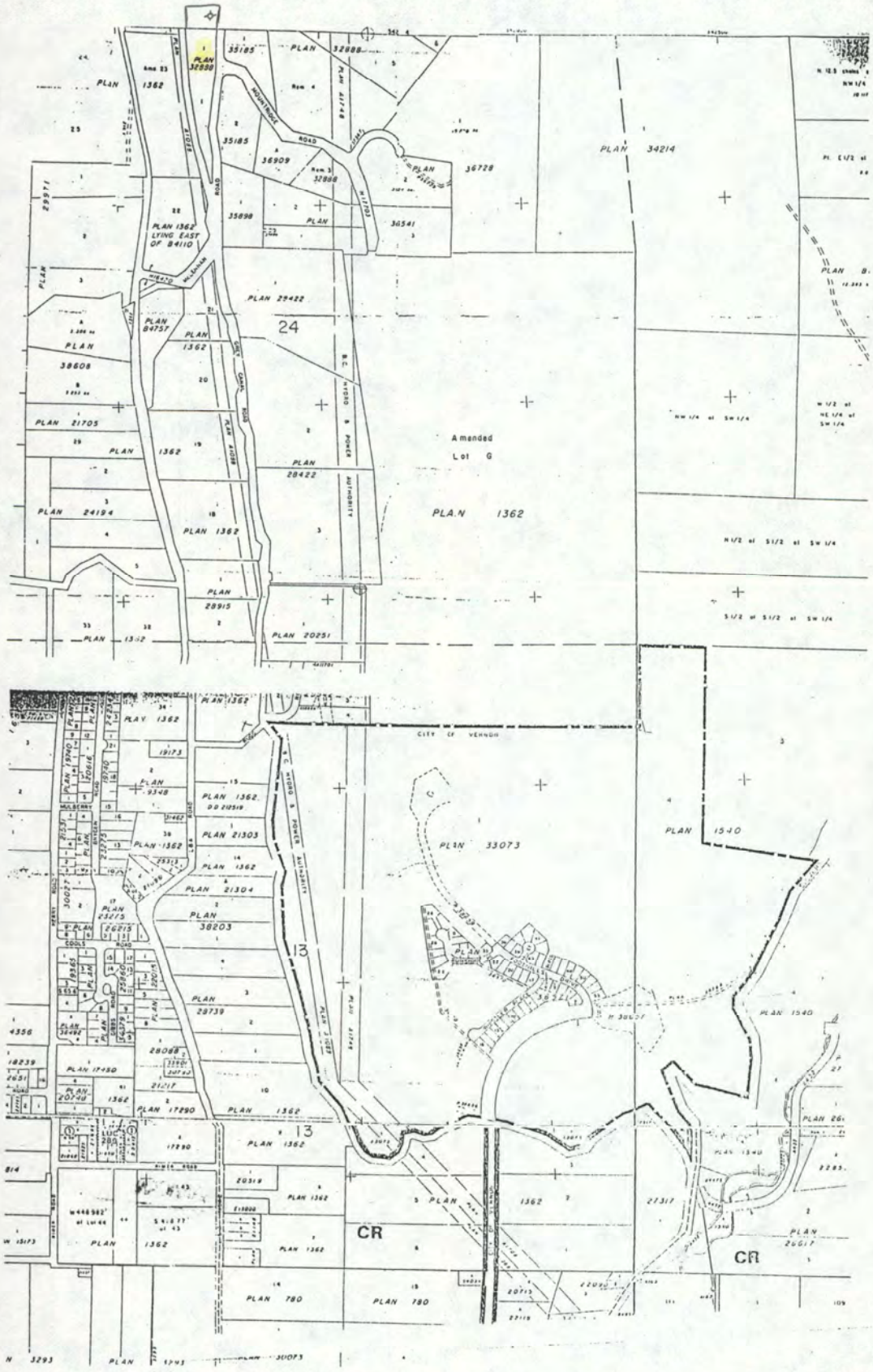
Signature

18. CONTRACTOR, Address

K. + W. Drilling Ltd.
Vernon B.C. 3905 12th Ave

Member, BCWWDA ☐ yes ☐ no ;

T. Dalonski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PLAN 34214
PLAN 1362 LYING EAST OF B4110
PLAN 29422
24
PLAN 38608
PLAN 21705
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PLAN 28422
PLAN 28915
PLAN 20751
Amended Lot G
PLAN 1362
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PLAN 21304
PLAN 17490
PLAN 17290
PLAN 780
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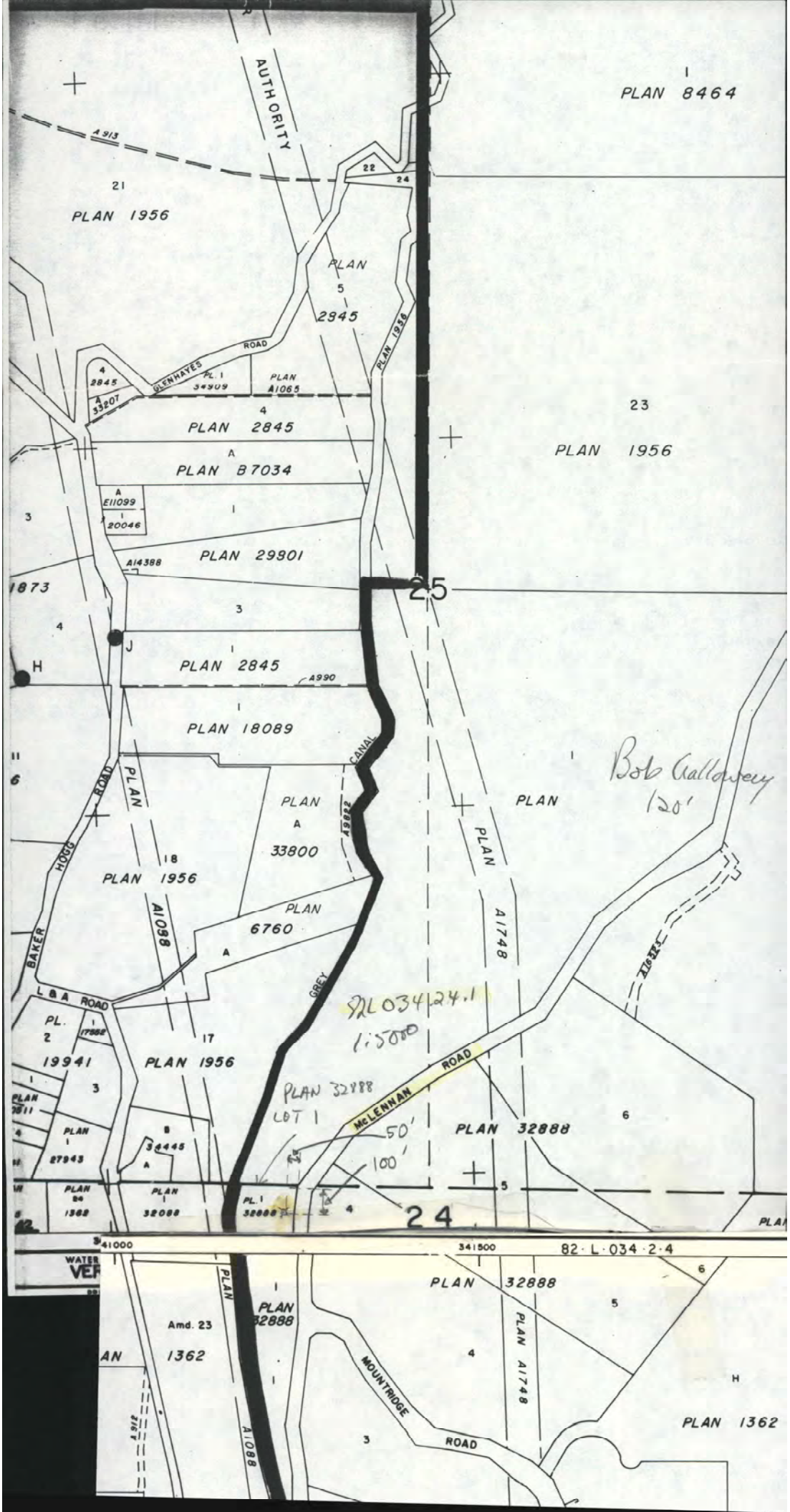
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21
PLAN 1956
22
24
PLAN 5 2945
GLENHAYES ROAD
PL. 1 34909
PLAN A1065
PLAN 1956
4 2845
A 33207
4
PLAN 2845
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PLAN B7034
A E11099
1 20046
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6
ROAD
PLAN
CANAL
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A19822
PLAN
Bob Galloway
120'
18
PLAN 1956
A1088
PLAN 6760
A
BAKER HOGG
L & A ROAD
GREY
PL. 2 19941
17988
17
PLAN 1956
PLAN 32888
LOT 1
McLENNAN ROAD
50'
100'
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5
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PLAN 27943
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PLAN 32088
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82·L·034·2·4
WATER
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PLAN 32888
MOUNTRIDGE ROAD
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PLAN 1362
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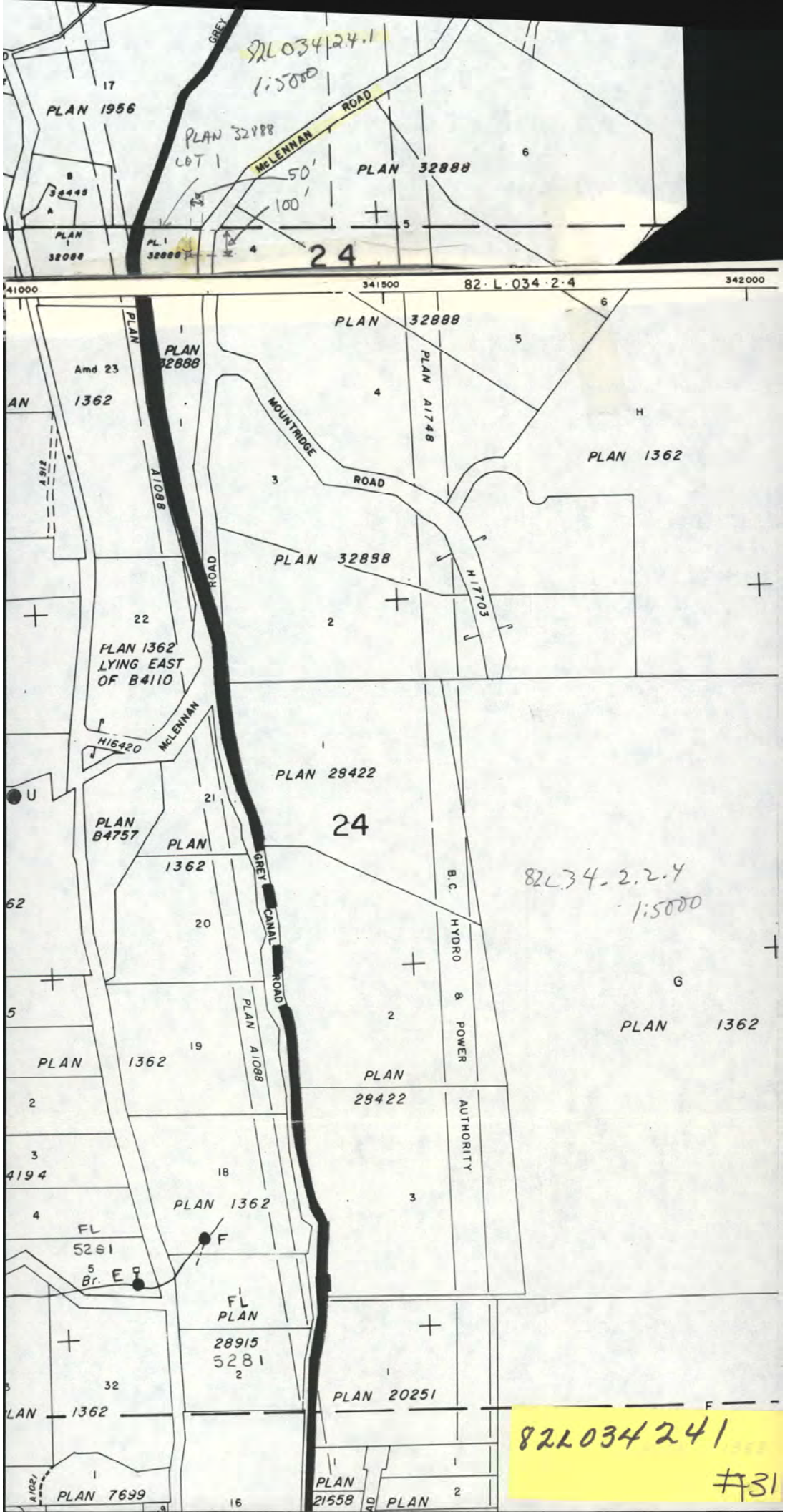
A1088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LOT 1
McLENNAN ROAD
50'
100'
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MOUNTRIDGE ROAD
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OF B4110
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ROAD
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PLAN 1362
PLAN 7699
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21558
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#731

82L·034·2·4·1

WTN:49639 #31

WATER WELL RECORD

DEPT. OF ENVIRONMENT, WATER RESOURCES SERVICE, WATER INVESTIGATIONS BRANCH VICTORIA, BRITISH COLUMBIA

LEGAL DESCRIPTION: LOT 1 SEC. 24 TP. 8 NW1/4 R. ____ D.L. ____ LAND DISTRICT ODYD PLAN 32888

DESCRIPTIVE LOCATION MacLENNAN RD. VERNON LOT 1 LICENCE NO. ____ DATE ____

WELL NO. Z ____

Z 10 X 7 Y 33 NO.

NAT. TOPO. SHEET NO. SHEET 8

OWNER'S NAME DBD HOLDINGS - BOB GALLOWAY ADDRESS VERNON

DRILLER'S NAME KEW DRILLING ADDRESS RR4 SITE 15 COMP 52 VERNON DATE COMPLETED 81/12

DEPTH 120' ELEVATION OF ____ (074) ☐ ESTIMATED ☐ SURVEYED CASING DIAM. ____ LENGTH ____

METHOD OF CONSTRUCTION AIR ROTARY 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 5 GPM DRAWDOWN ____

WATER LEVEL AT COMPLETION OF TEST ____

AVAILABLE DRAWDOWN ____ SPECIFIC CAPACITY ____

PERMEABILITY ____ STORAGE COEFF. ____

TRANSMISSIVITY ____

RECOMMENDED PUMPING RATE 5 GPM

RECOMMENDED PUMP SETTING 100'

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
0	12'	BROWN TILL & ROCK
12'	40'	BLUE ROCK - MICA
40'	65'	BLUE ROCK - WHITE LAYERS
65'	95'	CRACKED GREEN ROCK - SOME BLUE
95'	115'	WHITE & BLUE ROCK - CRACKED
115'	120'	WHITE ROCK
B		WATER HIT AT 45' 3/4 GPM
		105' 4 1/4 GPM
		5. AC.

CONTENTS OF FOLDER

☒ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER ____

SOURCES OF INFORMATION DRILLER

NORTH

WEST

EAST

SOUTH

CARD BY_____ DATE_____

ADDITIONAL DATA ADDED BY_____

REMARKS

McHARG DRILLING LTD.

HIGHWAY 97B, R.R. 3 ☐ SALMON ARM, B.C. ☐ V0E 2T0
PHONE 832-3264 ☐ MOBILE N497066

Date Oct 22. 85

Owner's Name Tri Coast

Address Box 809 Vernon.

Location N.W. Corner Lot G Plan 1362 Hole No. 4.

0-8 Clay Rks.

8-345 Bedrock

Prod. from 9 225'

Total Depth 345

1. Casing Size 6 5/8 Type _____ Set From 0 To 9.

2. Casing Size _____ Type _____ Set From _____ To _____

1. Screen _____ Length _____ Slot _____

2. Screen _____ Length _____ Slot _____

Set _____ From _____ To _____

Pump Tested Air lift GPM 3 Draw Down _____

Recommended Pumping Rate 3

Static Water Level 4 ft. Recommended Pump set at 200 ft.

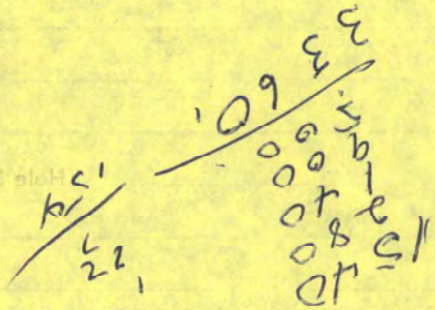
Drilling 345' @ 15.00	$ 5175.00
Casing 9' -	$ N/C
Screen(s)	$
Drive Shoe 1-	$ 70.00
K-Packer	$
Developing	$
Other (No Interest for 6 months then Due)	$
	$
Total Cost of Well	$ 5245.00
Amount Paid	$
Balance	$

Owner's Signature _____

McHARG DRILLING LTD.

Per _____

Terms: Cash. 2% per month or 24% per annum charged on overdue accounts.



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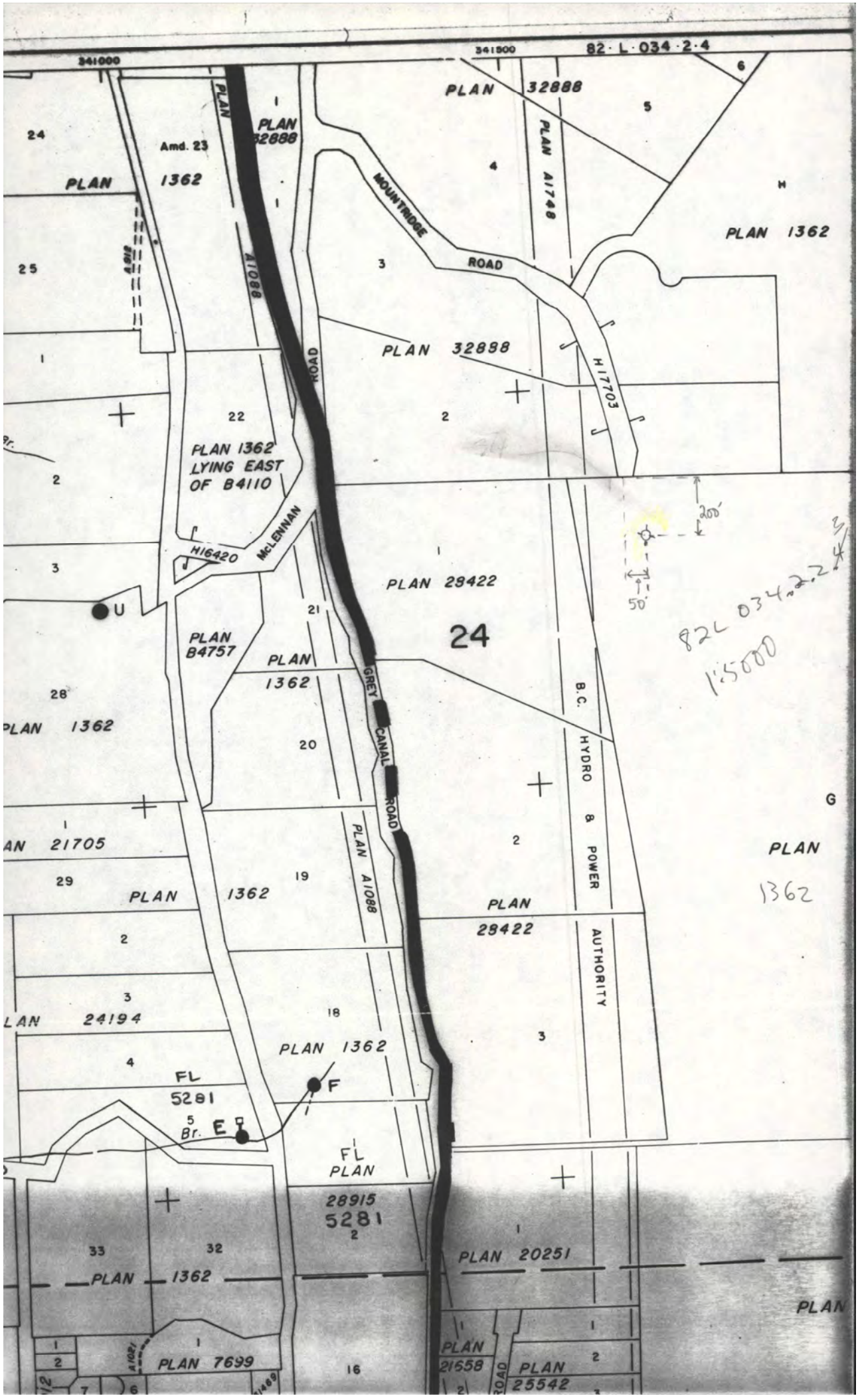
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341500
PLAN 32888
PLAN 1362
Amd. 23
PLAN A1088
MOUNTRIDGE ROAD
PLAN A1748
PLAN 32888
H17703
PLAN 1362 LYING EAST OF B4110
McLENNAN ROAD
H16420
PLAN 28422
24
PLAN B4757
PLAN 1362
GREY CANAL ROAD
B.C. HYDRO & POWER AUTHORITY
PLAN 28422
PLAN 1362
PLAN A1088
PLAN 1362
FL 5281
Br. E
F
FL PLAN 28915 5281
PLAN 20251
PLAN 1362
PLAN 7699
PLAN 21558
PLAN 25542
200'
50'
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1362

82L·034·2·2·3 WTN 55452 #53

WATER WELL RECORD

DEPT. OF ENVIRONMENT, WATER RESOURCES SERVICE, WATER INVESTIGATIONS BRANCH VICTORIA, BRITISH COLUMBIA

Z ___ WELL NO. ___ E ___ N ___

LEGAL DESCRIPTION: LOT G SEC. 19 & 24 TP. 8 R. ___ D.L. ___ LAND DISTRICT OKAN PLAN 1362

DESCRIPTIVE LOCATION Mt. Ridge Rd NW corner of lot G - Vernon ex pl. 28442 LICENCE NO. ___ DATE ___

Z 10 X 7 Y 33 NO.

OWNER'S NAME Tri Crest Realty ADDRESS Box 308 Vernon

DRILLER'S NAME McHarg ADDRESS Salmon Arm DATE COMPLETED 22/10/85

NAT. TOPO. SHEET NO. SHEET 8

DEPTH 345 ELEVATION OF ___ 090 ☐ ESTIMATED ☐ SURVEYED CASING DIAM. ___ LENGTH 9

METHOD OF CONSTRUCTION ___ CASING DIAM 6 5/8 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 air lift

BAIL TEST ☐ PUMP TEST ☐ DURATION OF TEST ___

RATE 3 gpm DRAWDOWN ___

WATER LEVEL AT COMPLETION OF TEST ___

AVAILABLE DRAWDOWN ___ SPECIFIC CAPACITY ___

PERMEABILITY ___ STORAGE COEFF. ___

TRANSMISSIVITY ___

RECOMMENDED PUMPING RATE 3 gpm

RECOMMENDED PUMP SETTING 200 ft

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 ($CaCO_3$) ___ 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
0	8	clay + rocks
8	345	Bedrock

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 Steve Holmes DATE Nov 5 - 86

ADDITIONAL DATA ADDED BY _____

REMARKS

ENV 1995

71668

Province of British Columbia Ministry of Environment Water Management Branch

WATER WELL RECORD

Date 91062 (YR MO DY)

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

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

Owners Name & Address MR. ALVIN STOBBE 7078 232nd STR. RR#8, LANGLEY, B.C. V3A6H4.

Legal Description & Address ____

Descriptive Location KETLESTON RD. VERNON B.C.

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 ____

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

4. DRILLING ADDITIVES —

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

casing height above ground level ____ ft.

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	70	GREY CEMENTED CLAY & BOULDERS	
70	80	GREY CLAY TILL WITH SILTY SAND LENSES	
80	94	GREY CEMENTED CLAY & ROCKS	
94	98	GREY SILTY SAND & GRAVEL	
98	104	GREY CLAY & ROCKS	
104	405	SHALE BEDROCK	

7. CONSULTANT ____

Address ____

8. WELL LOCATION SKETCH

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

							units
Hole Diameter							ins
Diameter	6						ins
from	0						ft
to	104						ft
Thickness	.189						ins
Weight	14						lb/ft

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

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

Perforations: ____

Shoe(s): YES

Open hole, from 104 to 405 ft Diameter 6 ins

Grout: ____

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	~~BLANK~~	80	20				ft
Diam. I D	#	4	4				ins
Slot Size		BLANK	.010				ins
from		+2	84				ft
to		84	104				ft

Fittings, top — bottom K PACKER

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 91053 (YR MO DY)

Rate 1/2 USgpm Temp ____ °C SWL before test 18 ft

Water Level 60 ft after test of 5 hrs

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

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
SUBMERSIBLE	80 ft	APROX. 1/2 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 ____ Lab Date ____ (YR MO DY)

SITE I D No ____

16. FINAL WELL COMPLETION DATA

Well Depth 104 ft Well Yield 1/2 US gpm

Static Water Level 18 ft Artesian Flow ____ US gpm Pressure Head ____ ft

Back filled ____

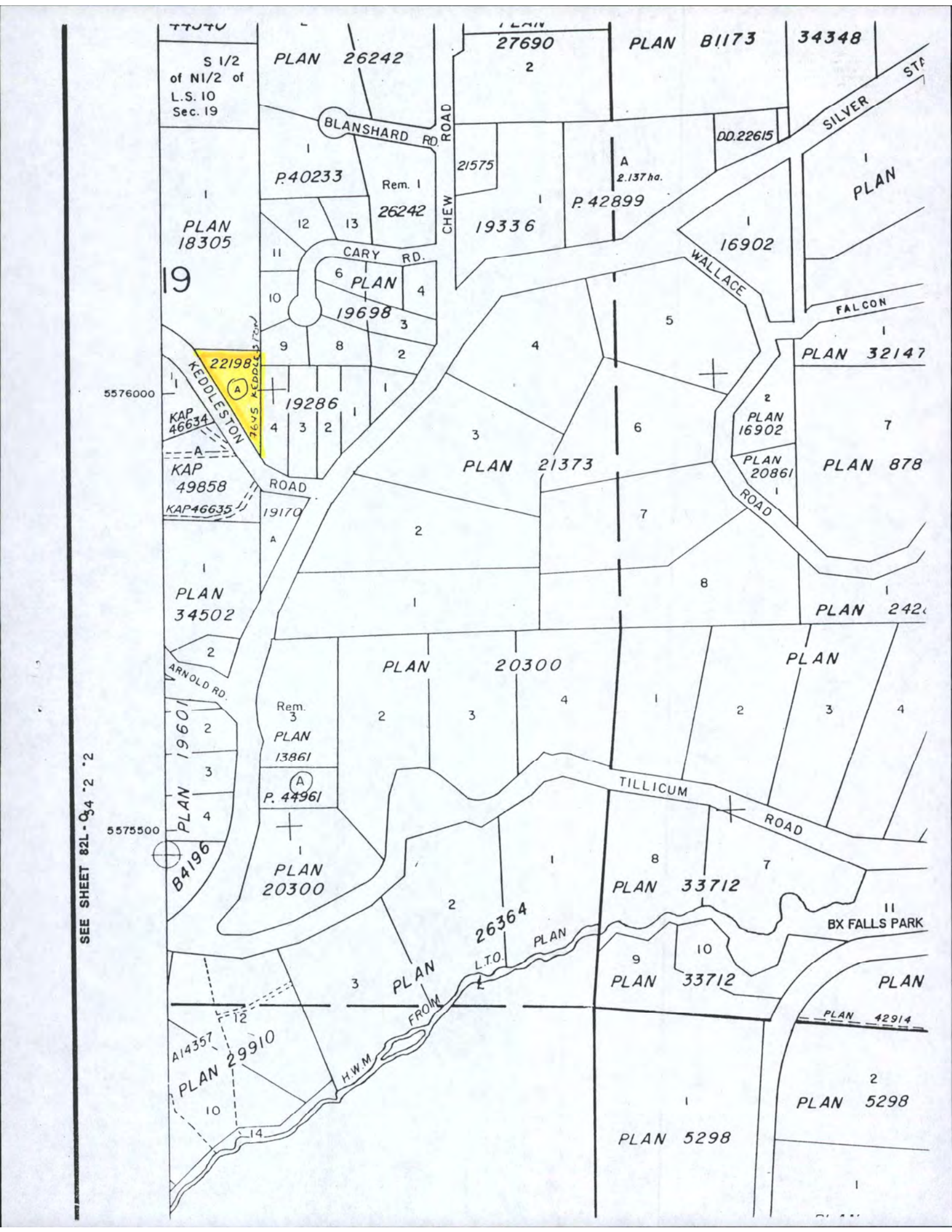
Well Head Completion CAPPED

17. DRILLER PLEASE PRINT SURNAME SCHIBLI FIRST NAME MAX

Signature Max Schibli

18. CONTRACTOR, Address M. SCHIBLI DRILLING R.R.# LUMBY B.C. V0E 2G0

Member, BCWWDA ☑ yes ☐ no ; ____


S 1/2 of N1/2 of L.S. 10 Sec. 19
PLAN 26242
PLAN 27690
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34348
BLANSHARD RD.
CHEW ROAD
SILVER
P.40233
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21575
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PLAN 18305
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12
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CARY RD.
19336
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PLAN
6
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WALLACE
FALCON
PLAN 32147
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PLAN 21373
KAP 49858
KAP46635
ROAD
19170
A
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2
7
PLAN 34502
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PLAN 242
ARNOLD RD.
PLAN 20300
PLAN
Rem. 3
PLAN 13861
P. 44961
TILLICUM
ROAD
5575500
PLAN 19601
B4196
PLAN 20300
PLAN 33712
BX FALLS PARK
26364
PLAN
L.T.O.
PLAN 33712
PLAN
PLAN 42914
FROM
A14357
PLAN 29910
H.W.M.
PLAN 5298
PLAN 5298
SEE SHEET 82L-034 '2 '2

BCGS MAP 082L.034.2.2.4 WTN 71668 WELL NO. 021

WATER WELL RECORD PID: 007-035-021

MINISTRY OF ENVIRONMENT WATER MANAGEMENT BRANCH VICTORIA, BRITISH COLUMBIA

Z WELL NO. E N Z X Y NO.

NAT. TOPO. SHEET NO.

LEGAL DESCRIPTION: LOT A SEC. 19 TP. 5 R. D.L. LAND DISTRICT 05OY00S PLAN 22198

DESCRIPTIVE LOCATION 7645 KEDDLESTON RD. VERNON LICENCE NO. DATE

OWNER'S NAME MR. ALVIN STOBBE ADDRESS 7078-232ND ST. LANGLEY

DRILLER'S NAME M. SCHIBLI ADDRESS LUMBY B.C. DATE COMPLETED 22/6/91

DEPTH 405' ELEVATION OF ☐ ESTIMATED ☐ SURVEYED CASING DIAM. LENGTH

METHOD OF CONSTRUCTION AIR ROTARY CASING DIAM 6" LENGTH 0-104'

SCREEN LOCATION 84-104' SCREEN ☑ SIZE #10 LENGTH 20' 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 18' ☐ ESTIMATED WATER LEVEL

FROM GROUND LEVEL ☐ MEASURED ELEVATION ARTESIAN PRESSURE

DATE OF WATER LEVEL MEASUREMENT WATER USE DOMESTIC

PRODUCTION TEST SUMMARY

DATE

TEST BY

BAIL TEST ☐ PUMP TEST ☑ DURATION OF TEST 5 HRS.

RATE 1/2 GPM DRAWDOWN 42'

WATER LEVEL AT COMPLETION OF TEST 60'

AVAILABLE DRAWDOWN SPECIFIC CAPACITY

PERMEABILITY STORAGE COEFF.

TRANSMISSIVITY

ESTIMATED WELL YIELD

RECOMMENDED PUMPING RATE 1/2 GPM

RECOMMENDED PUMP SETTING 80'

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 006979

LITHOLOGY

FROM	TO	DESCRIPTION
0	70'	GREY CEMENTED CLAY & BOULDERS
70	80	GREY CLAY TILL WITH SILTY SAND LENSES
80	94	GREY CEMENTED CLAY & ROCKS
94	98	GREY SILTY SAND & GRAVEL
98	104	GREY CLAY & ROCKS
104	405	SHALE BEDROCK.
		OPEN HOLE 104-405'

CONTENTS OF FOLDER

☑ DRILL LOG ☐ PUMP TEST DATA ☐ CHEMICAL ANALYSIS

☐ SIEVE ANALYSIS ☐ GEOPHYSICAL LOGS ☐ REPORT

OTHER

SOURCES OF INFORMATION DRILLER

NORTH

WEST

EAST

SOUTH

CARD BY _____ DATE _____

ADDITIONAL DATA ADDED BY _____

REMARKS

Legal enforced through P/C Assessment Authority 27/10/04

M28-1179
653/8

ENV 1995

08 AL 034 264 Wtn 84211

BRITISH COLUMBIA ECOCAT BC Environment Water Management Division

WATER WELL RECORD

Date 02 07 07 (YR MO DY)

NTS MAP | WELL No. | ELEV | Location Accuracy

UTM Z | E | N | UTM Date 19 | Well Type

Owners Name & Address KATHY GALLOWAY C/O 7480 HITCHCOCK RD. VERNON BC. V1B3N8

Legal Description & Address LOT 6 KAP 49151 O.D.Y.D. Sec 19 TP5 ODYD

Descriptive Location

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

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

4. DRILLING ADDITIVES —

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

casing height above ground level ft.

