# Groundwater Monitoring Plan Summit Pit Project

Mountain Ash Limited Partnership

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## 1.0 Introduction

Mountain Ash Limited Partnership (MALP) is planning to develop the Summit Pit (the Project) along Highway 567 within NW and SW 31-026-03 W5M, northeast of the Town of Cochrane, in Rocky View County (RVC), Alberta (Figure 1). The Project will encompass approximately 208 acres (84 ha) excluding existing road rights-of-way. This land is currently owned by 1410266 Alberta Ltd. (a general partner of MALP). The Project received land use and a master site development plan (MSDP) approval on March 2, 2021 (Land Use Bylaw C-8051-2020).

A hydrogeological assessment was undertaken as part of the MSDP application to assess the potential for groundwater impacts from Project operations in relation to nearby groundwater users. The assessment concluded that Project activities are not expected to effect adjacent groundwater well users because aggregate extraction occurs above the water table, and the nearest off-site residential wells are located more than 490 metres (m) away from the closest point of Project operations. As a requirement for the Code of Practice (COP) for Pits and Development Permit (DP) applications, and in response to supplementary information requests (SIRs) from Alberta Environment and Protected Areas (AEPA) dated August and December 2022, and April 2023, this report details the revised and updated Groundwater Monitoring Plan (GWMP) in relation to the operation of the Project. The objective of this GWMP is to monitor potential effects of Project operations on groundwater resources in the vicinity of the site, and to mitigate adverse effects wherever possible. This is also consistent with a condition required as part of the land re-designation and MSDP. Ongoing monitoring and assessment of groundwater levels and quality will be determined for effective monitoring of the lack of effect of operations on groundwater, and to plan and manage mitigation should un-anticipated impact occur.

Several residential water wells and groundwater springs exist near the proposed Project area. The Hydrogeological Assessment (SLR 2020c) concluded these receptors are not expected to be adversely affected by Project activities. This GWMP provides a description of:

- Local geology and hydrogeology
- Potential historical and future sources of contamination
- The proposed groundwater monitoring program including monitoring locations and parameters
- Groundwater response plan

## 2.0 Site Description

#### 2.1 Land Uses

The site is currently being used for agricultural purposes, previously referred to as Ranch/Farm. There are two large wetlands in the northwest corner which have been classified as Temporary Graminoid Marshes (M-G-II) and a number of other, smaller water bodies which are mainly ephemeral water bodies that have been farmed through. A detailed description of water bodies, including wetlands, on site is provided in the Wetland Assessment and Impact Report (SLR 2022). The site location and surrounding land use is shown on Figure 1.



#### 2.2 Proposed Site Activities

The property will be operated in six phases of similar size excluding Phase 4 and Phase 6 which are smaller than Phases 1 to 3 and Phase 5, with operations commencing initially in the southwest parcel. Phase 1 comprises about 14.4 ha (35.5 acres) and is expected to take 5 to 7 years to deplete, depending on market demand. Each of the subsequent phases is anticipated to take approximately 5 to 7 years to deplete, depending on market demand. The proposed phasing is shown on Figure 2.

Based on drilling investigations at the site, there is 3 m to 6 m of glacial till overburden overlying approximately 20 m of sand and gravel, on average (Appendix A). The till and organic topsoil will be stripped and stockpiled for future use during post-development restoration. It is anticipated that stripping will commence in the southwest corner of Phase 1 and move eastwards. Sand and gravel are the target deposit for extraction/processing and lies immediately above the underlying bedrock. Groundwater in assessment boreholes was noted at between 20 m and 24 m below ground surface (m bgs) and above the bedrock in most wells. the site will be excavated to a depth, not exceeding 1.0 m above the highest recorded groundwater level, within the targeted gravel deposit, and will therefore be a dry excavation. Dry excavations do not require operational or permanent dewatering. Actual depths will be determined with progressive investigation of water levels as the aggregate resource is developed (see Section 7.1.1).

## 2.3 Potential Sources of Groundwater Contamination

An assessment of potential sources for contamination was undertaken by SLR. Potential sources, which could affect groundwater at the site, are identified and described below, and are shown on Figure 2.

#### 2.3.1 Historical

A search of historical records for potential sources of contamination using the Alberta Environment and Parks (AEP) Environmental Site Assessment Repository (ESAR) indicated that no investigations on the public record had been carried out within the boundaries of the site. This is common for rural settings.

A review of historical air photos from Google Earth dating back as far as May 2002 indicates that the site was undeveloped and consisted of rough grazing land as is the current situation. No evidence of previous contaminating land uses was found.

#### 2.3.2 Current and Future

The following current and future operations at and adjacent to the site have been identified from a review of air photos, site visits, recent development applications and the MSDP which have the potential to impact soil and groundwater quality onsite:

- Oil and gas infrastructure is currently located in close proximity to the site and is likely the biggest contamination risk to groundwater in the area. This infrastructure includes several operational oil wells with associated pump jacks located along Highway 567 north of the site, and a pipeline which runs north/south along the western boundary of the site.
- Septic systems are present at the three residences on site and could be a potential hazard to groundwater quality if not functioning correctly.
- Volker Stevin Highways Maintenance Facility (10 acre) is located adjacent to SW31-26-3-W5M, to the west.



• Diesel fuel, equipment refueling, equipment and lubricants will be stored on-site adjacent to the scale building. Fuels and lubricants will be stored in accordance with current regulations and, as per the recommendations in the Hydrogeological Assessment (SLR 2020c), be located in an area where thick clay overburden is still present. The location of the proposed storage, refueling and maintenance area is shown on Figure 2.

There are no significant quantities of chemicals stored or used at the site. Future operations will ship incidental hazardous and non-hazardous wastes off site for disposal at an approved waste facility. This is common with other rural land uses.

## 3.0 Geology

The geology and hydrogeology in the vicinity of the site has been compiled from site specific drilling data, available published documents, and the AEP water well database. Figure 3 shows the line of a vertical cross-section (Figure 4) that runs northwest to southeast along the direction of groundwater flow towards the springs (A-A'). It has been prepared to illustrate the relationship between the various geological units at the site and is referred to in the following subsections.

### 3.1 Surficial Geology

Surficial geology in the vicinity of the Project has been determined from published geology maps (Shetsen 1987). Two primary layers are found, as can be seen in the cross-section in Figure 4. The upper strata are predominantly comprised of Pleistocene-age moraine draped over underlying sand and gravel. This moraine consists of an unsorted mixture of clay, silt, sand, and gravel with local water-sorted material; this is called a glacial till. The till in the vicinity of the site, is of a relatively consistent thickness with a flat to undulating topography. The till topography reflects the topography of underlying deposits, which in turn reflect the shape of the bedrock surface below. Underlying the draped moraine at the site is sand and gravel of glaciofluvial origin, which formed on the slopes and base of meltwater channels draining melting ice sheets (Shetsen 1981).

Borehole logs for 31 test holes from the site indicate that surficial deposits over the majority of the site include approximately 3 m to 6 m of silty, sandy or gravelly clay till and approximately 0.5 m of organic topsoil (this overburden and topsoil will have to be removed to expose the underlying aggregate deposit). Beneath the clay till is the sand and gravel deposit of interest, which is generally a well graded mixture of sand and gravel containing occasional beds of pure sand or pure gravel up to 2 m thick. The sand and gravel unit varies in thickness, with an average thickness of approximately 20 m.

## 3.2 Bedrock Geology

Consolidated bedrock underlies the unconsolidated sand and gravel layer as indicated on Figure 4. The bedrock represents the basement to site operations where the sand and gravel is not saturated. Structurally, the site is located several kilometres (km) east of the furthest extent of the main Cordilleran Deformation. As such, the bedrock is relatively flat lying with little folding or faulting compared to older bedrock further west in the Disturbed Belt. The bedrock beneath the sand and gravel at the site consists of Tertiary, Paleocene age (55 to 65 million years old) sedimentary rocks of the Upper Paskapoo Formation. The Paskapoo Formation comprises grey to greenish grey, thickly bedded, calcareous sandstone interbedded with siltstone or mudstone and minor conglomerate or thin limestone beds (Alberta Geological Survey 1999). Drilling at this site has found grey sandstones and siltstones directly underlying the sand and gravel. The bedrock was derived from sediments eroded from the Rocky



Mountains during a period of uplift and erosion and carried east by river systems which drained melting ice from the mountains west of the site. The sandstones within the Paskapoo are a complex series of stacked river channel deposits separated by floodplain siltstone and mudstone deposits (Hamblin 2004).

Outcrops of the Paskapoo Formation sandstone can be seen in the steep slopes at the Big Hill Springs Provincial Park southeast of the site. A number of domestic well records from the immediate vicinity identify sandstone and shale<sup>1</sup> beneath and surrounding the site.

## 4.0 Hydrogeology

The hydrogeological regime at the application site and the surrounding area is described in the following sub sections:

- Aquifer properties
- Groundwater levels and flow
- Baseline water quality assessment
- Regional and local water users

The hydrogeological data is drawn from the Hydrogeological Assessment (SLR 2020c). This data has been used to develop a conceptual site model that has in turn been used to develop the monitoring system installed to assess potential impacts associated with the proposed development.

#### 4.1 Aquifer Properties

A number of different geological units with different hydraulic properties are present in the study area. The distinct units are discussed here progressively with depth from surface (and increasing geological age). The testing of two monitoring wells and two residential wells was undertaken and a summary of the work is provided below. Hydraulic conductivity testing methodology and analysis are provided in the Hydrogeological Assessment (SLR 2020c) and are not reproduced here.

#### 4.1.1 Surficial Unconsolidated Deposits

Surficial deposits of unconsolidated soils consist of till overlying sand and gravel deposits as described in Section 3.1 above. Groundwater flows in the intergranular pores in these soils, and the rate of flow is proportional to the hydraulic conductivity of the soil. For example, the hydraulic conductivity is low where clay rich material infills these pores but is significantly higher where clean sand and gravel is present.

Since the upper glacial till that caps the site is not saturated, no groundwater monitoring wells were installed and therefore no field testing for hydraulic conductivity was undertaken. These soils are not typically aquifers, as their hydraulic conductivity is in the range of 10<sup>-8</sup> to 10<sup>-7</sup> m/s (Freeze and Cherry 1979), but they do act as a protective layer for underlying deposits.

<sup>&</sup>lt;sup>1</sup> It is common for drillers to use the term "shale" to describe mudstones and siltstones, as the differences are subtle, and they all share a common fine-grained appearance to the untrained eye.



As detailed in the Hydrogeological Assessment (SLR 2020c) a number of slug and pumping/recovery tests were undertaken on monitoring wells MW14-101 and MW14-103 which are screened in the sand and gravel. The testing determined hydraulic conductivities of approximately 1 x  $10^{-4}$  m/s to 3 x  $10^{-4}$  m/s. These values fall in a narrow range and are typical of sand and gravel aquifers.

#### 4.1.2 Paskapoo Formation Bedrock

The Paskapoo Formation is the most significant aquifer formation in western Alberta and potentially the Prairie region, and although of regional importance as a whole, the isolated nature of the main sandstone units can provide variable success for residential wells. Only the sandstone facies of the Paskapoo Formation demonstrate any significant intergranular porosity; however, the pore spaces may be filled with calcareous cement in some areas. Bedding planes, joints and structural fractures contribute to a secondary permeability of the bedrock as well. Based on water well records in the area and the drilling at this site, much of the formation in this area is primarily comprised of fine-grained bedrock such as siltstone, mudstone and shale which demonstrate low intergranular porosity. Secondary fracture porosity is likely to be responsible for the yields obtained from residential wells in the vicinity of the site. Lower yields are recorded from wells completed within mudstone and siltstone than from the sandstone (Geological Survey of Canada, 2007; Ozaray and Barnes 1977). The majority of residential wells in the area are drilled into the Paskapoo Formation indicating that the aquifer is locally important for groundwater supplies.

A short-term pumping and recovery test was undertaken on WW2 as described in the Hydrogeological Assessment (SLR 2020c). The test results showed that the Paskapoo Formation sandstone and shale penetrated by WW2 has an approximate hydraulic conductivity of  $2 \times 10^{-7}$  m/s. The hydraulic conductivity value obtained reflects this fractured bedrock. When purging the wells, WW2 had drawdown of >7 m at a flow rate of approximately 12 Litres per minute (L/min) and WW4 had drawdown of just 0.09 m at a flow rate of approximately 39 L/min. The contrast between the performances of the two wells demonstrates the variability of the hydraulic properties of the bedrock in the Paskapoo Formation.

#### 4.2 Groundwater Levels and Flow

A total of ten groundwater monitoring wells have been installed at various times in the sand and gravel at the site since 2014. The wells are variably screened from the bedrock up into the base of the sand and gravel.

The locations of these monitoring wells and their groundwater elevations (on July 3, 2019) are presented on Figure 5. The well construction details are found in Appendix A. The information from these wells have historically been supplemented with groundwater level information from residential wells WW2 and WW4 also presented in Figure 5.

The groundwater monitoring points completed at the site have been subject to periodic groundwater elevation monitoring between October 2014 and April 2023. Sand and gravel monitoring wells MW14-101 and MW14-103 and bedrock residential wells WW2 and WW4 have been equipped with dataloggers recording continuous groundwater levels on a daily basis since October 2014. Groundwater hydrographs of monitoring data to April 2023 are presented in Appendix B, a review of which shows:



- A downward vertical gradient between the sand and gravel deposits and the underlying Paskapoo Formation was demonstrated in SLR 2020c. Therefore, there is a component of downward vertical groundwater flow from the sand and gravel to the bedrock. The amount of downward groundwater flow is probably limited due to the relatively lower hydraulic conductivity of the underlying bedrock, inhibiting drainage to depth; however, the recharge is enough to locally sustain single wells drilled into the bedrock.
- Minimal short-term (daily/weekly) fluctuation in the groundwater levels within the sand and gravel (Appendices B1 and B2). This indicates negligible or no influence from pumping within residential wells in the area.
- Groundwater levels within the sand and gravel gradually fell over the initial years of monitoring between 2014 and 2019, with a drop of approximately 0.9 to 1.3 m during the period (Appendices B1 and B2). This is due to a series of dry years with <400 millimetres (mm) of precipitation each year, based on Environment and Climate Change Canada data for the meteorological station at Calgary International Airport. Even an above average precipitation year (2016) with 520 mm of precipitation did not increase water levels, likely due to a high soil moisture deficit absorbing much of the surplus. Levels rebounded somewhat (0.2 m) in the months between July and September 2019 due to the higher-than-average rainfall totals (526 mm) in the area in spring and summer 2019. This had followed an average precipitation year (424 mm) in 2020 which allowed soil moisture deficits to be reduced. The levels then gradually declined back to the pre-2019 recharge levels in March 2020 before again rising approximately 0.3 to 0.4 m in the 2020 spring recharge event (see Appendices B1 and B2). Groundwater levels continued to slowly rise through 2020 and into the spring of 2021 due to the high precipitation in 2020 (554 mm) before they started to decline again to the end of the monitoring record. Comparison of the groundwater elevations to rainfall therefore indicates that it takes a minimum of two consecutive years of above average precipitation to create a sustained rise of groundwater levels in the sand and gravel under natural conditions.
- A variable response to the pumping from normal use in residential bedrock wells, with the wells recovering within a few hours of extended pumping (Appendices B3 to B5). The degree of response between wells is indicative of the differing performance of the wells due to variability of the hydraulic conductivity within the Paskapoo Formation.