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	5	BROWN CLAY + ROCKS	
5	11	GREY CLAY, ROCKS + COBBLES	
11	340	GREY BROWN MICA SHIST WITH QUARTZ LENSES	
340	435	GREY GRANITE	
435	440	GREY GRANITE WITH QUARTZ SEAMS (FRACTURED)	
440	470	GREY GRANITE	

7. CONSULTANT

Address

8. WELL LOCATION SKETCH

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

							units
Hole Diameter							ins
Diameter	6						ins
from	0						ft
to	11						ft
Thickness	.188						ins
Weight	12.92						lb/ft

Pitless unit ft 1 ☐ above 2 ☐ below ground level

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

Perforations:

Shoe(s): YES

Open hole, from 11 to 470 ft Diameter 6 ins

Grout:

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 02 06 19 (YR MO DY)

Rate 10 USgpm Temp °C SWL before test ft

Water Level ft after test of 1 hrs

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

13.

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
SUBMERSIBLE	450 ft	APROX. 10 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 Lab Date (YR MO DY)

SITE I D No

16. FINAL WELL COMPLETION DATA

Well Depth 470 ft Well Yield EST. 10 US gpm

Static Water Level ft Artesian Flow US gpm Pressure Head ft

Back filled

Well Head Completion CAPPED

NO LINER

17. DRILLER (PLEASE PRINT) SURNAME SCHIBLI FIRST NAME MAX

Signature Max Schibli

18. CONTRACTOR, Address SCHIBLI DRILLING BOX 729 LUMBY BC, V0E 2G0

Member, BCWWDA ☑ yes ☐ no ;

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BRITISH COLUMBIA
Ministry of Environment

☒ Well Construction Report
☐ Well Closure Report
☐ Well Alteration Report

Integrity Drilling Inc
Stamp company name/address/ phone/fax/e-mail here, if desired.

Ministry Well ID Plate Number: 28025
Ministry Well Tag Number: 97354
☐ Confirmation/alternative specs. attached
☐ Original well construction report attached

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

Owner name: PAUL AND SHANNON LACASSE

Mailing address: 7925 WILSON JACKSON RD Town VERNON Prov. BC Postal Code V1B 3N5

Well Location: Address: Street no. 7925 Street name WILSON JACKSON Rd Town VERNON

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

(or) **PID:** ____ (and) **Description of well location (attach sketch, if nec.):** ____

NAD 83: Zone: ____ (see note 2) (and) **UTM Northing:** ____ m **UTM Easting:** ____ m (or) **Latitude (see note 3):** 50° 19. 52.86" N **Longitude:** 119° 11. 39.06" W

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

Orientation of well: ☒ vertical ☐ horizontal Ground elevation: 2996 ft (asl) Method (see note 4): GPS

Class of well (see note 5): 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 7-14) or closure description (see notes 15 and 16)

From ft (bgl)	To ft (bgl)	Relative Hardness	Colour	Material Description (Use recommended terms on reverse. List in order of decreasing amount, if applicable)	Water-bearing Estimated Flow (USgpm)	Observations (e.g., fractured, weathered, well sorted, silty wash), closure details

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material / Open Hole	Wall Thickness in	Drive Shoe
+2	40	6 5/8	STEEL	.250	

Screen details

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

Surface seal: Type: BENTONITE Depth: 15 ft
Method of installation: ☒ Poured ☐ Pumped Thickness: 1 in
Backfill: Type: ____ Depth: ____ ft
Liner: ☐ PVC ☐ Other (specify): ____
Diameter: ____ in Thickness: ____ in
From: ____ ft (bgl) To: ____ ft (bgl) Perforated: From: ____ ft (bgl) To: ____ ft (bgl)

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: 15 ft (btoc) Pumping water level: 420 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): DARRELL WAGLER
Registration no. (see note 20): WD#5092602
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 [signature]

Final well completion data:

Total depth drilled: 420 ft Finished well depth: 420 ft (bgl)
Final stick up: +2FT in Depth to bedrock: + ft (bgl)
SWL: 15 ft (btoc) Estimated well yield: ____ USgpm
Artesian flow: NO USgpm, or Artesian pressure: ____ ft
Type of well cap: VERMIN PROOF 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 17): ____

Date of work (YYYY/MM/DD):

Started: 2007/06/16 **Completed:** 2007/06/16
Comments: PRESSURE FRACTURE EXISTING 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

Sheet ____ of ____

50° 19' 52.86" 119° 11' 39.06" 082L.035.131

Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 98962
Well Identification Plate Number:
Owner Name: DAN LACASSE
Intended Water Use: Unknown Well Use
Artesian Condition: No

Well Status: Alteration
Well Class: Water Supply
Well Subclass: Not Applicable
Aquifer Number:

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:
Alternative specs submitted: No

Licensing Information

Licensed Status: Unlicensed

Licence Number:

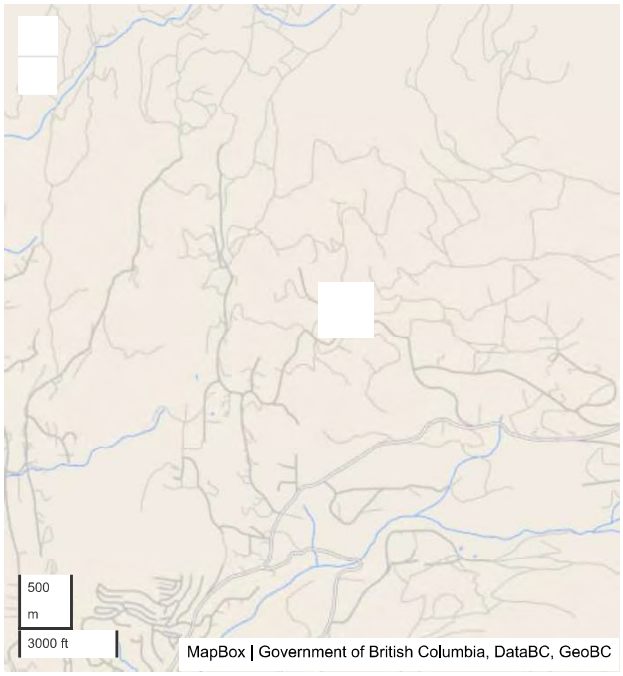
Location Information

Street Address: 7925 WILSON JACKSON ROAD
Town/City: VERNON

Legal Description:

Lot	
Plan	
District Lot	
Block	
Section	
Township	
Range	
Land District	
Property Identification Description (PID)	

Description of Well Location: NORTH SIDE OF PROPERTY HOLE #1.



Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 50.330607
Longitude: -119.191616
UTM Easting: 344020
UTM Northing: 5577687
Zone: 11
Coordinate Acquisition Code: (unknown, accuracy based on parcel size) No ICF cadastre, poor or no location sketch; site located in center of primary parcel

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record			Schibli Drilling	February 17th 2010 at 4:50 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
		2000-08-21	2000-08-21		

Well Completion Data

Total Depth Drilled:
Finished Well Depth: 640 ft bgl
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Estimated Well Yield: 0.25 USgpm
Well Cap: CAPPED
Well Disinfected Status: Not Disinfected
Drilling Method: Air Rotary
Method of determining elevation: Unknown

Static Water Level (BTOC): 5 feet btoc
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
300	640				vari-coloured		GREY GRANITE WITH BLACK SCHIST LAYERS	

Casing Details

From (ft bgl)	To (ft bgl)	Casing Type	Casing Material	Diameter (in)	Wall Thickness (in)	Drive Shoe
6	640		Open hole	6		Not Installed

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:

Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner from:

Liner Thickness:
Liner to:

Liner perforations

From (ft bgl)	To (ft bgl)
There are no records to show	

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From (ft bgl)	To (ft bgl)	Diameter (in)	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by: Air lifting

Development Total Duration:

Well Yield

Estimation Method: Air Lifting
Static Water Level Before Test: 5 ft (btoc)
Hydrofracturing Performed: No

Estimation Rate: 0.25 USgpm
Drawdown:
Increase in Yield Due to Hydrofracturing:

Estimation Duration: 1 hours

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:

Method of Decommission:
Backfill Material:

Comments

LINER RECOMMENDED IF PUMP IS TO BE INSTALLED.

Alternative Specs Submitted: Yes

Documents

No additional documentation available for this well.

Disclaimer

The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.

Aqua Source Drilling Ltd

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/e-mail here, if desired.

Ministry Well ID Plate Number: 38542
Ministry Well Tag Number: 109891
☐ Confirmation/alternative specs. attached
☒ Original well construction report attached

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

Owner name: Robert Galloway

Mailing address: Town Vernon Prov. BC Postal Code V1B 3S7

Well Location: Address: Street no. 7601 Street name McLennon Rd Town Vernon.

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

(or) **PID:** 010 - 991-357 (and) **Description of well location (attach sketch, if nec.):**

119° 13' 14.76", 50° 19' 50.28"

NAD 83: Zone: Nad83 (see note 2) (and) **UTM Easting:** 119° 13.246 W. m **UTM Northing:** 50° 19.838 N. m (or) **Latitude (see note 3):** 50°19' 50.28" **Longitude:** 119°13' 14.76"

Method of drilling: ☒ air rotary ☐ cable tool ☐ mud rotary ☐ auger ☐ driving ☐ jetting ☐ excavating ☐ other (specify):

Orientation of well: ☒ vertical ☐ horizontal Ground elevation: 2312 ft (asl) Method (see note 4): GPS.

Class of well (see note 5): 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 7-14) or closure description (see notes 15 and 16)

From ft (bgl)	To ft (bgl)	Relative Hardness	Colour	Material Description (Use recommended terms on reverse. List in order of decreasing amount, if applicable)	Water-bearing Estimated Flow (USgpm)	Observations (e.g., fractured, weathered, well sorted, silty wash), closure details
0	4	S	Black	silt.		
4	78	m	Brown	Gravel silt		
78	80	m	Purple	Bedrock.		
80	92	m	white.			
92	140	m	Grey			
140	185	H	Black + white		2GPM.	Fractured.
185	218	H	Green + white	marble.	30 GPM.	
218	220	S	Blue + white	Quartz + clay		

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material / Open Hole	Wall Thickness in	Drive Shoe
0	80	6	STEEL	.250	✓

Screen details

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

Surface seal: Type: Bentonite Depth: 20 ft
Method of installation: ☒ Poured ☐ Pumped Thickness: 2. in
Backfill: Type: Depth: ft

Liner: ☒ PVC ☐ Other (specify):
Diameter: 4 in Thickness: .250 in
From: 20 ft (bgl) To: ~~220~~ 200 ft (bgl) Perforated: From: 180 ft (bgl) To: 200 ft (bgl)

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:

Well yield estimated by:

☐ Pumping ☒ Air lifting ☐ Bailing ☐ Other (specify):
Rate: 30 USgpm Duration: 2. hrs
SWL before test: 39 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 Hare.
Registration no. (see note 20): 050 81001
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 Walter Hare

Final well completion data:

Total depth drilled: 220 ft Finished well depth: 220 ft (bgl)
Final stick up: 12 in Depth to bedrock: 78 ft (bgl)
SWL: 39 ft (btoc) Estimated well yield: 30. USgpm
Artesian flow: USgpm, or Artesian pressure: ft
Type of well cap: welded cap 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 17):

Date of work (YYYY/MM/DD):

Started: 20140915 **Completed:** 20140917
Comments:

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 ____

General

1. Requirements for well construction and well closure reports are found in Part 5 of the *Water Act* and the Ground Water Protection Regulation. Part 5 of the act and regulation are at: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/index.html#leg.
2. The current Ministry standard datum for mapping and geodetic use is the North American Datum of 1983 (NAD 83). To determine GPS coordinates using a Global Positioning System (GPS), set the datum to NAD 83.
3. For latitude and longitude coordinates, provide coordinates either in degree, minutes and seconds (e.g., 50° 2' 21.037") or decimal degrees (e.g., 50.039175°).
4. For the method of determining ground elevation, enter: GPS, differential GPS, level, altimeter, 1:50,000 map, 1:20,000 map, 1:10,000 map or 1:5,000 map.
5. The classes and sub-classes of wells are shown below:

Class	**Sub-class** (if applicable)
Water supply	Domestic; Non-domestic
Monitoring	Temporary; Permanent
Recharge or injection	
Dewatering or drainage	Temporary; Permanent
Remediation	Temporary; Permanent
Geotechnical	Borehole; Test pit; Special type of hole; Closed loop geothermal

6. Well reports submitted to the Deputy Comptroller, or retained by the person responsible, as required under the *Water Act* and the Ground Water Protection Regulation, shall be considered part of the Provincial Government records and subject to the *Freedom of Information and Protection of Privacy Act*.

How to Fill Out the Lithologic Description Table

7. Each row in the lithologic description table represents either a depth interval or depth in the well.
8. A row could represent a depth interval (e.g., from 0 feet to 12 feet), such as for a geologic stratum or a specific depth (e.g., 120 feet), such as for a depth location of a water-bearing fracture.
9. For a depth interval, enter the relative hardness of the material in the column "Relative Hardness," if applicable: Very Hard (VH), Hard (H), Dense (D), Stiff (ST), Medium (M), Loose (L), Soft (S), Very Soft (VS).
10. For a depth interval, enter the letter for the overall colour of the geologic material in the column "Colour," if applicable: White (W), Grey (Gy), Blue (Bl), Green (G), Yellow (Y), Brown (Br), Red (R), Tan (T), Black (Bk).
11. For each depth interval, enter the description of the geologic materials encountered during drilling in the column "Material Description." Material descriptions should be chosen from the following recommended list of m

Surficial materials (approximate range of particle size)	**Bedrock mate**
boulders (greater than 10 inches)	conglomerate
cobbles (2½ inches to 10 inches)	sandstone
gravel (80 slot to 2½ inches)	shale
coarse sand (25 slot to 80 slot)	siltstone
medium sand (10 slot to 25 slot)	limestone
fine sand (2 slot to 10 slot)	crystalline
silt (less than 2 slot)	granite
clay (much less than 2 slot)	basalt
till (variable particle size)	volcanic
organics (e.g., top soil, wood, peat)	bedrock

12. In describing the material, list the material in order from greatest to least and indic
The word "and" means both materials occur in approximately equal amounts (e.g
13. Under the column "Water-bearing Estimated Flow (USgpm)," use "D" for "dry," "V
14. If a water-bearing fracture is encountered, the depth of the fracture should be rec
fracture can be entered in the column "Water-bearing Estimated Flow (USgpm)."

Records Scanned. Upload to EcoCat.

How to Fill Out the Closure Description Table and the Well Closure Information Section

15. Each row in the closure description table represents either a depth interval (e.g., from 0 feet to 12 feet) or depth (e.g., 120 feet) in the well.
16. For a depth interval, enter the type of backfill or sealant material(s) in the column "Material Description."
17. Indicate in "Details of closure" whether casing(s) or screen(s) were pulled or left in place. If casing(s) were left in place, indicate whether it was perforated or ripped.

Screen Details

18. "Type" includes riser pipe, K-packer, screen, screen blank, or tail pipe.

Well Driller

19. Fill in the name of the driller who constructed the well.

Registration Number of Driller Responsible

20. Fill in the registration number on the Qualified Well Driller identification card. If the work was completed by a driller who is not registered as a Qualified Well Driller, the Qualified Well Driller who is directly supervising the work should fill in their registration number on their Qualified Well Driller identification card. The Qualified Well Driller signs the form.

Definitions of Abbreviations

asl .....above sea level
bgl .....below ground level
btoc .....below top of casing
Dia .....Diameter
D.L. .....District Lot
ft .....feet
hrs .....hours
in .....inches
NAD 83 ..North American Datum (1983)
PID .....Parcel Identifier
Rg. .....Range
Sec. .....Section
SWL .....static water level
Twp. .....Township
USgpm ...US gallons per minute
UTM .....Universal Transverse Mercator Grid

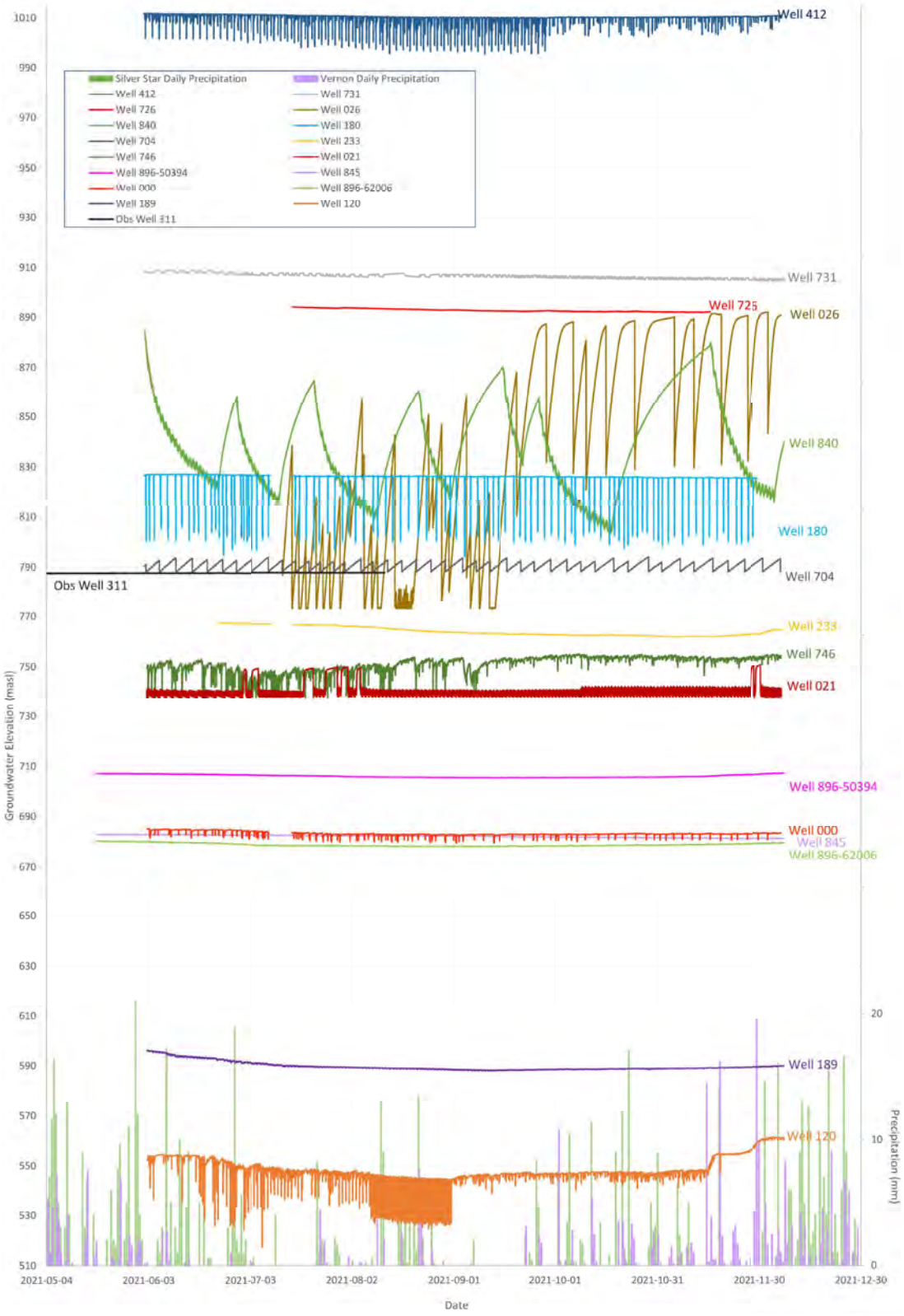
Return Completed Forms to:

Ground Water Data Technician
Water Stewardship Division, Ministry of Environment
PO Box 9362 Stn Prov Govt
Victoria BC V8W 9M2

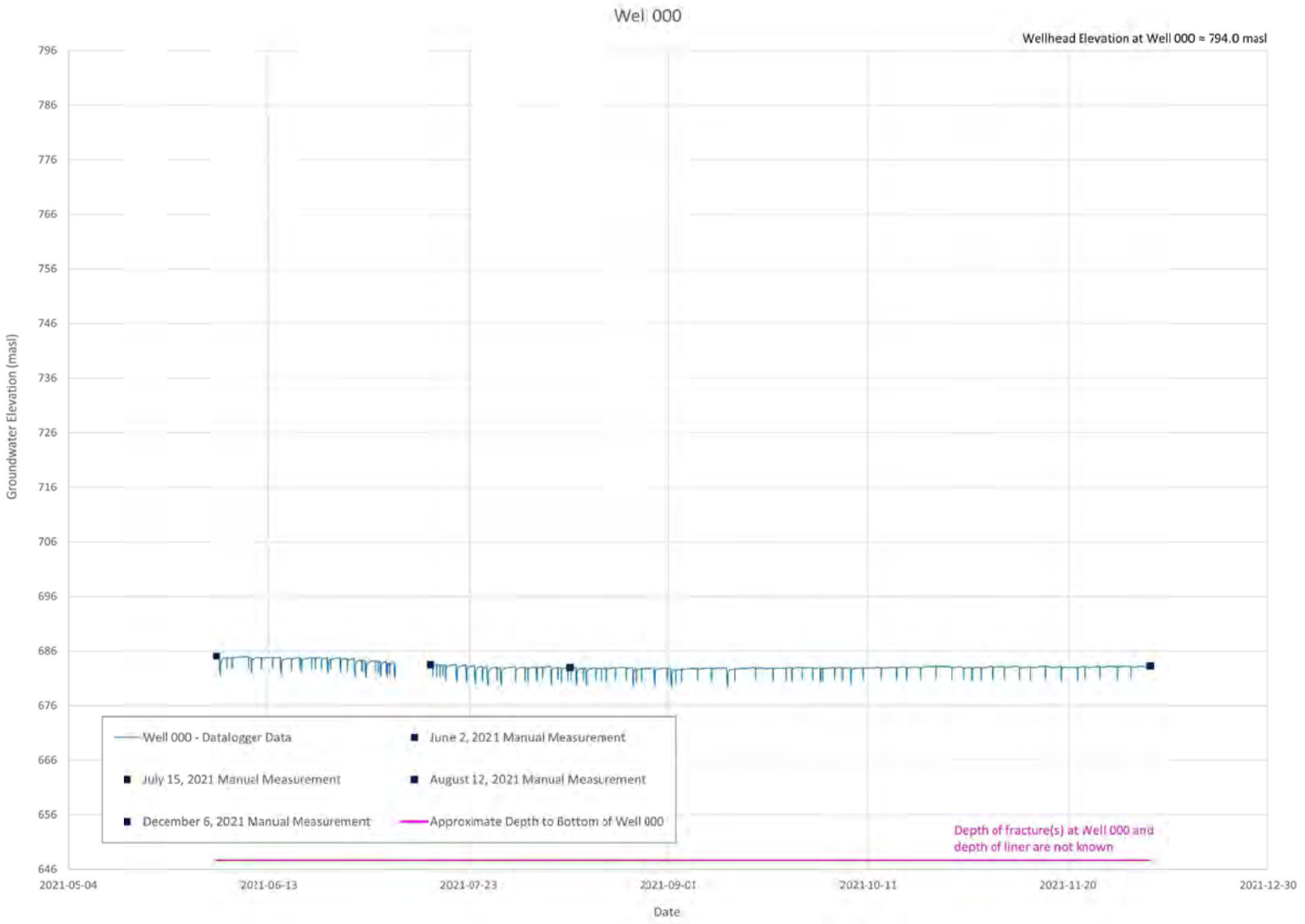
updated: Jan. 18, 2007

APPENDIX C

Water Level Trend Charts



CLIENT: REGIONAL DISTRICT OF NORTH OKANAGAN		PROJECT: KEDDLESTON PHASE 2 GROUNDWATER STUDY	
CONSULTANT: WSP GOLDER	YYYY-MM-DD: 2022-05-30	TITLE: WATER LEVEL TRENDS - OVERVIEW	
	DESIGNED: PA		
	PREPARED: RTJ		
	REVIEWED: MAB		
	APPROVED: JPS		
		PROJECT NO.: 20144760	PHASE: 4.0
		REV.: 0	FIGURE: C1



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 000 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C2

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:10:59 PM
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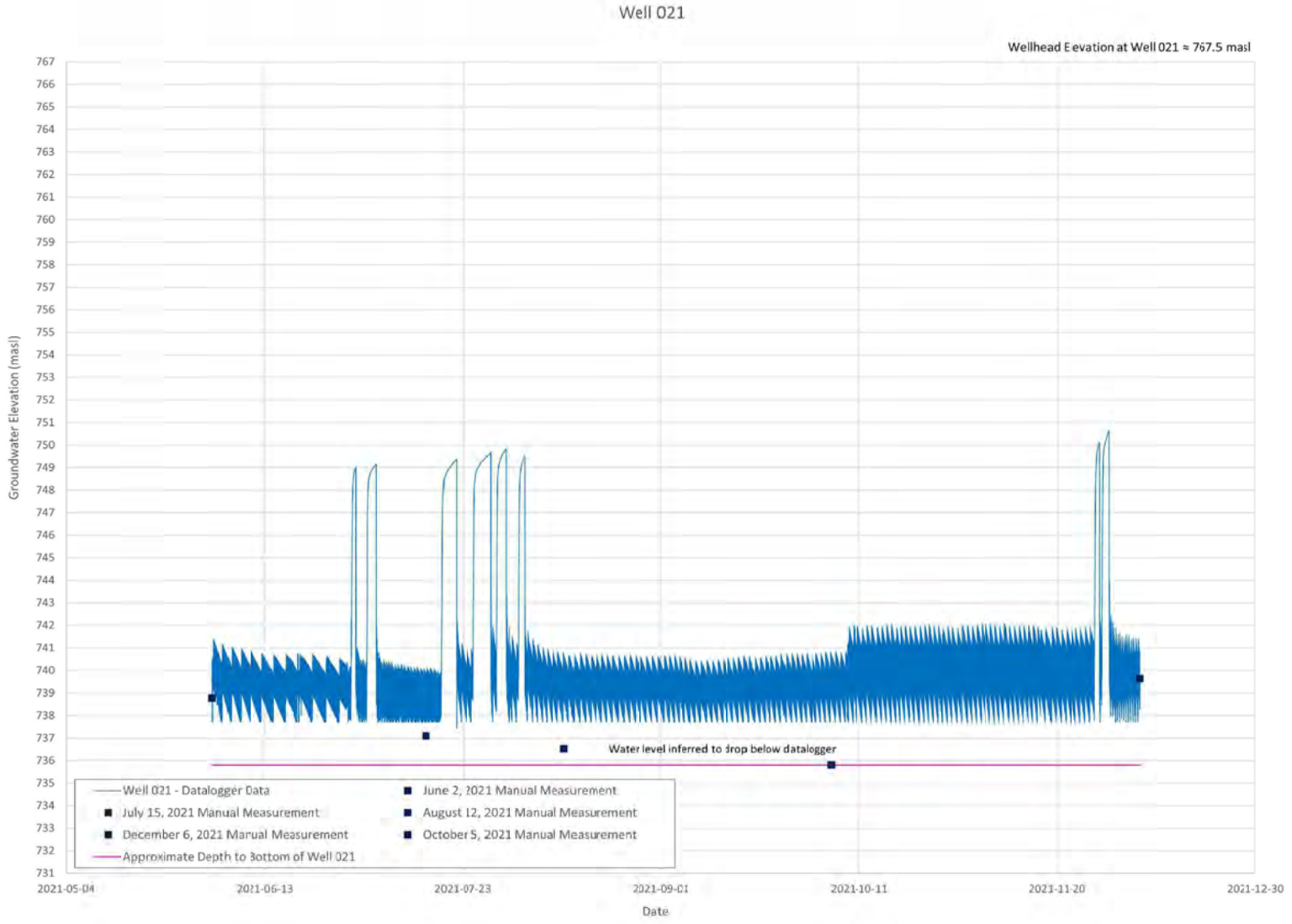


CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

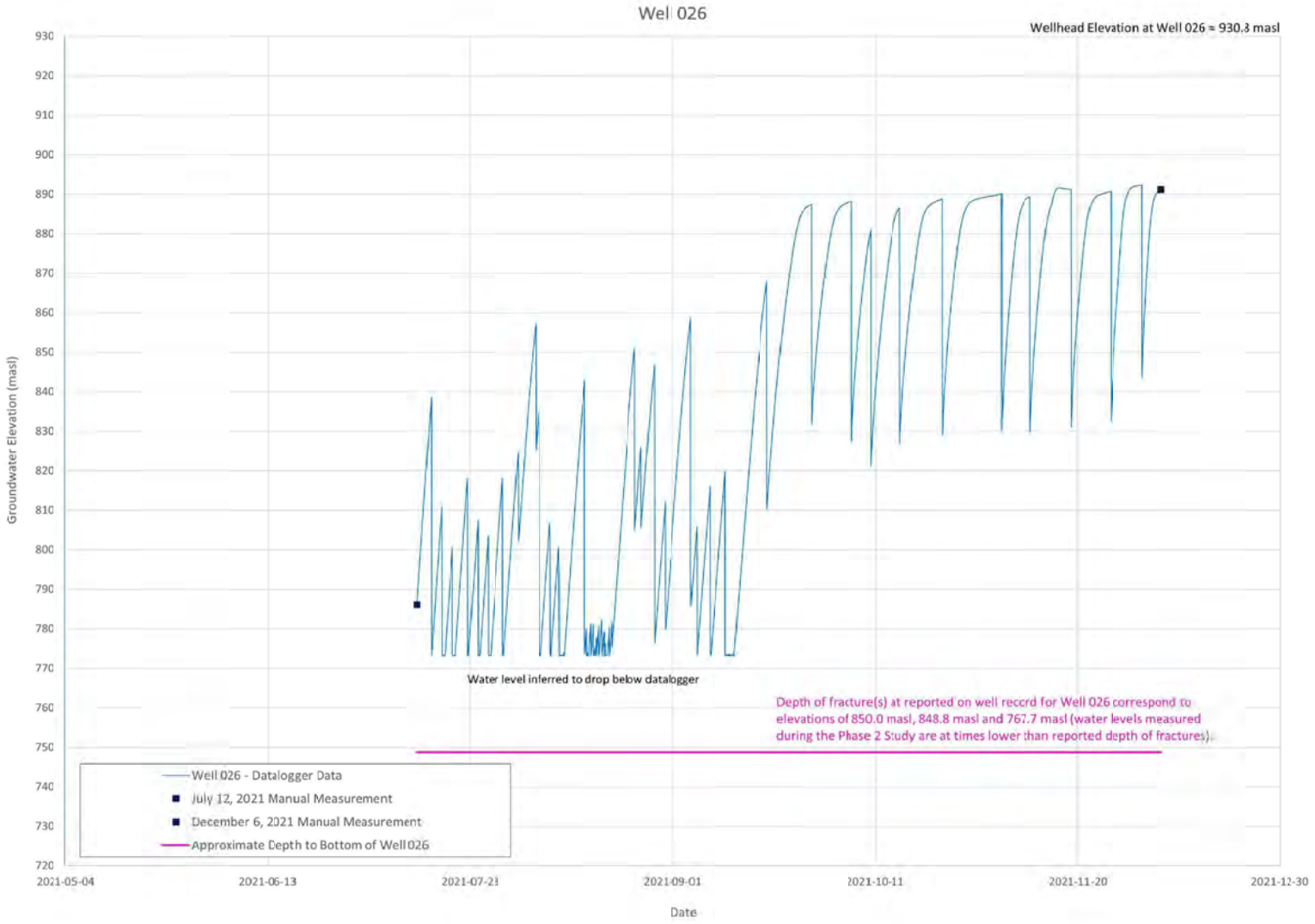
YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 021 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 25 mm

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:11:08 PM
Path: C:\Users\RYJames\AppData\Local\Temp\2\AcPublish_14572\ | File Name: 20144760_1000_5 - Excel.dwg



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 026 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C4

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:11:18 PM
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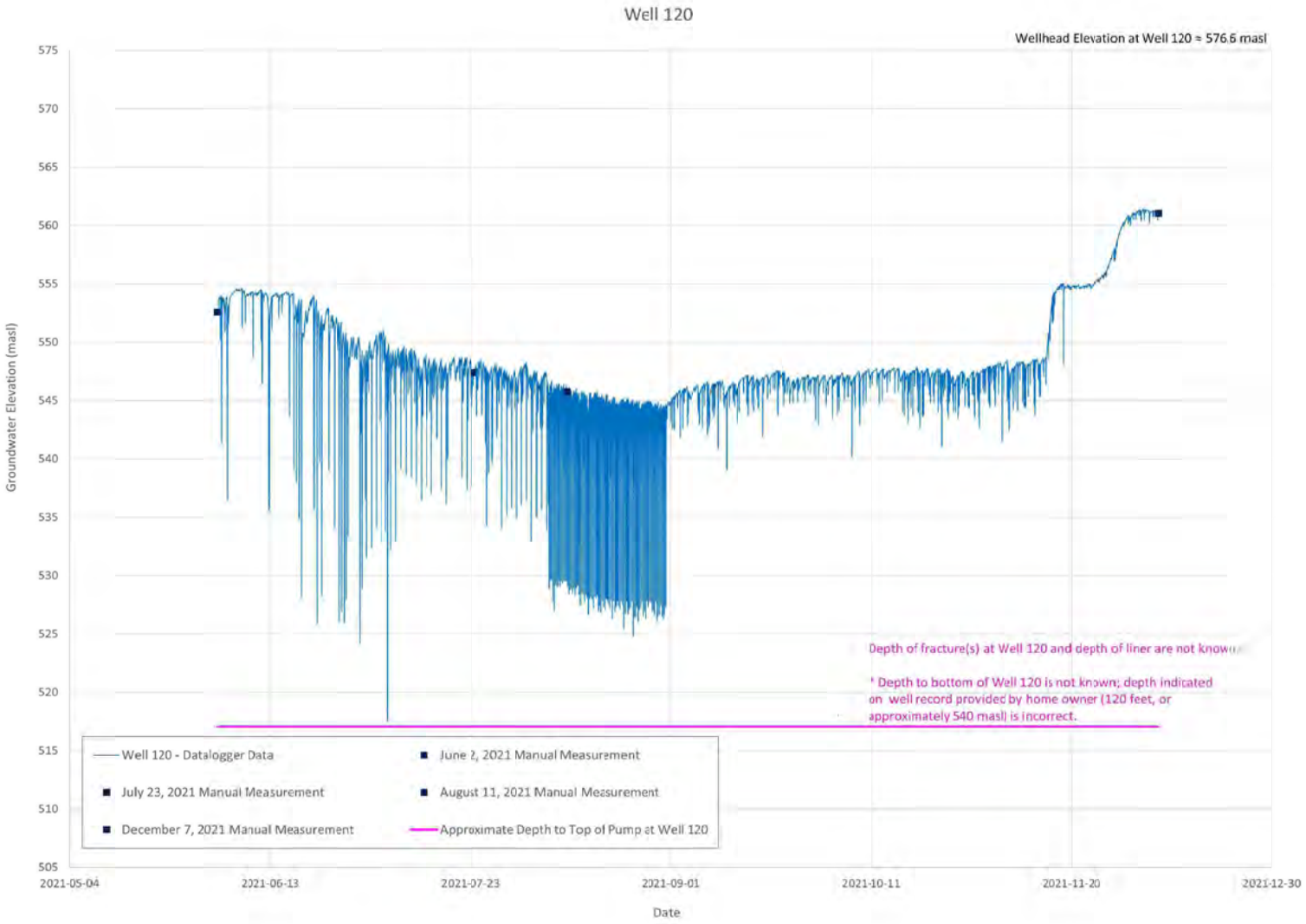