Using site groundwater observation data, Figure 5 shows the inferred potentiometric groundwater surface (drawn in blue) in the sand and gravel at site as recorded on 3 July 2019. Figure 5 shows that the horizontal flow direction in the sand and gravel is towards the south-southeast and the Big Hill Springs valley.

The potentiometric surface within the Paskapoo Formation cannot be drawn based on just two far apart data points (WW2 and WW4). Examination of historical water levels at other wells based on the water well records show that the elevation of the potentiometric surface is between about 1,266 and 1,268 metres above sea level (masl) in the area of the site, which is near the bedrock surface. If one assumes the bedrock potentiometric surface is near ground level at the Big Hill Springs, which is about 1,240 masl, then there is strong lateral gradient southeast towards the springs at which point groundwater is observed discharging to the surface.



#### 4.2.1 Groundwater/Surface Water Interactions

Two large wetlands (Water bodies 19 and 20) located in the northwestern corner of the site have a surface elevation of approximately 1,290 masl and are perched on 6 m of low permeability fine grained till. The presence of freestanding water is temporary based on observations made at the site, with water being present for only a temporary period of about four weeks after snow melt. Monitoring well MW14-101 located close to one of the wetlands (Water body 20) has a groundwater elevation in the sand and gravel of approximately 1,274 masl, which is well below the base of the till (at about 1,284 masl). This demonstrates that the wetlands are not fed by groundwater from the sand and gravel. Thus, it is inferred that the wetlands are fed by rainfall and snowmelt from the local catchment and from the catchment across Highway 567 transported by the culvert located beneath the highway. These wetlands will be retained on the landscape.

Since groundwater from beneath this site flows southeasterly towards the Big Hill Springs, it represents an offsite interaction of groundwater with surface water in the area. Bedrock outcrops can be seen on the valley walls surrounding the stream and springs and thus it is inferred that the host valley is incised into the bedrock. Stream flow downstream of Big Hill Springs has been manually measured in several studies at the Provincial Park over the years, the results of which are presented in Table 1. The collected data indicates that this flow ranges from 40 litres per second (L/s) to 400 L/s, with an average flow in the vicinity of 70 to 100 L/s. Flows from October to February (fall/winter) are generally in the range of 50 to 100 L/s, while flows from March to September (spring/summer) are more variable. The variability in flow rates speaks to the seasonality of inputs to the discharge. There is lower stream flow in late summer and over winter when groundwater flow is the primary input. The highest and more variable flows are found during spring and summer when spring freshet and snowmelt periods occur, and during summer storms when high runoff occurs.

Source	Measurement Point	Date	Number of Measurements	Lowest Flow (L/s)	Highest Flow (L/s)	Average Flow (L/s)
Ozaray and Barnes (1977)	Unknown	Unknown	Unknown		40.0*	
Borneuf (1983)	Unknown	Unknown	Unknown		11.3**	
	Source	2003 - 2004	9	45.3	89.4	73.0
Caron (2004)	Culvert downstream of Park	2003 - 2004	9	54.6	76.7	70.0
Poschmann (2007)	Source	2003 - 2006	20	50.0	240.0	100.0
Fouli (2018)	Main Spring	June 2017	1		184.0*	
Fouli (2020)	Main Spring	July 2019	1		227.0*	
Fennell (2021)	Unknown	Unknown	Unknown	100.0	400.0	

#### Table 1: Summary of Big Hill Spring Flow Data

\*Where only one figure for the spring has been quoted in the published source it has been added in the Highest Flow column. Those results posted for Fouli (2018, 2020) are the highest flows measured in the reports, other results for the main springs were only presented in charts with no specific values attached.

\*\*This figure is considered an outlier when compared with the other flows measured at the Project area and so is not included in the summary statistics.



#### 4.3 Baseline Water Quality Assessment

Groundwater samples have been collected from the accessible residential wells in the Paskapoo Formation bedrock, the onsite sand and gravel monitoring wells and the furthest publicly accessible upstream discharge point at Big Hill Springs as part of the baseline water quality assessment. A detailed comparison of the water quality in the Hydrogeological Assessment (SLR 2020c) concluded that this is the same water type for the sand and gravel, the Paskapoo bedrock, and the discharge from Big Hill Springs. The groundwater and spring water chemistry supports the conclusion that groundwater within the saturated sand and gravel recharges the Paskapoo Formation bedrock and provides baseflow to Big Hill Springs. A summary of historical water quality is provided in Table 2 with details provided in appended Tables A1, A2 and A3. In general, more recent results reflect historically measured ranges, as would be expected, since operations have not yet begun.

#### 4.3.1 Surficial Deposits

Table A1 (appended) indicates that groundwater in the sand and gravel deposit is of marginally poor quality for drinking. The Alberta Tier 1 Groundwater Remediation Guidelines (2023) set guidelines protective of all water users which have been applied for agricultural land use in coarse-grained soils.

Generally, natural groundwater has a moderately alkaline pH (7.2 to 8.2), low sodium (5 to 10 milligrams per litre {mg/L}), low chloride (7 to 29 mg/L) and high hardness (280 to 350 mg/L). A number of total metals exceeded Tier 1 guidelines. These included trace metals such as arsenic, barium, cadmium, chromium, lead, manganese, and mercury. In addition, microbiological parameters (total coliforms and E.Coli) were exceeded. Total metals exceeded guidelines likely due to high turbidity during sampling in the monitoring wells. Turbidity is an artifact of some sampling methodologies, like the one used for this Project. The method inadvertently stirs up sediment within the monitoring well during sampling. A comparison of dissolved (filtered) metals versus total metals was completed for the onsite sand and gravel groundwater samples collected on July 4, 2019, with concentrations of both presented in Table A1. Table A1 shows that in almost all cases where an exceedance of the total metal guideline concentration occurs, the dissolved concentration for the same sample is significantly reduced and falls below the relevant guideline. This is due to the total metal sample being preserved using acid, which dissolves sediments stirred up during sampling. This leads to higher metals concentrations than the filtered dissolved metal sample. The dissolved metal concentrations in groundwater are, therefore, more representative of natural conditions and indicate that groundwater is generally of good quality with low dissolved metals.

It is recommended that a program of well development occurs in the existing monitoring wells in an attempt to remove sediment remaining from drilling within the wells and reduce the turbidity sampling issues as much as possible.

#### 4.3.2 Paskapoo Formation Bedrock

Table A2 (appended) indicates that groundwater in the Paskapoo Formation is of relatively good quality for drinking, with all parameters meeting the Canadian Drinking Water Quality (CDWQ) guidelines except a single exceedance of total coliforms in WW4 and a single turbidity exceedance in WW2. E.Coli was not detected in WW4 which indicates that the coliforms were not related to fecal contamination; however, they do indicate that the well could be vulnerable to bacterial contamination. pH values were moderately high (7.6 to 8.1) in all samples, indicating slightly more alkaline conditions within the bedrock as compared to the sand and gravel.



		Groundwater						
Parameter	Units	Guideline	Sand and	d Gravel <sup>2</sup>	Guideline	Paskapoo Fo	Paskapoo Formation <sup>3</sup>	
		(Alberta Tier 1) <sup>1</sup>	min max		(CDWQ)	min	max	
Aluminum	mg/L	0.05 <sup>4</sup>	<0.0030	0.44	0.1 (OG)	0.0041	0.011	
Antimony	mg/L	0.006	<0.00060	0.0013	0.006 (MAC)	<0.00050	0.00088	
Arsenic	mg/L	0.005	<0.00020	0.00061	0.01 (MAC)	0.000121	0.00032	
Barium	mg/L	2	0.22	0.48	1 (MAC)	0.11	0.41	
Bicarbonate (as HCO3)	mg/L	NV	310	400	NV	340	391.6	
Boron	mg/L	1	<0.020	0.032	5 (MAC)	<0.020	0.039	
Cadmium	mg/L	0.000374	<0.000020	0.000063	0.005 (MAC)	<0.00005	0.00004	
Dissolved Calcium	mg/L	NV	61	79	NV	55	80	
Chloride	mg/L	100	7.83	29	<250 (AO)	1.38	17	
Chromium	mg/L	0.001	<0.0010	0.0013	0.05 (MAC)	<0.0010	0.0012	
Copper	mg/L	0.007	<0.0002	0.0074	2 (MAC) / 1 (AO)	0.0016	0.125	
Hardness	mg/L	NV	280	350	NV	-	-	
Iron	mg/L	0.3	<0.060	1.2	<0.3 (AO)	<0.010	0.3	
Lead	mg/L	0.005 <sup>4</sup>	<0.00020	0.0023	0.005 (MAC)	<0.00020	0.011	
Mercury	mg/L	0.000005	<0.0000019	0.0000048	0.001 (MAC)	<0.0000020	<0.00020	
Dissolved Magnesium	mg/L	NV	30	37	NV	30	39.9	
Manganese	mg/L	0.02	<0.0040	0.11	0.12 (MAC) / 0.02 (AO)	<0.0010	0.015	
Molybdenum	mg/L	NV	0.00051	0.012	NV	0.00063	0.00222	
Nickel	mg/L	0.12 <sup>4</sup>	<0.00050	0.0035	NV	<0.00050	0.00174	
Nitrate-N	mg/L	3	0.97	5.22	10 (MAC)	0.37	3.4	
Nitrite-N	mg/L	0.14	<0.010	0.098	1 (MAC)	<0.005	0.012	
Dissolved Potassium	mg/L	NV	2.4	6.3	NV	2	3.3	

Table 2:         Groundwater Quality Summary, Expressed as Historic Ranges	Table 2:	Groundwater Quality Summary, Expressed as Historic Ranges
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				Ground	water		
Parameter	Units	Guideline	Sand and	d Gravel <sup>2</sup>	Guideline	Paskapoo Formation <sup>3</sup>	
		(Alberta Tier 1) <sup>1</sup>	min max		(CDWQ)	min	max
рН		6.5 - 8.5	7.2	8.2	7.0 -10.5	7.6	8.1
Selenium	mg/L	0.002	0.00037	0.0022	0.05 (MAC)	0.00037	0.0018
Silver	mg/L	NV	<0.0001	<0.0001	NV	<0.00007	0.00012
Dissolved Sodium	mg/L	200	5.2	18	<200 (AO)	6.4	22
Sulphate	mg/L	500 <sup>4</sup>	4.8	77	<500 (AO)	5.9	21
Thallium	mg/L	NV	<0.00020	<0.00020	NV	<0.00020	<0.00020
Total Dissolved Solids (calculated)	mg/L	500	280	380	<500 (AO)	300	349
Turbidity	NTU	NV	0.54	>4000	1 (OG)	0.2	1.23
Uranium	mg/L	0.01	0.0014	0.0027	0.02 (MAC)	0.00064	0.0021
Zinc	mg/L	0.03	<0.003	0.01	<5 (AO)	0.0046	0.99
Total Coliforms	MPN/100 mL	<1 (MAC)	<1	120000	<1 (MAC)	<1	11
E.Coli	MPN/100 mL	<1 (MAC)	<1	100	<1 (MAC)	<1	<1

1. Table 2, Alberta Tier 1 Groundwater Remediation Guidelines (2023) applied for Agricultural land use in coarse grained soils

2. Metal concentrations are dissolved unless stated otherwise.

3. Metal concentrations are total unless stated otherwise.

4. Tier 1 guideline is the lowest of the aquatic life guideline and all other guidelines. Lead is based on the potable water pathway, as is sulphate in the absence of an assessment for the very high natural groundwater hardness. Cadmium and nickel guidelines are hardness dependent and nitrite as N guideline is chloride dependent for the aquatic life pathway. Guidelines quoted are based on the lowest chronic guideline applied for the range of hardness or chloride observed.

#### 4.3.3 Big Hill Springs

Table A3 (appended) summarizes water quality results of water samples taken from the creek downstream from the springs (BHS1) at Big Hill Springs Provincial Park on October 30, 2014, August 4, 2015, July 10, 2019, December 15, 2022, and April 19, 2023, by SLR. Data collected by SLR for general water quality parameters was combined with a number of published sources to provide the baseline water quality summary included in Table 3 below.



Units	Number of Measurements	Lowest Value	Mean Value	Highest Value	Standard Deviation
C°	36	3	5	7.9	0.9
uS/cm	19	260	365	580	78.0
uS/cm	26	403	536	610	56.6
	10	7.94	8.20	8.37	0.1
mg/L	1	10.92	N/A	10.92	N/A
NTU	5	0.8	2	5.1	N/A
mg/L	37	43	70	77.1	6.8
mg/L	37	18	34	39	4.2
mg/L	37	5	7	13.4	1.3
mg/L	37	1.9	3	6.7	0.8
mg/L	36	1.8	7	16.8	3.2
mg/L	36	1	3	7.2	1.4
mg/L	37	4.7	9	13.5	1.8
mg/L	37	200	364	390	36.6
mg/L	36	190	457	526	95.6
	C° uS/cm uS/cm  mg/L NTU mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	Units         Measurements           C°         36           uS/cm         19           uS/cm         26            10           mg/L         1           NTU         5           mg/L         37           mg/L         37           mg/L         37           mg/L         36           mg/L         36           mg/L         36           mg/L         36           mg/L         37           mg/L         36           mg/L         37           mg/L         36           mg/L         37	Units         Measurements         Value           C°         36         3           uS/cm         19         260           uS/cm         26         403            10         7.94           mg/L         1         10.92           NTU         5         0.8           mg/L         37         43           mg/L         37         18           mg/L         37         1.9           mg/L         36         1.8           mg/L         36         1.8           mg/L         36         1.47           mg/L         37         4.7           mg/L         37         200	Units         Measurements         Value         Value           C°         36         3         5           uS/cm         19         260         365           uS/cm         26         403         536           mg/L         10         7.94         8.20           mg/L         1         10.92         N/A           NTU         5         0.8         2           mg/L         37         43         70           mg/L         37         18         34           mg/L         37         1.9         3           mg/L         36         1.8         7           mg/L         36         1         3           mg/L         37         4.7         9           mg/L         37         200         364	Measurements         Value         Value         Value           C°         36         3         5         7.9           uS/cm         19         260         365         580           uS/cm         26         403         536         610            10         7.94         8.20         8.37           mg/L         1         10.92         N/A         10.92           NTU         5         0.8         2         5.1           mg/L         37         43         70         77.1           mg/L         37         18         34         39           mg/L         37         1.9         3         6.7           mg/L         36         1.8         7         16.8           mg/L         36         1.8         7         16.8           mg/L         36         1         3         7.2           mg/L         37         4.7         9         13.5           mg/L         36         1         3         7.2           mg/L         37         4.7         9         13.5           mg/L         37         200         36

#### Table 3:Historical Summary of Bighill Spring Water Quality

Groundwater emerging at Bighill Springs is generally cold (approximately 3 to 8°C), with an alkaline pH (>8), low sodium, low chloride, and saturated with respect to calcium (Turner and Jones, 2005). Of some interest, both calcium (Ca) and bicarbonate (HCO<sub>3</sub>) have the highest concentrations in the spring water. Tufa is primarily composed of CaCO<sub>3</sub>, which is consistent with these groundwater concentrations and the formation of tufa within the Provincial Park. It should be noted that data from July 10, 2019, showed uncharacteristically low bicarbonate, calcium, and TDS concentrations (200 mg/L, 43 mg/L and 190 mg/L respectively) and which, on first review, appears could be anomalously low. Further review reveals that two studies; SLR (2020) and Fouli (2020), sampled the springs on the same day (July 10, 2019), and while the concentrations were not identical, they were of the same order of magnitude. Flow measured on the sampling date by Fouli (2020) and listed in Table 1 indicates a high flow condition (227 L/s) on that day. This would indicate that a high proportion of the flow sampled may have been comprised of stormwater runoff (Environment Canada reported thundershowers in the area during previous days) which would have had a much lower dissolved mineral content and diluted the spring flow, thus lowering key parameter concentrations, therefore accounting for the uncharacteristically low values mentioned above.



Since this groundwater discharge is the source for a surface water stream, and the point of sampling is within that stream, it is compared to the Environmental Quality Guidelines (EQG) for Alberta Surface Waters (March 2018). The EQG has guidelines for 22 parameters of the sampling suite. The samples met 18 of the guidelines for these parameters indicating that water discharging from the spring is generally of good quality. It is noted that total coliforms and E.Coli concentrations exceed the CDWQ drinking water guidelines; however, there is no CWQG bacteria guideline for the protection of aquatic life. High concentrations of E.Coli are consistent with the presence of livestock in the stream catchment and of which evidence was abundant adjacent to the property line at the sampling location. Only aluminum, selenium and nitrate as nitrogen exceeded the EQG guideline in these natural waters. Of minor note, the laboratory detection limit for mercury (0.001 mg/L) in 2014 and 2015 exceeded the guideline (0.000005 mg/L) and thus the "non-detect" reported in Table A3 may or may not meet the lower guideline. Mercury sources in this geologic setting are not common, nor will the proposed aggregate operation be a source of mercury. Mercury concentrations measured in 2019 fell below the guideline. Since this water is the source for the stream, the downstream biota will be acclimatized to this form of the natural water guidity.

### 4.4 Regional and Local Water Users

As part of the original hydrogeologic study (SLR 2020c), a field verified water well survey was conducted to establish residential well use, baseline water quality conditions and to provide an assessment of the hydraulic parameters within the aquifers used by local residences adjacent to the site. Initially, a water well record search was undertaken by obtaining records from the Alberta Water Wells database which are presented in Appendix C (updated in 2019). This was followed by a door-to-door survey (October to December 2014) of residences within a 500 m radius of the site with visits on a number of occasions to those houses where no resident was at home. Where possible, the formal well records were correlated with the actual wells in the field. It was considered that the 1,600 m radius required for a *Water Act* application is not appropriate as no groundwater body is to be disturbed by the Project which will be worked dry, and much of that greater area is not in the same groundwater flow field. A number of properties were surveyed and sampled and/or yield tested in order to further assess the relevant aquifer units. At each residential well, a questionnaire was completed to determine the type of well, well completion details, water levels and whether the well user has any issues with water quality or quantity. The questionnaires completed at the residential wells are provided in Appendix D.

The majority of local wells (for which there are records) are used for domestic or commercial purposes. The Alberta records indicated a total of 17 wells within 500 m of the Project with two of those decommissioned (391599 and 391600) and one with very little available detail (395793). Figure 3 presents the locations of the wells identified from the records search and the door-to-door survey for which Table 4 summarizes the information collected. The majority of drilled wells are drilled to between 30 m and 75 m bgs and are screened within the Paskapoo Formation.

Two drilled wells (WW1 and WW4) are on the site at the residences of the current tenants; however, all of the other drilled wells recorded are greater than 100 m from the site boundary. With respect to the WW1 property, there is a well listed in the records for this property (494800); however, the geology recorded in this record is completely different than the rest of the area. It had been concluded that the available log is for a different well and has been misfiled in the digital records kept by AEPA. Therefore, the log has not been used in the analysis.



Dug wells identified at location WW5 (four wells in total) are between 6.1 m and 7.6 m deep according to details provided by the householder. This location is in the bottom of the valley at the southeast end of Section 31. No lithological logs are available for the dug wells; however, based on their estimated depth and the lithological details provided in nearby drilled wells to the east, it is inferred that they are completed in the sand and gravel deposits. The well owners reported that the static water level is 3 m bgs. Although this was unconfirmed by direct measurement, it is a reasonable estimate, given the shallow nature of the wells.

Water Well Number	Alberta Water Well Record Number	No. of Wells	Well Owner	Easting (UTM)	Northing (UTM)	Well Depth (m)	Drilled / Dug	Distance (m) and Direction from Site
WW1	Unknown	1	Waterman	680559 <sup>1</sup>	5682875	Unknown	Drilled	On Site
WW2	1475699	1	Rawn	680988 <sup>1</sup>	5682770	50.9	Drilled	200 E
WW3	1475698	1	Rawn	681173 <sup>1</sup>	5682907	36.0	Drilled	400 E
WW4	350194	1	Nugter	680257 <sup>1</sup>	5682091	35.1	Drilled	On Site
WW5	N/A	4	Burnco	681547 <sup>1</sup>	5681568	6.1 – 7.6	Dug	800 SE
WW6	Unknown	1	Unknown	See Note <sup>2</sup>	SW Quarter, S32-T26-R3	Unknown	Drilled	900 E
WW7	Unknown	1	Unknown	See Note <sup>2</sup>	SW Quarter, S32-T26-R3	Unknown	Drilled	900 E
WW8	395786	1	Hodgson	See Note <sup>2</sup>	NE Quarter, S31-T26-R3	62.5	Drilled	690 E
WW9	360164	1	Carroll	680744 <sup>1</sup>	5683480	67.1	Drilled	350 N
WW10	Unknown	1	Unknown	See Note <sup>2</sup>	SE Quarter, S6-T27-R3	Unknown	Unknown	800 N
WW11	391000	1	Unknown	679932 <sup>3</sup>	5683339	39.6	Drilled	350 N
WW12	Unknown	1	Unknown	See Note <sup>2</sup>	NE Quarter, S36-T26-R4	Unknown	Unknown	270 W
WW13	Unknown	1	Big Hill Estates	See Note <sup>2</sup>	SW Quarter, S30-T26-R3	Unknown	Drilled	1,800 S
N/A	1022436	1	Lafarge Canada Inc.	679682 <sup>3</sup>	5682526	30.5	Drilled	
N/A	387449	1	Lafarge Canada Inc.	See Note <sup>4</sup>	NE Quarter, S36-T26-R4	33.8	Drilled	
N/A	494773	1	Lafarge Canada Inc.	See Note <sup>4</sup>	NE Quarter, S36-T26-R4	30.5	Drilled	

Table 4:Water Wells within 800 Metres



Water Well Number	Alberta Water Well Record Number	No. of Wells	Well Owner	Easting (UTM)	Northing (UTM)	Well Depth (m)	Drilled / Dug	Distance (m) and Direction from Site
N/A	2095665	1	Unknown	See Note <sup>4</sup>	SW Quarter, S6-T27-R3	25.6	Drilled	
N/A	390998	1	Unknown	See Note <sup>4</sup>	SE Quarter, S6-T27-R3	65.5	Drilled	
N/A	390999	1	Unknown	See Note <sup>4</sup>	SE Quarter, S6-T27-R3	73.2	Drilled	
N/A	391598	1	Unknown	See Note <sup>4</sup>	NW Quarter, S3-T26-R3	39.6	Drilled	
N/A	395786	1	Unknown	See Note <sup>4</sup>	NE Quarter, S31-T26-R3	62.5	Drilled	

1. Location based on GPS measurement in the field.

2. Plotted by AEP at quarter centre centroid, adjusted to likely location, subject to field confirmation.

3. Location based on Abacus Datagraphics database.

4. Wells plotted at quarter-section centroid in Abacus Datagraphics database. Not likely actual location.

## 5.0 Regulatory Framework

The site will operate under a Development Permit issued by RVC and an Approval under the COP for Pits. A requirement of the Development Permit is to prepare a groundwater monitoring program for assessing whether site operations are impacting groundwater quality and levels. This document is intended to meet this latter requirement.

It is proposed that for the first year, groundwater quality at the onsite monitoring wells be assessed initially by comparing groundwater monitoring results with the Alberta Tier 1 and/or 2 Soil and Groundwater Remediation Guidelines (updated August 2022) and herein referred to as the Tier 1 or Tier 2 Guidelines. The Tier 1 Guidelines contain guidelines which are protective of all receptors and potential exposure pathways, whereas the Tier 2 Guidelines can be modified to exclude those pathways or receptors which don't apply. Monitoring results will be compared to guidelines for Agricultural land use based on the current site and surrounding land uses. The site is coarse-grained with respect to contaminant migration in the surficial deposits.

Water quality results obtained from residential wells which opted to join the monitoring program, will be assessed against the Guidelines for CDWQ and equivalent Alberta potable groundwater guidelines.

Water quality results obtained from the Bighill Springs (BHS1) will be compared against the Environmental Quality Guidelines (EQG) for Alberta Surface Waters as updated. Additional water quality guidelines were developed by SLR from baseline sampling by SLR and others for the protection of tufa formation (section 8.2).



Background groundwater chemistry will be established using historical groundwater monitoring data and additional data collected during April 2023 after spring freshet and prior to development of the site. Control limits setting upper and lower acceptable bounds for parameters have been derived for each sampling point using the pre-operational data, and subsequent data will be compared to these control limits.

## 6.0 Proposed Groundwater Monitoring Well Network

#### 6.1 Groundwater Monitoring Objectives

The objectives of the groundwater monitoring program are twofold:

- To enable understanding of the groundwater flow regime at the site and adapt the basal elevation of the pit in response to observed groundwater levels.
- To confirm the site is having only the effects predicted, but also to enable the gathering of sufficient information to identify and provide solutions to any unanticipated groundwater problems should they arise through the life of the site.

#### 6.2 Groundwater Monitoring Approach

The site monitoring program is designed to provide data to enable the assessment of potential impacts to groundwater quality in the vicinity of the site. By extrapolation it can be inferred what the likely effects of any observed changes will be at potential receptors such as private residential wells. In addition, potential receptors will also be monitored directly as a precaution to assess potential changes. All monitoring wells installed within the boundaries of the site will receive the earliest warning possible of any changes in the groundwater system.

Background monitoring provides a key benchmark for the assessment of change within the groundwater system, both temporally, before development commences, and spatially, in up-gradient locations. Down-gradient wells provide information on what changes, if any, may be occurring as the groundwater passes beneath the site. By this method, early warning is attained on site, long before any problem could manifest itself in the more distant private wells.

#### 6.3 Groundwater Monitoring Network Description

The groundwater monitoring network for the site will comprise three main elements:

- Existing onsite sentinel monitoring wells to monitor groundwater flowing directly beneath the site in upgradient, downgradient and cross-gradient locations from the actively working areas.
- Monitoring of adjacent residential wells as part of a precautionary water well protection program which protects both the operator and the local residents.
- Sampling of water quality within Big Hill Springs to confirm no negative effects are being seen.

The locations of the proposed groundwater monitoring points for the baseline monitoring are presented in Figure 3 and the monitoring wells for Phase 1 monitoring are presented in Figure 6.



Ten monitoring wells have been installed onsite. The monitoring wells are screened either at the base of the sand and gravel unit or across the upper bedrock / sand and gravel interface to ensure the water table could be measured. The wells are constructed of 50 mm diameter polyvinyl chloride (PVC) pipe with a hydrated bentonite chip seal placed around the annulus of the solid section of standpipe above the screened section. An above ground steel protective cover with a lockable lid was concreted in place above the top of the wells. Borehole geological information and monitoring well construction details are provided in the SLR well logs in Appendix A.

As indicated in Section 4.4 and Table 4, several residential wells are located within or close to an 800 m radius of the site (WW1 to WW12), and MALP has offered to include them in the monitoring program as a precautionary measure to confirm the quality and quantity of water available in these wells is unimpacted by the Project. WW13 (Big Hill Creek Estates Water Coop) is approximately 1.8 km to the south of the site, and unlikely to be affected by the Project because it falls on the other side of a groundwater divide; however, a commitment was made during the Public Hearing to review data from this well as part of the monitoring program. It is our understanding that this well is monitored by others and Mountain Ash proposed to enter into a data sharing agreement, however the Co-Op has not yet agreed.

Confirmatory sampling from the furthest publicly accessible upstream point of the stream flowing from Big Hill Springs will be sampled within the Big Hill Springs Provincial Park (BHS1).

## 7.0 Groundwater Monitoring Program

#### 7.1 Methodology

#### 7.1.1 Groundwater Monitoring

Each onsite groundwater monitoring well will be measured for depth to groundwater using an electronic water level tape on a monthly basis during operating months (April to November). Prior to the day's monitoring, the water level probe will be inspected and tested for proper operation. The depth to the nearest millimetre from the highest point of the well pipe (which has been surveyed for geodetic elevation) will be observed and recorded. The depth to the bottom of each well will also be measured and noted if any soil particles are present. The water level probe will be cleaned with an Alconox and water solution, rinsed with clean tap water, neutralized with isopropyl alcohol, and then rinsed with distilled water between each well to minimize the potential for cross contamination between wells.

Additional simple piezometers will be installed within the pit once the base of extraction reaches within approximately 3 m of the proposed extraction depth to confirm that no extraction takes place within 1 m of the groundwater table. These will be installed approximately every 200 m as the excavation moves laterally and will be removed as the area is worked out and prepared for restoration.



Groundwater levels will only be measured within residential wells where safe access to the wellhead can be provided. Water levels will be measured using the same methodology outlined above for the onsite monitoring wells. Pressure transducers with built in data loggers will also be installed in available residential wells to establish the normal range of water level fluctuation due to daily use. Twelve private wells have been identified (WW1 to WW12) within or near the 800 m limit as described above. Each owner has been approached to see if they wish to be included. Some decline as they do not wish to be disturbed by monitoring staff or due to their great distance from the operation. Participation will be based on owner's willingness. All owners within 800 m have been approached, and the monitoring details will be provided to them upon issuance and approval of the development permit. Owners initially were given an overview of the program's intentions, process, procedures, and pending approval by the development authority. Monitoring of wells within an 800 m radius of the active area of the pit will commence once DP approval has been obtained and will continue for a period of 5 years or until the Phase 1 DP expires.

#### 7.1.2 Monitoring Wells

Prior to groundwater sampling, each monitoring well will be purged using the parameter stabilization method. While purging, the following geochemical parameters will be monitored and recorded periodically with a minimum of three minutes between readings: temperature, pH, electrical conductivity (EC). The time, flow rate and cumulative volume purged will also be recorded with qualitative observations such as colour, odour and sheen, if any.

Stabilization will be considered achieved after all parameters have stabilized for three successive readings. The following stabilization criteria will be used:

- pH: +/- 0.2 units
- Temperature: +/- 0.2°C
- EC: +/- 5%

Each well will be purged until field parameters have stabilized.

#### 7.1.3 Residential Wells

Residential well samples will be collected from a point within the household system before any water quality treatment. The sample will be taken after a purge of 15 minutes or until field parameters are deemed to have stabilized. Attention will be paid to ensure that static water from the pressure tank is not inadvertently sampled.

#### 7.1.4 Groundwater and Surface Water Sampling

Samples will be collected from the dedicated sampling equipment (for monitoring wells and surface water) or the sampling tap (for residential wells) and transferred directly to clean, laboratory prepared sample containers that will be labelled prior to sample collection. A clean pair of disposable nitrile gloves will be worn during sample collection and a new pair of gloves used at each sample location. Upon collection, the sample containers will be placed immediately into sealed coolers with ice packs and delivered directly under Chain-of-Custody (COC) to the laboratory the same day.