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 120 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C5

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:11:27 PM
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CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

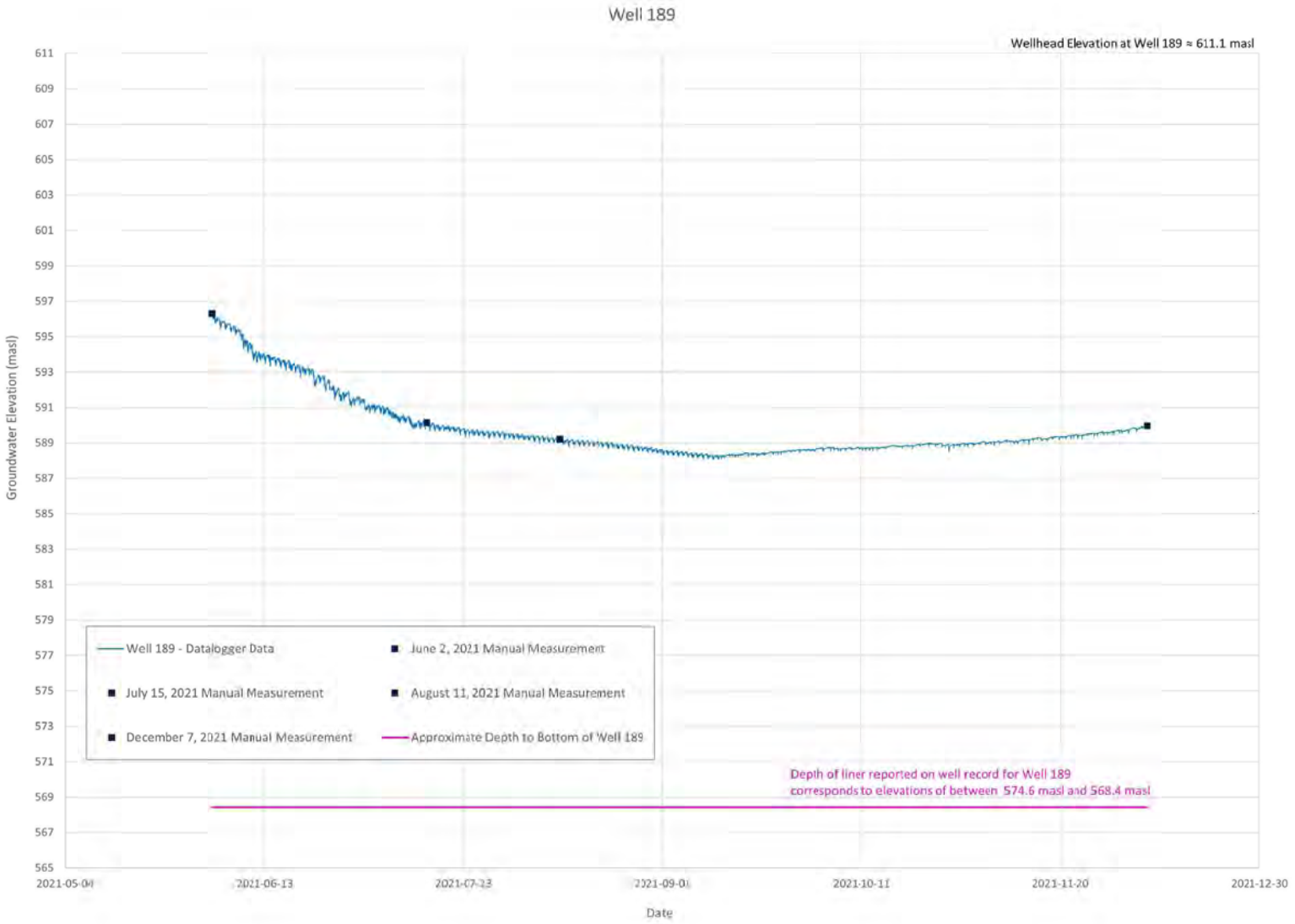
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 180 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 25 mm



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

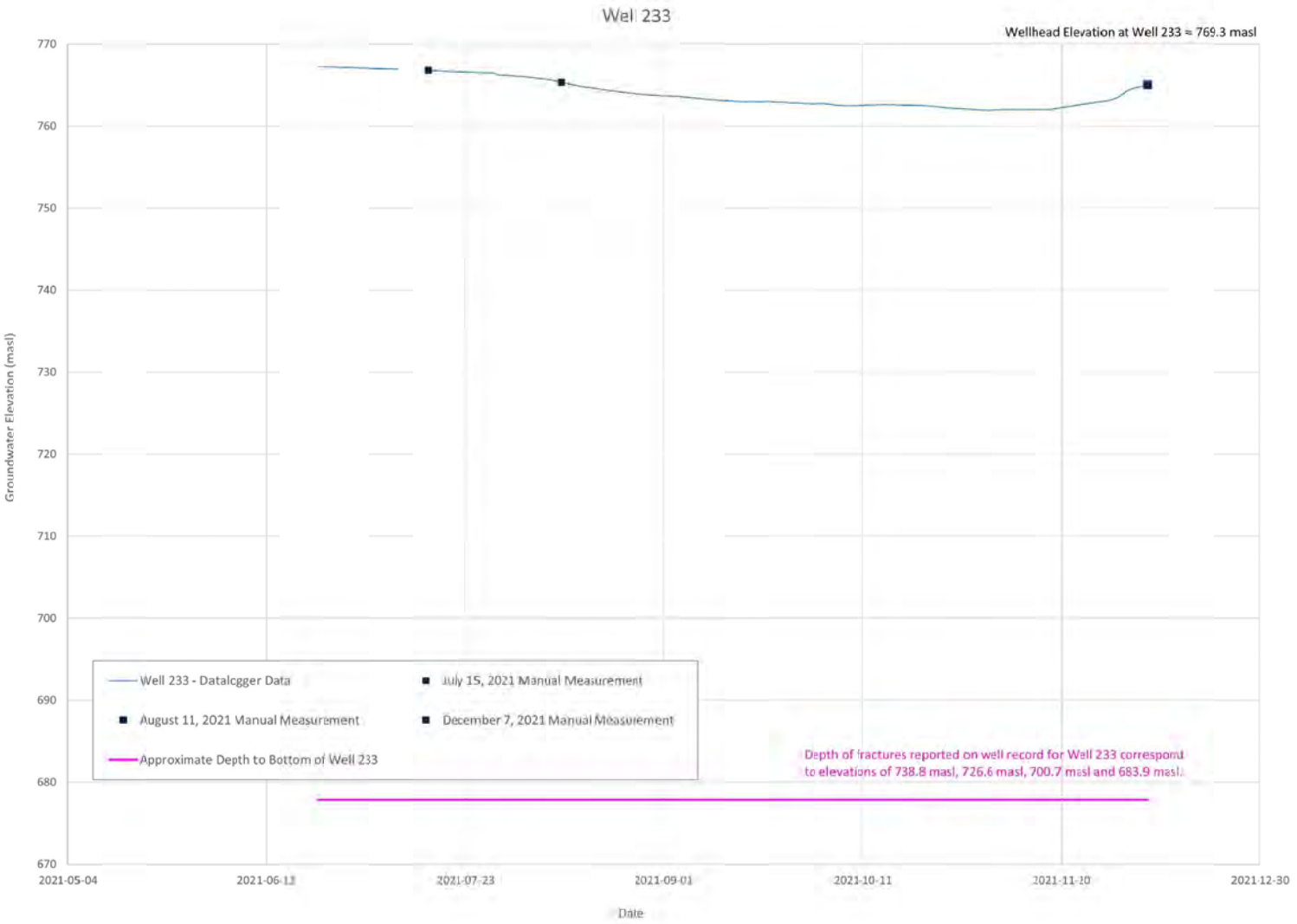
PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 189 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C6



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 233 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C7

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:11:55 PM
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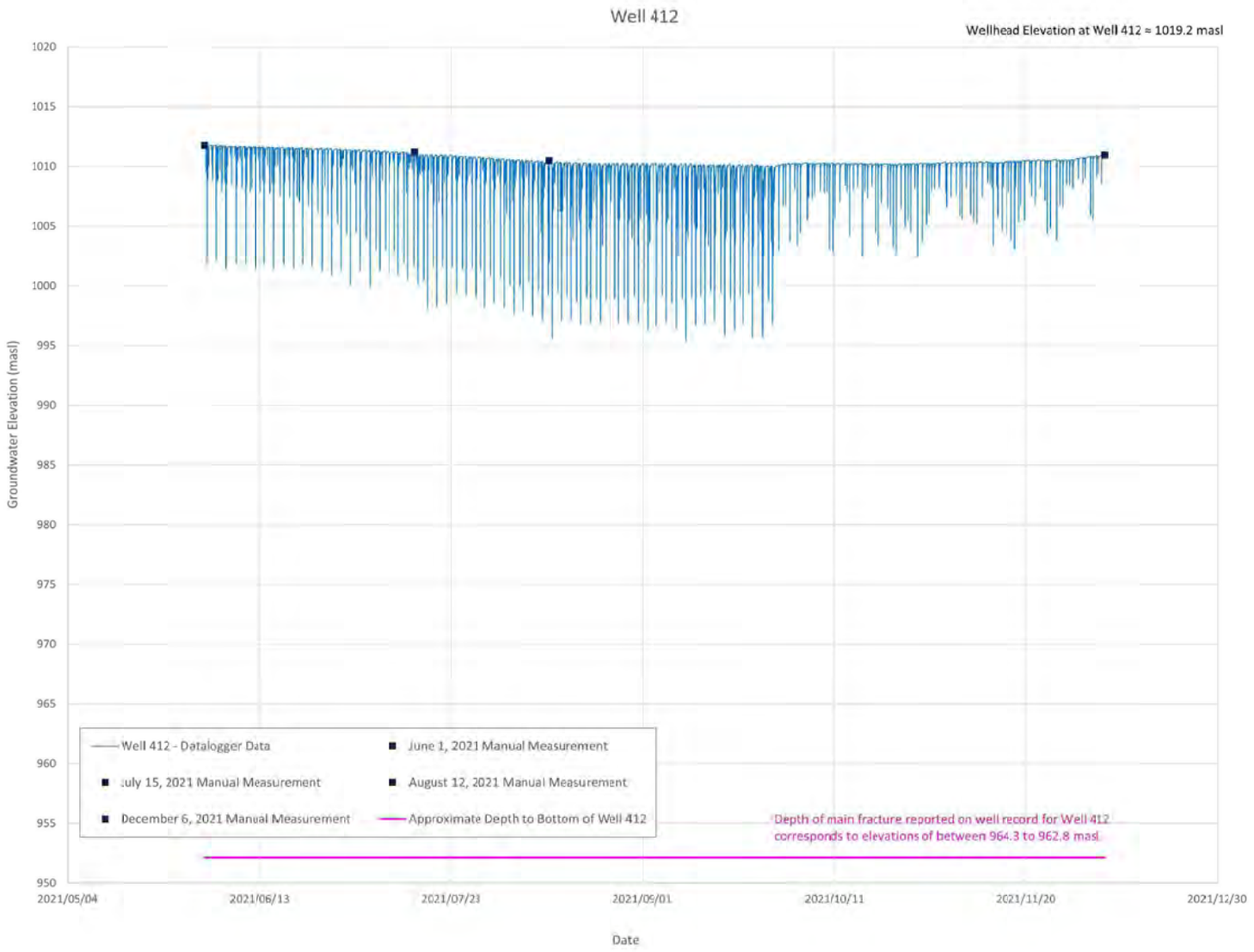


CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

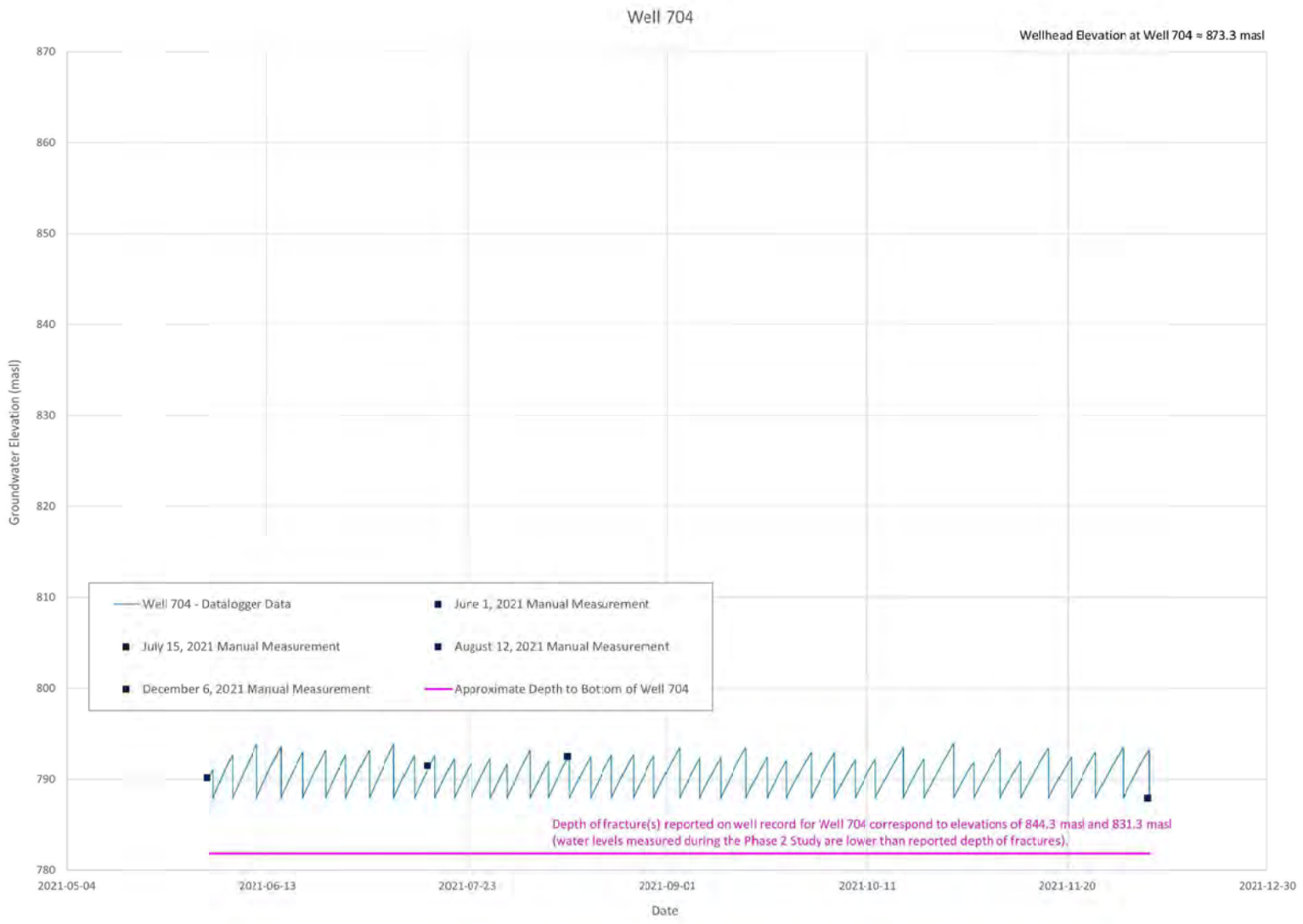
PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 412 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C10



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

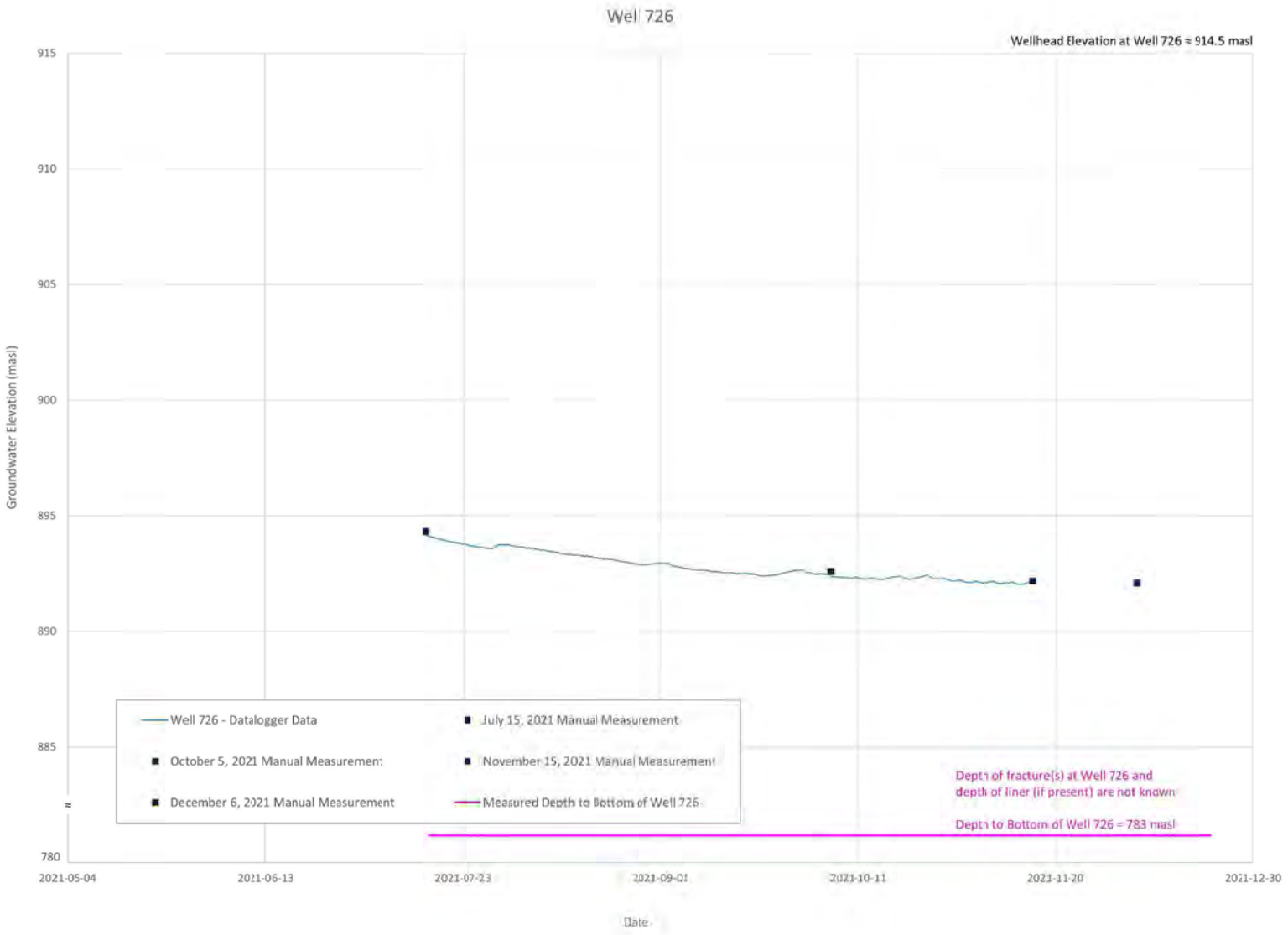
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 704 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C9

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:12:13 PM
Path: C:\Users\RYJames\AppData\Local\Temp\2\AcPublish_14572\ | File Name: 20144760_1000_5 - Excel.dwg



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 726 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C11

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 25 mm

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:12:22 PM
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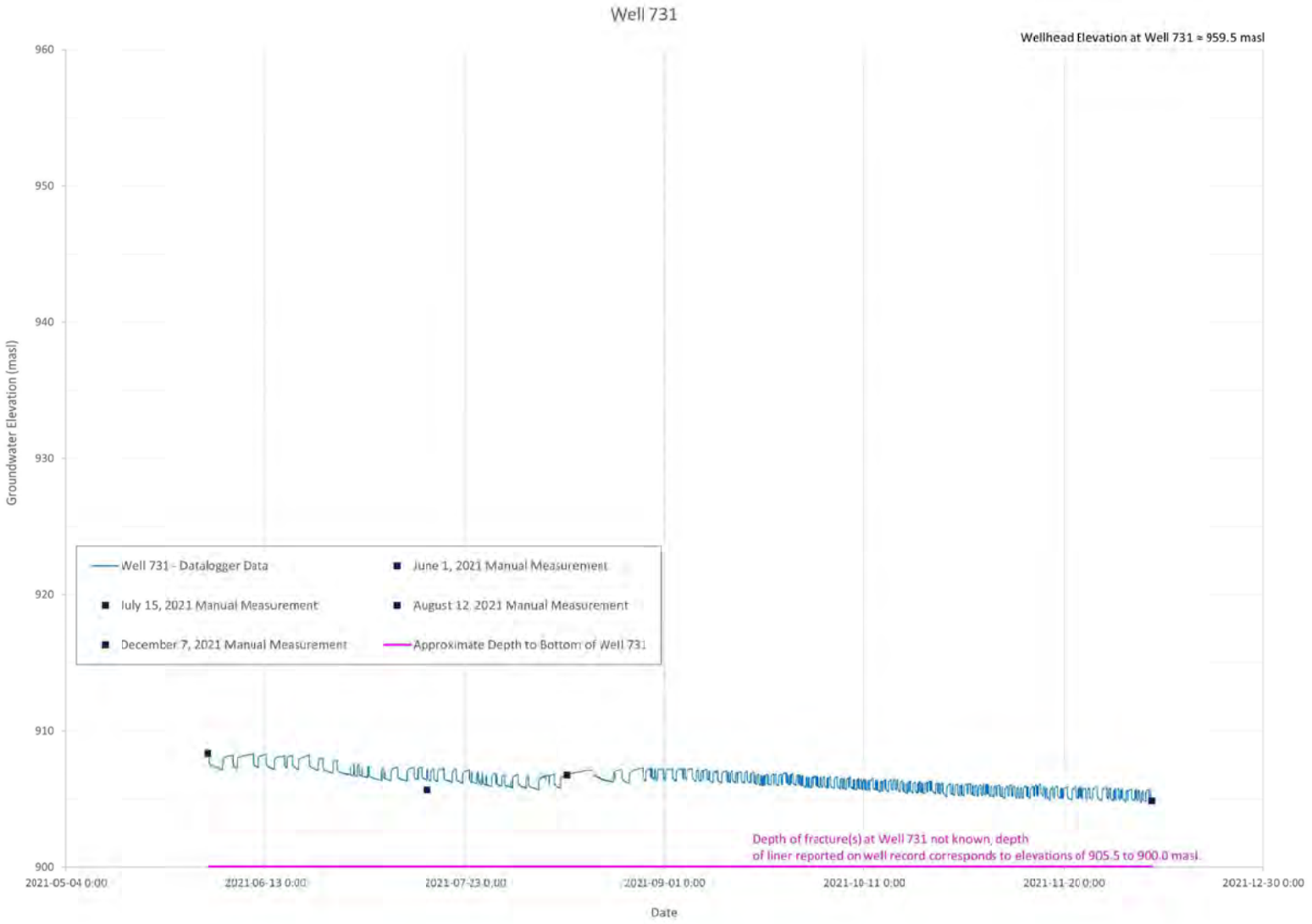

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 731 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C13

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:12:32 PM
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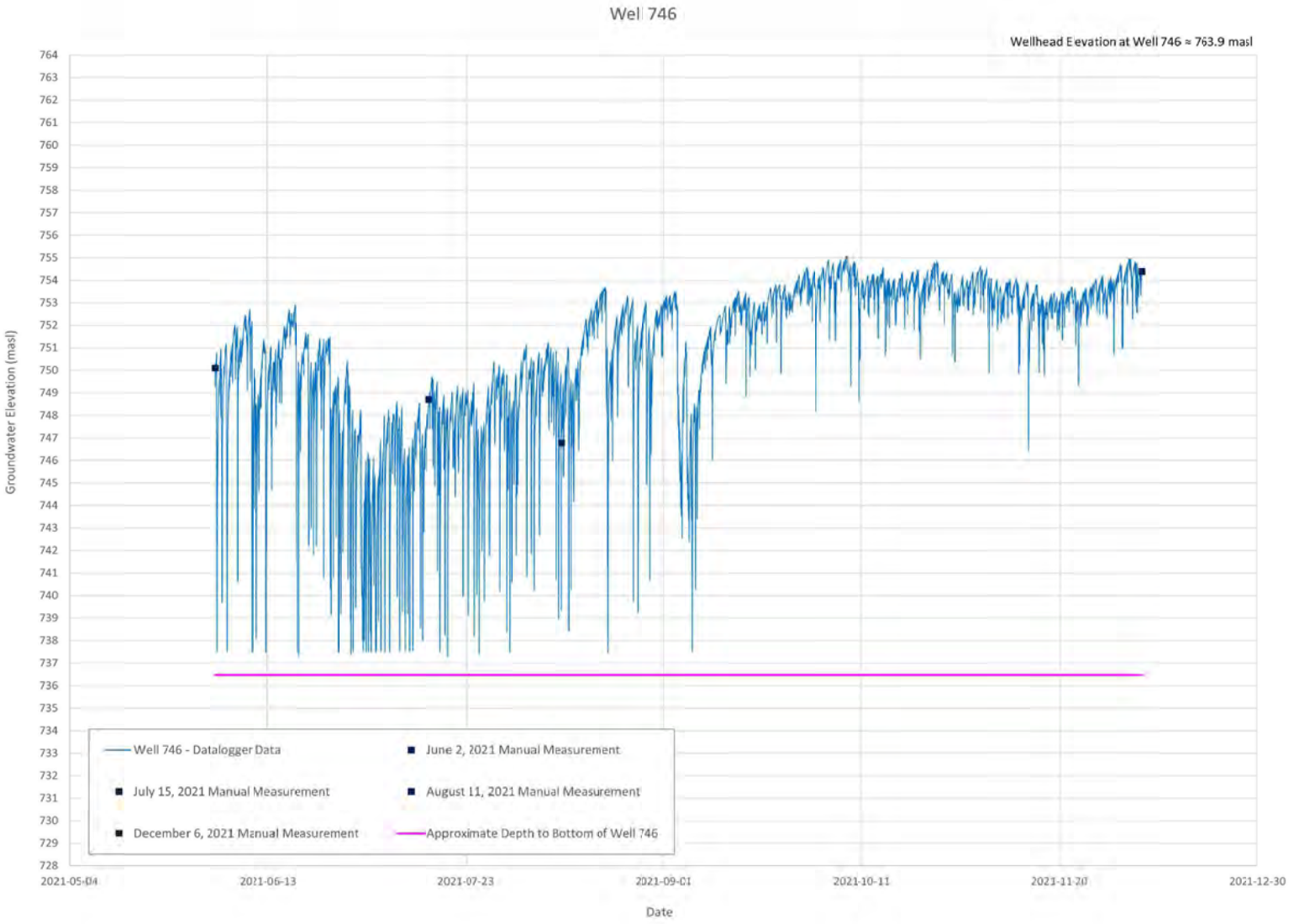


CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

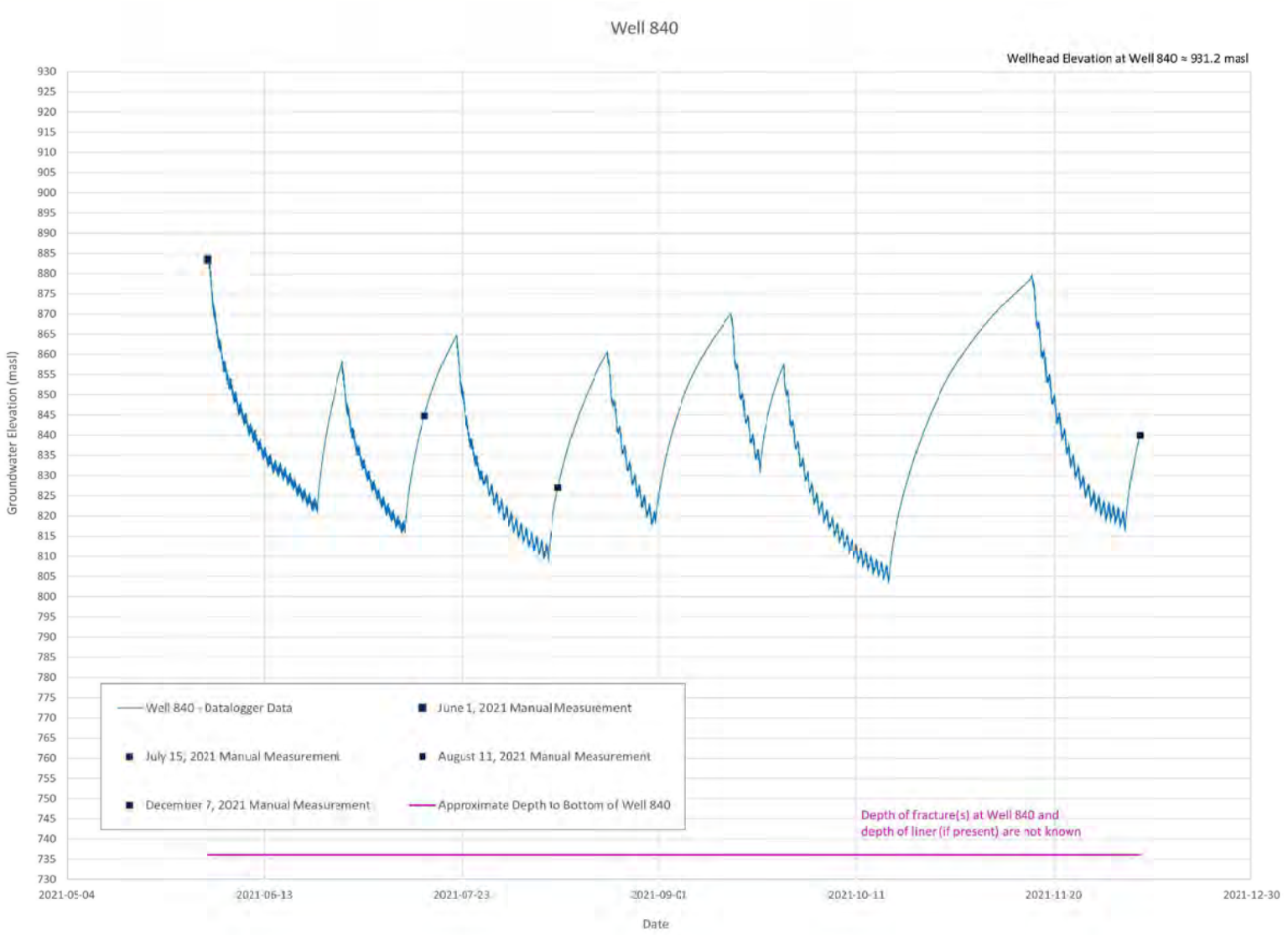
PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 746 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C14



CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 840 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C12

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:12:50 PM
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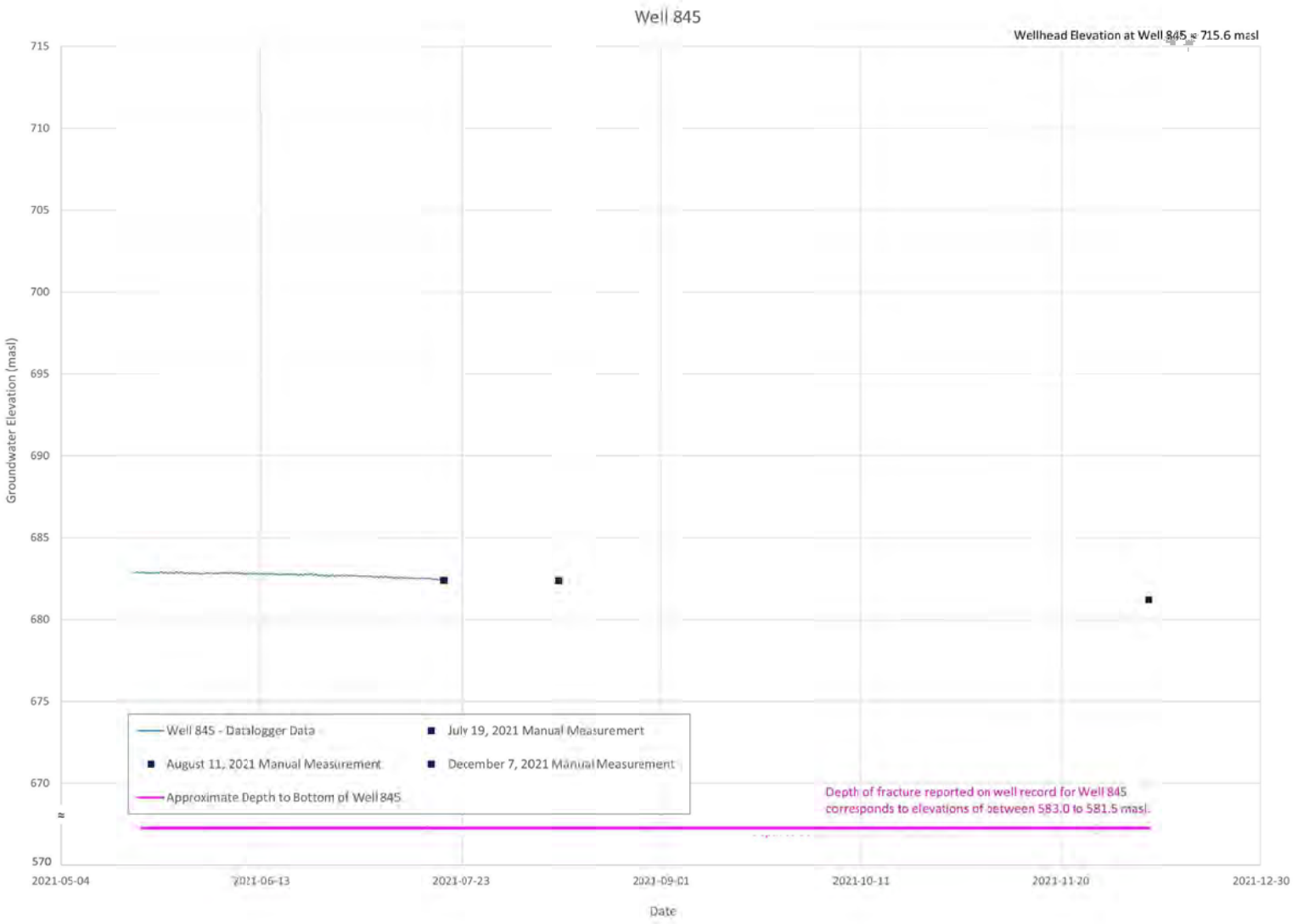

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 845 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C15

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:12:59 PM
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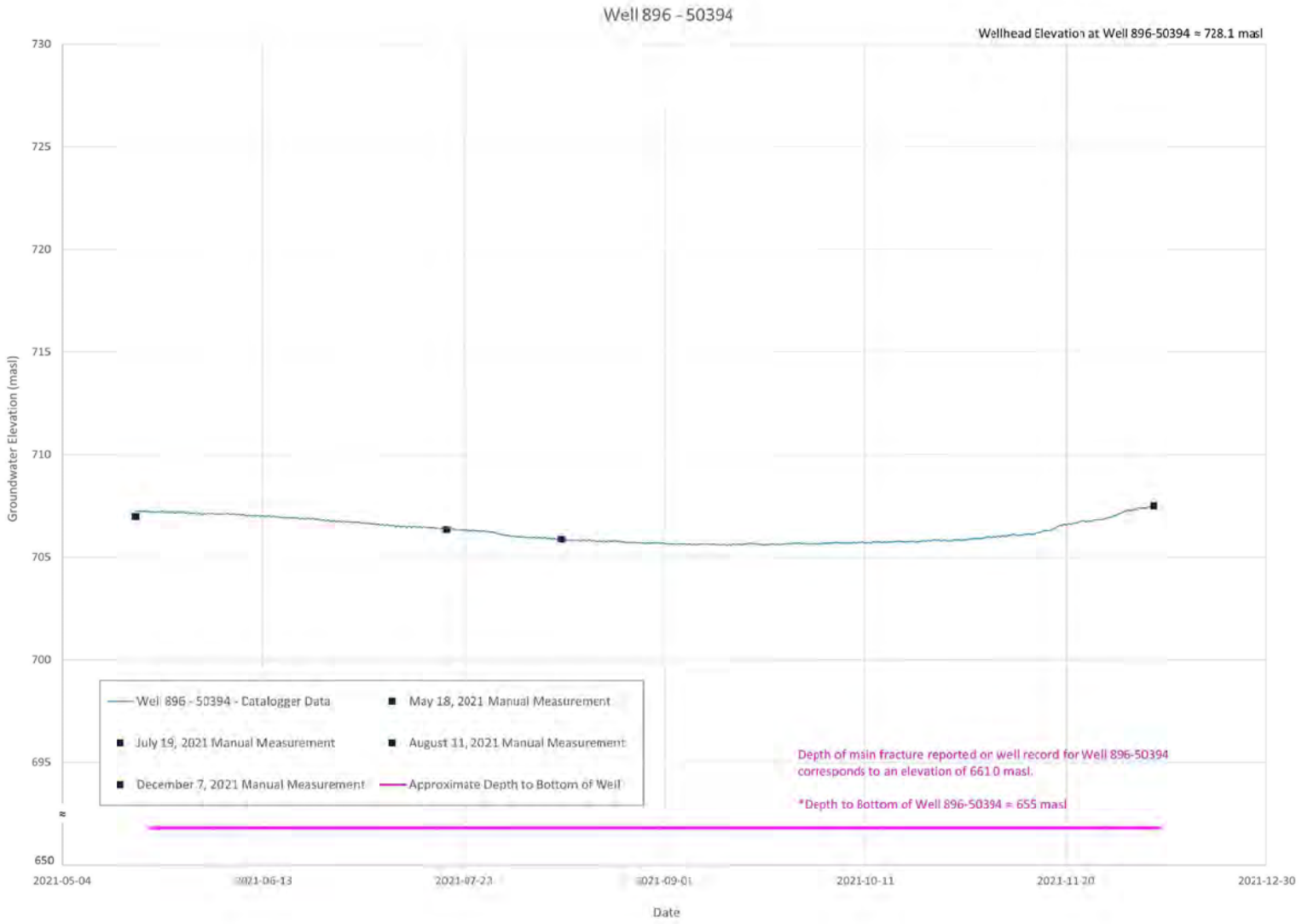

CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 896-50394 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C16

Last Edited By: ryjames Date: 2022-05-30 Time:8:03:17 PM | Printed By: RYJames Date: 2022-05-30 Time:8:13:08 PM
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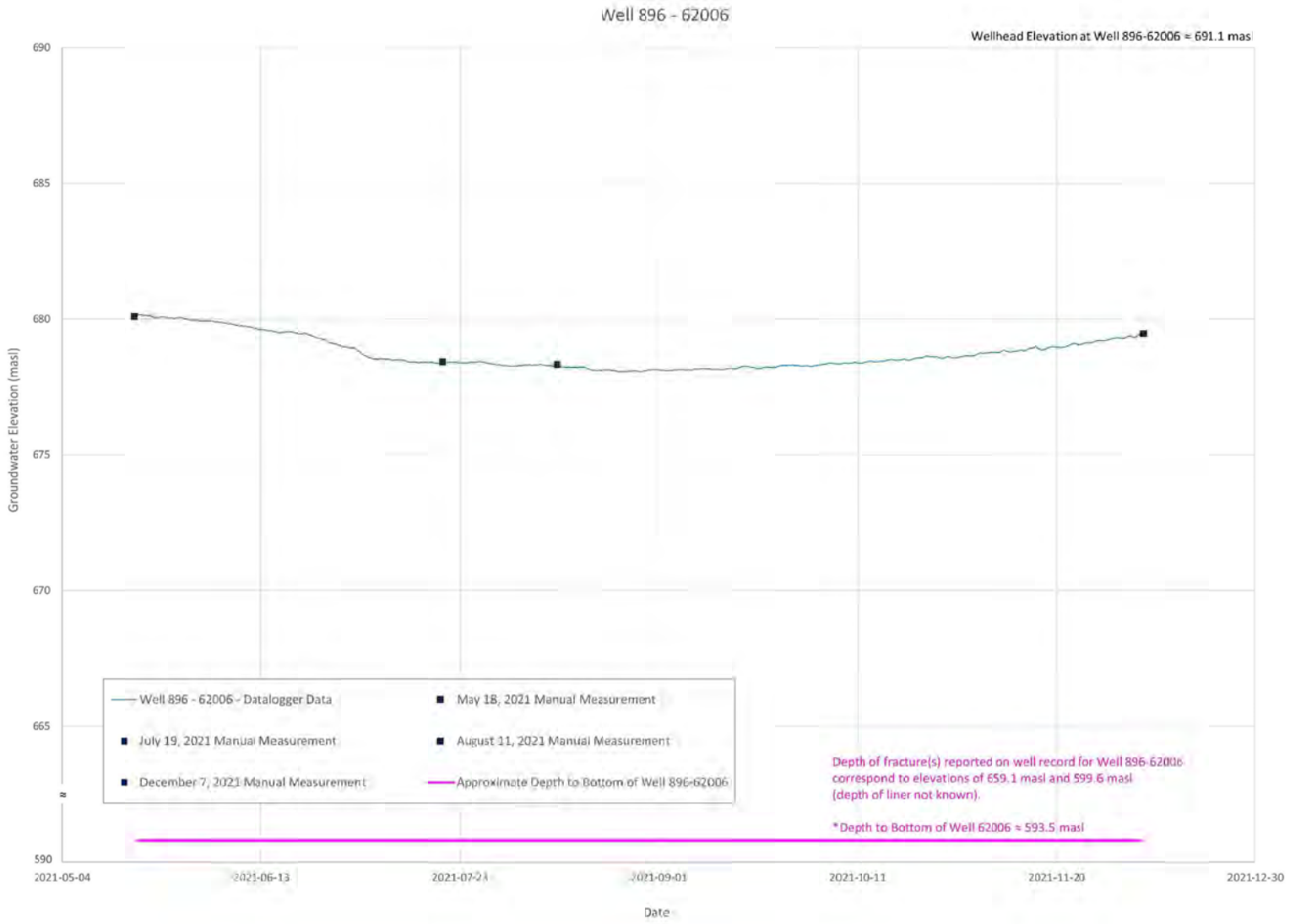


CLIENT
REGIONAL DISTRICT OF NORTH OKANAGAN

PROJECT
KEDDLESTON PHASE 2 GROUNDWATER STUDY

CONSULTANT
WSP GOLDER

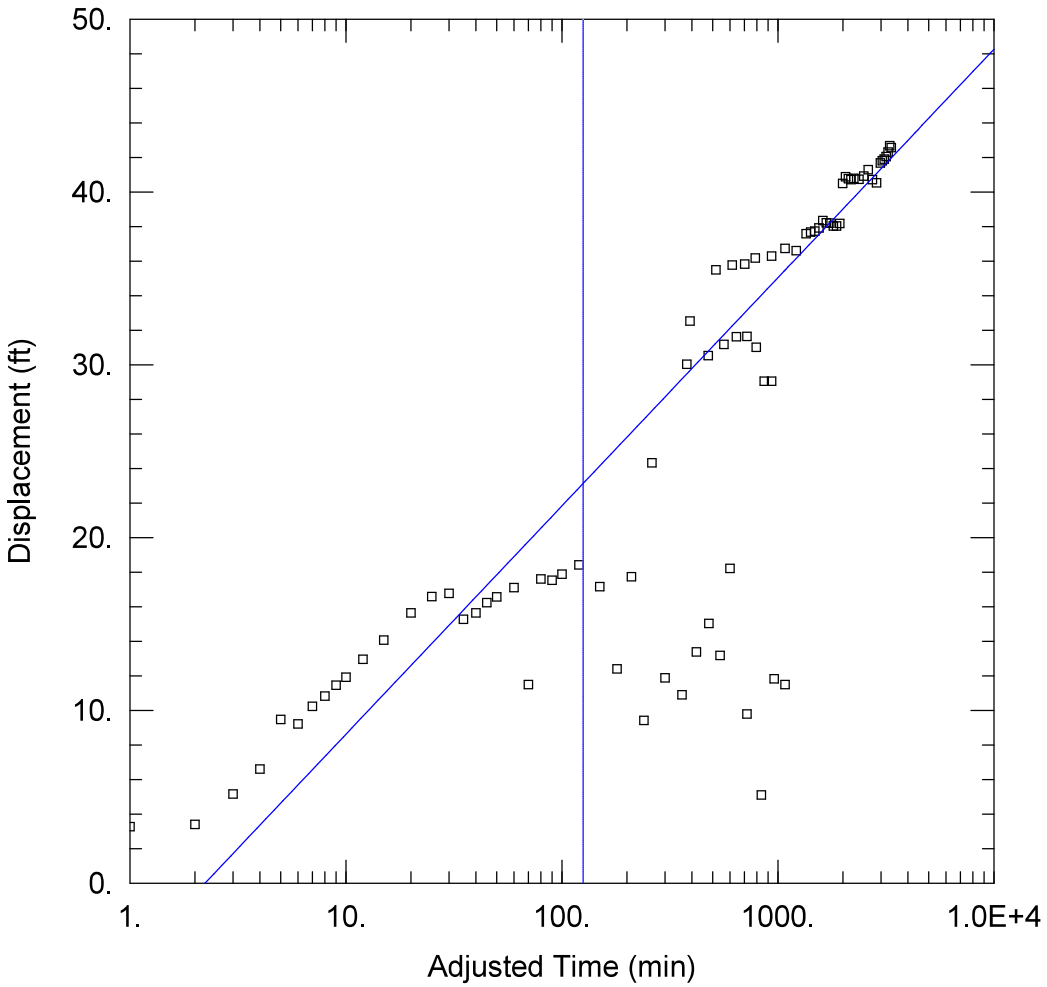
YYYY-MM-DD	2022-05-30
DESIGNED	PA
PREPARED	RTJ
REVIEWED	MAB
APPROVED	JPS

TITLE
WELL 896-62006 - WATER LEVEL TRENDS

PROJECT NO.	PHASE	REV.	APPENDIX
20144760	4.0	0	C17

APPENDIX D

Pumping Test Analysis



PUMPING TEST WELL 180

Data Set: C:\...\well 180 C J.aqt
Date: 03/21/22 Time: 19:25:29

PROJECT INFORMATION

Company: Golder
Client: RDNO
Project: 20144760
Location: Keddleston
Test Well: Well 180
Test Date: 29 Nov 2021

AQUIFER DATA

Saturated Thickness: 134.7 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Well 180	0	0

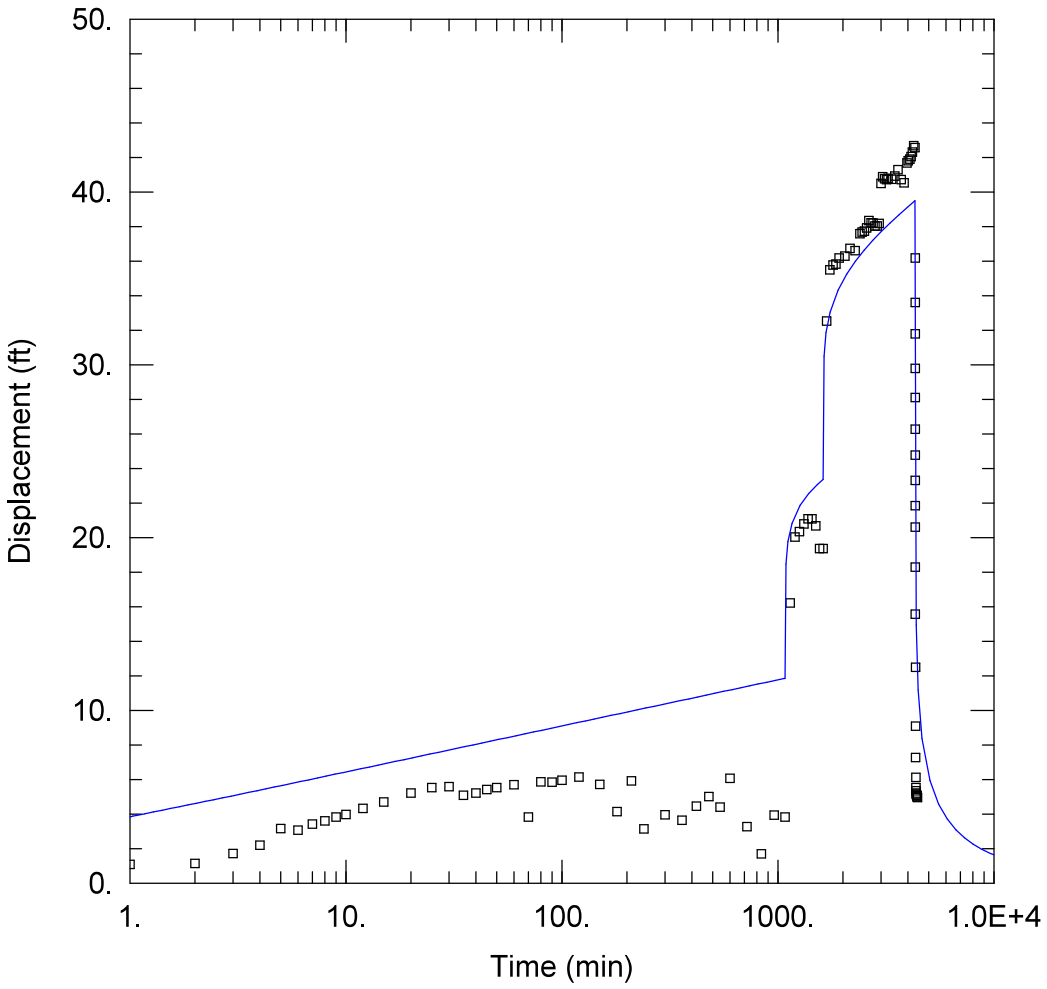
Observation Wells

Well Name	X (ft)	Y (ft)
Well 180	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 8.611E-6 m^2/sec S = 0.4464



PUMPING TEST WELL 180

Data Set: C:\...\well 180 G vert.aqt
Date: 03/21/22 Time: 19:26:53

PROJECT INFORMATION

Company: Golder
Client: RDNO
Project: 20144760
Location: Keddleston
Test Well: Well 180
Test Date: 29 Nov 2021

AQUIFER DATA

Saturated Thickness: 134.7 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Well 180	0	0

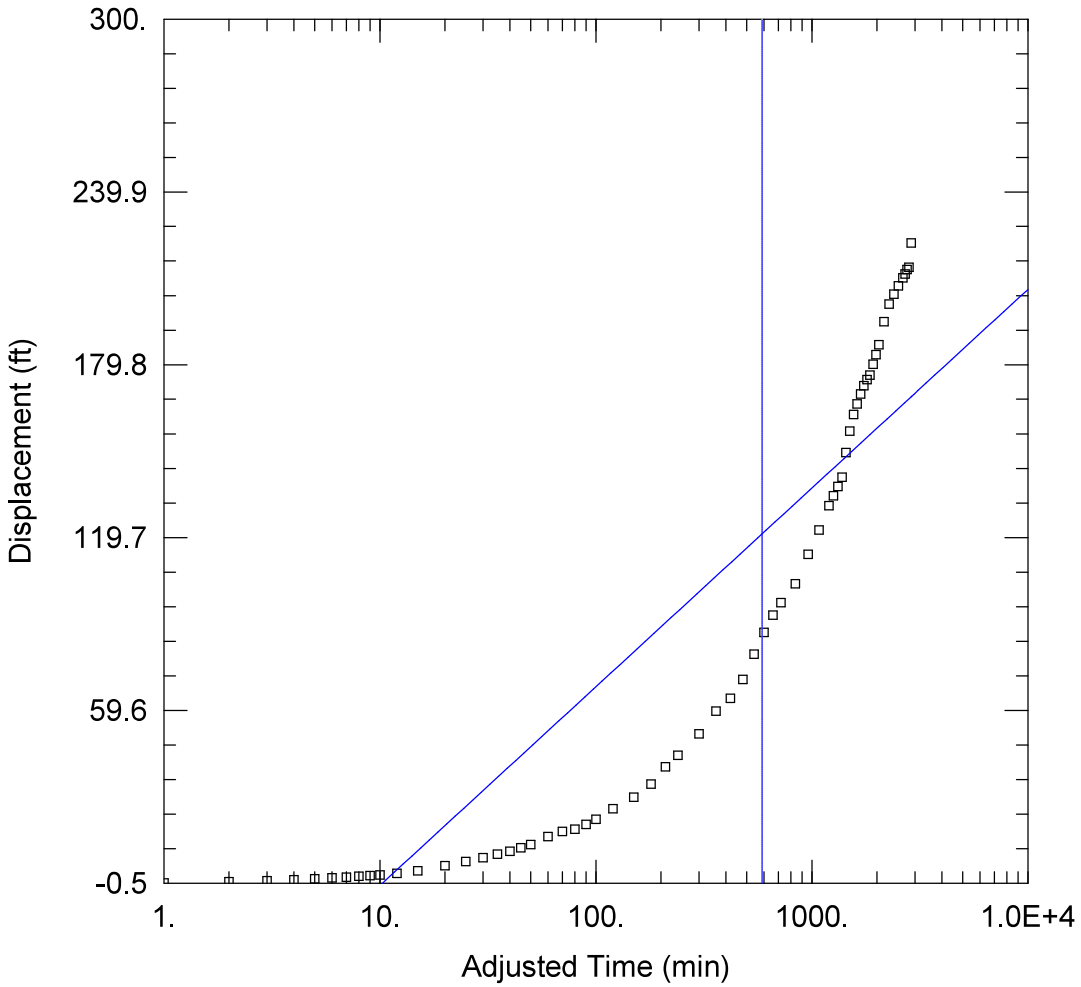
Observation Wells

Well Name	X (ft)	Y (ft)
▫ Well 180	0	0

SOLUTION

Aquifer Model: Fractured Solution Method: Gringarten (Vertical)

Kx = 3.461E-7 m/sec Ss = 9.766E-5 ft^{-1}
Ky/Kx = 1. Lf = 1. ft



WELL TEST ANALYSIS

Data Set: C:\...\well 726 cooper_jacob_metric.aqt
Date: 03/21/22 Time: 19:19:39

PROJECT INFORMATION

Company: Golder
Client: RDNO
Project: 20144760
Location: Keddleston
Test Well: Well 726
Test Date: 24 Jan 2022

AQUIFER DATA

Saturated Thickness: 355.1 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Well 726	0	0

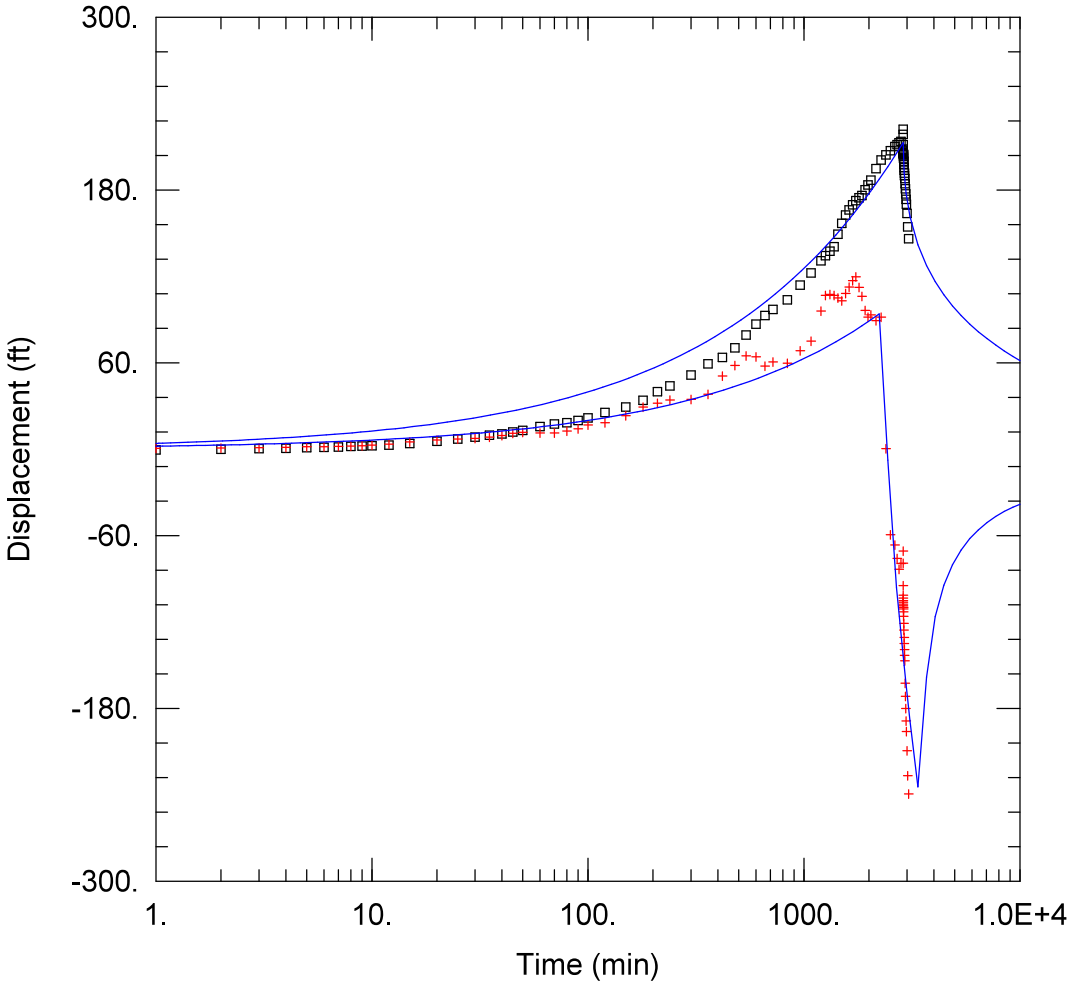
Observation Wells

Well Name	X (ft)	Y (ft)
Well 726	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 4.117E-7 m^2/sec S = 0.1



WELL TEST ANALYSIS

Data Set: C:\...\well 726 G_vert frac_metric.aqt
Date: 03/21/22 Time: 19:21:55

PROJECT INFORMATION

Company: Golder
Client: RDNO
Project: 20144760
Location: Keddleston
Test Well: Well 726
Test Date: 24 Jan 2022

AQUIFER DATA

Saturated Thickness: 355.1 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Well 726	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ Well 726	0	0

SOLUTION

Aquifer Model: Fractured Solution Method: Gringarten (Vertical)

Kx = 2.172E-9 m/sec Ss = 0.0002679 ft^{-1}
Ky/Kx = 0.001487 Lf = 97.41 ft

APPENDIX E

Laboratory Reports

CERTIFICATE OF ANALYSIS

REPORTED TO	Golder Associates Ltd. (Kelowna) 590 McKay Avenue, Suite 300 Kelowna, BC V1Y 5A8		
ATTENTION	Pana Athanasopoulos	**WORK ORDER**	21K2544
PO NUMBER	20448804	**RECEIVED / TEMP**	2021-11-18 16:20 / 3.7°C
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52
PROJECT INFO	[info]	**COC NUMBER**	12399

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.

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

Authorized By:

Nicole Yipp
Client Service Team Lead

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 01 - 120 (21K2544-01) | Matrix: Water | Sampled: 2021-11-18 10:30						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-11-20	
Chloride	**62.5**	AO ≤ 250	0.10	mg/L	2021-11-20	
Fluoride	**0.14**	MAC = 1.5	0.10	mg/L	2021-11-20	
Nitrate (as N)	**9.20**	MAC = 10	0.010	mg/L	2021-11-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-11-20	
Sulfate	**278**	AO ≤ 500	1.0	mg/L	2021-11-20	
Calculated Parameters						
Hardness, Total (as CaCO3)	**610**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**9.20**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**9.75**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Barium, dissolved	**0.0097**	N/A	0.0050	mg/L	2021-11-24	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-11-24	
Cadmium, dissolved	**0.000038**	N/A	0.000010	mg/L	2021-11-24	
Calcium, dissolved	**209**	N/A	0.20	mg/L	2021-11-24	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Copper, dissolved	**0.0210**	N/A	0.00040	mg/L	2021-11-24	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2021-11-24	
Lead, dissolved	**0.00064**	N/A	0.00020	mg/L	2021-11-24	
Lithium, dissolved	**0.0151**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, dissolved	**21.3**	N/A	0.010	mg/L	2021-11-24	
Manganese, dissolved	**0.00046**	N/A	0.00020	mg/L	2021-11-24	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-11-26	
Molybdenum, dissolved	**0.00053**	N/A	0.00010	mg/L	2021-11-24	
Nickel, dissolved	**0.00129**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, dissolved	**3.10**	N/A	0.10	mg/L	2021-11-24	
Selenium, dissolved	**0.00261**	N/A	0.00050	mg/L	2021-11-24	
Silicon, dissolved	**12.3**	N/A	1.0	mg/L	2021-11-24	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-11-24	
Sodium, dissolved	**33.3**	N/A	0.10	mg/L	2021-11-24	
Strontium, dissolved	**0.614**	N/A	0.0010	mg/L	2021-11-24	
Sulfur, dissolved	**88.4**	N/A	3.0	mg/L	2021-11-24	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 01 - 120 (21K2544-01) | Matrix: Water | Sampled: 2021-11-18 10:30, Continued						F2
Dissolved Metals, Continued						
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, dissolved	**0.0193**	N/A	0.000020	mg/L	2021-11-24	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, dissolved	**0.0651**	N/A	0.0040	mg/L	2021-11-24	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
General Parameters						
Alkalinity, Total (as CaCO3)	**276**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Bicarbonate (as CaCO3)	**276**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2021-11-23	
Conductivity (EC)	**1230**	N/A	2.0	µS/cm	2021-11-21	
Nitrogen, Total Kjeldahl	**0.553**	N/A	0.050	mg/L	2021-11-25	
pH	**7.23**	7.0-10.5	0.10	pH units	2021-11-21	HT2
Solids, Total Dissolved	**806**	AO ≤ 500	15	mg/L	2021-11-22	
Solids, Total Suspended	< 2.0	N/A	2.0	mg/L	2021-11-24	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-11-19	
Coliforms, Total	16	MAC = 0		MPN/100 mL	2021-11-19	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-11-19	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-16.32**	N/A		per mil	2022-01-20	
delta-2-H	**-126.6**	N/A		per mil	2022-01-20	
Total Metals						
Aluminum, total	**0.0443**	OG < 0.1	0.0050	mg/L	2021-11-24	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-11-24	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2021-11-24	
Barium, total	**0.0106**	MAC = 2	0.0050	mg/L	2021-11-24	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-11-24	
Cadmium, total	**0.000044**	MAC = 0.005	0.000010	mg/L	2021-11-24	
Calcium, total	**227**	None Required	0.20	mg/L	2021-11-24	
Chromium, total	**0.00145**	MAC = 0.05	0.00050	mg/L	2021-11-24	
Cobalt, total	**0.00014**	N/A	0.00010	mg/L	2021-11-24	
Copper, total	**0.0100**	MAC = 2	0.00040	mg/L	2021-11-24	
Iron, total	**0.070**	AO ≤ 0.3	0.010	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 01 - 120 (21K2544-01) | Matrix: Water | Sampled: 2021-11-18 10:30, Continued						F2
Total Metals, Continued						
Lead, total	**0.00075**	MAC = 0.005	0.00020	mg/L	2021-11-24	
Lithium, total	**0.0195**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, total	**22.7**	None Required	0.010	mg/L	2021-11-24	
Manganese, total	**0.00261**	MAC = 0.12	0.00020	mg/L	2021-11-24	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-11-24	CT5
Molybdenum, total	**0.00072**	N/A	0.00010	mg/L	2021-11-24	
Nickel, total	**0.00243**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, total	**3.66**	N/A	0.10	mg/L	2021-11-24	
Selenium, total	**0.00222**	MAC = 0.05	0.00050	mg/L	2021-11-24	
Silicon, total	**12.8**	N/A	1.0	mg/L	2021-11-24	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-11-24	
Sodium, total	**34.3**	AO ≤ 200	0.10	mg/L	2021-11-24	
Strontium, total	**0.641**	MAC = 7	0.0010	mg/L	2021-11-24	
Sulfur, total	**103**	N/A	3.0	mg/L	2021-11-24	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, total	**0.0214**	MAC = 0.02	0.000020	mg/L	2021-11-24	
Vanadium, total	**0.0011**	N/A	0.0010	mg/L	2021-11-24	
Zinc, total	**0.0453**	AO ≤ 5	0.0040	mg/L	2021-11-24	
Zirconium, total	**0.00015**	N/A	0.00010	mg/L	2021-11-24	
12399 - 02 - 000 (21K2544-02) | Matrix: Water | Sampled: 2021-11-18 12:00						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-11-20	
Chloride	**5.96**	AO ≤ 250	0.10	mg/L	2021-11-20	
Fluoride	**1.43**	MAC = 1.5	0.10	mg/L	2021-11-20	
Nitrate (as N)	**0.025**	MAC = 10	0.010	mg/L	2021-11-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-11-20	
Sulfate	**635**	AO ≤ 500	1.0	mg/L	2021-11-20	
Calculated Parameters						
Hardness, Total (as CaCO3)	**600**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.0252**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 02 - 000 (21K2544-02) | Matrix: Water | Sampled: 2021-11-18 12:00, Continued						F2
Dissolved Metals, Continued						
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Barium, dissolved	**0.0073**	N/A	0.0050	mg/L	2021-11-24	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-11-24	
Cadmium, dissolved	**0.000019**	N/A	0.000010	mg/L	2021-11-24	
Calcium, dissolved	**105**	N/A	0.20	mg/L	2021-11-24	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Cobalt, dissolved	**0.00043**	N/A	0.00010	mg/L	2021-11-24	
Copper, dissolved	**0.00363**	N/A	0.00040	mg/L	2021-11-24	
Iron, dissolved	**0.016**	N/A	0.010	mg/L	2021-11-24	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Lithium, dissolved	**0.423**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, dissolved	**81.9**	N/A	0.010	mg/L	2021-11-24	
Manganese, dissolved	**0.0305**	N/A	0.00020	mg/L	2021-11-24	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-11-26	
Molybdenum, dissolved	**0.00239**	N/A	0.00010	mg/L	2021-11-24	
Nickel, dissolved	**0.00495**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, dissolved	**11.0**	N/A	0.10	mg/L	2021-11-24	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Silicon, dissolved	**16.8**	N/A	1.0	mg/L	2021-11-24	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-11-24	
Sodium, dissolved	**192**	N/A	0.10	mg/L	2021-11-24	
Strontium, dissolved	**2.80**	N/A	0.0010	mg/L	2021-11-24	
Sulfur, dissolved	**189**	N/A	3.0	mg/L	2021-11-24	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, dissolved	**0.000023**	N/A	0.000020	mg/L	2021-11-24	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, dissolved	**0.0104**	N/A	0.00020	mg/L	2021-11-24	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, dissolved	**0.00119**	N/A	0.000020	mg/L	2021-11-24	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, dissolved	**0.816**	N/A	0.0040	mg/L	2021-11-24	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
General Parameters						
Alkalinity, Total (as CaCO3)	**439**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Bicarbonate (as CaCO3)	**439**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 02 - 000 (21K2544-02) | Matrix: Water | Sampled: 2021-11-18 12:00, Continued						F2
General Parameters, Continued						
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2021-11-23	
Conductivity (EC)	**1860**	N/A	2.0	µS/cm	2021-11-21	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2021-11-25	
pH	**7.58**	7.0-10.5	0.10	pH units	2021-11-21	HT2
Solids, Total Dissolved	**1210**	AO ≤ 500	15	mg/L	2021-11-22	
Solids, Total Suspended	< 2.0	N/A	2.0	mg/L	2021-11-24	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-11-19	
Coliforms, Total	**5**	MAC = 0		MPN/100 mL	2021-11-19	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-11-19	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-18.77**	N/A		per mil	2022-01-20	
delta-2-H	**-144.6**	N/A		per mil	2022-01-20	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2021-11-24	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-11-24	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2021-11-24	
Barium, total	**0.0086**	MAC = 2	0.0050	mg/L	2021-11-24	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-11-24	
Cadmium, total	**0.000048**	MAC = 0.005	0.000010	mg/L	2021-11-24	
Calcium, total	**127**	None Required	0.20	mg/L	2021-11-24	
Chromium, total	**0.00055**	MAC = 0.05	0.00050	mg/L	2021-11-24	
Cobalt, total	**0.00052**	N/A	0.00010	mg/L	2021-11-24	
Copper, total	**0.00441**	MAC = 2	0.00040	mg/L	2021-11-24	
Iron, total	**0.172**	AO ≤ 0.3	0.010	mg/L	2021-11-24	
Lead, total	**0.00035**	MAC = 0.005	0.00020	mg/L	2021-11-24	
Lithium, total	**0.585**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, total	**90.5**	None Required	0.010	mg/L	2021-11-24	
Manganese, total	**0.0376**	MAC = 0.12	0.00020	mg/L	2021-11-24	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-11-24	CT5
Molybdenum, total	**0.00295**	N/A	0.00010	mg/L	2021-11-24	
Nickel, total	**0.00658**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, total	**13.6**	N/A	0.10	mg/L	2021-11-24	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-11-24	
Silicon, total	**19.4**	N/A	1.0	mg/L	2021-11-24	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-11-24	
Sodium, total	**213**	AO ≤ 200	0.10	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 02 - 000 (21K2544-02) | Matrix: Water | Sampled: 2021-11-18 12:00, Continued						F2
Total Metals, Continued						
Strontium, total	**3.33**	MAC = 7	0.0010	mg/L	2021-11-24	
Sulfur, total	**240**	N/A	3.0	mg/L	2021-11-24	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, total	**0.000033**	N/A	0.000020	mg/L	2021-11-24	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, total	**0.00332**	N/A	0.00020	mg/L	2021-11-24	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, total	**0.00143**	MAC = 0.02	0.000020	mg/L	2021-11-24	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, total	**0.955**	AO ≤ 5	0.0040	mg/L	2021-11-24	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
12399 - 03 - 021 (21K2544-03) | Matrix: Water | Sampled: 2021-11-18 12:45						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-11-20	
Chloride	**11.3**	AO ≤ 250	0.10	mg/L	2021-11-20	
Fluoride	**0.23**	MAC = 1.5	0.10	mg/L	2021-11-20	
Nitrate (as N)	**0.082**	MAC = 10	0.010	mg/L	2021-11-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-11-20	
Sulfate	**518**	AO ≤ 500	1.0	mg/L	2021-11-20	
Calculated Parameters						
Hardness, Total (as CaCO3)	**659**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.0824**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.239**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	**0.0054**	N/A	0.0050	mg/L	2021-11-24	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Arsenic, dissolved	**0.00076**	N/A	0.00050	mg/L	2021-11-24	
Barium, dissolved	**0.0251**	N/A	0.0050	mg/L	2021-11-24	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-11-24	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-11-24	
Calcium, dissolved	**166**	N/A	0.20	mg/L	2021-11-24	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Copper, dissolved	**0.00180**	N/A	0.00040	mg/L	2021-11-24	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2021-11-24	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 03 - 021 (21K2544-03) | Matrix: Water | Sampled: 2021-11-18 12:45, Continued						F2
Dissolved Metals, Continued						
Lithium, dissolved	**0.0171**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, dissolved	**59.4**	N/A	0.010	mg/L	2021-11-24	
Manganese, dissolved	**0.0145**	N/A	0.00020	mg/L	2021-11-24	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-11-26	
Molybdenum, dissolved	**0.00921**	N/A	0.00010	mg/L	2021-11-24	
Nickel, dissolved	< 0.00040	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, dissolved	**5.63**	N/A	0.10	mg/L	2021-11-24	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Silicon, dissolved	**9.2**	N/A	1.0	mg/L	2021-11-24	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-11-24	
Sodium, dissolved	**53.8**	N/A	0.10	mg/L	2021-11-24	
Strontium, dissolved	**2.17**	N/A	0.0010	mg/L	2021-11-24	
Sulfur, dissolved	**161**	N/A	3.0	mg/L	2021-11-24	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, dissolved	**0.0139**	N/A	0.000020	mg/L	2021-11-24	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2021-11-24	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
General Parameters						
Alkalinity, Total (as CaCO3)	**259**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Bicarbonate (as CaCO3)	**259**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2021-11-23	
Conductivity (EC)	**1320**	N/A	2.0	µS/cm	2021-11-21	
Nitrogen, Total Kjeldahl	**0.157**	N/A	0.050	mg/L	2021-11-25	
pH	**7.67**	7.0-10.5	0.10	pH units	2021-11-21	HT2
Solids, Total Dissolved	**965**	AO ≤ 500	15	mg/L	2021-11-22	
Solids, Total Suspended	< 2.0	N/A	2.0	mg/L	2021-11-24	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-11-19	
Coliforms, Total	**276**	MAC = 0		MPN/100 mL	2021-11-19	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-11-19	
Miscellaneous Subcontracted Parameters						

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 03 - 021 (21K2544-03) | Matrix: Water | Sampled: 2021-11-18 12:45, Continued						F2
Miscellaneous Subcontracted Parameters, Continued						
delta-18-O	**-18.1**	N/A		per mil	2022-01-20	
delta-2-H	**-139.1**	N/A		per mil	2022-01-20	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2021-11-24	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-11-24	
Arsenic, total	**0.00076**	MAC = 0.01	0.00050	mg/L	2021-11-24	
Barium, total	**0.0265**	MAC = 2	0.0050	mg/L	2021-11-24	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-11-24	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2021-11-24	
Calcium, total	**185**	None Required	0.20	mg/L	2021-11-24	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-11-24	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Copper, total	**0.00121**	MAC = 2	0.00040	mg/L	2021-11-24	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2021-11-24	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2021-11-24	
Lithium, total	**0.0218**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, total	**61.2**	None Required	0.010	mg/L	2021-11-24	
Manganese, total	**0.0162**	MAC = 0.12	0.00020	mg/L	2021-11-24	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-11-24	CT5
Molybdenum, total	**0.00966**	N/A	0.00010	mg/L	2021-11-24	
Nickel, total	**0.00042**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, total	**6.39**	N/A	0.10	mg/L	2021-11-24	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-11-24	
Silicon, total	**9.2**	N/A	1.0	mg/L	2021-11-24	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-11-24	
Sodium, total	**54.9**	AO ≤ 200	0.10	mg/L	2021-11-24	
Strontium, total	**2.20**	MAC = 7	0.0010	mg/L	2021-11-24	
Sulfur, total	**187**	N/A	3.0	mg/L	2021-11-24	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, total	**0.0150**	MAC = 0.02	0.000020	mg/L	2021-11-24	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2021-11-24	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 04 - 412 (21K2544-04) | Matrix: Water | Sampled: 2021-11-18 13:50						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-11-20	
Chloride	**1.09**	AO ≤ 250	0.10	mg/L	2021-11-20	
Fluoride	**0.12**	MAC = 1.5	0.10	mg/L	2021-11-20	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2021-11-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-11-20	
Sulfate	**72.3**	AO ≤ 500	1.0	mg/L	2021-11-20	
Calculated Parameters						
Hardness, Total (as CaCO3)	**385**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Barium, dissolved	**0.0265**	N/A	0.0050	mg/L	2021-11-24	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-11-24	
Cadmium, dissolved	**0.000022**	N/A	0.000010	mg/L	2021-11-24	
Calcium, dissolved	**97.8**	N/A	0.20	mg/L	2021-11-24	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Cobalt, dissolved	**0.00013**	N/A	0.00010	mg/L	2021-11-24	
Copper, dissolved	**0.00266**	N/A	0.00040	mg/L	2021-11-24	
Iron, dissolved	**0.017**	N/A	0.010	mg/L	2021-11-24	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Lithium, dissolved	**0.0185**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, dissolved	**34.2**	N/A	0.010	mg/L	2021-11-24	
Manganese, dissolved	**0.0500**	N/A	0.00020	mg/L	2021-11-24	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-11-26	
Molybdenum, dissolved	**0.00429**	N/A	0.00010	mg/L	2021-11-24	
Nickel, dissolved	**0.00095**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, dissolved	**3.59**	N/A	0.10	mg/L	2021-11-24	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Silicon, dissolved	**9.5**	N/A	1.0	mg/L	2021-11-24	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-11-24	
Sodium, dissolved	**8.48**	N/A	0.10	mg/L	2021-11-24	
Strontium, dissolved	**0.888**	N/A	0.0010	mg/L	2021-11-24	
Sulfur, dissolved	**22.1**	N/A	3.0	mg/L	2021-11-24	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 04 - 412 (21K2544-04) | Matrix: Water | Sampled: 2021-11-18 13:50, Continued						F2
Dissolved Metals, Continued						
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, dissolved	**0.00498**	N/A	0.000020	mg/L	2021-11-24	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, dissolved	**0.0351**	N/A	0.0040	mg/L	2021-11-24	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
General Parameters						
Alkalinity, Total (as CaCO3)	**352**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Bicarbonate (as CaCO3)	**352**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2021-11-23	
Conductivity (EC)	**710**	N/A	2.0	µS/cm	2021-11-21	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2021-11-25	
pH	**7.41**	7.0-10.5	0.10	pH units	2021-11-21	HT2
Solids, Total Dissolved	**438**	AO ≤ 500	15	mg/L	2021-11-23	
Solids, Total Suspended	< 2.0	N/A	2.0	mg/L	2021-11-24	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-11-19	
Coliforms, Total	43	MAC = 0		MPN/100 mL	2021-11-19	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-11-19	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-18.15**	N/A		per mil	2022-01-20	
delta-2-H	**-137.6**	N/A		per mil	2022-01-20	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2021-11-24	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-11-24	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2021-11-24	
Barium, total	**0.0290**	MAC = 2	0.0050	mg/L	2021-11-24	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-11-24	
Cadmium, total	**0.000023**	MAC = 0.005	0.000010	mg/L	2021-11-24	
Calcium, total	**112**	None Required	0.20	mg/L	2021-11-24	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-11-24	
Cobalt, total	**0.00015**	N/A	0.00010	mg/L	2021-11-24	
Copper, total	**0.00243**	MAC = 2	0.00040	mg/L	2021-11-24	
Iron, total	**0.122**	AO ≤ 0.3	0.010	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 04 - 412 (21K2544-04) | Matrix: Water | Sampled: 2021-11-18 13:50, Continued						F2
Total Metals, Continued						
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2021-11-24	
Lithium, total	**0.0229**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, total	**35.5**	None Required	0.010	mg/L	2021-11-24	
Manganese, total	**0.0591**	MAC = 0.12	0.00020	mg/L	2021-11-24	
Mercury, total	**0.000101**	MAC = 0.001	0.000040	mg/L	2021-11-24	CT5
Molybdenum, total	**0.00473**	N/A	0.00010	mg/L	2021-11-24	
Nickel, total	**0.00141**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, total	**4.20**	N/A	0.10	mg/L	2021-11-24	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-11-24	
Silicon, total	**10.5**	N/A	1.0	mg/L	2021-11-24	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-11-24	
Sodium, total	**9.10**	AO ≤ 200	0.10	mg/L	2021-11-24	
Strontium, total	**0.971**	MAC = 7	0.0010	mg/L	2021-11-24	
Sulfur, total	**27.2**	N/A	3.0	mg/L	2021-11-24	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, total	**0.00584**	MAC = 0.02	0.000020	mg/L	2021-11-24	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, total	**0.0279**	AO ≤ 5	0.0040	mg/L	2021-11-24	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
12399 - 05 - WEWELL3 (21K2544-05) | Matrix: Water | Sampled: 2021-11-18 14:45						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-11-20	
Chloride	**15.0**	AO ≤ 250	0.10	mg/L	2021-11-20	
Fluoride	**7.50**	MAC = 1.5	0.10	mg/L	2021-11-20	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2021-11-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-11-20	
Sulfate	**176**	AO ≤ 500	1.0	mg/L	2021-11-20	
Calculated Parameters						
Hardness, Total (as CaCO3)	**105**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.0590**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 05 - WEWELL3 (21K2544-05) | Matrix: Water | Sampled: 2021-11-18 14:45, Continued						F2
Dissolved Metals, Continued						
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Barium, dissolved	**0.0199**	N/A	0.0050	mg/L	2021-11-24	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-11-24	
Cadmium, dissolved	**0.000012**	N/A	0.000010	mg/L	2021-11-24	
Calcium, dissolved	**25.9**	N/A	0.20	mg/L	2021-11-24	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Cobalt, dissolved	**0.00016**	N/A	0.00010	mg/L	2021-11-24	
Copper, dissolved	**0.00292**	N/A	0.00040	mg/L	2021-11-24	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2021-11-24	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Lithium, dissolved	**0.0339**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, dissolved	**9.76**	N/A	0.010	mg/L	2021-11-24	
Manganese, dissolved	**0.0108**	N/A	0.00020	mg/L	2021-11-24	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-11-26	
Molybdenum, dissolved	**0.00896**	N/A	0.00010	mg/L	2021-11-24	
Nickel, dissolved	**0.00116**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-11-24	
Potassium, dissolved	**1.95**	N/A	0.10	mg/L	2021-11-24	
Selenium, dissolved	**0.00094**	N/A	0.00050	mg/L	2021-11-24	
Silicon, dissolved	**6.4**	N/A	1.0	mg/L	2021-11-24	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-11-24	
Sodium, dissolved	**213**	N/A	0.10	mg/L	2021-11-24	
Strontium, dissolved	**0.521**	N/A	0.0010	mg/L	2021-11-24	
Sulfur, dissolved	**56.3**	N/A	3.0	mg/L	2021-11-24	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-11-24	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-11-24	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-11-24	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Uranium, dissolved	**0.00540**	N/A	0.000020	mg/L	2021-11-24	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-11-24	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2021-11-24	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
General Parameters						
Alkalinity, Total (as CaCO3)	**353**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Bicarbonate (as CaCO3)	**353**	N/A	1.0	mg/L	2021-11-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 05 - WEWELL3 (21K2544-05) | Matrix: Water | Sampled: 2021-11-18 14:45, Continued						F2
General Parameters, Continued						
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-11-21	
Ammonia, Total (as N)	**0.057**	None Required	0.050	mg/L	2021-11-23	
Conductivity (EC)	**1040**	N/A	2.0	µS/cm	2021-11-21	
Nitrogen, Total Kjeldahl	**0.059**	N/A	0.050	mg/L	2021-11-25	
pH	**8.16**	7.0-10.5	0.10	pH units	2021-11-21	HT2
Solids, Total Dissolved	**679**	AO ≤ 500	15	mg/L	2021-11-22	
Solids, Total Suspended	**151**	N/A	2.0	mg/L	2021-11-24	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-11-19	
Coliforms, Total	< 1	MAC = 0		MPN/100 mL	2021-11-19	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-11-19	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-19.04**	N/A		per mil	2022-01-20	
delta-2-H	**-145.7**	N/A		per mil	2022-01-20	
Total Metals						
Aluminum, total	**4.18**	OG < 0.1	0.0050	mg/L	2021-11-24	
Antimony, total	**0.00026**	MAC = 0.006	0.00020	mg/L	2021-11-24	
Arsenic, total	**0.00054**	MAC = 0.01	0.00050	mg/L	2021-11-24	
Barium, total	**0.0613**	MAC = 2	0.0050	mg/L	2021-11-24	
Beryllium, total	**0.00037**	N/A	0.00010	mg/L	2021-11-24	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-11-24	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-11-24	
Cadmium, total	**0.000194**	MAC = 0.005	0.000010	mg/L	2021-11-24	
Calcium, total	**32.0**	None Required	0.20	mg/L	2021-11-24	
Chromium, total	**0.0108**	MAC = 0.05	0.00050	mg/L	2021-11-24	
Cobalt, total	**0.00291**	N/A	0.00010	mg/L	2021-11-24	
Copper, total	**0.0228**	MAC = 2	0.00040	mg/L	2021-11-24	
Iron, total	**16.7**	AO ≤ 0.3	0.010	mg/L	2021-11-24	
Lead, total	**0.00552**	MAC = 0.005	0.00020	mg/L	2021-11-24	
Lithium, total	**0.0452**	N/A	0.00010	mg/L	2021-11-24	
Magnesium, total	**12.0**	None Required	0.010	mg/L	2021-11-24	
Manganese, total	**0.191**	MAC = 0.12	0.00020	mg/L	2021-11-24	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-11-24	CT5
Molybdenum, total	**0.0110**	N/A	0.00010	mg/L	2021-11-24	
Nickel, total	**0.00626**	N/A	0.00040	mg/L	2021-11-24	
Phosphorus, total	**0.095**	N/A	0.050	mg/L	2021-11-24	
Potassium, total	**4.54**	N/A	0.10	mg/L	2021-11-24	
Selenium, total	**0.00174**	MAC = 0.05	0.00050	mg/L	2021-11-24	
Silicon, total	**15.9**	N/A	1.0	mg/L	2021-11-24	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-11-24	
Sodium, total	**223**	AO ≤ 200	0.10	mg/L	2021-11-24	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12399 - 05 - WEWELL3 (21K2544-05) | Matrix: Water | Sampled: 2021-11-18 14:45, Continued						F2
Total Metals, Continued						
Strontium, total	**0.600**	MAC = 7	0.0010	mg/L	2021-11-24	
Sulfur, total	**68.5**	N/A	3.0	mg/L	2021-11-24	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-11-24	
Thallium, total	**0.000085**	N/A	0.000020	mg/L	2021-11-24	
Thorium, total	**0.00111**	N/A	0.00010	mg/L	2021-11-24	
Tin, total	**0.00038**	N/A	0.00020	mg/L	2021-11-24	
Titanium, total	**0.0546**	N/A	0.0050	mg/L	2021-11-24	
Tungsten, total	**0.0014**	N/A	0.0010	mg/L	2021-11-24	
Uranium, total	**0.00700**	MAC = 0.02	0.000020	mg/L	2021-11-24	
Vanadium, total	**0.0096**	N/A	0.0010	mg/L	2021-11-24	
Zinc, total	**0.0361**	AO ≤ 5	0.0040	mg/L	2021-11-24	
Zirconium, total	**0.00452**	N/A	0.00010	mg/L	2021-11-24	

Sample Qualifiers:

CT5	This sample has been incorrectly preserved for Mercury analysis
F2	The sample was not field-preserved with HNO3 and was therefore preserved in the laboratory and held for at least 16 hours prior to analysis for total metals.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
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Analysis Description	Method Ref.	Technique	Accredited	Location
2H and 18O Isotope Ratios in Water	Stable Isotopes	CRDS		Sublet
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	✓	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Coliforms, Fecal in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Coliforms, Total in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	✓	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
E. coli in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	✓	Kelowna
pH in Water	SM 4500-H+ B (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 2540 C* (2017)	Gravimetry (Dried at 103-105C)	✓	Kelowna
Solids, Total Suspended in Water	SM 2540 D* (2017)	Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

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

Glossary of Terms:

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

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

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

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

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.

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: nyipp@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 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in “batches” and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B1K2285										
Blank (B1K2285-BLK1)				Prepared: 2021-11-20, Analyzed: 2021-11-20						
Bromide	< 0.10	0.10	mg/L							
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B1K2285-BS1)				Prepared: 2021-11-20, Analyzed: 2021-11-20						
Bromide	4.00	0.10	mg/L	4.00		100	85-115			
Chloride	16.0	0.10	mg/L	16.0		100	90-110			
Fluoride	3.91	0.10	mg/L	4.00		98	88-108			
Sulfate	16.1	1.0	mg/L	16.0		101	90-110			
Anions, Batch B1K2304										
Blank (B1K2304-BLK1)				Prepared: 2021-11-20, Analyzed: 2021-11-20						
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
LCS (B1K2304-BS1)				Prepared: 2021-11-20, Analyzed: 2021-11-20						
Nitrate (as N)	4.01	0.010	mg/L	4.00		100	90-110			
Nitrite (as N)	2.01	0.010	mg/L	2.00		101	85-115			
Dissolved Metals, Batch B1K2590										
Blank (B1K2590-BLK1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, dissolved	< 0.0050	0.0050	mg/L							
Antimony, dissolved	< 0.00020	0.00020	mg/L							
Arsenic, dissolved	< 0.00050	0.00050	mg/L							
Barium, dissolved	< 0.0050	0.0050	mg/L							
Beryllium, dissolved	< 0.00010	0.00010	mg/L							
Bismuth, dissolved	< 0.00010	0.00010	mg/L							
Boron, dissolved	< 0.0500	0.0500	mg/L							
Cadmium, dissolved	< 0.000010	0.000010	mg/L							
Calcium, dissolved, dissolved	< 0.20	0.20	mg/L							
Chromium, dissolved	< 0.00050	0.00050	mg/L							
Cobalt, dissolved	< 0.00010	0.00010	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1K2590, Continued										
Blank (B1K2590-BLK1), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Copper, dissolved	< 0.00040	0.00040	mg/L							
Iron, dissolved	< 0.010	0.010	mg/L							
Lead, dissolved	< 0.00020	0.00020	mg/L							
Lithium, dissolved	< 0.00010	0.00010	mg/L							
Magnesium, dissolved, dissolved	< 0.010	0.010	mg/L							
Manganese, dissolved	< 0.00020	0.00020	mg/L							
Molybdenum, dissolved	< 0.00010	0.00010	mg/L							
Nickel, dissolved	< 0.00040	0.00040	mg/L							
Phosphorus, dissolved	< 0.050	0.050	mg/L							
Potassium, dissolved	< 0.10	0.10	mg/L							
Selenium, dissolved	< 0.00050	0.00050	mg/L							
Silicon, dissolved	< 1.0	1.0	mg/L							
Silver, dissolved	< 0.000050	0.000050	mg/L							
Sodium, dissolved	< 0.10	0.10	mg/L							
Strontium, dissolved	< 0.0010	0.0010	mg/L							
Sulfur, dissolved	< 3.0	3.0	mg/L							
Tellurium, dissolved	< 0.00050	0.00050	mg/L							
Thallium, dissolved	< 0.000020	0.000020	mg/L							
Thorium, dissolved	< 0.00010	0.00010	mg/L							
Tin, dissolved	< 0.00020	0.00020	mg/L							
Titanium, dissolved	< 0.0050	0.0050	mg/L							
Tungsten, dissolved	< 0.0010	0.0010	mg/L							
Uranium, dissolved	< 0.000020	0.000020	mg/L							
Vanadium, dissolved	< 0.0010	0.0010	mg/L							
Zinc, dissolved	< 0.0040	0.0040	mg/L							
Zirconium, dissolved	< 0.00010	0.00010	mg/L							
LCS (B1K2590-BS1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, dissolved	0.0198	0.0050	mg/L	0.0200		99	80-120			
Antimony, dissolved	0.0173	0.00020	mg/L	0.0200		86	80-120			
Arsenic, dissolved	0.0162	0.00050	mg/L	0.0200		81	80-120			
Barium, dissolved	0.0175	0.0050	mg/L	0.0200		88	80-120			
Beryllium, dissolved	0.0164	0.00010	mg/L	0.0200		82	80-120			
Bismuth, dissolved	0.0184	0.00010	mg/L	0.0200		92	80-120			
Boron, dissolved	< 0.0500	0.0500	mg/L	0.0200		90	80-120			
Cadmium, dissolved	0.0162	0.000010	mg/L	0.0200		81	80-120			
Calcium, dissolved, dissolved	1.75	0.20	mg/L	2.00		87	80-120			
Chromium, dissolved	0.0178	0.00050	mg/L	0.0200		89	80-120			
Cobalt, dissolved	0.0177	0.00010	mg/L	0.0200		89	80-120			
Copper, dissolved	0.0188	0.00040	mg/L	0.0200		94	80-120			
Iron, dissolved	1.83	0.010	mg/L	2.00		91	80-120			
Lead, dissolved	0.0191	0.00020	mg/L	0.0200		95	80-120			
Lithium, dissolved	0.0181	0.00010	mg/L	0.0200		91	80-120			
Magnesium, dissolved, dissolved	1.88	0.010	mg/L	2.00		94	80-120			
Manganese, dissolved	0.0174	0.00020	mg/L	0.0200		87	80-120			
Molybdenum, dissolved	0.0183	0.00010	mg/L	0.0200		92	80-120			
Nickel, dissolved	0.0177	0.00040	mg/L	0.0200		88	80-120			
Phosphorus, dissolved	1.66	0.050	mg/L	2.00		83	80-120			
Potassium, dissolved	1.75	0.10	mg/L	2.00		87	80-120			
Selenium, dissolved	0.0174	0.00050	mg/L	0.0200		87	80-120			
Silicon, dissolved	2.0	1.0	mg/L	2.00		99	80-120			
Silver, dissolved	0.0176	0.000050	mg/L	0.0200		88	80-120			
Sodium, dissolved	1.76	0.10	mg/L	2.00		88	80-120			
Strontium, dissolved	0.0168	0.0010	mg/L	0.0200		84	80-120			
Sulfur, dissolved	4.3	3.0	mg/L	5.00		87	80-120			
Tellurium, dissolved	0.0179	0.00050	mg/L	0.0200		90	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1K2590, Continued										
LCS (B1K2590-BS1), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Thallium, dissolved	0.0178	0.000020	mg/L	0.0200		89	80-120			
Thorium, dissolved	0.0183	0.00010	mg/L	0.0200		92	80-120			
Tin, dissolved	0.0188	0.00020	mg/L	0.0200		94	80-120			
Titanium, dissolved	0.0198	0.0050	mg/L	0.0200		99	80-120			
Tungsten, dissolved	0.0193	0.0010	mg/L	0.0200		96	80-120			
Uranium, dissolved	0.0188	0.000020	mg/L	0.0200		94	80-120			
Vanadium, dissolved	0.0176	0.0010	mg/L	0.0200		88	80-120			
Zinc, dissolved	0.0185	0.0040	mg/L	0.0200		92	80-120			
Zirconium, dissolved	0.0189	0.00010	mg/L	0.0200		95	80-120			
Duplicate (B1K2590-DUP1)				**Source: 21K2544-02**	Prepared: 2021-11-24, Analyzed: 2021-11-24					
Aluminum, dissolved	< 0.0050	0.0050	mg/L		< 0.0050				20	
Antimony, dissolved	< 0.00020	0.00020	mg/L		< 0.00020				20	
Arsenic, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Barium, dissolved	0.0076	0.0050	mg/L		0.0073				20	
Beryllium, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Bismuth, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Boron, dissolved	< 0.0500	0.0500	mg/L		< 0.0500				20	
Cadmium, dissolved	0.000019	0.000010	mg/L		0.000019				20	
Calcium, dissolved, dissolved	111	0.20	mg/L		105			5	20	
Chromium, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Cobalt, dissolved	0.00042	0.00010	mg/L		0.00043				20	
Copper, dissolved	0.00367	0.00040	mg/L		0.00363			1	20	
Iron, dissolved	0.018	0.010	mg/L		0.016				20	
Lead, dissolved	< 0.00020	0.00020	mg/L		< 0.00020				20	
Lithium, dissolved	0.439	0.00010	mg/L		0.423			4	20	
Magnesium, dissolved, dissolved	83.7	0.010	mg/L		81.9			2	20	
Manganese, dissolved	0.0313	0.00020	mg/L		0.0305			3	20	
Molybdenum, dissolved	0.00243	0.00010	mg/L		0.00239			2	20	
Nickel, dissolved	0.00534	0.00040	mg/L		0.00495			8	20	
Phosphorus, dissolved	< 0.050	0.050	mg/L		< 0.050				20	
Potassium, dissolved	11.3	0.10	mg/L		11.0			3	20	
Selenium, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Silicon, dissolved	17.2	1.0	mg/L		16.8			2	20	
Silver, dissolved	< 0.000050	0.000050	mg/L		< 0.000050				20	
Sodium, dissolved	198	0.10	mg/L		192			3	20	
Strontium, dissolved	2.94	0.0010	mg/L		2.80			5	20	
Sulfur, dissolved	192	3.0	mg/L		189			2	20	
Tellurium, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Thallium, dissolved	0.000029	0.000020	mg/L		0.000023				20	
Thorium, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Tin, dissolved	0.0107	0.00020	mg/L		0.0104			3	20	
Titanium, dissolved	< 0.0050	0.0050	mg/L		< 0.0050				20	
Tungsten, dissolved	< 0.0010	0.0010	mg/L		< 0.0010				20	
Uranium, dissolved	0.00125	0.000020	mg/L		0.00119			5	20	
Vanadium, dissolved	< 0.0010	0.0010	mg/L		< 0.0010				20	
Zinc, dissolved	0.838	0.0040	mg/L		0.816			3	20	
Zirconium, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Reference (B1K2590-SRM1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, dissolved	0.219	0.0050	mg/L	0.235		93	70-130			
Antimony, dissolved	0.0424	0.00020	mg/L	0.0431		98	70-130			
Arsenic, dissolved	0.394	0.00050	mg/L	0.423		93	70-130			
Barium, dissolved	2.92	0.0050	mg/L	3.30		88	70-130			
Beryllium, dissolved	0.181	0.00010	mg/L	0.209		87	70-130			
Boron, dissolved	1.49	0.0500	mg/L	1.65		90	70-130			
Cadmium, dissolved	0.195	0.000010	mg/L	0.221		88	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1K2590, Continued										
Reference (B1K2590-SRM1), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Calcium, dissolved, dissolved	7.36	0.20	mg/L	7.72		95	70-130			
Chromium, dissolved	0.414	0.00050	mg/L	0.434		95	70-130			
Cobalt, dissolved	0.119	0.00010	mg/L	0.124		96	70-130			
Copper, dissolved	0.821	0.00040	mg/L	0.815		101	70-130			
Iron, dissolved	1.26	0.010	mg/L	1.27		100	70-130			
Lead, dissolved	0.114	0.00020	mg/L	0.110		103	70-130			
Lithium, dissolved	0.0978	0.00010	mg/L	0.100		98	70-130			
Magnesium, dissolved, dissolved	6.54	0.010	mg/L	6.59		99	70-130			
Manganese, dissolved	0.321	0.00020	mg/L	0.342		94	70-130			
Molybdenum, dissolved	0.400	0.00010	mg/L	0.404		99	70-130			
Nickel, dissolved	0.797	0.00040	mg/L	0.835		95	70-130			
Phosphorus, dissolved	0.411	0.050	mg/L	0.499		82	70-130			
Potassium, dissolved	2.77	0.10	mg/L	2.88		96	70-130			
Selenium, dissolved	0.0314	0.00050	mg/L	0.0324		97	70-130			
Sodium, dissolved	17.7	0.10	mg/L	18.0		98	70-130			
Strontium, dissolved	0.827	0.0010	mg/L	0.935		88	70-130			
Thallium, dissolved	0.0364	0.000020	mg/L	0.0385		94	70-130			
Uranium, dissolved	0.235	0.000020	mg/L	0.258		91	70-130			
Vanadium, dissolved	0.800	0.0010	mg/L	0.873		92	70-130			
Zinc, dissolved	0.810	0.0040	mg/L	0.848		96	70-130			
Dissolved Metals, Batch B1K2939										
Blank (B1K2939-BLK1)				Prepared: 2021-11-26, Analyzed: 2021-11-26						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B1K2939-BLK2)				Prepared: 2021-11-26, Analyzed: 2021-11-26						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B1K2939-BLK3)				Prepared: 2021-11-26, Analyzed: 2021-11-26						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Reference (B1K2939-SRM1)				Prepared: 2021-11-26, Analyzed: 2021-11-26						
Mercury, dissolved	0.000459	0.000010	mg/L	0.000500		92	0-200			
Reference (B1K2939-SRM2)				Prepared: 2021-11-26, Analyzed: 2021-11-26						
Mercury, dissolved	0.000481	0.000010	mg/L	0.000500		96	0-200			
Reference (B1K2939-SRM3)				Prepared: 2021-11-26, Analyzed: 2021-11-26						
Mercury, dissolved	0.000464	0.000010	mg/L	0.000500		93	0-200			
General Parameters, Batch B1K2348										
Blank (B1K2348-BLK1)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B1K2348-BLK2)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B1K2348, Continued										
Blank (B1K2348-BLK2), Continued				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
LCS (B1K2348-BS1)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Alkalinity, Total (as CaCO3)	96.8	1.0	mg/L	100		97	80-120			
LCS (B1K2348-BS2)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Alkalinity, Total (as CaCO3)	96.5	1.0	mg/L	100		97	80-120			
LCS (B1K2348-BS3)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Conductivity (EC)	1420	2.0	µS/cm	1410		101	95-105			
LCS (B1K2348-BS4)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
Conductivity (EC)	1430	2.0	µS/cm	1410		102	95-105			
Reference (B1K2348-SRM1)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
pH	6.99	0.10	pH units	7.01		100	98-102			
Reference (B1K2348-SRM2)				Prepared: 2021-11-21, Analyzed: 2021-11-21						
pH	6.99	0.10	pH units	7.01		100	98-102			
General Parameters, Batch B1K2403										
Blank (B1K2403-BLK1)				Prepared: 2021-11-22, Analyzed: 2021-11-22						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B1K2403-BS1)				Prepared: 2021-11-22, Analyzed: 2021-11-22						
Solids, Total Dissolved	239	15	mg/L	240		100	85-115			
General Parameters, Batch B1K2479										
Blank (B1K2479-BLK1)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Ammonia, Total (as N)	< 0.050	0.050	mg/L							
Blank (B1K2479-BLK2)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Ammonia, Total (as N)	< 0.050	0.050	mg/L							
Blank (B1K2479-BLK3)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Ammonia, Total (as N)	< 0.050	0.050	mg/L							
LCS (B1K2479-BS1)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Ammonia, Total (as N)	0.990	0.050	mg/L	1.00		99	90-115			
LCS (B1K2479-BS2)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Ammonia, Total (as N)	1.02	0.050	mg/L	1.00		102	90-115			
LCS (B1K2479-BS3)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Ammonia, Total (as N)	1.02	0.050	mg/L	1.00		102	90-115			
General Parameters, Batch B1K2490										
Blank (B1K2490-BLK1)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B1K2490-BS1)				Prepared: 2021-11-23, Analyzed: 2021-11-23						
Solids, Total Dissolved	236	15	mg/L	240		98	85-115			