#### 7.1.5 Groundwater and Surface Water Analytical Program

The proposed Phase 1 monitoring and sampling schedule is provided in Table 5 and the monitoring point locations presented in Drawing 6. The parameters included in the suites in Table 5 are defined as follows:

- Field Parameters: Temperature, pH, specific conductance, turbidity
- Routine Potability: alkalinity, bicarbonate (HCO3), electrical conductivity (EC), ion balance, dissolved calcium (Ca), iron (Fe), potassium (K), manganese (Mn), magnesium (Mg), sodium (Na), chloride (Cl), sulphate (SO4), nitrite (NO2), nitrate (NO3), pH, hardness, total dissolved solids
- Tier 1 metals: Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, U, V, Zn
- **Petroleum Hydrocarbons**: Benzene, toluene, ethylbenzene, xylenes, petroleum hydrocarbon fractions F1 & F2 Turbidity.

These parameters take into account all those likely indicator parameters which would indicate unanticipated impacts to the groundwater from the operations. Full details of the parameters to be tested are provided in Table 5, below.

### 7.2 Quality Assurance and Quality Control (QA/QC)

Field procedures will be implemented to minimize the potential of cross contamination between sampling locations. Sample handling protocols will be established to track and maintain the integrity of the samples. Disposable Nitrile gloves will be used at all times and will be changed between sampling locations. Sampling will progress from up-gradient locations to down-gradient locations, reducing the potential for cross contamination from potentially impacted areas to un-impacted or background locations.

Field duplicates will be submitted at a rate of 1 per every 10 samples collected or a minimum of one per sampling event. A field or equipment blank will be run through the sampling equipment and then submitted to the laboratory for analysis to assist in assessing the effect of field sampling and sample shipping methodologies on the accuracy and precision of the analytical results. For volatile parameters, a travel or trip blank prepared by the laboratory will accompany the sample bottles and be submitted for analysis.

For each duplicate, a relative percent difference (RPD) is calculated for each parameter analysed for comparison to SLR's standard QA/QC acceptance limits. RPD will be calculated as follows:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100$$

Where: C1 is the concentration in the original sample; and

C2 is the concentration in the duplicate.

Analytical error increases near the reported detection limit (RDL); therefore, the RPD is not normally calculated unless the concentrations of both the original and duplicate samples are greater than five times the RDL. If the RPD for a sample and its duplicate do not meet SLR's RPD standards (60% for organic parameters or 40% for inorganic parameters) for the parameters analysed, an explanation is required to qualify the difference in values.



Chain-of-custody forms will be completed for all samples submitted to the laboratory and will accompany each sample shipment. Sample temperatures will be maintained between 0°C and 10°C at all times by being kept in sealed coolers on ice. Samples will be shipped for analyses within the recommended time requirements.

All samples will be submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory that uses AEP recognized methods to conduct laboratory analyses. Laboratories accredited by CALA are required to be ISO17025 compliant. Method blanks, control standards samples, certified reference material standards, method spikes, replicates, duplicates and instrument blanks are routinely analysed as part of the analytical laboratory's QA/QC programs.

#### 7.3 Proposed Monitoring Schedule

Historical water quality from the residential wells shows that the water is of consistent quality between the residential wells collected at different times and at various depths within the bedrock. Water quality within the sand and gravel is likewise consistent between the monitoring wells and at different times of year (excluding the outliers due to high turbidity within the samples). This historical data (excluding outliers) is used to form the baseline groundwater quality with the completion of baseline sampling during the spring 2023 freshet and prior to the commencement of stripping and excavation. Results of the baseline sampling to date is provided in Tables A1 to A3, with the monitoring point locations presented in Figure 3.

Now baseline water quality has been established for all sampling points, the program will be reduced to sampling of only those monitoring wells surrounding the working areas (i.e., those stripped areas. those extracting sand and gravel, or those being actively restored) and for wells which will act as baseline for later phases, plus those residential wells within 800 m of the working areas. Monthly water level monitoring will continue at onsite monitoring wells during operating months. The Phase 1 monitoring and sampling schedule is provided in Table 5 and the monitoring point locations presented in Figure 6.



#### Table 5:Proposed Phase 1 Monitoring Schedule

Parameter / Parameter Suite	Monitoring Point	Frequency
Water Level	Onsite Monitoring Wells MW14-101, MW14-102*, MW14- 103, MW18-104, MW18-105, MW18-106, MW18-107, MW19- 108, MW19-109, MW19-110, PIZ21- 001	Monthly during Operating Months (April -November)
	Residential Wells WW1, WW2, WW3, WW4, WW5**, WW6**, WW7**, WW8**, WW9**, WW10**, WW11**, WW12**, WW13**	Manual readings twice annually (April and November). Data loggers installed and recording daily fluctuations.
Field Parameters Routine Potability Tier 1 dissolved metals	Onsite Monitoring Wells MW14-102*, MW19-108, MW19-109, MW19-110	Biannually (twice per year)
	MW18-106, MW18-107	Every 2 years
Petroleum Hydrocarbons	Onsite Monitoring Wells MW14-102*, MW19-108, MW19- 109, MW19-110	Annually
Field Parameters Routine Potability Tier 1 dissolved and total metals	Residential Wells WW1, WW2, WW3, WW4, WW5**, WW6**, WW7**, WW8**, WW13**	Annually until Phase 1 DP expires
	Surface Water BHS1	Annually
Turbidity: Field measurement	Surface Water	Quarterly
Stream Flow Rate	BHS1	Monthly

\*\* - Pending well owner agreement for inclusion in the monitoring program



## 8.0 Groundwater Response Plan

The groundwater response plan is presented schematically in Figure 7. The following sections describe the components of the plan.

#### 8.1 Baseline Groundwater Sampling

Groundwater sampling has been conducted previously at the site to establish existing conditions and perform an impact assessment. To establish the baseline, historical data has been aggregated for the onsite monitoring wells and residential wells to define the baseline groundwater quality in the sand and gravel and the bedrock, respectively. This allows the natural seasonal and annual variability of the groundwater quality to be established. Routine sampling frequencies will be undertaken on the proposed schedule in Table 5 going forwards. All water quality taken from private wells will be shared with homeowners.

## 8.2 Establish Control Limits

The initial baseline groundwater monitoring has been used to develop "control limits" (described in Section 5) that can be used to identify groundwater quality issues at the site. Control limits are provided in Table 6 below for those parameters not included in the Alberta Tier 1 or EQG guidelines using all available data to April 2023. These control limits are applied to ensure all groundwater quality parameters remain stable to protect water dependent features not covered by the guidelines, and which includes the tufa formations in the Provincial Park. The control limits are dependent on the parameter considered for each aquifer and incorporate statistically significant deviation from background groundwater quality if natural concentrations are above applicable guideline values. Consideration of natural seasonal variability in measured concentrations or if results are potentially being driven by impacts from operations.

Parameter	Units		n Monitoring Wells at pject Site	Spring Water Quality at BHS1 (Downstream of the Spring)		
		Lower Control Limit	Upper Control Limit	Lower Control Limit	Upper Control Limit	
Temp	C°	3.0	7.9	3.0	7.9	
рН		7.2	8.4	7.9	8.4	
HCO <sub>3</sub>	mg/L	310	400	200	390	
Са	mg/L	61	79	43	77	
TDS	mg/L	280	380	190	526	
Turbidity	NTU	0	100*	0	7.1**	

Table 6:	Control Limits for Parameters Not Covered by Provincial Guidelines

\* While turbidity can be measured reasonably accurately in surface water, representative groundwater values are difficult to obtain from monitoring wells, as they are highly method dependent and subject to large fluctuations depending on how much disturbance occurs within the well. Efforts will be made to use best practice in obtaining representative turbidity samples, however historical results in some of the monitoring wells indicate turbidities much higher than the proposed upper control limit can be obtained on occasion.

\*\* From Environmental Quality Guidelines for Alberta Surface Waters - Maximum average increase of 2 NTU from background for longer term exposures used. Maximum increase of 8 NTU from background can be used for short term exceedances (i.e., high runoff events).



In addition to the control limits developed above, annual monitoring data will be reviewed to determine the presence of increasing or decreasing trends in groundwater quality and elevations using Mann-Kendall analysis or equivalent statistical method once a sufficient data set has been established. Increasing trends in parameters of concern will initiate source identification and flag a given well for follow up during subsequent monitoring events.

#### 8.3 Annual Groundwater Monitoring

Annual groundwater monitoring and sampling for Excavation Phase 1 will occur as described in Table 5 after the baseline sampling period. Groundwater monitoring data will be entered and stored in a format suitable for identifying control limit exceedances and trends. Please be aware that this program will be extended in breadth for each successive Phase; however, those steps are subject to renewed approvals at that time.

#### 8.4 Annual Groundwater Monitoring Report

An annual groundwater monitoring report will be prepared and submitted to RVC by April 30 of the year following the year in which the information on which the report is based was collected. It will include data summaries and an interpretation of the results with respect to the environmental performance of the site.

The report will also highlight any recommended changes to the monitoring program to make it more effective or recommendations for any risk management measures to be undertaken in the subsequent year. This is a key component of any adaptive monitoring plan, whereby groundwater is managed based on progressive results, and risk management is undertaken based on real risk.

Individual well owners will receive a summary of the data for their well privately each year.

#### 8.5 Identification of a Problem

If an exceedance of a control limit or increasing trend is detected at a given well, the well will be resampled for the full suite of parameters. If the re-sampling confirms the initial result, AEPA will be notified of the result. If the source can be easily identified and managed, details will be provided to APEA with the notification. If not, a Source Investigation Plan will be provided.

#### 8.6 Source Investigation

Once a control limit exceedance or increasing trend is confirmed by re-sampling, attempts will be made to identify potential sources and remove or manage them if feasible. Source removal might include such activities as removal of surficial soil impact, repair of leaks, etc., however, the operator will be doing daily inspections of equipment, routine maintenance and monitoring at the site which will likely flag issues before impacts show up at the sentinel wells. Depending upon the situation, a detailed investigation of the source zone may be necessary and will be included as part of the Risk Management Plan (Section 8.7).

#### 8.7 Risk Management Plan

As indicated on the flow chart in Figure 7, a risk management plan will only be developed if an issue and its source are identified as being related to the operation. This plan will be developed if exceedances or increasing trends are confirmed and source removal is not feasible.



The first step in any risk management plan will be a preliminary risk assessment to identify any potential receptors and applicable pathways. The preliminary risk assessment will determine if there are any immediate risks to receptors.

After the preliminary risk assessment is completed, a specific risk management and mitigation process will be developed and implemented to reduce the potential risk to any receptors to levels acceptable to AEPA. Such activities will be commensurate with the problem at hand. For example, a spill of hydrocarbons would entail containment with soaker pads and the subsequent removal of impacted soils as appropriate depending on the nature of the impact. The actions required could include but not be limited to additional sampling, installation of monitoring wells, residential well investigation and rehabilitation, changes to operational practices or reporting. If risks cannot be managed or mitigated to the satisfaction of the Director, this may result in the cessation of operations and/or cancellation of the Registration.

## 9.0 Summary

The foregoing groundwater monitoring plan has been developed using both industry standard techniques and enhancements based on the unique setting of this site. Monitoring of both groundwater levels (as they might conceptually affect private well performance) and groundwater quality (given the local use of the underlying aquifer by others as a potable water source) will be undertaken. It is expected that the monitoring program will confirm and refine the interpretation of the site found in the supporting hydrogeological report (SLR 2020c). It will also serve to identify unanticipated problems, first and foremost at the site by way of the sentry monitoring well network. Private wells are a much greater distance from the excavation and given that the pit development is above the water table, there is little likelihood of impacts there. The monitoring program is intended to periodically confirm this and provide that data to the pit operator and private well owners alike. A groundwater response plan has been presented that outlines the steps that will be taken should unanticipated conditions develop.

## 10.0 Statement of Limitations

This report has been prepared and the work referred to in this report has been undertaken by SLR Consulting (Canada) Ltd. (SLR) for Mountain Ash Limited Partnership, hereafter referred to as the "Client". It is intended for the sole and exclusive use of Mountain Ash Limited Partnership. The report has been prepared in accordance with the Scope of Work and agreement between SLR and the Client. Other than by the Client and as set out herein, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted unless payment for the work has been made in full and express written permission has been obtained from SLR.

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Opinions and recommendations contained in this report are based on conditions that existed at the time the services were performed and are intended only for the client, purposes, locations, time frames and project parameters as outlined in the Scope or Work and agreement between SLR and the Client. The data reported, findings, observations and conclusions expressed are limited by the Scope of Work. SLR is not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. SLR does not warranty the accuracy of information provided by third party sources.

Sincerely,

SLR Consulting (Canada) Ltd.

Robert Till, M.Sc., P.Geo. Senior Hydrogeologist

Steve Usher, M.Sc., P.Geo., FGC Principal Hydrogeologist

Distribution: 1 electronic copy – Mountain Ash Limited Partnership 1 electronic copy – SLR Consulting (Canada) Ltd.



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## Tables

Groundwater Monitoring Plan

Summit Pit Project

Mountain Ash Limited Partnership

SLR Project No. 212.06650.00007

May 11, 2023



						Sand and	I Gravel Monit	oring Well Gro	oundwater Qu	ality Results							
Guideline				MW1	4-101				MW14-103			MW18-104					
Parameter	(Alberta Tier 1)*	Units	20-Nov-14	16-Aug-22	15-Dec-22	19-Apr-23	20-Nov-14	4-Aug-15	16-Aug-22	14-Dec-22	19-Apr-23	4-Jı	ul-19	16-Aug-22	14-Dec-22	19-Apr-23	
Aluminum	0.05 <sup>1</sup>	mg/L	0.164	0.0072	<0.0030	0.034	5.57	0.109	<0.0030	<0.0030	0.23	3.7	0.0051	<0.0030	<0.0030	<0.003	
Antimony	0.006	mg/L	<0.00050	<0.00060	<0.00060	<0.00060	<0.00050	<0.00050	<0.00060	<0.00060	<0.00060	0.0049	0.0013	<0.00060	<0.00060	<0.00060	
Arsenic	0.005	mg/L	0.00035	<0.00020	<0.00020	<0.00020	0.007858	0.000336	<0.00020	<0.00020	0.0003	0.0044	0.00080	0.00025	0.00027	0.00023	
Barium	2	mg/L	0.424	0.43	0.4	0.39	0.7	0.332	0.38	0.37	0.39	0.	61	0.48	0.43	0.41	
Bicarbonate (as HCO3)	NV	mg/L	382	340	330	370	380	375	380	360	400	310		330	360	370	
Boron	1	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.031	0.025	0.031	<0.020	<0.020	<0.020	
Cadmium	0.00037 <sup>1</sup>	mg/L	0.000016	<0.000020	<0.000020	<0.000020	0.00029	<0.000005	<0.000020	<0.000020	0.000031	0.00036	0.000039	<0.020	<0.000020	<0.000020	
Calcium	NV	mg/L	76	73	73	70	75	73	76	78	79		63	69	70	63	
Chloride	100	mg/L	10.5	13.0	13	12	7.8	8.8	17.0	20	22	29	9.0	17	18	15	
Chromium	0.001 <sup>2</sup>	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0076	0.0016	<0.0010	<0.0010	<0.0010	0.018	<0.001	<0.0010	<0.0010	<0.0010	
Copper	0.007	mg/L	<0.0010	<0.0010	0.002	0.0032	0.0093	0.0013	0.001	<0.0010	0.0035	0.064	0.0025	0.0063	0.0027	0.0026	
Hardness	NV	mg/L	329	310	320	300	324	317	340	350	340	2	80	320	330	290	
Iron	0.3	mg/L	0.28	<0.060	<0.060	<0.060	12	0.22	<0.060	<0.060	0.21	7.6	0.18	<0.060	<0.060	<0.060	
Lead	0.005 <sup>1</sup>	mg/L	0.00031	<0.00020	<0.00020	<0.00020	0.00464	<0.00030	<0.00020	<0.00020	0.00032	0.0049	<0.0002	<0.00020	<0.00020	<0.00020	
Mercury	0.000005	mg/L	<0.00010	-	< 0.0000019	0.0000028	<0.00010	<0.00020	-	< 0.0000019	0.0000041	0.00003		-	<0.0000019	<0.0000019	
Magnesium	NV	mg/L	33.7	31	33	31	33.4	32.6	36	37	35	30		36	37	33	
Manganese	0.02	mg/L	0.02	<0.0040	<0.0040	0.012	0.93	0.01	<0.0040	<0.0040	0.048	0.62		0.017	<0.0040	<0.0040	
Molybdenum	NV	mg/L	0.0008	0.00063	0.00061	0.001	0.00184	0.00086	0.00064	0.00069	0.00051	0.015	0.012	0.0034	0.0035	0.0023	
Nickel	0.12 <sup>1</sup>	mg/L	<0.00050	0.0027	<0.00050	<0.00050	0.01196	0.00051	<0.00050	<0.00050	<0.00050	0.02	0.0024	0.00089	<0.00050	<0.00050	
Nitrate-N	3	mg/L	1.19	1.5	1.5	1.7	5.22	1.801	1.7	1.5	1.6	0.	.97	1.6	1.7	1.6	
Nitrite-N	0.1 <sup>1</sup>	mg/L	<0.05	<0.010	<0.010	<0.010	<0.05	< 0.005	<0.010	<0.010	<0.010	0.0	098	<0.010	<0.010	<0.010	
Potassium	NV	mg/L	4.8	4.4	4	3.8	4.3	3.9	3.5	3.6	3.6	4	.1	3.3	3.3	2.9	
pН	6.5 - 8.5		7.9	7.58	7.87	7.87	7.8	8	7.63	7.86	7.75	7.	.91	7.24	8.19	7.57	
Selenium	0.002	mg/L	<0.00060	0.00038	0.00052	0.00048	0.00112	0.00087	0.00098	0.0012	0.00089	0.00049	0.00024	0.00079	0.00064	0.0005	
Silver	NV	mg/L	<0.000070	<0.00010	<0.00010	<0.00010	<0.000070	<0.000070	<0.00010	<0.00010	<0.00010	0.00044	<0.0001	<0.00010	<0.00010	<0.00010	
Sodium	200	mg/L	6	5.5	5.8	5.9	8.8	7.9	9.6	9.6	9.4	1	13	7.8	8.2	7.1	
Sulphate	500 <sup>1</sup>	mg/L	8.88	7.3	7.8	7.1	11.9	10.56	13	13	11	9	0.2	77	7.3	6.8	
Thallium	NV	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
Total Dissolved Solids (calculated)	500	mg/L	337	310	300	320	354	333	350	350	370	3	10	380	330	320	
Turbidity	NV	NTU	9.6	-	0.54	580	680	8	-	29	81	1	30	-	1.2	36	
Uranium	0.01	mg/L	0.001697	0.0016	0.0014	0.0015	0.002014	0.001563	0.0017	0.0016	0.0017	0.0019	0.0015	0.0019	0.0018	0.0018	
Zinc	0.03	mg/L	<0.020	<0.0030	<0.0030	<0.0030	0.033	<0.020	<0.0030	<0.0030	<0.0030	0.072	< 0.003	< 0.0030	<0.0030	<0.0030	
Total Coliforms	<1 (MAC) <sup>3</sup>	MPN/100 mL	-	-	-	-	-	<1	-	-	-	>24	1000	-	-	-	
E.Coli	<1 (MAC) <sup>3</sup>	MPN/100 mL	-	-	-	-	-	<1	-	-	-	1	10	-	-	-	

Table A1 Sand and Gravel Monitoring Well Groundwater Quality Results

\* - Table 2, Alberta Tier 1 Groundwater Remediation Guidelines (2023) applied for Agricultural land use in coarse grained soils

NV = no value

1. Tier 1 guideline is the lowest of the aquatic life guideline and all other guidelines. Lead is based on the potable water pathway, as is sulphate in the absence of an assessment for the very high natural groundwater hardness. Cadmium and nickel guidelines are hardness dependent, aluminum is pH dependent and nitrite as N guideline is chloride dependent for the aquatic life pathway. Guidelines quoted are based on the lowest chronic guideline applied for the range of hardness, pH or chloride observed.

2. Guideline is for chromium (hexavalent) and used for screening purposes when not analyzed

3. No guideline value is provided in Alberta Tier 1 guidelines, so Canadian Drinking Water Guideline value has been included for comparison purposes. (MAC = Maximum Allowable Concentration)

Metal concentrations in groundwater are provided as dissolved metals unless otherwise indicated or by total metal concentrations being indicated in *italics*. A comparison between total and dissolved metals was undertaken on 4 July 2019 and therefore two columns of metal concentrations are shown.

BOLD RED – Exceeds guideline

						Sar	nd and Gravel I	Monitoring W	ell Groundwat	er Quality Res	sults								
	Guideline		MW18-105 MW18-106												MW18-107 16-Aug-22 15-Dec-22 19-Apr-23				
Parameter	(Alberta Tier 1)*	Units	4-Jı	ul-19	16-Aug-22	14-Dec-22	19-Apr-23	Apr-23 4-Jul-19		16-Aug-22	15-Dec-22	19-Apr-23	4-Jı	ul-19	16-Aug-22	15-Dec-22	19-Apr-23		
Aluminum	0.05 <sup>1</sup>	mg/L	5.4	< 0.003	0.0051	<0.0030	0.017	13	0.0034	<0.0030	<0.0030	0.0059	7	0.0033	<0.0030	<0.0030	0.02		
Antimony	0.006	mg/L	0.006	<0.00060	<0.00060	<0.00060	<0.00060	0.0048	<0.00060	<0.00060	<0.00060	<0.00060	0.00079	<0.00060	<0.00060	<0.00060	<0.00060		
Arsenic	0.005	mg/L	0.0056	<0.0002	<0.00020	<0.00020	<0.00020	0.017	<0.0002	<0.00020	<0.00020	<0.00020	0.0076	0.00023	<0.00020	<0.00020	<0.00020		
Barium	2	mg/L	2	.8	0.36	0.34	0.34	1	.1	0.35	0.31	0.31	0.79		0.35	0.32	0.32		
Bicarbonate (as HCO3)	NV	mg/L		20	340	320	320	3	60	350	330	360	3	70	360	330	360		
Boron	1	mg/L	0.021	<0.02	<0.020	<0.020	<0.020	<0.020	<0.02	<0.020	0.032	<0.020	<0.020	0.029	<0.020	<0.020	<0.020		
Cadmium	0.00037 <sup>1</sup>	mg/L	0.0055	<0.00002	<0.000020	<0.000020	<0.000020	0.00095	<0.00002	<0.000020	<0.000020	<0.000020	0.00033	<0.00002	<0.000020	<0.000020	0.000033		
Calcium	NV	mg/L		69	64	65	61	1	73	70	72	67		71	71	70	68		
Chloride	100	mg/L	1:	3.0	10	10	9.5	ç	9.3	11	11	9.7	1(	0.0	15	16	15		
Chromium	0.001 <sup>2</sup>	mg/L	0.0046	<0.0010	<0.0010	<0.0010	<0.0010	0.081	<0.001	<0.0010	<0.0010	<0.0010	0.025	<0.001	<0.0010	<0.0010	<0.0010		
Copper	0.007	mg/L	0.11	0.0003	0.0054	0.0013	<0.0010	0.11	0.00072	0.0015	<0.0010	0.0033	0.018	<0.0002	0.0074	0.001	0.0038		
Hardness	NV	mg/L	3	00	290	300	280	3	10	310	320	300	3	10	320	320	300		
Iron	0.3	mg/L	49	0.16	<0.060	<0.060	<0.060	37	0.16	<0.060	<0.060	<0.060	17	0.15	<0.060	< 0.060	<0.060		
Lead	0.005 <sup>1</sup>	mg/L	0.025	< 0.0002	0.0015	<0.00020	<0.00020	0.019	<0.0002	<0.00020	<0.00020	<0.00020	0.0075	<0.0002	<0.00020	<0.00020	<0.00020		
Total Mercury	0.000005	mg/L	0.0013		-	<0.000019	<0.000019	000019 <b>0.00032</b>		-	<0.0000019	<0.000019	0.000048		-	<0.000019	<0.0000019		
Magnesium	NV	mg/L	3	32	31	33	30		31	33	34	32	3	32	34	34	32		
Manganese	0.02	mg/L	2.	90	<0.0040	<0.0040	<0.0040	1.	.90	<0.0040	0.0058	<0.0040	0.	60	<0.0040	<0.0040	<0.0040		
Molybdenum	NV	mg/L	0.0014	0.00096	0.00062	0.00071	0.00061	0.005	0.0012	0.0006	0.00088	0.00073	0.0021	0.00095	0.00069	0.0007	0.00074		
Nickel	0.12 <sup>1</sup>	mg/L	0.015	<0.0005	<0.00050	<0.00050	<0.00050	0.036	<0.0005	<0.00050	<0.00050	<0.00050	0.014	<0.0005	<0.00050	<0.00050	<0.00050		
Nitrate-N	3	mg/L	2	.6	2.3	2.1	2.3	2	2.3	2.6	2.4	2.7		2	2.6	2.3	2.6		
Nitrite-N	0.1 <sup>1</sup>	mg/L	<0.	.010	<0.010	<0.010	<0.010	<0	.010	<0.010	<0.010	<0.010	0.0	034	<0.010	<0.010	<0.010		
Potassium	NV	mg/L	2	.9	2.4         2.4         2.4         3.3         3.3         3.2         3.2		3.2		3	3.2	3.1	3							
pН	6.5 - 8.5		8.	.05	7.56	8.01	8.08	7.	.87	7.71	7.95	7.86	7	.8	7.53	7.79	7.64		
Selenium	0.002	mg/L	0.00093	0.00043	0.00037	0.00052	0.0004	0.0011	0.00067	0.00048	0.00085	0.00058	0.00094	0.00081	0.00055	0.00088	0.00065		
Silver	NV	mg/L	<0.00010	<0.0001	<0.00010	<0.00010	<0.00010	0.0017	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	<0.0001	<0.00010	<0.00010	<0.00010		
Sodium	200	mg/L	5	5.7	5.2	5.3	5		9	6.2	7.1	6.3	6	.6	6.2	6.7	7.1		
Sulphate	500 <sup>1</sup>	mg/L	5	6.8	4.8	5.6	5.2	7	7.6	6.3	7.2	7	6	.6	6	6.7	5.8		
Thallium	NV	mg/L	0.00023	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		
Total Dissolved Solids (calculated)	500	mg/L	3	00	290	290	280	3	20	310	310	320	3	20	320	310	320		
Turbidity	NV	NTU	>4	000	-	86	>4000	3	100	-	6.7	>4000	5	53	-	19	160		
Uranium	0.01	mg/L	0.012	0.0018	0.0016	0.0014	0.0016	0.003	0.002	0.0015	0.0016	0.0016	0.0027	0.0017	0.0015	0.0014	0.0016		
Zinc	0.03	mg/L	0.19	< 0.003	0.0048	<0.0030	<0.0030	0.13	< 0.003	0.0031	<0.0030	<0.0030	0.037	< 0.003	<0.0030	<0.0030	<0.0030		
Total Coliforms	<1 (MAC) <sup>3</sup>	MPN/100mL	<1	100	-	-	-	1100		-	-	-	>2400		-	-	-		
E.Coli	<1 (MAC) <sup>3</sup>	MPN/100mL	<1	100	-	-	-	<	:10	-	-	-	<	<1	-	-	-		

Table A1 Sand and Gravel Monitoring Well Groundwater Quality Results

\* - Table 2, Alberta Tier 1 Groundwater Remediation Guidelines (2023) applied for Agricultural land use in coarse grained soils

NV = no value

1. Tier 1 guideline is the lowest of the aquatic life guideline and all other guidelines. Lead is based on the potable water pathway, as is sulphate in the absence of an assessment for the very high natural groundwater hardness. Cadmium and nickel guidelines are hardness dependent, aluminum is pH dependent and nitrite as N guideline is chloride dependent for the aquatic life pathway. Guidelines quoted are based on the lowest chronic guideline applied for the range of hardness, pH or chloride observed.

2. Guideline is for chromium (hexavalent) and used for screening purposes when not analyzed

3. No guideline value is provided in Alberta Tier 1 guidelines, so Canadian Drinking Water Guideline value has been included for comparison purposes. (MAC = Maximum Allowable Concentration)

Metal concentrations in groundwater are provided as dissolved metals unless otherwise indicated or by total metal concentrations being indicated in *italics*. A comparison between total and dissolved metals was undertaken on 4 July 2019 and therefore two columns of metal concentrations are shown.