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B1K2549										
Blank (B1K2549-BLK1)				Prepared: 2021-11-23, Analyzed: 2021-11-25						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
Blank (B1K2549-BLK2)				Prepared: 2021-11-23, Analyzed: 2021-11-25						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
LCS (B1K2549-BS1)				Prepared: 2021-11-23, Analyzed: 2021-11-25						
Nitrogen, Total Kjeldahl	1.00	0.050	mg/L	1.00		100	85-115			
LCS (B1K2549-BS2)				Prepared: 2021-11-23, Analyzed: 2021-11-25						
Nitrogen, Total Kjeldahl	0.997	0.050	mg/L	1.00		100	85-115			
General Parameters, Batch B1K2618										
Blank (B1K2618-BLK1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Solids, Total Suspended	< 2.0	2.0	mg/L							
Blank (B1K2618-BLK2)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Solids, Total Suspended	< 2.0	2.0	mg/L							
LCS (B1K2618-BS1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Solids, Total Suspended	88.0	10.0	mg/L	100		88	85-115			
LCS (B1K2618-BS2)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Solids, Total Suspended	104	10.0	mg/L	100		104	85-115			
Duplicate (B1K2618-DUP2)		**Source: 21K2544-05**		Prepared: 2021-11-24, Analyzed: 2021-11-24						
Solids, Total Suspended	149	2.0	mg/L		151			1	20	
Microbiological Parameters, Batch B1K2238										
Blank (B1K2238-BLK1)				Prepared: 2021-11-19, Analyzed: 2021-11-19						
Coliforms, Total	< 1	1	MPN/100 mL							
E. coli	< 1	1	MPN/100 mL							
Blank (B1K2238-BLK2)				Prepared: 2021-11-19, Analyzed: 2021-11-19						
Coliforms, Fecal	< 1	1	MPN/100 mL							
E. coli	< 1	1	MPN/100 mL							
Total Metals, Batch B1K2652										
Blank (B1K2652-BLK1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	< 0.0050	0.0050	mg/L							
Antimony, total	< 0.00020	0.00020	mg/L							
Arsenic, total	< 0.00050	0.00050	mg/L							
Barium, total	< 0.0050	0.0050	mg/L							
Beryllium, total	< 0.00010	0.00010	mg/L							
Bismuth, total	< 0.00010	0.00010	mg/L							
Boron, total	< 0.0500	0.0500	mg/L							
Cadmium, total	< 0.000010	0.000010	mg/L							
Calcium, total	< 0.20	0.20	mg/L							
Chromium, total	< 0.00050	0.00050	mg/L							
Cobalt, total	< 0.00010	0.00010	mg/L							
Copper, total	< 0.00040	0.00040	mg/L							
Iron, total	< 0.010	0.010	mg/L							
Lead, total	< 0.00020	0.00020	mg/L							
Lithium, total	< 0.00010	0.00010	mg/L							

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1K2652, Continued										
Blank (B1K2652-BLK1), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Magnesium, total	< 0.010	0.010	mg/L							
Manganese, total	< 0.00020	0.00020	mg/L							
Mercury, total	< 0.000040	0.000040	mg/L							
Molybdenum, total	< 0.00010	0.00010	mg/L							
Nickel, total	< 0.00040	0.00040	mg/L							
Phosphorus, total	< 0.050	0.050	mg/L							
Potassium, total	< 0.10	0.10	mg/L							
Selenium, total	< 0.00050	0.00050	mg/L							
Silicon, total	< 1.0	1.0	mg/L							
Silver, total	< 0.000050	0.000050	mg/L							
Sodium, total	< 0.10	0.10	mg/L							
Strontium, total	< 0.0010	0.0010	mg/L							
Sulfur, total	< 3.0	3.0	mg/L							
Tellurium, total	< 0.00050	0.00050	mg/L							
Thallium, total	< 0.000020	0.000020	mg/L							
Thorium, total	< 0.00010	0.00010	mg/L							
Tin, total	< 0.00020	0.00020	mg/L							
Titanium, total	< 0.0050	0.0050	mg/L							
Tungsten, total	< 0.0010	0.0010	mg/L							
Uranium, total	< 0.000020	0.000020	mg/L							
Vanadium, total	< 0.0010	0.0010	mg/L							
Zinc, total	< 0.0040	0.0040	mg/L							
Zirconium, total	< 0.00010	0.00010	mg/L							
Blank (B1K2652-BLK2)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	< 0.0050	0.0050	mg/L							
Antimony, total	< 0.00020	0.00020	mg/L							
Arsenic, total	< 0.00050	0.00050	mg/L							
Barium, total	< 0.0050	0.0050	mg/L							
Beryllium, total	< 0.00010	0.00010	mg/L							
Bismuth, total	< 0.00010	0.00010	mg/L							
Boron, total	< 0.0500	0.0500	mg/L							
Cadmium, total	< 0.000010	0.000010	mg/L							
Calcium, total	< 0.20	0.20	mg/L							
Chromium, total	< 0.00050	0.00050	mg/L							
Cobalt, total	< 0.00010	0.00010	mg/L							
Copper, total	< 0.00040	0.00040	mg/L							
Iron, total	< 0.010	0.010	mg/L							
Lead, total	< 0.00020	0.00020	mg/L							
Lithium, total	< 0.00010	0.00010	mg/L							
Magnesium, total	< 0.010	0.010	mg/L							
Manganese, total	< 0.00020	0.00020	mg/L							
Mercury, total	< 0.000040	0.000040	mg/L							
Molybdenum, total	< 0.00010	0.00010	mg/L							
Nickel, total	< 0.00040	0.00040	mg/L							
Phosphorus, total	< 0.050	0.050	mg/L							
Potassium, total	< 0.10	0.10	mg/L							
Selenium, total	< 0.00050	0.00050	mg/L							
Silicon, total	< 1.0	1.0	mg/L							
Silver, total	< 0.000050	0.000050	mg/L							
Sodium, total	< 0.10	0.10	mg/L							
Strontium, total	< 0.0010	0.0010	mg/L							
Sulfur, total	< 3.0	3.0	mg/L							
Tellurium, total	< 0.00050	0.00050	mg/L							
Thallium, total	< 0.000020	0.000020	mg/L							
Thorium, total	< 0.00010	0.00010	mg/L							

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PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1K2652, Continued										
Blank (B1K2652-BLK2), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Tin, total	< 0.00020	0.00020	mg/L							
Titanium, total	< 0.0050	0.0050	mg/L							
Tungsten, total	< 0.0010	0.0010	mg/L							
Uranium, total	< 0.000020	0.000020	mg/L							
Vanadium, total	< 0.0010	0.0010	mg/L							
Zinc, total	< 0.0040	0.0040	mg/L							
Zirconium, total	< 0.00010	0.00010	mg/L							
LCS (B1K2652-BS1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	0.0226	0.0050	mg/L	0.0200		113	80-120			
Antimony, total	0.0207	0.00020	mg/L	0.0200		103	80-120			
Arsenic, total	0.0183	0.00050	mg/L	0.0200		91	80-120			
Barium, total	0.0195	0.0050	mg/L	0.0200		97	80-120			
Beryllium, total	0.0205	0.00010	mg/L	0.0200		103	80-120			
Bismuth, total	0.0198	0.00010	mg/L	0.0200		99	80-120			
Boron, total	< 0.0500	0.0500	mg/L	0.0200		109	80-120			
Cadmium, total	0.0182	0.000010	mg/L	0.0200		91	80-120			
Calcium, total	2.13	0.20	mg/L	2.00		106	80-120			
Chromium, total	0.0208	0.00050	mg/L	0.0200		104	80-120			
Cobalt, total	0.0200	0.00010	mg/L	0.0200		100	80-120			
Copper, total	0.0192	0.00040	mg/L	0.0200		96	80-120			
Iron, total	1.99	0.010	mg/L	2.00		99	80-120			
Lead, total	0.0216	0.00020	mg/L	0.0200		108	80-120			
Lithium, total	0.0224	0.00010	mg/L	0.0200		112	80-120			
Magnesium, total	2.21	0.010	mg/L	2.00		111	80-120			
Manganese, total	0.0190	0.00020	mg/L	0.0200		95	80-120			
Mercury, total	0.000953	0.000040	mg/L	0.00101		94	80-120			
Molybdenum, total	0.0205	0.00010	mg/L	0.0200		103	80-120			
Nickel, total	0.0208	0.00040	mg/L	0.0200		104	80-120			
Phosphorus, total	1.99	0.050	mg/L	2.00		99	80-120			
Potassium, total	2.09	0.10	mg/L	2.00		105	80-120			
Selenium, total	0.0164	0.00050	mg/L	0.0200		82	80-120			
Silicon, total	2.3	1.0	mg/L	2.00		114	80-120			
Silver, total	0.0189	0.000050	mg/L	0.0200		94	80-120			
Sodium, total	2.12	0.10	mg/L	2.00		106	80-120			
Strontium, total	0.0185	0.0010	mg/L	0.0200		92	80-120			
Sulfur, total	5.4	3.0	mg/L	5.00		108	80-120			
Tellurium, total	0.0165	0.00050	mg/L	0.0200		82	80-120			
Thallium, total	0.0191	0.000020	mg/L	0.0200		95	80-120			
Thorium, total	0.0197	0.00010	mg/L	0.0200		99	80-120			
Tin, total	0.0215	0.00020	mg/L	0.0200		107	80-120			
Titanium, total	0.0223	0.0050	mg/L	0.0200		112	80-120			
Tungsten, total	0.0204	0.0010	mg/L	0.0200		102	80-120			
Uranium, total	0.0201	0.000020	mg/L	0.0200		101	80-120			
Vanadium, total	0.0215	0.0010	mg/L	0.0200		108	80-120			
Zinc, total	0.0213	0.0040	mg/L	0.0200		106	80-120			
Zirconium, total	0.0218	0.00010	mg/L	0.0200		109	80-120			
LCS (B1K2652-BS2)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	0.0238	0.0050	mg/L	0.0200		119	80-120			
Antimony, total	0.0212	0.00020	mg/L	0.0200		106	80-120			
Arsenic, total	0.0187	0.00050	mg/L	0.0200		94	80-120			
Barium, total	0.0204	0.0050	mg/L	0.0200		102	80-120			
Beryllium, total	0.0207	0.00010	mg/L	0.0200		104	80-120			
Bismuth, total	0.0196	0.00010	mg/L	0.0200		98	80-120			
Boron, total	< 0.0500	0.0500	mg/L	0.0200		111	80-120			
Cadmium, total	0.0191	0.000010	mg/L	0.0200		95	80-120			

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REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1K2652, Continued										
LCS (B1K2652-BS2), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Calcium, total	2.11	0.20	mg/L	2.00		105	80-120			
Chromium, total	0.0217	0.00050	mg/L	0.0200		108	80-120			
Cobalt, total	0.0205	0.00010	mg/L	0.0200		103	80-120			
Copper, total	0.0200	0.00040	mg/L	0.0200		100	80-120			
Iron, total	2.02	0.010	mg/L	2.00		101	80-120			
Lead, total	0.0223	0.00020	mg/L	0.0200		111	80-120			
Lithium, total	0.0230	0.00010	mg/L	0.0200		115	80-120			
Magnesium, total	2.29	0.010	mg/L	2.00		114	80-120			
Manganese, total	0.0197	0.00020	mg/L	0.0200		99	80-120			
Mercury, total	0.000920	0.000040	mg/L	0.00101		91	80-120			
Molybdenum, total	0.0211	0.00010	mg/L	0.0200		106	80-120			
Nickel, total	0.0218	0.00040	mg/L	0.0200		109	80-120			
Phosphorus, total	2.07	0.050	mg/L	2.00		104	80-120			
Potassium, total	2.19	0.10	mg/L	2.00		109	80-120			
Selenium, total	0.0193	0.00050	mg/L	0.0200		96	80-120			
Silicon, total	2.3	1.0	mg/L	2.00		114	80-120			
Silver, total	0.0194	0.000050	mg/L	0.0200		97	80-120			
Sodium, total	2.17	0.10	mg/L	2.00		109	80-120			
Strontium, total	0.0188	0.0010	mg/L	0.0200		94	80-120			
Sulfur, total	5.7	3.0	mg/L	5.00		114	80-120			
Tellurium, total	0.0163	0.00050	mg/L	0.0200		82	80-120			
Thallium, total	0.0189	0.000020	mg/L	0.0200		95	80-120			
Thorium, total	0.0196	0.00010	mg/L	0.0200		98	80-120			
Tin, total	0.0222	0.00020	mg/L	0.0200		111	80-120			
Titanium, total	0.0236	0.0050	mg/L	0.0200		118	80-120			
Tungsten, total	0.0208	0.0010	mg/L	0.0200		104	80-120			
Uranium, total	0.0198	0.000020	mg/L	0.0200		99	80-120			
Vanadium, total	0.0229	0.0010	mg/L	0.0200		114	80-120			
Zinc, total	0.0227	0.0040	mg/L	0.0200		113	80-120			
Zirconium, total	0.0231	0.00010	mg/L	0.0200		115	80-120			
Duplicate (B1K2652-DUP1)			**Source: 21K2544-02**	Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	< 0.0050	0.0050	mg/L		< 0.0050				20	
Antimony, total	< 0.00020	0.00020	mg/L		< 0.00020				20	
Arsenic, total	< 0.00050	0.00050	mg/L		< 0.00050				20	
Barium, total	0.0088	0.0050	mg/L		0.0086				20	
Beryllium, total	< 0.00010	0.00010	mg/L		< 0.00010				20	
Bismuth, total	< 0.00010	0.00010	mg/L		< 0.00010				20	
Boron, total	0.0564	0.0500	mg/L		< 0.0500				20	
Cadmium, total	0.000040	0.000010	mg/L		0.000048				20	
Calcium, total	119	0.20	mg/L		127			6	20	
Chromium, total	0.00054	0.00050	mg/L		0.00055				20	
Cobalt, total	0.00051	0.00010	mg/L		0.00052			3	20	
Copper, total	0.00424	0.00040	mg/L		0.00441			4	20	
Iron, total	0.197	0.010	mg/L		0.172			13	20	
Lead, total	0.00034	0.00020	mg/L		0.00035				20	
Lithium, total	0.562	0.00010	mg/L		0.585			4	20	
Magnesium, total	87.6	0.010	mg/L		90.5			3	20	
Manganese, total	0.0365	0.00020	mg/L		0.0376			3	20	
Mercury, total	< 0.000040	0.000040	mg/L		< 0.000040				20	
Molybdenum, total	0.00281	0.00010	mg/L		0.00295			5	20	
Nickel, total	0.00629	0.00040	mg/L		0.00658			5	20	
Phosphorus, total	< 0.050	0.050	mg/L		< 0.050				20	
Potassium, total	13.2	0.10	mg/L		13.6			3	20	
Selenium, total	0.00050	0.00050	mg/L		< 0.00050				20	
Silicon, total	18.8	1.0	mg/L		19.4			3	20	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1K2652, Continued										
Duplicate (B1K2652-DUP1), Continued		**Source: 21K2544-02**		Prepared: 2021-11-24, Analyzed: 2021-11-24						
Silver, total	< 0.000050	0.000050	mg/L		< 0.000050				20	
Sodium, total	207	0.10	mg/L		213			3	20	
Strontium, total	3.21	0.0010	mg/L		3.33			4	20	
Sulfur, total	232	3.0	mg/L		240			3	20	
Tellurium, total	< 0.00050	0.00050	mg/L		< 0.00050				20	
Thallium, total	0.000029	0.000020	mg/L		0.000033				20	
Thorium, total	< 0.00010	0.00010	mg/L		< 0.00010				20	
Tin, total	0.00326	0.00020	mg/L		0.00332			2	20	
Titanium, total	< 0.0050	0.0050	mg/L		< 0.0050				20	
Tungsten, total	< 0.0010	0.0010	mg/L		< 0.0010				20	
Uranium, total	0.00136	0.000020	mg/L		0.00143			5	20	
Vanadium, total	< 0.0010	0.0010	mg/L		< 0.0010				20	BLK
Zinc, total	0.924	0.0040	mg/L		0.955			3	20	
Zirconium, total	< 0.00010	0.00010	mg/L		< 0.00010				20	
Reference (B1K2652-SRM1)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	0.200	0.0050	mg/L	0.198		101	70-130			
Antimony, total	0.0256	0.00020	mg/L	0.0230		111	70-130			
Arsenic, total	0.0200	0.00050	mg/L	0.0200		100	70-130			
Barium, total	0.0171	0.0050	mg/L	0.0161		106	70-130			
Beryllium, total	0.00414	0.00010	mg/L	0.00384		108	70-130			
Boron, total	0.196	0.0500	mg/L	0.191		103	70-130			
Cadmium, total	0.00388	0.000010	mg/L	0.00404		96	70-130			
Calcium, total	1.12	0.20	mg/L	0.938		119	70-130			
Chromium, total	0.0287	0.00050	mg/L	0.0256		112	70-130			
Cobalt, total	0.0233	0.00010	mg/L	0.0214		109	70-130			
Copper, total	0.0330	0.00040	mg/L	0.0322		102	70-130			
Iron, total	0.062	0.010	mg/L	0.0580		106	70-130			
Lead, total	0.00913	0.00020	mg/L	0.00796		115	70-130			
Lithium, total	0.0118	0.00010	mg/L	0.0102		116	70-130			
Magnesium, total	0.131	0.010	mg/L	0.112		117	70-130			
Manganese, total	0.0119	0.00020	mg/L	0.0120		99	70-130			
Molybdenum, total	0.0486	0.00010	mg/L	0.0438		111	70-130			
Nickel, total	0.0443	0.00040	mg/L	0.0394		113	70-130			
Potassium, total	0.89	0.10	mg/L	0.820		108	70-130			
Selenium, total	0.118	0.00050	mg/L	0.117		100	70-130			
Sodium, total	0.55	0.10	mg/L	0.490		111	70-130			
Strontium, total	0.269	0.0010	mg/L	0.276		98	70-130			
Thallium, total	0.0121	0.000020	mg/L	0.0118		102	70-130			
Uranium, total	0.00986	0.000020	mg/L	0.00970		102	70-130			
Vanadium, total	0.0308	0.0010	mg/L	0.0274		112	70-130			
Zinc, total	0.0934	0.0040	mg/L	0.0884		106	70-130			
Reference (B1K2652-SRM2)				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Aluminum, total	0.209	0.0050	mg/L	0.198		105	70-130			
Antimony, total	0.0264	0.00020	mg/L	0.0230		115	70-130			
Arsenic, total	0.0204	0.00050	mg/L	0.0200		102	70-130			
Barium, total	0.0167	0.0050	mg/L	0.0161		104	70-130			
Beryllium, total	0.00449	0.00010	mg/L	0.00384		117	70-130			
Boron, total	0.207	0.0500	mg/L	0.191		108	70-130			
Cadmium, total	0.00403	0.000010	mg/L	0.00404		100	70-130			
Calcium, total	1.16	0.20	mg/L	0.938		124	70-130			
Chromium, total	0.0297	0.00050	mg/L	0.0256		116	70-130			
Cobalt, total	0.0240	0.00010	mg/L	0.0214		112	70-130			
Copper, total	0.0341	0.00040	mg/L	0.0322		106	70-130			
Iron, total	0.061	0.010	mg/L	0.0580		106	70-130			
Lead, total	0.0103	0.00020	mg/L	0.00796		129	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21K2544
PROJECT	Keddleston Ph. 2 G W Study	**REPORTED**	2022-01-20 13:52

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1K2652, Continued										
Reference (B1K2652-SRM2), Continued				Prepared: 2021-11-24, Analyzed: 2021-11-24						
Lithium, total	0.0124	0.00010	mg/L	0.0102		122	70-130			
Magnesium, total	0.132	0.010	mg/L	0.112		118	70-130			
Manganese, total	0.0124	0.00020	mg/L	0.0120		103	70-130			
Molybdenum, total	0.0497	0.00010	mg/L	0.0438		113	70-130			
Nickel, total	0.0476	0.00040	mg/L	0.0394		121	70-130			
Potassium, total	0.91	0.10	mg/L	0.820		111	70-130			
Selenium, total	0.121	0.00050	mg/L	0.117		104	70-130			
Sodium, total	0.55	0.10	mg/L	0.490		113	70-130			
Strontium, total	0.277	0.0010	mg/L	0.276		100	70-130			
Thallium, total	0.0126	0.000020	mg/L	0.0118		107	70-130			
Uranium, total	0.0102	0.000020	mg/L	0.00970		106	70-130			
Vanadium, total	0.0326	0.0010	mg/L	0.0274		119	70-130			
Zinc, total	0.0984	0.0040	mg/L	0.0884		111	70-130			

QC Qualifiers:

BLK Analyte concentration in the Method Blank is above the Reporting Limit (RL).

CHAIN OF CUSTODY RECORD/ANALYSIS REQUEST

No. 12399 page 1 of 1

200 – 2920 Virtual Way
Vancouver, British Columbia, Canada V5M 0C4
Telephone (604) 296-4200 Fax (604) 298-5253

Project Number: 20144760 /3.0		Laboratory Name: CARO – Kelowna	
Short Title: Keddleston Ph. 2 GW Study	Golder Contact: panagathanasopoulos	Address: #102-3677 Hwy 97N	
Golder E-mail Address 1: pathanas @golder.com	Golder E-mail Address 2: Olivia_Kirby @golder.com	Telephone/Fax: 1-888-311-9846	Contact:

Office Name: Golder Kelowna

EQuIS Facility Code: ____
EQuIS upload: ☐

Turnaround Time: ☐ 24 hr ☐ 48 hr ☐ 72 hr ☒ Regular (5 Days)
Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☑ Other Can Drinking Water Qual

Note: Final Reports to be issued by e-mail

Quote No.: 48912

Analyses Required

Sample Control Number (SCN)	Sample Location	Sa. #	Sample Depth (m)	Sample Matrix (over)	Date Sampled (D / M / Y)	Time Sampled (HH:MM)	Sample Type (over)	QAQC Code (over)	Related SCN (over)	Number of Containers	total coliforms	fecal coliforms	e. coli	pH, conductivity	TDS, turbidity	hardness, Hg	anions (Br, Cl, F, SO4)	ammonia, nitrate, nitrite	dissolved metals	Isotopes of water (δ18O, δ2H) RUSH (select 7-14 days)	speciated alkalinity	total metals	Remarks (over)
12399 - 01	120	–	–	WG	18/11/21	10:30AM	G/Water			7	X	X	X	X	X	X	X	X	X	X	X	X	
12399 - 02	000	–	–	WG	18/11/21	12:00PM	G/Water			7	X	X	X	X	X	X	X	X	X	X	X	X	
12399 - 03	021	–	–	WG	18/11/21	12:45PM	G/Water			7	X	X	X	X	X	X	X	X	X	X	X	X	
12399 - 04	412	–	–	WG	18/11/21	1:50pm	G/Water			7	X	X	X	X	X	X	X	X	X	X	X	X	
12399 - 05	WELL3	–	–	WG	18/11/21	2:45pm	G/Water			7	X	X	X	X	X	X	X	X	X	X	X	X	
- 06																							
- 07																							
- 08																							
- 09																							
- 10																							
- 11																							
- 12																							

Sampler's Signature: Pana Athanasopoulos	Relinquished by: Signature	Company: Golder	Date: Nov 18/2021	Time: 4:20	Received by: Signature	Company
Comments:	Method of Shipment: drop off	Waybill No.:	Received for Lab by: BW/C Lund	Date: 18Nov21	Time: 16:20	
	Shipped by:	Shipment Condition: Seal Intact:	Temp (°C): 3.7	Cooler opened by: BW	Date	Time

WHITE: Golder Copy YELLOW: Lab Copy

ESED

CERTIFICATE OF ANALYSIS

REPORTED TO	Golder Associates Ltd. (Kelowna) 590 McKay Avenue, Suite 300 Kelowna, BC V1Y 5A8		
ATTENTION	Pana Athanasopoulos	**WORK ORDER**	21L0506
PO NUMBER	20144760	**RECEIVED / TEMP**	2021-12-02 16:49 / 11.9°C
PROJECT	20144760	**REPORTED**	2022-01-19 11:53
PROJECT INFO	Keddleston	**COC NUMBER**	12406

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.

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

Authorized By:

Nicole Yipp
Client Service Team Lead

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12406-01 - 180 (21L0506-01) | Matrix: Water | Sampled: 2021-12-02 12:15						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-12-03	
Chloride	**1.35**	AO ≤ 250	0.10	mg/L	2021-12-03	
Fluoride	**1.19**	MAC = 1.5	0.10	mg/L	2021-12-03	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2021-12-03	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-12-03	
Sulfate	**410**	AO ≤ 500	1.0	mg/L	2021-12-03	
Calculated Parameters						
Hardness, Total (as CaCO3)	**620**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.155**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-12-08	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-12-08	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Barium, dissolved	**0.0150**	N/A	0.0050	mg/L	2021-12-08	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-12-08	
Cadmium, dissolved	**0.000041**	N/A	0.000010	mg/L	2021-12-08	
Calcium, dissolved	**115**	N/A	0.20	mg/L	2021-12-08	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Cobalt, dissolved	**0.00071**	N/A	0.00010	mg/L	2021-12-08	
Copper, dissolved	**0.00201**	N/A	0.00040	mg/L	2021-12-08	
Iron, dissolved	**0.098**	N/A	0.010	mg/L	2021-12-08	
Lead, dissolved	**0.00025**	N/A	0.00020	mg/L	2021-12-08	
Lithium, dissolved	**0.238**	N/A	0.00010	mg/L	2021-12-08	
Magnesium, dissolved	**80.9**	N/A	0.010	mg/L	2021-12-08	
Manganese, dissolved	**0.128**	N/A	0.00020	mg/L	2021-12-08	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-12-09	
Molybdenum, dissolved	**0.00332**	N/A	0.00010	mg/L	2021-12-08	
Nickel, dissolved	**0.00326**	N/A	0.00040	mg/L	2021-12-08	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-12-08	
Potassium, dissolved	**12.2**	N/A	0.10	mg/L	2021-12-08	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Silicon, dissolved	**9.8**	N/A	1.0	mg/L	2021-12-08	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-12-08	
Sodium, dissolved	**110**	N/A	0.10	mg/L	2021-12-08	
Strontium, dissolved	**3.54**	N/A	0.0010	mg/L	2021-12-08	
Sulfur, dissolved	**187**	N/A	3.0	mg/L	2021-12-08	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-12-08	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12406-01 - 180 (21L0506-01) | Matrix: Water | Sampled: 2021-12-02 12:15, Continued						F2
Dissolved Metals, Continued						
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-12-08	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-12-08	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-12-08	
Uranium, dissolved	**0.00470**	N/A	0.000020	mg/L	2021-12-08	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-12-08	
Zinc, dissolved	**0.0362**	N/A	0.0040	mg/L	2021-12-08	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
General Parameters						
Alkalinity, Total (as CaCO3)	**394**	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Bicarbonate (as CaCO3)	**394**	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-06	
Ammonia, Total (as N)	**0.056**	None Required	0.050	mg/L	2021-12-07	
Conductivity (EC)	**1340**	N/A	2.0	µS/cm	2021-12-06	
Nitrogen, Total Kjeldahl	**0.155**	N/A	0.050	mg/L	2021-12-07	
pH	**7.78**	7.0-10.5	0.10	pH units	2021-12-06	HT2
Solids, Total Dissolved	**981**	AO ≤ 500	15	mg/L	2021-12-07	
Turbidity	**0.72**	OG < 1	0.10	NTU	2021-12-03	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-12-03	
Coliforms, Total	< 1	MAC = 0		MPN/100 mL	2021-12-03	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-12-03	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-18.59**	N/A		per mil	2022-01-19	
delta-2-H	**-142.5**	N/A		per mil	2022-01-19	
Total Metals						
Aluminum, total	**0.0219**	OG < 0.1	0.0050	mg/L	2021-12-07	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-12-07	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2021-12-07	
Barium, total	**0.0155**	MAC = 2	0.0050	mg/L	2021-12-07	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-12-07	
Cadmium, total	**0.000027**	MAC = 0.005	0.000010	mg/L	2021-12-07	
Calcium, total	**106**	None Required	0.20	mg/L	2021-12-07	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-12-07	
Cobalt, total	**0.00067**	N/A	0.00010	mg/L	2021-12-07	
Copper, total	**0.00120**	MAC = 2	0.00040	mg/L	2021-12-07	
Iron, total	**0.306**	AO ≤ 0.3	0.010	mg/L	2021-12-07	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12406-01 - 180 (21L0506-01) | Matrix: Water | Sampled: 2021-12-02 12:15, Continued						F2
Total Metals, Continued						
Lead, total	**0.00040**	MAC = 0.005	0.00020	mg/L	2021-12-07	
Lithium, total	**0.242**	N/A	0.00010	mg/L	2021-12-07	
Magnesium, total	**72.6**	None Required	0.010	mg/L	2021-12-07	
Manganese, total	**0.135**	MAC = 0.12	0.00020	mg/L	2021-12-07	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-12-07	CT5
Molybdenum, total	**0.00338**	N/A	0.00010	mg/L	2021-12-07	
Nickel, total	**0.00301**	N/A	0.00040	mg/L	2021-12-07	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-12-07	
Potassium, total	**12.9**	N/A	0.10	mg/L	2021-12-07	
Selenium, total	**0.00092**	MAC = 0.05	0.00050	mg/L	2021-12-07	
Silicon, total	**10.2**	N/A	1.0	mg/L	2021-12-07	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-12-07	
Sodium, total	**107**	AO ≤ 200	0.10	mg/L	2021-12-07	
Strontium, total	**3.66**	MAC = 7	0.0010	mg/L	2021-12-07	
Sulfur, total	**158**	N/A	3.0	mg/L	2021-12-07	
Tellurium, total	**0.00052**	N/A	0.00050	mg/L	2021-12-07	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2021-12-07	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2021-12-07	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-12-07	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-12-07	
Uranium, total	**0.00508**	MAC = 0.02	0.000020	mg/L	2021-12-07	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2021-12-07	
Zinc, total	**0.0243**	AO ≤ 5	0.0040	mg/L	2021-12-07	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
12406-02 - SMWell 2 (21L0506-02) | Matrix: Water | Sampled: 2021-12-02 13:45						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-12-03	
Chloride	**2.90**	AO ≤ 250	0.10	mg/L	2021-12-03	
Fluoride	**3.39**	MAC = 1.5	0.10	mg/L	2021-12-03	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2021-12-03	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-12-03	
Sulfate	**157**	AO ≤ 500	1.0	mg/L	2021-12-03	
Calculated Parameters						
Hardness, Total (as CaCO3)	**171**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.0900**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-12-08	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12406-02 - SMWell 2 (21L0506-02) | Matrix: Water | Sampled: 2021-12-02 13:45, Continued						F2
Dissolved Metals, Continued						
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-12-08	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Barium, dissolved	**0.0212**	N/A	0.0050	mg/L	2021-12-08	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-12-08	
Cadmium, dissolved	**0.000130**	N/A	0.000010	mg/L	2021-12-08	
Calcium, dissolved	**36.3**	N/A	0.20	mg/L	2021-12-08	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
Copper, dissolved	**0.00287**	N/A	0.00040	mg/L	2021-12-08	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2021-12-08	
Lead, dissolved	**0.00345**	N/A	0.00020	mg/L	2021-12-08	
Lithium, dissolved	**0.0740**	N/A	0.00010	mg/L	2021-12-08	
Magnesium, dissolved	**19.5**	N/A	0.010	mg/L	2021-12-08	
Manganese, dissolved	**0.00466**	N/A	0.00020	mg/L	2021-12-08	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-12-09	
Molybdenum, dissolved	**0.00413**	N/A	0.00010	mg/L	2021-12-08	
Nickel, dissolved	**0.00320**	N/A	0.00040	mg/L	2021-12-08	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-12-08	
Potassium, dissolved	**1.25**	N/A	0.10	mg/L	2021-12-08	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Silicon, dissolved	**6.4**	N/A	1.0	mg/L	2021-12-08	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-12-08	
Sodium, dissolved	**149**	N/A	0.10	mg/L	2021-12-08	
Strontium, dissolved	**1.76**	N/A	0.0010	mg/L	2021-12-08	
Sulfur, dissolved	**67.0**	N/A	3.0	mg/L	2021-12-08	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-08	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-12-08	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-12-08	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-12-08	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-12-08	
Uranium, dissolved	**0.000737**	N/A	0.000020	mg/L	2021-12-08	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-12-08	
Zinc, dissolved	**1.79**	N/A	0.0040	mg/L	2021-12-08	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-08	
General Parameters						
Alkalinity, Total (as CaCO3)	**320**	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Bicarbonate (as CaCO3)	**320**	N/A	1.0	mg/L	2021-12-06	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-06	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12406-02 - SMWell 2 (21L0506-02) | Matrix: Water | Sampled: 2021-12-02 13:45, Continued						F2
General Parameters, Continued						
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-06	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2021-12-07	
Conductivity (EC)	**837**	N/A	2.0	µS/cm	2021-12-06	
Nitrogen, Total Kjeldahl	**0.090**	N/A	0.050	mg/L	2021-12-07	
pH	**7.95**	7.0-10.5	0.10	pH units	2021-12-06	HT2
Solids, Total Dissolved	**558**	AO ≤ 500	15	mg/L	2021-12-07	
Turbidity	**0.55**	OG < 1	0.10	NTU	2021-12-03	
Microbiological Parameters						
Coliforms, Fecal	< 1	N/A		MPN/100 mL	2021-12-03	
Coliforms, Total	< 1	MAC = 0		MPN/100 mL	2021-12-03	
E. coli	< 1	MAC = 0		MPN/100 mL	2021-12-03	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-18.67**	N/A		per mil	2022-01-19	
delta-2-H	**-142.7**	N/A		per mil	2022-01-19	
Total Metals						
Aluminum, total	**0.0062**	OG < 0.1	0.0050	mg/L	2021-12-07	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-12-07	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2021-12-07	
Barium, total	**0.0236**	MAC = 2	0.0050	mg/L	2021-12-07	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-12-07	
Cadmium, total	**0.000172**	MAC = 0.005	0.000010	mg/L	2021-12-07	
Calcium, total	**37.7**	None Required	0.20	mg/L	2021-12-07	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-12-07	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Copper, total	**0.0234**	MAC = 2	0.00040	mg/L	2021-12-07	
Iron, total	**0.058**	AO ≤ 0.3	0.010	mg/L	2021-12-07	
Lead, total	**0.00820**	MAC = 0.005	0.00020	mg/L	2021-12-07	
Lithium, total	**0.0831**	N/A	0.00010	mg/L	2021-12-07	
Magnesium, total	**20.6**	None Required	0.010	mg/L	2021-12-07	
Manganese, total	**0.00496**	MAC = 0.12	0.00020	mg/L	2021-12-07	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-12-07	CT5
Molybdenum, total	**0.00473**	N/A	0.00010	mg/L	2021-12-07	
Nickel, total	**0.00366**	N/A	0.00040	mg/L	2021-12-07	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-12-07	
Potassium, total	**1.44**	N/A	0.10	mg/L	2021-12-07	
Selenium, total	**0.00076**	MAC = 0.05	0.00050	mg/L	2021-12-07	
Silicon, total	**7.4**	N/A	1.0	mg/L	2021-12-07	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-12-07	
Sodium, total	**156**	AO ≤ 200	0.10	mg/L	2021-12-07	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12406-02 - SMWell 2 (21L0506-02) | Matrix: Water | Sampled: 2021-12-02 13:45, Continued						F2
Total Metals, Continued						
Strontium, total	**1.89**	MAC = 7	0.0010	mg/L	2021-12-07	
Sulfur, total	**63.6**	N/A	3.0	mg/L	2021-12-07	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-12-07	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2021-12-07	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	
Tin, total	**0.00033**	N/A	0.00020	mg/L	2021-12-07	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-12-07	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-12-07	
Uranium, total	**0.000922**	MAC = 0.02	0.000020	mg/L	2021-12-07	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2021-12-07	
Zinc, total	**1.47**	AO ≤ 5	0.0040	mg/L	2021-12-07	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-07	