BOLD RED – Exceeds guideline

SLR Project No.: 212.06650.00007 May 2023

	Guideline				MW19-108		J	undwater Quality Results MW19-109					MW19-110		
Parameter (Alberta Tier Units 1)*		4-Jul-19		16-Aug-22	14-Dec-22	19-Apr-23	5-Jul-19	16-Aug-22	14-Dec-22	19-Apr-23	10-Jul-19	14-Dec-22	19-Apr-23		
Aluminum	0.05 <sup>1</sup>	mg/L	15	0.0051	0.39	<0.0030	0.44	95	0.029	0.0035	0.32	10	<0.0030	< 0.003	
Antimony	0.006	mg/L	0.0022	<0.00060	<0.00060	<0.00060	<0.00060	0.0034	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	< 0.0006	
Arsenic	0.005	mg/L	0.0086	0.00022	0.00061	<0.00020	0.00039	0.071	0.00023	<0.00020	0.0003	0.0084	<0.00020	< 0.0002	
Barium	2	mg/L	1	.1	0.39	0.33	0.37	7.2	0.24	0.22	0.25	2.2	0.33	0.32	
Bicarbonate (as HCO3)	NV	mg/L	3	90	340	350	370	350	370	370	370	330	320	360	
Boron	1	mg/L	0.029	<0.02	<0.020	<0.020	<0.020	0.087	<0.020	<0.020	0.031	<0.020	<0.020	<0.020	
Cadmium	0.00037 <sup>1</sup>	mg/L	0.00095	< 0.00002	0.000063	<0.000020	0.00005	0.01	<0.000020	0.000024	0.000054	0.0042	<0.000020	< 0.00002	
Calcium	NV	mg/L	7	4	79	68	70	77	73	77	72	62	68	62	
Chloride	100	mg/L	14	4.0	10	12	12	18	17	17	16	8.4	9.1	8	
Chromium	0.001 <sup>2</sup>	mg/L	0.038	<0.001	0.0011	<0.0010	0.0013	0.19	<0.0010	<0.0010	<0.0010	0.019	<0.0010	<0.0010	
Copper	0.007	mg/L	0.038	< 0.0002	0.005	<0.0010	0.0036	0.29	0.0013	<0.0010	0.003	0.032	<0.0010	0.0015	
Hardness	NV	mg/L	3	20	340	310	310	350	320	340	310	280	310	280	
Iron	0.3	mg/L	29	0.16	1.2	<0.060	0.59	190	<0.060	<0.060	0.32	10	<0.060	<0.060	
Lead	0.005 <sup>1</sup>	mg/L	0.024	<0.0002	0.0023	<0.00020	0.00089	0.15	<0.00020	<0.00020	0.0006	0.019	<0.00020	<0.0002	
Total Mercury	0.000005	mg/L	0.000067		-	< 0.0000019	0.0000046	0.00208	-	< 0.0000019	0.0000048	0.000002	< 0.0000019	<0.00000	
Magnesium	NV	mg/L	32		34	34	33	37	33	36	31	30	33	31	
Manganese	0.02	mg/L	0.	74	0.11	0.0055	0.054	8.9	0.0054	0.0068	0.030	7.3	< 0.0040	<0.0040	
Molybdenum	NV	mg/L	0.0065	0.0029	0.0012	0.0012	0.0034	0.023	0.0022	0.0019	0.0017	0.0015	0.00075	0.00084	
Nickel	0.12 <sup>1</sup>	mg/L	0.047	0.0023	0.0035	0.00071	0.0021	0.41	0.00084	0.00065	0.0015	0.065	<0.00050	<0.0005	
Nitrate-N	3	mg/L	2	.4	2	2	2.1	1.7	3.2	2.9	3.1	1.9	1.6	1.7	
Nitrite-N	0.1 <sup>1</sup>	mg/L	0.0	048	<0.010	<0.010	<0.010	0.065	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Potassium	NV	mg/L	3	.4	3.3	3.1	3.1	6.3	2.9	3	2.8	2.7	2.9	2.9	
pН	6.5 - 8.5		7.	91	8	8.01	7.88	8.19	7.48	8.07	7.97	7.82	7.96	7.98	
Selenium	0.002	mg/L	0.0013	0.00074	0.00079	0.00076	0.00061	0.00059	0.0022	0.002	0.0019	0.00096	0.0006	0.00052	
Silver	NV	mg/L	0.0003	<0.0001	< 0.00010	<0.00010	<0.00010	0.0025	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	
Sodium	200	mg/L	1	2	8.8	7.4	6.7	18	7.2	7.7	6.8	6	6.2	5.7	
Sulphate	500 <sup>1</sup>	mg/L	1	7	8.7	8.3	6.9	26	10	10	10	8.1	6.7	6.1	
Thallium	NV	mg/L	0.00028	<0.00020	<0.00020	<0.00020	<0.00020	0.0026	<0.00020	<0.00020	<0.00020	0.00024	<0.00020	< 0.0002	
Total Dissolved Solids (calculated)	500	mg/L	350		320	310	320	360	340	340	340	290	290	300	
Turbidity	NV	NTU	6	70	-	48	30	>4000	-	1.5	330	<0.10	3	46	
Uranium	0.01	mg/L	0.0047	0.0027	0.0023	0.0018	0.0017	0.016	0.0025	0.0022	0.0025	0.006	0.0015	0.0016	
Zinc	0.03	mg/L	0.15	<0.003	0.01	<0.0030	0.0039	1.2	< 0.0030	<0.0030	<0.0030	0.14	< 0.0030	< 0.003	
otal Coliforms	<1 (MAC) <sup>3</sup>	MPN/100mL	<	<10		-	-	120000	-	-	-	180	-	-	
E.Coli	<1 (MAC) <sup>3</sup>	MPN/100mL	<	10	-	-	-	100	-	-	-	63	-	-	

Table A1 Sand and Gravel Monitoring Well Groundwater Quality Results

\* - Table 2, Alberta Tier 1 Groundwater Remediation Guidelines (2023) applied for Agricultural land use in coarse grained soils

NV = no value

1. Tier 1 guideline is the lowest of the aquatic life guideline and all other guidelines. Lead is based on the potable water pathway, as is sulphate in the absence of an assessment for the very high natural groundwater hardness. Cadmium and nickel guidelines are hardness dependent, aluminum is pH dependent and nitrite as N guideline is chloride dependent for the aquatic life pathway. Guidelines quoted are based on the lowest chronic guideline applied for the range of hardness, pH or chloride observed.

2. Guideline is for chromium (hexavalent) and used for screening purposes when not analyzed

3. No guideline value is provided in Alberta Tier 1 guidelines, so Canadian Drinking Water Guideline value has been included for comparison purposes. (MAC = Maximum Allowable Concentration)

Metal concentrations in groundwater are provided as dissolved metals unless otherwise indicated or by total metal concentrations being indicated in *italics*. A comparison between total and dissolved metals was undertaken on 4 July 2019 and therefore two columns of metal concentrations are shown.

BOLD RED – Exceeds guideline

CONFIDENTIAL

Paskapoo Formation Residential Well Groundwater Quality Results															
Parameter	Guideline (CDWQ)	Units	WW1		WW2				WW3			WW4			
			29-Oct-14	4-Aug-15	29-Oct-14	4-Aug-15	10-Jul-19	16-Aug-22	29-Oct-14	4-Aug-15	16-Aug-22	30-Oct-14	4-Aug-15	5-Jul-19	16-Aug-22
Total Aluminum	2.9 (MAC) / 0.1 (OG)	mg/L	0.0068	0.011	<0.0050	<0.0050	0.006	<0.0030	0.0061	<0.0050	<0.0030	<0.0050	<0.0050	0.0041	<0.0030
Total Antimony	0.006 (MAC)	mg/L	0.00088	<0.00050	0.00059	<0.00050	<0.00060	<0.00060	<0.00050	<0.00050	<0.00060	<0.00050	< 0.00050	< 0.00060	<0.00060
Total Arsenic	0.01 (MAC)	mg/L	0.000126	0.000132	0.000165	0.000205	<0.00020	<0.00020	0.000143	0.000121	<0.00020	0.000192	0.000194	0.00032	<0.00020
Total Barium	2 (MAC)	mg/L	0.282	0.284	0.128	0.142	0.11	0.12	0.221	0.225	0.24	0.385	0.391	0.36	0.41
Bicarbonate (as HCO3)	NV	mg/L	366.6	359.6	380.6	375.1	350	370	391.6	377.7	380	371.8	365.2	340	360
Total Boron	5 (MAC)	mg/L	0.022	<0.020	0.032	<0.020	0.023	0.039	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Cadmium	0.007 (MAC)	mg/L	0.000013	<0.000005	0.000016	0.000024	0.000029	<0.000020	0.00004	0.000024	<0.000020	0.00008	<0.000005	<0.000020	<0.000020
Dissolved Calcium	NV	mg/L	70.3	68.2	63.6	63.4	55	59	73.2	69.7	72	75.3	72	80	75
Chloride	<250 (AO)	mg/L	4.29	4.49	1.38	1.93	2	1.7	10.31	5.88	15	10.86	10.95	12	17
Total Chromium	0.05 (MAC)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010
Total Copper	2 (MAC) / 1 (AO)	mg/L	0.0317	0.013	0.0022	0.0016	0.0045	0.012	0.125	0.0057	0.0035	0.0017	0.0018	0.034	0.0035
Total Iron	<0.3 (AO)	mg/L	0.015	0.014	0.018	0.04	<0.060	<0.060	<0.010	<0.010	<0.060	0.017	0.044	0.3	<0.060
Total Lead	0.005 (MAC)	mg/L	0.00127	0.00048	<0.00030	<0.00030	0.00054	0.0012	0.00302	<0.00030	<0.00020	<0.00030	<0.00030	0.011	0.00025
Total Mercury	0.001 (MAC)	mg/L	<0.00010	<0.00020	<0.00010	<0.00020	<0.000020	-	<0.00010	<0.00020	-	<0.00010	<0.00020	<0.000020	-
Dissolved Magnesium	NV	mg/L	35.1	31.8	37.3	35	30	32	39.9	35.5	37	35.2	31.5	35	33
Total Manganese	0.12 (MAC) / 0.02 (AO)	mg/L	<0.0010	<0.0010	0.004	0.0042	0.012	0.015	0.0014	<0.0010	<0.0040	<0.0010	<0.0010	<0.0040	<0.0040
Total Molybdenum	NV	mg/L	0.00148	0.00147	0.00222	0.00193	0.0014	0.0015	0.00113	0.00104	0.00081	0.00076	0.00066	0.00065	0.00063
Total Nickel	NV	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.0006	<0.00050	0.00174	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Nitrate-N	10 (MAC)	mg/L	1.67	1.658	0.78	1.054	0.37	0.54	1.87	1.889	1.9	3.02	3.314	3.2	3.4
Nitrite-N	1 (MAC)	mg/L	<0.05	<0.005	<0.05	<0.005	<0.010	0.012	<0.05	<0.005	<0.010	<0.05	<0.005	<0.010	<0.010
Dissolved Potassium	NV	mg/L	3.3	3.2	2.8	2.6	2	2.3	3.1	3	2.9	3.1	2.9	3	2.8
pH <sup>2</sup>	7.0 -10.5		8.1	8	8	8.1	7.95	7.58	7.9	8	7.64	8	8	8.13	7.62
Total Selenium	0.05 (MAC)	mg/L	0.00084	<0.00060	0.00112	0.00105	0.00052	0.00037	0.0007	0.00085	0.00068	0.0018	0.00096	0.00093	0.00086
Total Silver	NV	mg/L	<0.000070	<0.00007	<0.00007	<0.00007	<0.00010	<0.00010	<0.00007	<0.00007	<0.00010	<0.00007	<0.00007	0.00012	<0.00010
Dissolved Sodium	<200 (AO)	mg/L	7.2	7	13.8	9.3	17	22	7.8	7.6	7	7.1	6.5	7.7	6.4
Sulphate	<500 (AO)	mg/L	6.95	7.51	15.82	12.85	20	21	10.33	11.09	9.7	7.66	6.77	5.9	5.9
Total Thallium	NV	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Total Dissolved Solids (calculated) <sup>3</sup>	<500 (AO)	mg/L	318	310	328	317	300	320	349	330	340	339	328	330	330
Turbidity	1 (OG)	NTU	0.2	0.31	0.2	1.23	0.31	-	0.2	0.25	-	0.6	0.23	0.66	-
Total Uranium	0.02 (MAC)	mg/L	0.001299	0.001241	0.001023	0.001214	0.00091	0.00064	0.001744	0.001688	0.0016	0.001785	0.001672	0.0021	0.0017
Total Zinc	<5 (AO)	mg/L	<0.020	<0.020	0.024	<0.020	0.046	0.013	0.205	<0.020	0.0046	0.029	0.031	0.99	0.028
Total Coliforms	<1 (MAC)	MPN/100 mL	-	<1	-	<1	1	-	-	<1	-	-	<1	11	-
E.Coli	<1 (MAC)	MPN/100 mL	-	<1	-	<1	<1	-	-	<1	-	-	<1	<1	-

Table A2 Paskapoo Formation Residential Well Groundwater Quality Results

NV = no value

OG = Operational Guidance

AO = Aesthetic Objective

MAC = Maximum Allowable Concentration

Canadian Drinking Water Quality CDWQ Guidelines: September 2019

2. pH Objective (CDWQ): 7.0 - 10.5

3. Calculated result only includes measured parameters. Actual TDS may be higher.

BOLD RED – Exceeds guideline

	Guideline (Alberta		BHS1							
Parameter	EQG for Surface Water)	Units	30-Oct-14	4-Aug-15	10-Jul-19	15-Dec-22	19-Apr-23			
Hardness (as CaCO3)	NV	mg/L	336	317	200	330	310			
Total Aluminum <sup>1</sup>	0.05	mg/L	0.0182	0.0144	0.3	-	-			
Total Antimony	NV	mg/L	<0.00050	<0.00050	<0.00060	-	-			
Total Arsenic	0.005	mg/L	0.000153	0.000146	0.00061	-	-			
Total Barium	NV	mg/L	0.304	0.313	0.21	-	-			
Bicarbonate (as HCO3)	NV	mg/L	376.1	371	240	360	390			
Total Boron <sup>2</sup>	1.5	mg/L	0.024	<0.020	<0.020	-	-			
Total Cadmium <sup>3</sup>	0.00037	mg/L	0.000032	0.000008	0.000034	-	-			
Dissolved Calcium	NV	mg/L	74.1	72	48	75	70			
Chloride <sup>4</sup>	120	mg/L	9.6	10.12	8.2	16	13			
Total Chromium <sup>5</sup>	0.001	mg/L	<0.0010	<0.0010	0.001	-	-			
Total Copper <sup>6</sup>	0.007	mg/L	<0.0010	0.001	0.0013	-	-			
Total Iron	0.3	mg/L	0.027	0.019	0.25	-	-			
Total Lead <sup>7</sup>	0.007	mg/L	<0.00030	<0.00030	<0.00020	-	-			
Total Mercury	0.000005	mg/L	<0.00010	<0.00020	0.0000025	-	-			
Dissolved Magnesium	NV	mg/L	36.7	33.3	20	36	33			
Total Manganese	NV	mg/L	0.0019	0.0012	<0.0040	-	-			
Total Molybdenum	0.073	mg/L	0.00141	0.00089	0.00038	-	-			
Total Nickel <sup>8</sup>	0.13	mg/L	<0.00050	<0.00050	0.00088	-	-			
Nitrate-N <sup>9</sup>	3	mg/L	2.83	3.037	1.4	2.7	2.9			
Nitrite-N <sup>10</sup>	0.1	mg/L	<0.05	<0.005	<0.010	<0.010	<0.010			
Dissolved Potassium	NV	mg/L	3.4	3.3	4.8	3.0	2.8			
pН	6.5-9		8.2	8.2	8.07	8.37	8.21			
Total Selenium <sup>11</sup>	0.001	mg/L	0.00218	0.0013	0.00068	-	-			
Total Silver	0.00025	mg/L	<0.000070	<0.000070	<0.00010	-	-			
Dissolved Sodium	NV	mg/L	7.8	7.5	5	7.6	7.4			
Sulphate <sup>12</sup>	500	mg/L	9.36	8.36	4.7	8.8	7.2			
Total Thallium	0.0008	mg/L	<0.00020	<0.00020	<0.00020	-	-			
Total Dissolved Solids (calculated) <sup>13</sup>	NV	mg/L	342	334	210	340	340			
Turbidity <sup>14</sup>	7.1	NTU	0.8	1.07	5.1	1.7	0.19			
Total Uranium <sup>15</sup>	0.015	mg/L	0.001953	0.001875	0.0013	-	-			
Total Zinc	0.03	mg/L	<0.020	<0.020	<0.0030	-	-			
Total Coliforms	NV	MPN	-	2420	>2400	-	-			
E.Coli	NV	MPN	-	1733	1600	-	-			

Table A3 Big Hill Springs Water Quality Results

NV = no value

Environmental Quality Guidelines for Alberta Surface Waters, March 2018

1. Aluminum Guideline value is for long term exposure. (Protection of Freshwater Aquatic Life): if pH >= 6.5 then 0.05 mg/L, else if pH <

6.5 then use equation

2. Boron Guideline value is for long term exposure. Short term exposure value is 29 mg/L

3. Cadmium Guideline value varies with hardness. Based on a typical hardness of 300 to 340 mg/L

4. Chloride Guideline value is for long term exposure. Short term exposure value is 640 mg/L

5. Chromium Guideline value is for hexavalent chromium as conservative value. Trivalent chromium guideline is 0.0089 mg/L.

6. Copper Guideline is for long term exposure and only applies to waters of hardness >= 50mg/L as CaCO<sub>3</sub>

7. Lead Guideline varies with hardness. Based on a typical hardness of 300 to 340 mg/L  $\,$ 

8. Nickel Guideline varies with hardness. Based on a typical hardness of 300 to 340 mg/L

9. Nitrate Guideline value is for long term exposure.. Short Term exposure value is 124 for Freshwater

10. Nitrite as N guideline varies with chloride. Based on a typical chloride concentration of 8 to 10 mg/L  $\,$ 

11. Alert concentration for sensitive environments = 0.001 mg/L. Guideline value = 0.002 mg/L

12. Sulphate Guideline value varies with hardness. Based on a typical hardness of 300 to 340 mg/L  $\,$ 

13. Calculated result only includes measured parameters. Actual TDS may be higher.

14. Maximum increase of 8 NTU from background for short term. Maximum average increase of 2 NTU from background for longer term exposures.

15. Uranium Guideline value is for long term exposure. Short term exposure value is 0.033 mg/L

BOLD RED – Indicates Exceeds guideline

SLR Project No.: 212.06650.00007 May 2023

## Figures

Groundwater Monitoring Plan

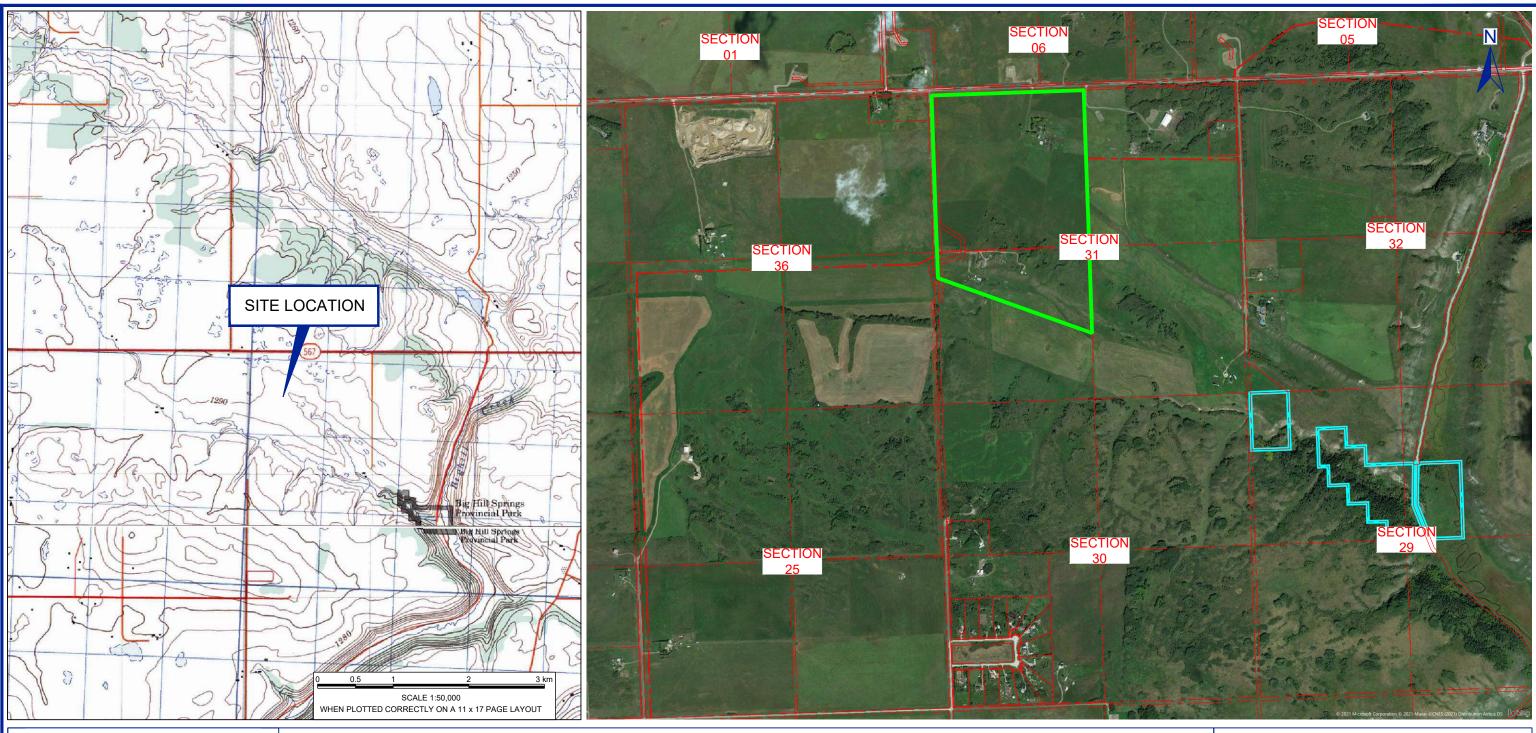
Summit Pit Project

Mountain Ash Limited Partnership

SLR Project No. 212.06650.00007

May 11, 2023







#### NOTES:

DRAWING COMPILED FROM LIDAR DATA, PROPERTY LINE DATA AND AIR PHOTOS AS PROVIDED BY THE CLIENT, NTS MAP 82 O/01 TITLED "CALGARY" AND 82 O/08 TITLED "CROSSFIELD" AND SITE RECONNAISSANCE INFORMATION.

LEGAL DESCRIPTION: W 1/2 SEC 31 TWP 026 RGE 03 W5M ROCKY VIEW COUNTY, ALBERTA

IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY. IMAGERY DATE: SEPTEMBER 9, 2016.

#### LEGEND:



PROPERTY BOUNDARY SUBJECT BOUNDARY

BIG HILL SPRINGS PROVINCIAL PARK

0.8 02 04

SCALE 1:20,000 WHEN PLOTTED CORRECTLY ON A 11 x 17 PAGE LAYOUT NAD 1983 UTM ZONE 11N

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

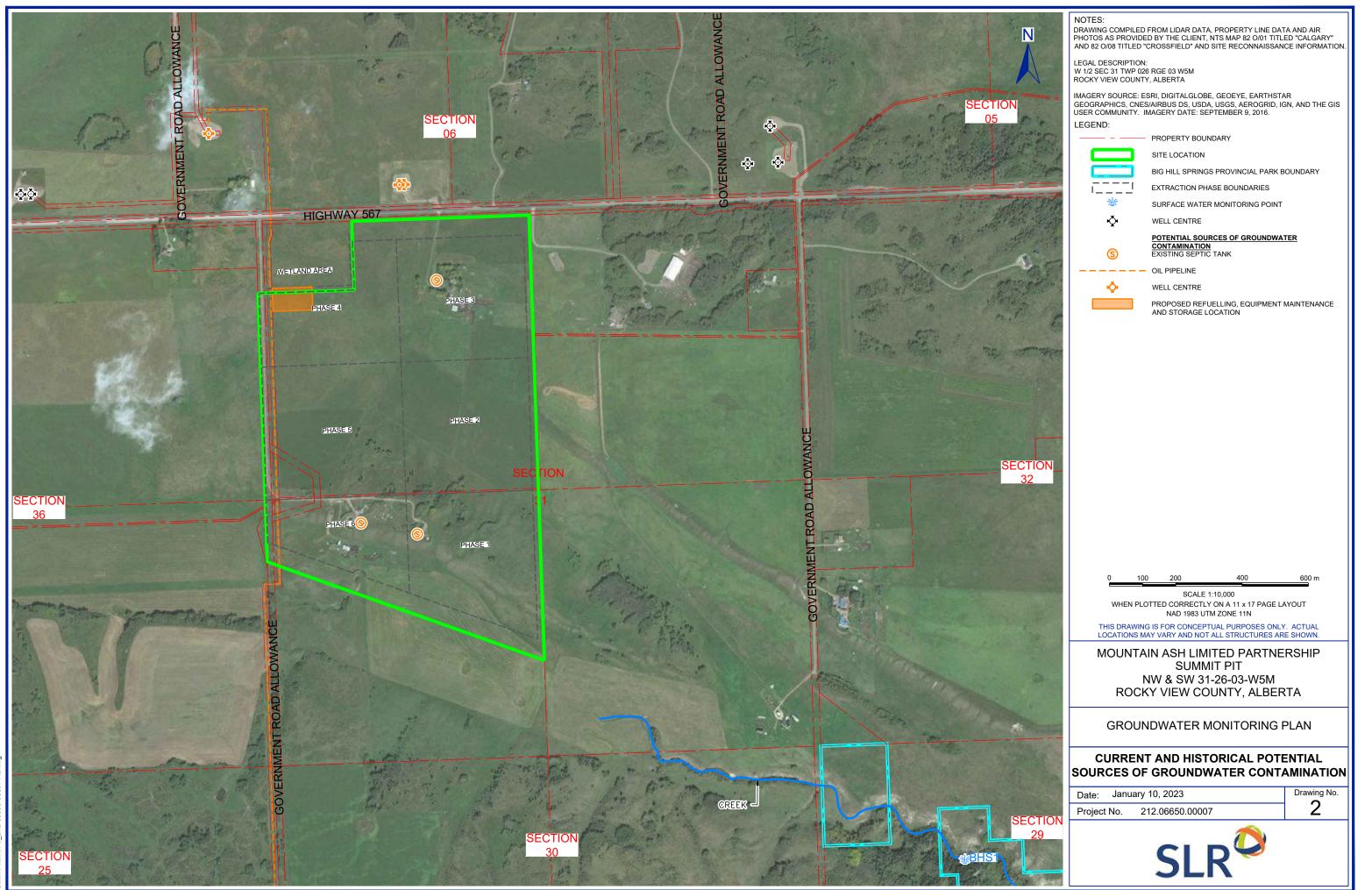
MOUNTAIN ASH LIMITED PARTNERSHIP SUMMIT PIT NW & SW 31-26-03-W5M ROCKY VIEW COUNTY, ALBERTA

GROUNDWATER MONITORING PLAN

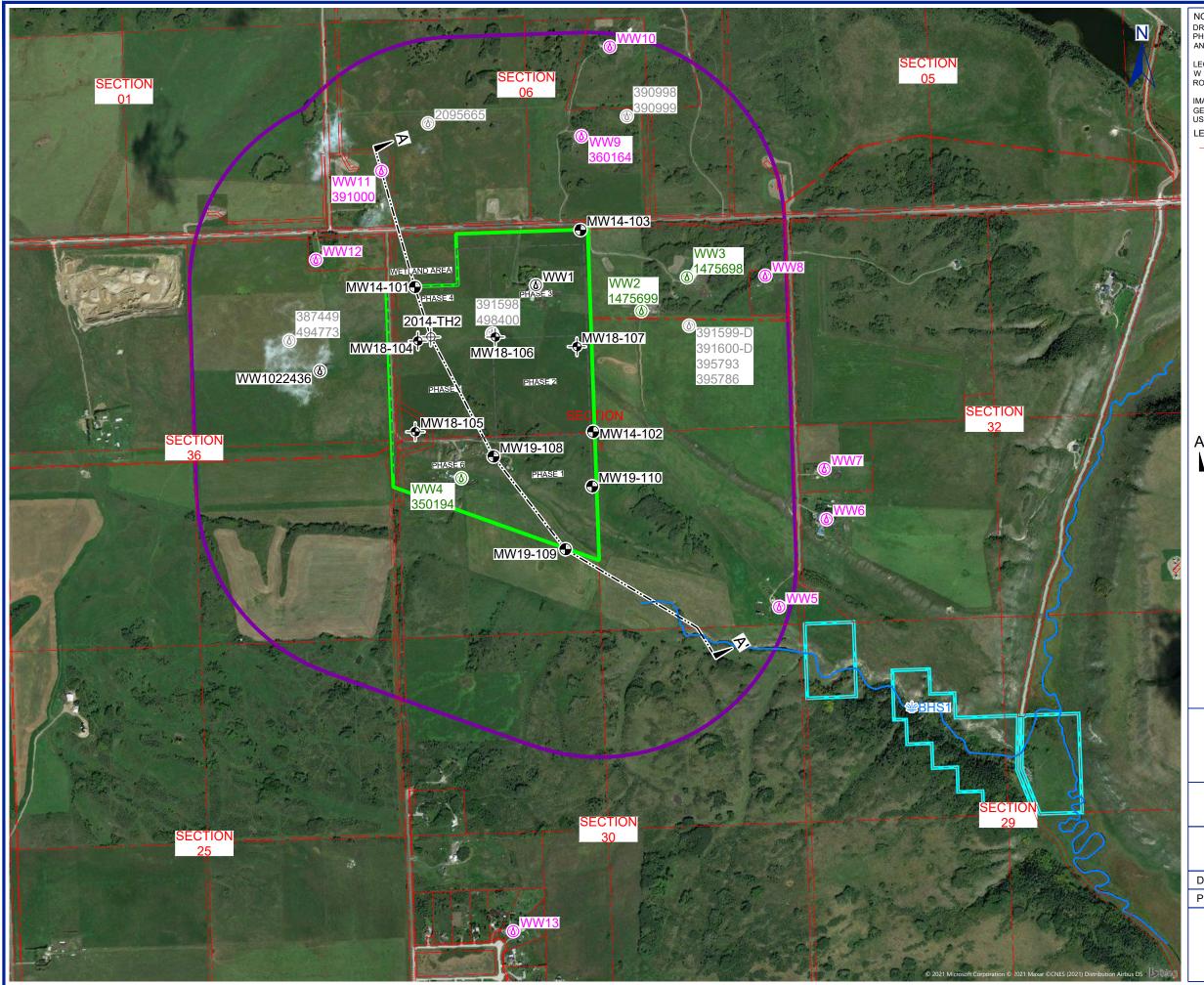
### SITE LOCATION & STUDY AREA

1.2 km

Date: January 10, 2023 Project No. 212.06650.00007 Drawing No. 1



adfile name: S\_212-06650-00007-A5.dw



adfile name: S\_212-06650-00007-A5.dwg

ΤС	ES:	
DТ	ES:	

DRAWING COMPILED FROM LIDAR DATA, PROPERTY LINE DATA AND AIR PHOTOS AS PROVIDED BY THE CLIENT, NTS MAP 82 O/01 TITLED "CALGARY" AND 82 O/08 TITLED "CROSSFIELD" AND SITE RECONNAISSANCE INFORMATION.