Sample Qualifiers:

CT5	This sample has been incorrectly preserved for Mercury analysis
F2	The sample was not field-preserved with HNO3 and was therefore preserved in the laboratory and held for at least 16 hours prior to analysis for total metals.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analysis Description	Method Ref.	Technique	Accredited	Location
2H and 18O Isotope Ratios in Water	Stable Isotopes	CRDS		Sublet
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	✓	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Coliforms, Fecal in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Coliforms, Total in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	✓	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
E. coli in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	✓	Kelowna
pH in Water	SM 4500-H+ B (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 2540 C* (2017)	Gravimetry (Dried at 103-105C)	✓	Kelowna
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
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
MPN/100 mL	Most Probable Number per 100 millilitres
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
per mil	Parts per thousand
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

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

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

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.

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: nyipp@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 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B1L0434										
Blank (B1L0434-BLK1)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Bromide	< 0.10	0.10	mg/L							
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B1L0434-BLK2)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Bromide	< 0.10	0.10	mg/L							
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B1L0434-BS1)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Bromide	4.02	0.10	mg/L	4.00		100	85-115			
Chloride	16.1	0.10	mg/L	16.0		100	90-110			
Fluoride	3.95	0.10	mg/L	4.00		99	88-108			
Nitrate (as N)	4.04	0.010	mg/L	4.00		101	90-110			
Nitrite (as N)	1.98	0.010	mg/L	2.00		99	85-115			
Sulfate	16.0	1.0	mg/L	16.0		100	90-110			
LCS (B1L0434-BS2)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Bromide	3.96	0.10	mg/L	4.00		99	85-115			
Chloride	16.2	0.10	mg/L	16.0		101	90-110			
Fluoride	3.92	0.10	mg/L	4.00		98	88-108			
Nitrate (as N)	4.06	0.010	mg/L	4.00		102	90-110			
Nitrite (as N)	2.08	0.010	mg/L	2.00		104	85-115			
Sulfate	16.0	1.0	mg/L	16.0		100	90-110			
Dissolved Metals, Batch B1L0783										
Blank (B1L0783-BLK1)				Prepared: 2021-12-08, Analyzed: 2021-12-08						
Aluminum, dissolved	< 0.0050	0.0050	mg/L							
Antimony, dissolved	< 0.00020	0.00020	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1L0783, Continued										
Blank (B1L0783-BLK1), Continued				Prepared: 2021-12-08, Analyzed: 2021-12-08						
Arsenic, dissolved	< 0.00050	0.00050	mg/L							
Barium, dissolved	< 0.0050	0.0050	mg/L							
Beryllium, dissolved	< 0.00010	0.00010	mg/L							
Bismuth, dissolved	< 0.00010	0.00010	mg/L							
Boron, dissolved	< 0.0500	0.0500	mg/L							
Cadmium, dissolved	< 0.000010	0.000010	mg/L							
Calcium, dissolved, dissolved	< 0.20	0.20	mg/L							
Chromium, dissolved	< 0.00050	0.00050	mg/L							
Cobalt, dissolved	< 0.00010	0.00010	mg/L							
Copper, dissolved	< 0.00040	0.00040	mg/L							
Iron, dissolved	< 0.010	0.010	mg/L							
Lead, dissolved	< 0.00020	0.00020	mg/L							
Lithium, dissolved	< 0.00010	0.00010	mg/L							
Magnesium, dissolved, dissolved	< 0.010	0.010	mg/L							
Manganese, dissolved	< 0.00020	0.00020	mg/L							
Molybdenum, dissolved	< 0.00010	0.00010	mg/L							
Nickel, dissolved	< 0.00040	0.00040	mg/L							
Phosphorus, dissolved	< 0.050	0.050	mg/L							
Potassium, dissolved	< 0.10	0.10	mg/L							
Selenium, dissolved	< 0.00050	0.00050	mg/L							
Silicon, dissolved	< 1.0	1.0	mg/L							
Silver, dissolved	< 0.000050	0.000050	mg/L							
Sodium, dissolved	< 0.10	0.10	mg/L							
Strontium, dissolved	< 0.0010	0.0010	mg/L							
Sulfur, dissolved	< 3.0	3.0	mg/L							
Tellurium, dissolved	< 0.00050	0.00050	mg/L							
Thallium, dissolved	< 0.000020	0.000020	mg/L							
Thorium, dissolved	< 0.00010	0.00010	mg/L							
Tin, dissolved	< 0.00020	0.00020	mg/L							
Titanium, dissolved	< 0.0050	0.0050	mg/L							
Tungsten, dissolved	< 0.0010	0.0010	mg/L							
Uranium, dissolved	< 0.000020	0.000020	mg/L							
Vanadium, dissolved	< 0.0010	0.0010	mg/L							
Zinc, dissolved	< 0.0040	0.0040	mg/L							
Zirconium, dissolved	< 0.00010	0.00010	mg/L							
LCS (B1L0783-BS1)				Prepared: 2021-12-08, Analyzed: 2021-12-08						
Aluminum, dissolved	0.0184	0.0050	mg/L	0.0200		92	80-120			
Antimony, dissolved	0.0189	0.00020	mg/L	0.0200		95	80-120			
Arsenic, dissolved	0.0203	0.00050	mg/L	0.0200		102	80-120			
Barium, dissolved	0.0171	0.0050	mg/L	0.0200		85	80-120			
Beryllium, dissolved	0.0161	0.00010	mg/L	0.0200		81	80-120			
Bismuth, dissolved	0.0190	0.00010	mg/L	0.0200		95	80-120			
Boron, dissolved	< 0.0500	0.0500	mg/L	0.0200		112	80-120			
Cadmium, dissolved	0.0174	0.000010	mg/L	0.0200		87	80-120			
Calcium, dissolved, dissolved	1.93	0.20	mg/L	2.00		97	80-120			
Chromium, dissolved	0.0184	0.00050	mg/L	0.0200		92	80-120			
Cobalt, dissolved	0.0186	0.00010	mg/L	0.0200		93	80-120			
Copper, dissolved	0.0180	0.00040	mg/L	0.0200		90	80-120			
Iron, dissolved	1.73	0.010	mg/L	2.00		86	80-120			
Lead, dissolved	0.0184	0.00020	mg/L	0.0200		92	80-120			
Lithium, dissolved	0.0174	0.00010	mg/L	0.0200		87	80-120			
Magnesium, dissolved, dissolved	1.97	0.010	mg/L	2.00		98	80-120			
Manganese, dissolved	0.0185	0.00020	mg/L	0.0200		92	80-120			
Molybdenum, dissolved	0.0198	0.00010	mg/L	0.0200		99	80-120			
Nickel, dissolved	0.0186	0.00040	mg/L	0.0200		93	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1L0783, Continued										
LCS (B1L0783-BS1), Continued				Prepared: 2021-12-08, Analyzed: 2021-12-08						
Phosphorus, dissolved	2.06	0.050	mg/L	2.00		103	80-120			
Potassium, dissolved	1.83	0.10	mg/L	2.00		91	80-120			
Selenium, dissolved	0.0189	0.00050	mg/L	0.0200		95	80-120			
Silicon, dissolved	2.2	1.0	mg/L	2.00		112	80-120			
Silver, dissolved	0.0183	0.000050	mg/L	0.0200		92	80-120			
Sodium, dissolved	1.93	0.10	mg/L	2.00		96	80-120			
Strontium, dissolved	0.0171	0.0010	mg/L	0.0200		86	80-120			
Sulfur, dissolved	4.3	3.0	mg/L	5.00		86	80-120			
Tellurium, dissolved	0.0198	0.00050	mg/L	0.0200		99	80-120			
Thallium, dissolved	0.0188	0.000020	mg/L	0.0200		94	80-120			
Thorium, dissolved	0.0190	0.00010	mg/L	0.0200		95	80-120			
Tin, dissolved	0.0203	0.00020	mg/L	0.0200		102	80-120			
Titanium, dissolved	0.0221	0.0050	mg/L	0.0200		110	80-120			
Tungsten, dissolved	0.0207	0.0010	mg/L	0.0200		103	80-120			
Uranium, dissolved	0.0213	0.000020	mg/L	0.0200		106	80-120			
Vanadium, dissolved	0.0164	0.0010	mg/L	0.0200		82	80-120			
Zinc, dissolved	0.0162	0.0040	mg/L	0.0200		81	80-120			
Zirconium, dissolved	0.0199	0.00010	mg/L	0.0200		99	80-120			
Duplicate (B1L0783-DUP1)		**Source: 21L0506-01**		Prepared: 2021-12-08, Analyzed: 2021-12-08						
Aluminum, dissolved	< 0.0050	0.0050	mg/L		< 0.0050				20	
Antimony, dissolved	< 0.00020	0.00020	mg/L		< 0.00020				20	
Arsenic, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Barium, dissolved	0.0207	0.0050	mg/L		0.0150				20	
Beryllium, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Bismuth, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Boron, dissolved	< 0.0500	0.0500	mg/L		< 0.0500				20	
Cadmium, dissolved	0.000043	0.000010	mg/L		0.000041				20	
Calcium, dissolved, dissolved	113	0.20	mg/L		115			2	20	
Chromium, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Cobalt, dissolved	0.00070	0.00010	mg/L		0.00071			< 1	20	
Copper, dissolved	0.00204	0.00040	mg/L		0.00201			2	20	
Iron, dissolved	0.098	0.010	mg/L		0.098			< 1	20	
Lead, dissolved	0.00025	0.00020	mg/L		0.00025				20	
Lithium, dissolved	0.236	0.00010	mg/L		0.238			1	20	
Magnesium, dissolved, dissolved	79.7	0.010	mg/L		80.9			1	20	
Manganese, dissolved	0.125	0.00020	mg/L		0.128			2	20	
Molybdenum, dissolved	0.00336	0.00010	mg/L		0.00332			1	20	
Nickel, dissolved	0.00339	0.00040	mg/L		0.00326			4	20	
Phosphorus, dissolved	< 0.050	0.050	mg/L		< 0.050				20	
Potassium, dissolved	12.1	0.10	mg/L		12.2			1	20	
Selenium, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Silicon, dissolved	9.6	1.0	mg/L		9.8			3	20	
Silver, dissolved	< 0.000050	0.000050	mg/L		< 0.000050				20	
Sodium, dissolved	108	0.10	mg/L		110			2	20	
Strontium, dissolved	3.55	0.0010	mg/L		3.54			< 1	20	
Sulfur, dissolved	188	3.0	mg/L		187			< 1	20	
Tellurium, dissolved	< 0.00050	0.00050	mg/L		< 0.00050				20	
Thallium, dissolved	< 0.000020	0.000020	mg/L		< 0.000020				20	
Thorium, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Tin, dissolved	< 0.00020	0.00020	mg/L		< 0.00020				20	
Titanium, dissolved	< 0.0050	0.0050	mg/L		< 0.0050				20	
Tungsten, dissolved	< 0.0010	0.0010	mg/L		< 0.0010				20	
Uranium, dissolved	0.00465	0.000020	mg/L		0.00470			1	20	
Vanadium, dissolved	< 0.0010	0.0010	mg/L		< 0.0010				20	
Zinc, dissolved	0.0406	0.0040	mg/L		0.0362			11	20	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1L0783, Continued										
Duplicate (B1L0783-DUP1), Continued		**Source: 21L0506-01**		Prepared: 2021-12-08, Analyzed: 2021-12-08						
Zirconium, dissolved	< 0.00010	0.00010	mg/L		< 0.00010				20	
Reference (B1L0783-SRM1)				Prepared: 2021-12-08, Analyzed: 2021-12-08						
Aluminum, dissolved	0.217	0.0050	mg/L	0.235		92	70-130			
Antimony, dissolved	0.0531	0.00020	mg/L	0.0431		123	70-130			
Arsenic, dissolved	0.410	0.00050	mg/L	0.423		97	70-130			
Barium, dissolved	3.15	0.0050	mg/L	3.30		95	70-130			
Beryllium, dissolved	0.254	0.00010	mg/L	0.209		122	70-130			
Boron, dissolved	2.02	0.0500	mg/L	1.65		123	70-130			
Cadmium, dissolved	0.278	0.000010	mg/L	0.221		126	70-130			
Calcium, dissolved, dissolved	8.80	0.20	mg/L	7.72		114	70-130			
Chromium, dissolved	0.442	0.00050	mg/L	0.434		102	70-130			
Cobalt, dissolved	0.136	0.00010	mg/L	0.124		110	70-130			
Copper, dissolved	0.893	0.00040	mg/L	0.815		110	70-130			
Iron, dissolved	1.28	0.010	mg/L	1.27		101	70-130			
Lead, dissolved	0.116	0.00020	mg/L	0.110		106	70-130			
Lithium, dissolved	0.101	0.00010	mg/L	0.100		101	70-130			
Magnesium, dissolved, dissolved	7.15	0.010	mg/L	6.59		108	70-130			
Manganese, dissolved	0.329	0.00020	mg/L	0.342		96	70-130			
Molybdenum, dissolved	0.401	0.00010	mg/L	0.404		99	70-130			
Nickel, dissolved	0.924	0.00040	mg/L	0.835		111	70-130			
Phosphorus, dissolved	0.505	0.050	mg/L	0.499		101	70-130			
Potassium, dissolved	2.95	0.10	mg/L	2.88		103	70-130			
Selenium, dissolved	0.0356	0.00050	mg/L	0.0324		110	70-130			
Sodium, dissolved	19.3	0.10	mg/L	18.0		107	70-130			
Strontium, dissolved	0.847	0.0010	mg/L	0.935		91	70-130			
Thallium, dissolved	0.0403	0.000020	mg/L	0.0385		105	70-130			
Uranium, dissolved	0.246	0.000020	mg/L	0.258		95	70-130			
Vanadium, dissolved	0.864	0.0010	mg/L	0.873		99	70-130			
Zinc, dissolved	0.957	0.0040	mg/L	0.848		113	70-130			
Dissolved Metals, Batch B1L1043										
Blank (B1L1043-BLK1)				Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B1L1043-BLK2)				Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B1L1043-BLK3)				Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Duplicate (B1L1043-DUP1)		**Source: 21L0506-01**		Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	< 0.000010	0.000010	mg/L		< 0.000010				20	
Matrix Spike (B1L1043-MS1)		**Source: 21L0506-02**		Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	0.000231	0.000010	mg/L	0.000250	< 0.000010	93	70-130			
Reference (B1L1043-SRM1)				Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	0.000488	0.000010	mg/L	0.000500		98	0-200			
Reference (B1L1043-SRM2)				Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	0.000490	0.000010	mg/L	0.000500		98	0-200			
Reference (B1L1043-SRM3)				Prepared: 2021-12-09, Analyzed: 2021-12-09						
Mercury, dissolved	0.000478	0.000010	mg/L	0.000500		96	0-200			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B1L0452										
Blank (B1L0452-BLK1)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Turbidity	< 0.10	0.10	NTU							
LCS (B1L0452-BS1)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Turbidity	38.1	0.10	NTU	40.0		95	90-110			
General Parameters, Batch B1L0667										
Blank (B1L0667-BLK1)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B1L0667-BLK2)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B1L0667-BLK3)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
LCS (B1L0667-BS1)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	106	1.0	mg/L	100		106	80-120			
LCS (B1L0667-BS2)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	95.3	1.0	mg/L	100		95	80-120			
LCS (B1L0667-BS3)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	106	1.0	mg/L	100		106	80-120			
LCS (B1L0667-BS4)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Conductivity (EC)	1430	2.0	µS/cm	1410		102	95-105			
LCS (B1L0667-BS5)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Conductivity (EC)	1440	2.0	µS/cm	1410		102	95-105			
LCS (B1L0667-BS6)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
Conductivity (EC)	1440	2.0	µS/cm	1410		102	95-105			
Duplicate (B1L0667-DUP1)		**Source: 21L0506-02**		Prepared: 2021-12-06, Analyzed: 2021-12-06						
Alkalinity, Total (as CaCO3)	318	1.0	mg/L		320			< 1	10	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO3)	318	1.0	mg/L		320			< 1	10	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Conductivity (EC)	854	2.0	µS/cm		837			2	5	
pH	7.96	0.10	pH units		7.95			< 1	4	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B1L0667, Continued										
Reference (B1L0667-SRM1)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
pH	7.02	0.10	pH units	7.01		100	98-102			
Reference (B1L0667-SRM2)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
pH	7.02	0.10	pH units	7.01		100	98-102			
Reference (B1L0667-SRM3)				Prepared: 2021-12-06, Analyzed: 2021-12-06						
pH	7.03	0.10	pH units	7.01		100	98-102			
General Parameters, Batch B1L0696										
Blank (B1L0696-BLK1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B1L0696-BS1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Solids, Total Dissolved	239	15	mg/L	240		100	85-115			
General Parameters, Batch B1L0698										
Blank (B1L0698-BLK1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B1L0698-BLK2)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B1L0698-BLK3)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
LCS (B1L0698-BS1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	0.934	0.020	mg/L	1.00		93	90-115			
LCS (B1L0698-BS2)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	0.941	0.020	mg/L	1.00		94	90-115			
LCS (B1L0698-BS3)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	0.957	0.020	mg/L	1.00		96	90-115			
Duplicate (B1L0698-DUP1)		**Source: 21L0506-02**		Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	< 0.020	0.050	mg/L		< 0.050				15	
Matrix Spike (B1L0698-MS1)		**Source: 21L0506-02**		Prepared: 2021-12-07, Analyzed: 2021-12-07						
Ammonia, Total (as N)	0.261	0.020	mg/L	0.250	< 0.050	97	75-125			
General Parameters, Batch B1L0756										
Blank (B1L0756-BLK1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
Blank (B1L0756-BLK2)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
LCS (B1L0756-BS1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Nitrogen, Total Kjeldahl	0.890	0.050	mg/L	1.00		89	85-115			
LCS (B1L0756-BS2)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Nitrogen, Total Kjeldahl	0.855	0.050	mg/L	1.00		86	85-115			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Microbiological Parameters, Batch B1L0422										
Blank (B1L0422-BLK1)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Coliforms, Total	< 1	1	MPN/100 mL							
E. coli	< 1	1	MPN/100 mL							
Blank (B1L0422-BLK2)				Prepared: 2021-12-03, Analyzed: 2021-12-03						
Coliforms, Fecal	< 1	1	MPN/100 mL							
E. coli	< 1	1	MPN/100 mL							
Duplicate (B1L0422-DUP1)	**Source: 21L0506-01**			Prepared: 2021-12-03, Analyzed: 2021-12-03						
Coliforms, Total	< 1		MPN/100 mL		< 1			80		RS2
E. coli	< 1		MPN/100 mL		< 1			80		RS2
Duplicate (B1L0422-DUP2)	**Source: 21L0506-02**			Prepared: 2021-12-03, Analyzed: 2021-12-03						
Coliforms, Fecal	< 1		MPN/100 mL		< 1			80		RS2
E. coli	< 1		MPN/100 mL		< 1			80		RS2
Total Metals, Batch B1L0788										
Blank (B1L0788-BLK1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Aluminum, total	< 0.0050	0.0050	mg/L							
Antimony, total	< 0.00020	0.00020	mg/L							
Arsenic, total	< 0.00050	0.00050	mg/L							
Barium, total	< 0.0050	0.0050	mg/L							
Beryllium, total	< 0.00010	0.00010	mg/L							
Bismuth, total	< 0.00010	0.00010	mg/L							
Boron, total	< 0.0500	0.0500	mg/L							
Cadmium, total	< 0.000010	0.000010	mg/L							
Calcium, total	< 0.20	0.20	mg/L							
Chromium, total	< 0.00050	0.00050	mg/L							
Cobalt, total	< 0.00010	0.00010	mg/L							
Copper, total	< 0.00040	0.00040	mg/L							
Iron, total	< 0.010	0.010	mg/L							
Lead, total	< 0.00020	0.00020	mg/L							
Lithium, total	< 0.00010	0.00010	mg/L							
Magnesium, total	< 0.010	0.010	mg/L							
Manganese, total	< 0.00020	0.00020	mg/L							
Mercury, total	< 0.000040	0.000040	mg/L							
Molybdenum, total	< 0.00010	0.00010	mg/L							
Nickel, total	< 0.00040	0.00040	mg/L							
Phosphorus, total	< 0.050	0.050	mg/L							
Potassium, total	< 0.10	0.10	mg/L							
Selenium, total	< 0.00050	0.00050	mg/L							
Silicon, total	< 1.0	1.0	mg/L							
Silver, total	< 0.000050	0.000050	mg/L							
Sodium, total	< 0.10	0.10	mg/L							
Strontium, total	< 0.0010	0.0010	mg/L							
Sulfur, total	< 3.0	3.0	mg/L							
Tellurium, total	< 0.00050	0.00050	mg/L							
Thallium, total	< 0.000020	0.000020	mg/L							
Thorium, total	< 0.00010	0.00010	mg/L							
Tin, total	< 0.00020	0.00020	mg/L							
Titanium, total	< 0.0050	0.0050	mg/L							
Tungsten, total	< 0.0010	0.0010	mg/L							
Uranium, total	< 0.000020	0.000020	mg/L							
Vanadium, total	< 0.0010	0.0010	mg/L							
Zinc, total	< 0.0040	0.0040	mg/L							
Zirconium, total	< 0.00010	0.00010	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1L0788, Continued										
LCS (B1L0788-BS1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Aluminum, total	0.0226	0.0050	mg/L	0.0200		113	80-120			
Antimony, total	0.0228	0.00020	mg/L	0.0200		114	80-120			
Arsenic, total	0.0216	0.00050	mg/L	0.0200		108	80-120			
Barium, total	0.0227	0.0050	mg/L	0.0200		114	80-120			
Beryllium, total	0.0225	0.00010	mg/L	0.0200		113	80-120			
Bismuth, total	0.0221	0.00010	mg/L	0.0200		110	80-120			
Boron, total	< 0.0500	0.0500	mg/L	0.0200		114	80-120			
Cadmium, total	0.0221	0.000010	mg/L	0.0200		111	80-120			
Calcium, total	2.14	0.20	mg/L	2.00		107	80-120			
Chromium, total	0.0202	0.00050	mg/L	0.0200		101	80-120			
Cobalt, total	0.0210	0.00010	mg/L	0.0200		105	80-120			
Copper, total	0.0205	0.00040	mg/L	0.0200		102	80-120			
Iron, total	2.11	0.010	mg/L	2.00		106	80-120			
Lead, total	0.0237	0.00020	mg/L	0.0200		118	80-120			
Lithium, total	0.0211	0.00010	mg/L	0.0200		106	80-120			
Magnesium, total	2.26	0.010	mg/L	2.00		113	80-120			
Manganese, total	0.0203	0.00020	mg/L	0.0200		102	80-120			
Mercury, total	0.00111	0.000040	mg/L	0.00101		109	80-120			
Molybdenum, total	0.0220	0.00010	mg/L	0.0200		110	80-120			
Nickel, total	0.0213	0.00040	mg/L	0.0200		107	80-120			
Phosphorus, total	2.21	0.050	mg/L	2.00		111	80-120			
Potassium, total	2.31	0.10	mg/L	2.00		116	80-120			
Selenium, total	0.0223	0.00050	mg/L	0.0200		112	80-120			
Silicon, total	2.3	1.0	mg/L	2.00		113	80-120			
Silver, total	0.0220	0.000050	mg/L	0.0200		110	80-120			
Sodium, total	2.25	0.10	mg/L	2.00		113	80-120			
Strontium, total	0.0209	0.0010	mg/L	0.0200		105	80-120			
Sulfur, total	5.5	3.0	mg/L	5.00		111	80-120			
Tellurium, total	0.0227	0.00050	mg/L	0.0200		114	80-120			
Thallium, total	0.0213	0.000020	mg/L	0.0200		107	80-120			
Thorium, total	0.0225	0.00010	mg/L	0.0200		113	80-120			
Tin, total	0.0237	0.00020	mg/L	0.0200		119	80-120			
Titanium, total	0.0219	0.0050	mg/L	0.0200		110	80-120			
Tungsten, total	0.0237	0.0010	mg/L	0.0200		119	80-120			
Uranium, total	0.0230	0.000020	mg/L	0.0200		115	80-120			
Vanadium, total	0.0202	0.0010	mg/L	0.0200		101	80-120			
Zinc, total	0.0204	0.0040	mg/L	0.0200		102	80-120			
Zirconium, total	0.0230	0.00010	mg/L	0.0200		115	80-120			
Reference (B1L0788-SRM1)				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Aluminum, total	0.240	0.0050	mg/L	0.198		121	70-130			
Antimony, total	0.0267	0.00020	mg/L	0.0230		116	70-130			
Arsenic, total	0.0216	0.00050	mg/L	0.0200		108	70-130			
Barium, total	0.0179	0.0050	mg/L	0.0161		112	70-130			
Beryllium, total	0.00441	0.00010	mg/L	0.00384		115	70-130			
Boron, total	0.204	0.0500	mg/L	0.191		107	70-130			
Cadmium, total	0.00433	0.000010	mg/L	0.00404		107	70-130			
Calcium, total	0.89	0.20	mg/L	0.938		95	70-130			
Chromium, total	0.0261	0.00050	mg/L	0.0256		102	70-130			
Cobalt, total	0.0228	0.00010	mg/L	0.0214		107	70-130			
Copper, total	0.0328	0.00040	mg/L	0.0322		102	70-130			
Iron, total	0.060	0.010	mg/L	0.0580		104	70-130			
Lead, total	0.00936	0.00020	mg/L	0.00796		118	70-130			
Lithium, total	0.0108	0.00010	mg/L	0.0102		106	70-130			
Magnesium, total	0.126	0.010	mg/L	0.112		113	70-130			
Manganese, total	0.0119	0.00020	mg/L	0.0120		99	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L0506
PROJECT	20144760	**REPORTED**	2022-01-19 11:53

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1L0788, Continued										
Reference (B1L0788-SRM1), Continued				Prepared: 2021-12-07, Analyzed: 2021-12-07						
Molybdenum, total	0.0482	0.00010	mg/L	0.0438		110	70-130			
Nickel, total	0.0416	0.00040	mg/L	0.0394		106	70-130			
Potassium, total	0.90	0.10	mg/L	0.820		110	70-130			
Selenium, total	0.130	0.00050	mg/L	0.117		111	70-130			
Sodium, total	0.41	0.10	mg/L	0.490		84	70-130			
Strontium, total	0.291	0.0010	mg/L	0.276		105	70-130			
Thallium, total	0.0125	0.000020	mg/L	0.0118		106	70-130			
Uranium, total	0.0106	0.000020	mg/L	0.00970		109	70-130			
Vanadium, total	0.0286	0.0010	mg/L	0.0274		104	70-130			
Zinc, total	0.0870	0.0040	mg/L	0.0884		98	70-130			

QC Qualifiers:

RS2 The Reporting Limits for this sample have been raised due to limited sample volume.

CHAIN OF CUSTODY RECORD/ANALYSIS REQUEST

No. 12406 page __ of __

21L0506

0C4
Telephone (604) 296-4200 Fax (604) 298-5253

Project Number: 20144760		Laboratory Name: Caro	
Short Title: Keddleston	Golder Contact: Panagiota Athanasopoulos	Address: 3677 BC-97 Kelowna	
Golder E-mail Address 1: Pathanas @golder.com	Golder E-mail Address 2: @golder.com	Telephone/Fax:	Contact:

Office Name: Kelowna

EQuIS Facility Code: _____
EQuIS upload: ☐

Turnaround Time: ☐ 24 hr ☐ 48 hr ☐ 72 hr ☒ Regular (5 Days)
Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☑ Other Canadian Drinking Water Quality Guidelines

Note: Final Reports to be issued by e-mail

Quote No.:

Analyses Required

Sample Control Number (SCN)	Sample Location	Sa. #	Sample Depth (m)	Sample Matrix (over)	Date Sampled (D / M / Y)	Time Sampled (HH:MM)	Sample Type (over)	QAQC Code (over)	Related SCN (over)	Number of Containers	total/fecal coliforms	e.coli	pH, conductivity, TDS	turbidity, hardness	anions (Br, Cl, F, SO4)	ammonia, nitrate, nitrite	dissolved metals	total metals	speciated alkalinity	isotopes of water	RUSH (Select TAT above) 24 HR	Remarks (over)
12406-01	180			GW	2/12/21	12:15				7	X	X	X	X	X	X	X	X	X	X	X	
12406-02	SMWell2			GW	2/12/21	13:45				7	X	X	X	X	X	X	X	X	X	X	X	
-03																						
-04																						
-05																						
-06																						
-07																						
-08																						
-09																						
-10																						
-11																						
-12																						

Sampler's Signature: Alex M ON ICE	Relinquished by: Signature Alex M	Company Golder	Date 2 Dec, 2021	Time 16:50	Received by: Signature ~~JS~~ JS	Company Caro
Comments:	Method of Shipment:	Waybill No.:	Received for Lab by: Julie	Date 12/2/21	Time 16:49	
	Shipped by:	Shipment Condition: Seal Intact:	Temp (°C) 11.9	Cooler opened by: J.S	Date 12/2/21	Time 16:50

WHITE: Golder Copy YELLOW: Lab Copy

ESED

CERTIFICATE OF ANALYSIS

REPORTED TO	Golder Associates Ltd. (Kelowna) 590 McKay Avenue, Suite 300 Kelowna, BC V1Y 5A8		
ATTENTION	Pana Athanasopoulos	**WORK ORDER**	21L2571
PO NUMBER	20448804	**RECEIVED / TEMP**	2021-12-16 11:46 / 2.5°C
PROJECT	20144760	**REPORTED**	2022-01-27 11:02
PROJECT INFO	Keddleston	**COC NUMBER**	12411

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.

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

Authorized By:

Nicole Yipp
Client Service Team Lead

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12411-01- 840 (21L2571-01) | Matrix: Water | Sampled: 2021-12-16 09:50						F2
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2021-12-17	
Chloride	**5.01**	AO ≤ 250	0.10	mg/L	2021-12-17	
Fluoride	**8.17**	MAC = 1.5	0.10	mg/L	2021-12-17	
Nitrate (as N)	**0.024**	MAC = 10	0.010	mg/L	2021-12-17	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2021-12-17	
Sulfate	**107**	AO ≤ 500	1.0	mg/L	2021-12-17	
Calculated Parameters						
Hardness, Total (as CaCO3)	**64.4**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.0243**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Aluminum, dissolved	**0.0055**	N/A	0.0050	mg/L	2021-12-23	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-12-23	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-23	
Barium, dissolved	**0.0139**	N/A	0.0050	mg/L	2021-12-23	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Boron, dissolved	< 0.0500	N/A	0.0500	mg/L	2021-12-23	
Cadmium, dissolved	**0.000022**	N/A	0.000010	mg/L	2021-12-23	
Calcium, dissolved	**19.3**	N/A	0.20	mg/L	2021-12-23	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-23	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2021-12-23	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2021-12-23	
Lead, dissolved	**0.00181**	N/A	0.00020	mg/L	2021-12-23	
Lithium, dissolved	**0.0191**	N/A	0.00010	mg/L	2021-12-23	
Magnesium, dissolved	**3.89**	N/A	0.010	mg/L	2021-12-23	
Manganese, dissolved	**0.00056**	N/A	0.00020	mg/L	2021-12-23	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2021-12-20	
Molybdenum, dissolved	**0.00345**	N/A	0.00010	mg/L	2021-12-23	
Nickel, dissolved	< 0.00040	N/A	0.00040	mg/L	2021-12-23	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2021-12-23	
Potassium, dissolved	**1.41**	N/A	0.10	mg/L	2021-12-23	
Selenium, dissolved	**0.00052**	N/A	0.00050	mg/L	2021-12-23	
Silicon, dissolved	**6.2**	N/A	1.0	mg/L	2021-12-23	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2021-12-23	
Sodium, dissolved	**185**	N/A	0.10	mg/L	2021-12-23	
Strontium, dissolved	**0.285**	N/A	0.0010	mg/L	2021-12-23	
Sulfur, dissolved	**32.7**	N/A	3.0	mg/L	2021-12-23	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2021-12-23	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2021-12-23	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-23	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12411-01- 840 (21L2571-01) | Matrix: Water | Sampled: 2021-12-16 09:50, Continued						F2
Dissolved Metals, Continued						
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2021-12-23	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2021-12-23	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-12-23	
Uranium, dissolved	**0.00234**	N/A	0.000020	mg/L	2021-12-23	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2021-12-23	
Zinc, dissolved	**0.244**	N/A	0.0040	mg/L	2021-12-23	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
General Parameters						
Alkalinity, Total (as CaCO3)	**349**	N/A	1.0	mg/L	2021-12-17	
Alkalinity, Phenolphthalein (as CaCO3)	**2.6**	N/A	1.0	mg/L	2021-12-17	
Alkalinity, Bicarbonate (as CaCO3)	**344**	N/A	1.0	mg/L	2021-12-17	
Alkalinity, Carbonate (as CaCO3)	**5.1**	N/A	1.0	mg/L	2021-12-17	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2021-12-17	
Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2021-12-20	
Conductivity (EC)	**896**	N/A	2.0	µS/cm	2021-12-17	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2021-12-21	
pH	**8.33**	7.0-10.5	0.10	pH units	2021-12-17	HT2
Solids, Total Dissolved	**548**	AO ≤ 500	15	mg/L	2021-12-21	
Turbidity	**0.88**	OG < 1	0.10	NTU	2021-12-17	
Microbiological Parameters						
Coliforms, Total (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2021-12-17	
Coliforms, Fecal (Q-Tray)	< 1	N/A	1	MPN/100 mL	2021-12-17	
E. coli (Q-Tray)	< 1	MAC = 0	1	MPN/100 mL	2021-12-17	
Miscellaneous Subcontracted Parameters						
delta-18-O	**-19.55**	N/A		per mil	2022-01-20	
delta-2-H	**-150.1**	N/A		per mil	2022-01-20	
Total Metals						
Aluminum, total	**0.0171**	OG < 0.1	0.0050	mg/L	2021-12-23	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2021-12-23	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2021-12-23	
Barium, total	**0.0146**	MAC = 2	0.0050	mg/L	2021-12-23	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2021-12-23	
Cadmium, total	**0.000080**	MAC = 0.005	0.000010	mg/L	2021-12-23	
Calcium, total	**20.3**	None Required	0.20	mg/L	2021-12-23	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-12-23	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Copper, total	**0.00093**	MAC = 2	0.00040	mg/L	2021-12-23	
Iron, total	**0.026**	AO ≤ 0.3	0.010	mg/L	2021-12-23	

TEST RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12411-01- 840 (21L2571-01) | Matrix: Water | Sampled: 2021-12-16 09:50, Continued						F2
Total Metals, Continued						
Lead, total	**0.00254**	MAC = 0.005	0.00020	mg/L	2021-12-23	
Lithium, total	**0.0193**	N/A	0.00010	mg/L	2021-12-23	
Magnesium, total	**3.99**	None Required	0.010	mg/L	2021-12-23	
Manganese, total	**0.00032**	MAC = 0.12	0.00020	mg/L	2021-12-23	
Mercury, total	< 0.000040	MAC = 0.001	0.000040	mg/L	2021-12-23	
Molybdenum, total	**0.00383**	N/A	0.00010	mg/L	2021-12-23	
Nickel, total	**0.00044**	N/A	0.00040	mg/L	2021-12-23	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2021-12-23	
Potassium, total	**1.41**	N/A	0.10	mg/L	2021-12-23	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2021-12-23	
Silicon, total	**6.5**	N/A	1.0	mg/L	2021-12-23	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2021-12-23	
Sodium, total	**190**	AO ≤ 200	0.10	mg/L	2021-12-23	
Strontium, total	**0.290**	MAC = 7	0.0010	mg/L	2021-12-23	
Sulfur, total	**31.8**	N/A	3.0	mg/L	2021-12-23	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2021-12-23	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2021-12-23	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2021-12-23	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2021-12-23	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2021-12-23	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2021-12-23	
Uranium, total	**0.00214**	MAC = 0.02	0.000020	mg/L	2021-12-23	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2021-12-23	
Zinc, total	**0.387**	AO ≤ 5	0.0040	mg/L	2021-12-23	
Zirconium, total	**0.00010**	N/A	0.00010	mg/L	2021-12-23	

Sample Qualifiers:

F2	The sample was not field-preserved with HNO3 and was therefore preserved in the laboratory and held for at least 16 hours prior to analysis for total metals.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analysis Description	Method Ref.	Technique	Accredited	Location
2H and 18O Isotope Ratios in Water	Stable Isotopes	CRDS		Sublet
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	✓	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Coliforms, Fecal in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Coliforms, Total in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	✓	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
E. coli in Water	NA / SM 9223 (2017)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	✓	Kelowna
pH in Water	SM 4500-H+ B (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 2540 C* (2017)	Gravimetry (Dried at 103-105C)	✓	Kelowna
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
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
MPN/100 mL	Most Probable Number per 100 millilitres
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
per mil	Parts per thousand
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, June 2019)

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

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

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.

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: nyipp@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 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B1L2039										
Blank (B1L2039-BLK1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Bromide	< 0.10	0.10	mg/L							
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B1L2039-BLK2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Bromide	< 0.10	0.10	mg/L							
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B1L2039-BS1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Bromide	4.23	0.10	mg/L	4.00		106	85-115			
Chloride	16.0	0.10	mg/L	16.0		100	90-110			
Fluoride	3.95	0.10	mg/L	4.00		99	88-108			
Nitrate (as N)	4.02	0.010	mg/L	4.00		101	90-110			
Nitrite (as N)	2.07	0.010	mg/L	2.00		104	85-115			
Sulfate	16.3	1.0	mg/L	16.0		102	90-110			
LCS (B1L2039-BS2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Bromide	3.91	0.10	mg/L	4.00		98	85-115			
Chloride	16.1	0.10	mg/L	16.0		100	90-110			
Fluoride	3.96	0.10	mg/L	4.00		99	88-108			
Nitrate (as N)	4.00	0.010	mg/L	4.00		100	90-110			
Nitrite (as N)	2.00	0.010	mg/L	2.00		100	85-115			
Sulfate	16.2	1.0	mg/L	16.0		101	90-110			
Dissolved Metals, Batch B1L2214										
Blank (B1L2214-BLK1)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Mercury, dissolved	< 0.000010	0.000010	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1L2214, Continued										
Reference (B1L2214-SRM1)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Mercury, dissolved	0.000477	0.000010	mg/L	0.000500		95	0-200			
Reference (B1L2214-SRM2)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Mercury, dissolved	0.000473	0.000010	mg/L	0.000500		95	0-200			
Dissolved Metals, Batch B1L2530										
Blank (B1L2530-BLK1)				Prepared: 2021-12-22, Analyzed: 2021-12-22						
Aluminum, dissolved	< 0.0050	0.0050	mg/L							
Antimony, dissolved	< 0.00020	0.00020	mg/L							
Arsenic, dissolved	< 0.00050	0.00050	mg/L							
Barium, dissolved	< 0.0050	0.0050	mg/L							
Beryllium, dissolved	< 0.00010	0.00010	mg/L							
Bismuth, dissolved	< 0.00010	0.00010	mg/L							
Boron, dissolved	< 0.0500	0.0500	mg/L							
Cadmium, dissolved	< 0.000010	0.000010	mg/L							
Calcium, dissolved, dissolved	< 0.20	0.20	mg/L							
Chromium, dissolved	< 0.00050	0.00050	mg/L							
Cobalt, dissolved	< 0.00010	0.00010	mg/L							
Copper, dissolved	< 0.00040	0.00040	mg/L							
Iron, dissolved	< 0.010	0.010	mg/L							
Lead, dissolved	< 0.00020	0.00020	mg/L							
Lithium, dissolved	< 0.00010	0.00010	mg/L							
Magnesium, dissolved, dissolved	< 0.010	0.010	mg/L							
Manganese, dissolved	< 0.00020	0.00020	mg/L							
Molybdenum, dissolved	< 0.00010	0.00010	mg/L							
Nickel, dissolved	< 0.00040	0.00040	mg/L							
Phosphorus, dissolved	< 0.050	0.050	mg/L							
Potassium, dissolved	< 0.10	0.10	mg/L							
Selenium, dissolved	< 0.00050	0.00050	mg/L							
Silicon, dissolved	< 1.0	1.0	mg/L							
Silver, dissolved	< 0.000050	0.000050	mg/L							
Sodium, dissolved	< 0.10	0.10	mg/L							
Strontium, dissolved	< 0.0010	0.0010	mg/L							
Sulfur, dissolved	< 3.0	3.0	mg/L							
Tellurium, dissolved	< 0.00050	0.00050	mg/L							
Thallium, dissolved	< 0.000020	0.000020	mg/L							
Thorium, dissolved	< 0.00010	0.00010	mg/L							
Tin, dissolved	< 0.00020	0.00020	mg/L							
Titanium, dissolved	< 0.0050	0.0050	mg/L							
Tungsten, dissolved	< 0.0010	0.0010	mg/L							
Uranium, dissolved	< 0.000020	0.000020	mg/L							
Vanadium, dissolved	< 0.0010	0.0010	mg/L							
Zinc, dissolved	< 0.0040	0.0040	mg/L							
Zirconium, dissolved	< 0.00010	0.00010	mg/L							
LCS (B1L2530-BS1)				Prepared: 2021-12-22, Analyzed: 2021-12-22						
Aluminum, dissolved	0.0209	0.0050	mg/L	0.0200		105	80-120			
Antimony, dissolved	0.0189	0.00020	mg/L	0.0200		94	80-120			
Arsenic, dissolved	0.0181	0.00050	mg/L	0.0200		90	80-120			
Barium, dissolved	0.0179	0.0050	mg/L	0.0200		89	80-120			
Beryllium, dissolved	0.0184	0.00010	mg/L	0.0200		92	80-120			
Bismuth, dissolved	0.0195	0.00010	mg/L	0.0200		97	80-120			
Boron, dissolved	< 0.0500	0.0500	mg/L	0.0200		102	80-120			
Cadmium, dissolved	0.0190	0.000010	mg/L	0.0200		95	80-120			
Calcium, dissolved, dissolved	1.85	0.20	mg/L	2.00		93	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1L2530, Continued										
LCS (B1L2530-BS1), Continued				Prepared: 2021-12-22, Analyzed: 2021-12-22						
Chromium, dissolved	0.0189	0.00050	mg/L	0.0200		94	80-120			
Cobalt, dissolved	0.0195	0.00010	mg/L	0.0200		98	80-120			
Copper, dissolved	0.0189	0.00040	mg/L	0.0200		95	80-120			
Iron, dissolved	1.88	0.010	mg/L	2.00		94	80-120			
Lead, dissolved	0.0193	0.00020	mg/L	0.0200		97	80-120			
Lithium, dissolved	0.0185	0.00010	mg/L	0.0200		92	80-120			
Magnesium, dissolved, dissolved	1.92	0.010	mg/L	2.00		96	80-120			
Manganese, dissolved	0.0191	0.00020	mg/L	0.0200		96	80-120			
Molybdenum, dissolved	0.0192	0.00010	mg/L	0.0200		96	80-120			
Nickel, dissolved	0.0194	0.00040	mg/L	0.0200		97	80-120			
Phosphorus, dissolved	1.80	0.050	mg/L	2.00		90	80-120			
Potassium, dissolved	1.79	0.10	mg/L	2.00		90	80-120			
Selenium, dissolved	0.0185	0.00050	mg/L	0.0200		93	80-120			
Silicon, dissolved	2.0	1.0	mg/L	2.00		99	80-120			
Silver, dissolved	0.0195	0.000050	mg/L	0.0200		97	80-120			
Sodium, dissolved	1.81	0.10	mg/L	2.00		90	80-120			
Strontium, dissolved	0.0178	0.0010	mg/L	0.0200		89	80-120			
Sulfur, dissolved	4.0	3.0	mg/L	5.00		80	80-120			
Tellurium, dissolved	0.0200	0.00050	mg/L	0.0200		100	80-120			
Thallium, dissolved	0.0194	0.000020	mg/L	0.0200		97	80-120			
Thorium, dissolved	0.0209	0.00010	mg/L	0.0200		104	80-120			
Tin, dissolved	0.0196	0.00020	mg/L	0.0200		98	80-120			
Titanium, dissolved	0.0199	0.0050	mg/L	0.0200		100	80-120			
Tungsten, dissolved	0.0195	0.0010	mg/L	0.0200		98	80-120			
Uranium, dissolved	0.0209	0.000020	mg/L	0.0200		104	80-120			
Vanadium, dissolved	0.0189	0.0010	mg/L	0.0200		94	80-120			
Zinc, dissolved	0.0170	0.0040	mg/L	0.0200		85	80-120			
Zirconium, dissolved	0.0201	0.00010	mg/L	0.0200		100	80-120			
Reference (B1L2530-SRM1)				Prepared: 2021-12-22, Analyzed: 2021-12-22						
Aluminum, dissolved	0.239	0.0050	mg/L	0.235		102	70-130			
Antimony, dissolved	0.0449	0.00020	mg/L	0.0431		104	70-130			
Arsenic, dissolved	0.445	0.00050	mg/L	0.423		105	70-130			
Barium, dissolved	3.13	0.0050	mg/L	3.30		95	70-130			
Beryllium, dissolved	0.202	0.00010	mg/L	0.209		97	70-130			
Boron, dissolved	1.63	0.0500	mg/L	1.65		99	70-130			
Cadmium, dissolved	0.223	0.000010	mg/L	0.221		101	70-130			
Calcium, dissolved, dissolved	7.06	0.20	mg/L	7.72		91	70-130			
Chromium, dissolved	0.435	0.00050	mg/L	0.434		100	70-130			
Cobalt, dissolved	0.132	0.00010	mg/L	0.124		106	70-130			
Copper, dissolved	0.843	0.00040	mg/L	0.815		103	70-130			
Iron, dissolved	1.30	0.010	mg/L	1.27		103	70-130			
Lead, dissolved	0.113	0.00020	mg/L	0.110		103	70-130			
Lithium, dissolved	0.0981	0.00010	mg/L	0.100		98	70-130			
Magnesium, dissolved, dissolved	6.87	0.010	mg/L	6.59		104	70-130			
Manganese, dissolved	0.348	0.00020	mg/L	0.342		102	70-130			
Molybdenum, dissolved	0.412	0.00010	mg/L	0.404		102	70-130			
Nickel, dissolved	0.862	0.00040	mg/L	0.835		103	70-130			
Phosphorus, dissolved	0.487	0.050	mg/L	0.499		98	70-130			
Potassium, dissolved	2.94	0.10	mg/L	2.88		102	70-130			
Selenium, dissolved	0.0337	0.00050	mg/L	0.0324		104	70-130			
Sodium, dissolved	18.7	0.10	mg/L	18.0		104	70-130			
Strontium, dissolved	0.864	0.0010	mg/L	0.935		92	70-130			
Thallium, dissolved	0.0405	0.000020	mg/L	0.0385		105	70-130			
Uranium, dissolved	0.257	0.000020	mg/L	0.258		100	70-130			
Vanadium, dissolved	0.857	0.0010	mg/L	0.873		98	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B1L2530, Continued										
Reference (B1L2530-SRM1), Continued				Prepared: 2021-12-22, Analyzed: 2021-12-22						
Zinc, dissolved	0.852	0.0040	mg/L	0.848		100	70-130			
General Parameters, Batch B1L2044										
Blank (B1L2044-BLK1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B1L2044-BLK2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B1L2044-BLK3)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
LCS (B1L2044-BS1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Alkalinity, Total (as CaCO3)	102	1.0	mg/L	100		102	80-120			
LCS (B1L2044-BS2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Alkalinity, Total (as CaCO3)	99.5	1.0	mg/L	100		100	80-120			
LCS (B1L2044-BS3)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Alkalinity, Total (as CaCO3)	102	1.0	mg/L	100		102	80-120			
LCS (B1L2044-BS4)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Conductivity (EC)	1440	2.0	µS/cm	1410		102	95-105			
LCS (B1L2044-BS5)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Conductivity (EC)	1440	2.0	µS/cm	1410		102	95-105			
LCS (B1L2044-BS6)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Conductivity (EC)	1440	2.0	µS/cm	1410		102	95-105			
Reference (B1L2044-SRM1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
pH	7.03	0.10	pH units	7.01		100	98-102			
Reference (B1L2044-SRM2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
pH	7.04	0.10	pH units	7.01		100	98-102			
Reference (B1L2044-SRM3)				Prepared: 2021-12-18, Analyzed: 2021-12-18						
pH	7.04	0.10	pH units	7.01		100	98-102			
General Parameters, Batch B1L2051										

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B1L2051, Continued										
Blank (B1L2051-BLK1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Turbidity	< 0.10	0.10	NTU							
Blank (B1L2051-BLK2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Turbidity	< 0.10	0.10	NTU							
LCS (B1L2051-BS1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Turbidity	37.2	0.10	NTU	40.0		93	90-110			
LCS (B1L2051-BS2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Turbidity	37.0	0.10	NTU	40.0		92	90-110			
General Parameters, Batch B1L2163										
Blank (B1L2163-BLK1)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Ammonia, Total (as N)	< 0.050	0.050	mg/L							
Blank (B1L2163-BLK2)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Ammonia, Total (as N)	< 0.050	0.050	mg/L							
Blank (B1L2163-BLK3)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Ammonia, Total (as N)	< 0.050	0.050	mg/L							
LCS (B1L2163-BS1)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Ammonia, Total (as N)	1.01	0.050	mg/L	1.00		101	90-115			
LCS (B1L2163-BS2)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Ammonia, Total (as N)	1.04	0.050	mg/L	1.00		104	90-115			
LCS (B1L2163-BS3)				Prepared: 2021-12-20, Analyzed: 2021-12-20						
Ammonia, Total (as N)	1.01	0.050	mg/L	1.00		101	90-115			
General Parameters, Batch B1L2247										
Blank (B1L2247-BLK1)				Prepared: 2021-12-20, Analyzed: 2021-12-21						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
Blank (B1L2247-BLK2)				Prepared: 2021-12-20, Analyzed: 2021-12-21						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
LCS (B1L2247-BS1)				Prepared: 2021-12-20, Analyzed: 2021-12-21						
Nitrogen, Total Kjeldahl	1.08	0.050	mg/L	1.00		108	85-115			
LCS (B1L2247-BS2)				Prepared: 2021-12-20, Analyzed: 2021-12-21						
Nitrogen, Total Kjeldahl	1.08	0.050	mg/L	1.00		108	85-115			
General Parameters, Batch B1L2275										
Blank (B1L2275-BLK1)				Prepared: 2021-12-21, Analyzed: 2021-12-21						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B1L2275-BS1)				Prepared: 2021-12-21, Analyzed: 2021-12-21						
Solids, Total Dissolved	240	15	mg/L	240		100	85-115			
Microbiological Parameters, Batch B1L2016										

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Microbiological Parameters, Batch B1L2016, Continued										
Blank (B1L2016-BLK1)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Coliforms, Total (Q-Tray)	< 1	1	MPN/100 mL							
E. coli (Q-Tray)	< 1	1	MPN/100 mL							
Blank (B1L2016-BLK2)				Prepared: 2021-12-17, Analyzed: 2021-12-17						
Coliforms, Fecal (Q-Tray)	< 1	1	MPN/100 mL							
E. coli (Q-Tray)	< 1	1	MPN/100 mL							
Duplicate (B1L2016-DUP1)	**Source: 21L2571-01**			Prepared: 2021-12-17, Analyzed: 2021-12-17						
Coliforms, Total (Q-Tray)	< 1	1	MPN/100 mL		< 1			80		RS2
E. coli (Q-Tray)	< 1	1	MPN/100 mL		< 1			80		RS2
Total Metals, Batch B1L2383										
Blank (B1L2383-BLK1)				Prepared: 2021-12-21, Analyzed: 2021-12-23						
Aluminum, total	< 0.0050	0.0050	mg/L							
Antimony, total	< 0.00020	0.00020	mg/L							
Arsenic, total	< 0.00050	0.00050	mg/L							
Barium, total	< 0.0050	0.0050	mg/L							
Beryllium, total	< 0.00010	0.00010	mg/L							
Bismuth, total	< 0.00010	0.00010	mg/L							
Boron, total	< 0.0500	0.0500	mg/L							
Cadmium, total	< 0.000010	0.000010	mg/L							
Calcium, total	< 0.20	0.20	mg/L							
Chromium, total	< 0.00050	0.00050	mg/L							
Cobalt, total	< 0.00010	0.00010	mg/L							
Copper, total	< 0.00040	0.00040	mg/L							
Iron, total	< 0.010	0.010	mg/L							
Lead, total	< 0.00020	0.00020	mg/L							
Lithium, total	< 0.00010	0.00010	mg/L							
Magnesium, total	< 0.010	0.010	mg/L							
Manganese, total	< 0.00020	0.00020	mg/L							
Mercury, total	< 0.000040	0.000040	mg/L							
Molybdenum, total	< 0.00010	0.00010	mg/L							
Nickel, total	< 0.00040	0.00040	mg/L							
Phosphorus, total	< 0.050	0.050	mg/L							
Potassium, total	< 0.10	0.10	mg/L							
Selenium, total	< 0.00050	0.00050	mg/L							
Silicon, total	< 1.0	1.0	mg/L							
Silver, total	< 0.000050	0.000050	mg/L							
Sodium, total	< 0.10	0.10	mg/L							
Strontium, total	< 0.0010	0.0010	mg/L							
Sulfur, total	< 3.0	3.0	mg/L							
Tellurium, total	< 0.00050	0.00050	mg/L							
Thallium, total	< 0.000020	0.000020	mg/L							
Thorium, total	< 0.00010	0.00010	mg/L							
Tin, total	< 0.00020	0.00020	mg/L							
Titanium, total	< 0.0050	0.0050	mg/L							
Tungsten, total	< 0.0010	0.0010	mg/L							
Uranium, total	< 0.000020	0.000020	mg/L							
Vanadium, total	< 0.0010	0.0010	mg/L							
Zinc, total	< 0.0040	0.0040	mg/L							
Zirconium, total	< 0.00010	0.00010	mg/L							
LCS (B1L2383-BS1)				Prepared: 2021-12-21, Analyzed: 2021-12-23						
Aluminum, total	0.0226	0.0050	mg/L	0.0200		113	80-120			
Antimony, total	0.0189	0.00020	mg/L	0.0200		95	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1L2383, Continued										
LCS (B1L2383-BS1), Continued				Prepared: 2021-12-21, Analyzed: 2021-12-23						
Arsenic, total	0.0176	0.00050	mg/L	0.0200		88	80-120			
Barium, total	0.0182	0.0050	mg/L	0.0200		91	80-120			
Beryllium, total	0.0176	0.00010	mg/L	0.0200		88	80-120			
Bismuth, total	0.0194	0.00010	mg/L	0.0200		97	80-120			
Boron, total	< 0.0500	0.0500	mg/L	0.0200		87	80-120			
Cadmium, total	0.0187	0.000010	mg/L	0.0200		93	80-120			
Calcium, total	1.89	0.20	mg/L	2.00		95	80-120			
Chromium, total	0.0185	0.00050	mg/L	0.0200		93	80-120			
Cobalt, total	0.0193	0.00010	mg/L	0.0200		96	80-120			
Copper, total	0.0189	0.00040	mg/L	0.0200		94	80-120			
Iron, total	1.86	0.010	mg/L	2.00		93	80-120			
Lead, total	0.0191	0.00020	mg/L	0.0200		96	80-120			
Lithium, total	0.0180	0.00010	mg/L	0.0200		90	80-120			
Magnesium, total	1.96	0.010	mg/L	2.00		98	80-120			
Manganese, total	0.0192	0.00020	mg/L	0.0200		96	80-120			
Mercury, total	0.000886	0.000040	mg/L	0.00101		88	80-120			
Molybdenum, total	0.0189	0.00010	mg/L	0.0200		94	80-120			
Nickel, total	0.0190	0.00040	mg/L	0.0200		95	80-120			
Phosphorus, total	1.62	0.050	mg/L	2.00		81	80-120			
Potassium, total	1.77	0.10	mg/L	2.00		89	80-120			
Selenium, total	0.0180	0.00050	mg/L	0.0200		90	80-120			
Silicon, total	1.9	1.0	mg/L	2.00		95	80-120			
Silver, total	0.0195	0.000050	mg/L	0.0200		97	80-120			
Sodium, total	1.78	0.10	mg/L	2.00		89	80-120			
Strontium, total	0.0171	0.0010	mg/L	0.0200		86	80-120			
Sulfur, total	5.1	3.0	mg/L	5.00		101	80-120			
Tellurium, total	0.0191	0.00050	mg/L	0.0200		96	80-120			
Thallium, total	0.0193	0.000020	mg/L	0.0200		96	80-120			
Thorium, total	0.0207	0.00010	mg/L	0.0200		103	80-120			
Tin, total	0.0197	0.00020	mg/L	0.0200		98	80-120			
Titanium, total	0.0206	0.0050	mg/L	0.0200		103	80-120			
Tungsten, total	0.0193	0.0010	mg/L	0.0200		97	80-120			
Uranium, total	0.0207	0.000020	mg/L	0.0200		103	80-120			
Vanadium, total	0.0183	0.0010	mg/L	0.0200		91	80-120			
Zinc, total	0.0187	0.0040	mg/L	0.0200		94	80-120			
Zirconium, total	0.0197	0.00010	mg/L	0.0200		98	80-120			
Reference (B1L2383-SRM1)				Prepared: 2021-12-21, Analyzed: 2021-12-23						
Aluminum, total	0.214	0.0050	mg/L	0.198		108	70-130			
Antimony, total	0.0242	0.00020	mg/L	0.0230		105	70-130			
Arsenic, total	0.0194	0.00050	mg/L	0.0200		97	70-130			
Barium, total	0.0160	0.0050	mg/L	0.0161		100	70-130			
Beryllium, total	0.00393	0.00010	mg/L	0.00384		102	70-130			
Boron, total	0.178	0.0500	mg/L	0.191		93	70-130			
Cadmium, total	0.00408	0.000010	mg/L	0.00404		101	70-130			
Calcium, total	1.02	0.20	mg/L	0.938		109	70-130			
Chromium, total	0.0265	0.00050	mg/L	0.0256		104	70-130			
Cobalt, total	0.0229	0.00010	mg/L	0.0214		107	70-130			
Copper, total	0.0337	0.00040	mg/L	0.0322		105	70-130			
Iron, total	0.059	0.010	mg/L	0.0580		102	70-130			
Lead, total	0.00836	0.00020	mg/L	0.00796		105	70-130			
Lithium, total	0.00999	0.00010	mg/L	0.0102		98	70-130			
Magnesium, total	0.122	0.010	mg/L	0.112		109	70-130			
Manganese, total	0.0129	0.00020	mg/L	0.0120		107	70-130			
Molybdenum, total	0.0462	0.00010	mg/L	0.0438		105	70-130			
Nickel, total	0.0415	0.00040	mg/L	0.0394		105	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Golder Associates Ltd. (Kelowna)	**WORK ORDER**	21L2571
PROJECT	20144760	**REPORTED**	2022-01-27 11:02

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B1L2383, Continued										
Reference (B1L2383-SRM1), Continued				Prepared: 2021-12-21, Analyzed: 2021-12-23						
Potassium, total	0.76	0.10	mg/L	0.820		93	70-130			
Selenium, total	0.123	0.00050	mg/L	0.117		105	70-130			
Sodium, total	0.41	0.10	mg/L	0.490		84	70-130			
Strontium, total	0.267	0.0010	mg/L	0.276		97	70-130			
Thallium, total	0.0126	0.000020	mg/L	0.0118		107	70-130			
Uranium, total	0.0106	0.000020	mg/L	0.00970		110	70-130			
Vanadium, total	0.0281	0.0010	mg/L	0.0274		103	70-130			
Zinc, total	0.0855	0.0040	mg/L	0.0884		97	70-130			

QC Qualifiers:

RS2 The Reporting Limits for this sample have been raised due to limited sample volume.

21L2571

CHAIN OF CUSTODY RECORD/ANALYSIS REQUEST

No. 12411 page 1 of 1

200 – 2920 Virtual Way
Vancouver, British Columbia, Canada V5M 0C4
Telephone (604) 296-4200 Fax (604) 298-5253

Project Number: 20144760 /3.0		Laboratory Name: CARO - Kelowna
Short Title: Keddleston Ph.2 GW Study	Golder Contact: Pana Athanasopoulos	Address: #102-3677 Hwy 97 W
Golder E-mail Address 1: @golder.com	Golder E-mail Address 2: @golder.com	Telephone/Fax: 1 888 311 8846 / Contact:

Office Name: Golder Kelowna

EQuIS Facility Code: _____
EQuIS upload: ☐

Turnaround Time: ☐ 24 hr ☐ 48 hr ☐ 72 hr ☑ Regular (5 Days)
Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☑ Other Cdn Drinking Water Guidelines

Note: Final Reports to be issued by e-mail

Quote No.:

Analyses Required

Sample Control Number (SCN)	Sample Location	Sa. #	Sample Depth (m)	Sample Matrix (over)	Date Sampled (D / M / Y)	Time Sampled (HH:MM)	Sample Type (over)	QAQC Code (over)	Related SCN (over)	Number of Containers	total coliforms	fecal coliforms	e.coli	pH, conductivity	TDS, turbidity	hardness	anions (Br, Cl, FS)	ammonia, nitrate, nitrite	dissolved metals	isotopes of water (δ O-18, δ H-2) RUSH (Select TAT above)	speciated alkalinity, total metals	Remarks (over)
12411 - 01	840	-	-	W6	16/12/21	9:50am	6 water			7	X	X	X	X	X	X	X	X	X	X	XX	
- 02																						
- 03																						
- 04																						
- 05																						
- 06																						
- 07																						
- 08																						
- 09																						
- 10																						
- 11																						
- 12																						

Sampler's Signature:	Relinquished by: Signature	Company	Date	Time	Received by: Signature / Company: Caro
Comments: on ice	Method of Shipment:	Waybill No.:	Received for Lab by: JS	Date 12/16/21	Time 11:46
	Shipped by:	Shipment Condition: Seal Intact:	Temp (°C) 25 / Cooler opened by: JS	Date "	Time "

WHITE: Golder Copy YELLOW: Lab Copy

ESED

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