LEGAL DESCRIPTION: W 1/2 SEC 31 TWP 026 RGE 03 W5M ROCKY VIEW COUNTY, ALBERTA

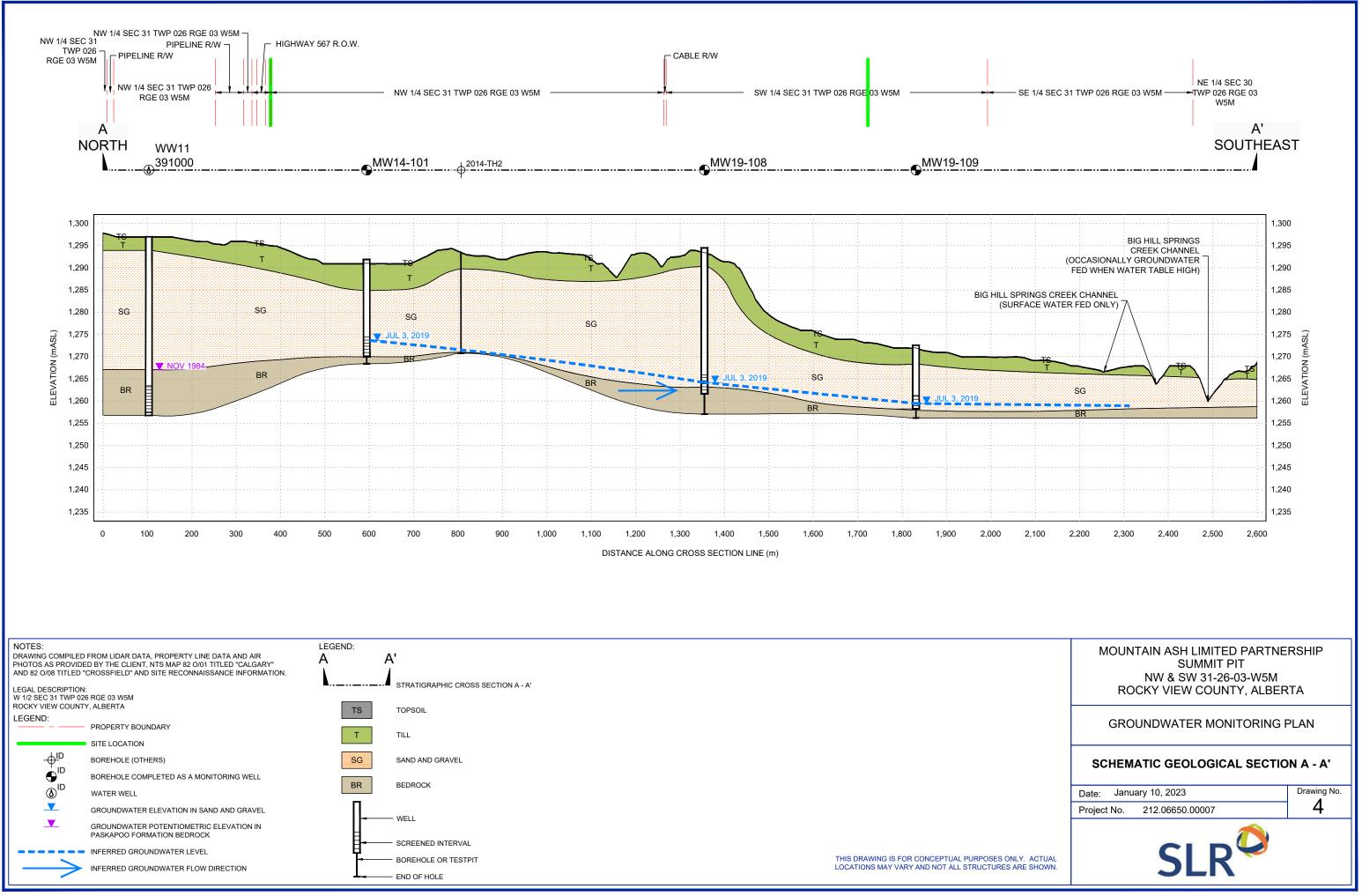
IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY. IMAGERY DATE: SEPTEMBER 9, 2016. LEGEND:

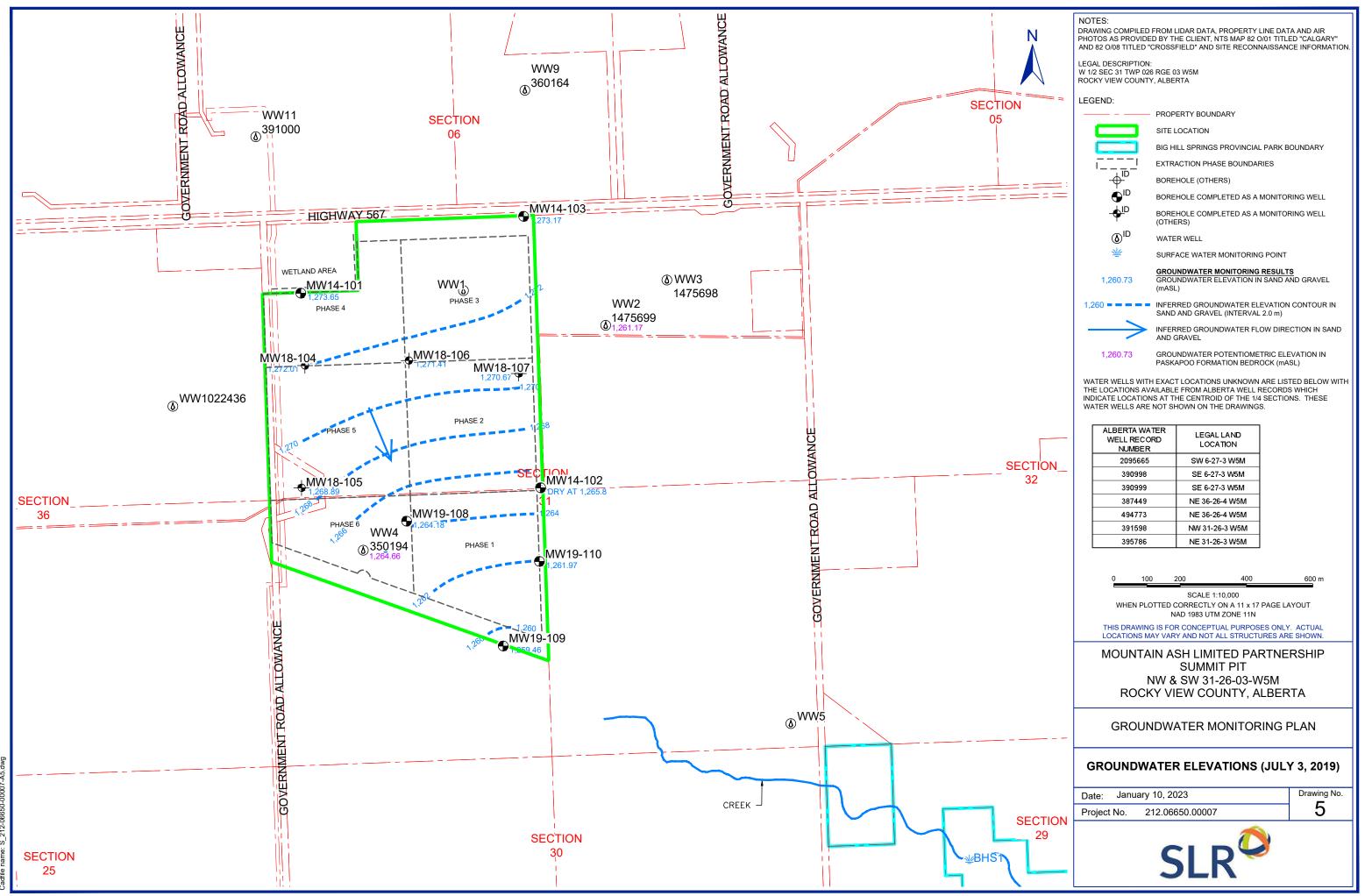
PROPERTY BOUNDARY PROJECT BOUNDARY BIG HILL SPRINGS PROVINCIAL PARK BOUNDARY \_\_\_\_\_ EXTRACTION (PIT) PHASE BOUNDARIES 800 m RADIUS FROM SITE ⊕<sup>ID</sup> BOREHOLE (OTHERS) BOREHOLE COMPLETED AS A MONITORING WELL -¢ID BOREHOLE COMPLETED AS A MONITORING WELL (OTHERS)  $(b)^{\mathsf{ID}}$ WATER WELL  $\textcircled{D}^{\mathsf{ID}}$ WATER WELL (WELL PLOTTED AT QUATER SECTION CENTROID BASED ON DATABASE. EXACT LOCATION WITHIN QUARTER SECTION IS UNKNOWN) () ID-D WATER WELL (DECOMMISSIONED)  $\textcircled{D}^{\mathsf{ID}}$ PREVIOUSLY SAMPLED WATER WELL TO BE INCLUDED IN MONITORING PROGRAM **()**<sup>ID</sup> WATER WELL TO BE ADDED TO MONITORING PROGRAM 16 SURFACE WATER MONITORING POINT Α' STRATIGRAPHIC CROSS SECTION LINE STATION ID NORTHING EASTING MW14-101 5682867.5 680067.9 MW14-102 5682278.7 680793.2 MW14-103 5683099.2 680740.6 MW18-104 5682648.9 680080.8 MVV18-105 5682280.0 680070. MW18-106 5682664.2 
 MV18-107
 5682625.1
 680726.1

 MV19-108
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 680387.3

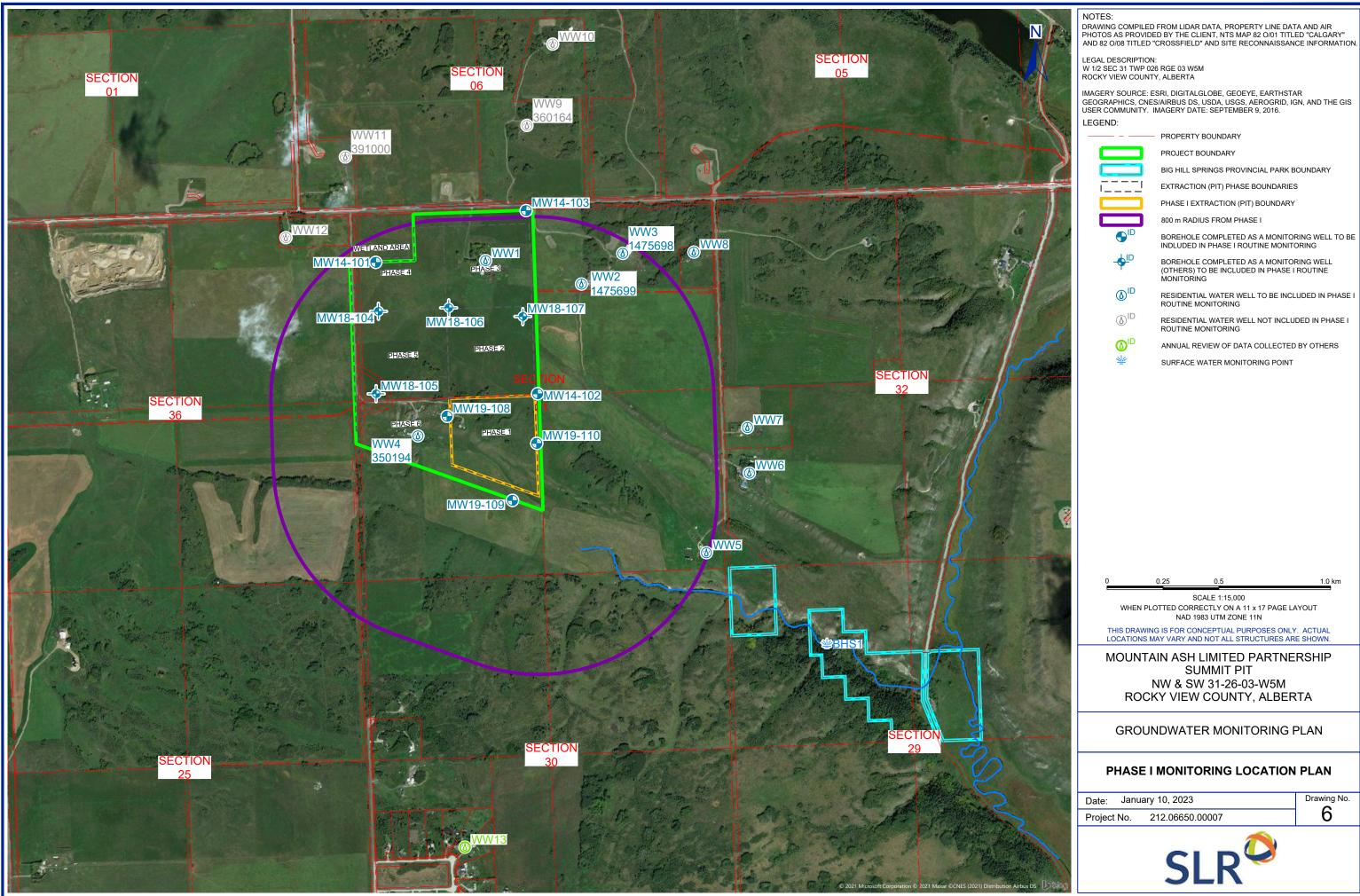
 MV19-109
 5681802.5
 680679.1

 MV19-100
 5682057.8
 680788.1
 WW2/1475699 5682770.4 WW4/350194 5682091.3 0 25 0.5 1.0 km SCALE 1:15,000 WHEN PLOTTED CORRECTLY ON A 11 x 17 PAGE LAYOUT NAD 1983 UTM ZONE 11N THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN. MOUNTAIN ASH LIMITED PARTNERSHIP SUMMIT PIT NW & SW 31-26-03-W5M ROCKY VIEW COUNTY, ALBERTA GROUNDWATER MONITORING PLAN MONITORING WELL AND WATER WELL LOCATION PLAN Drawing No. Date: January 10, 2023 3 Project No. 212.06650.00007

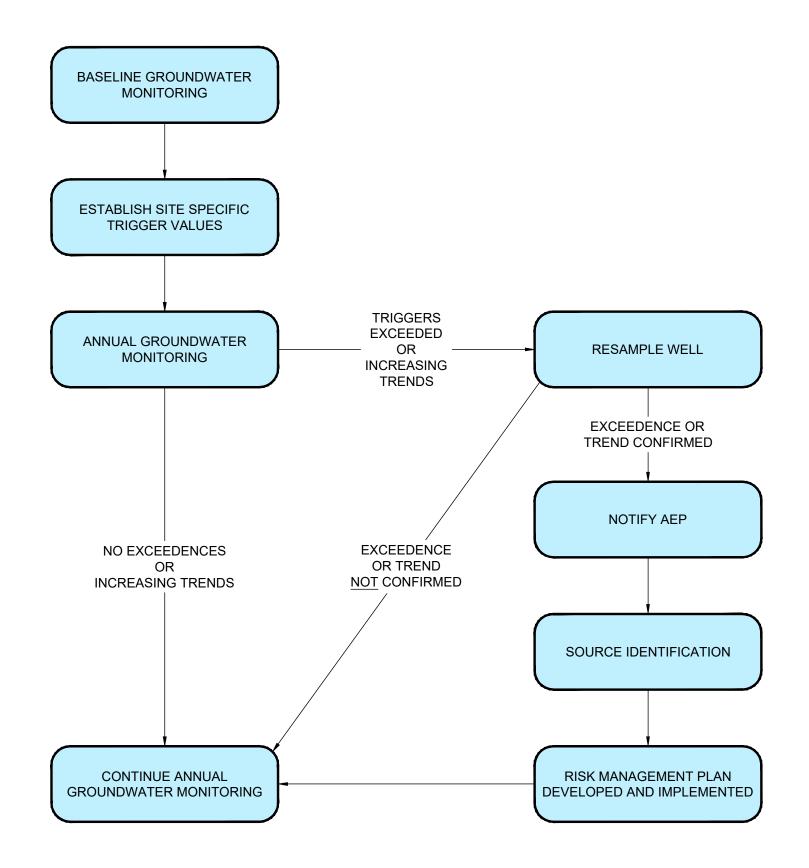




ile name: S\_212-06650-00007-A5.dw



BOREHOLE COMPLETED AS A MONITORING WELL TO BE INDLUDED IN PHASE I ROUTINE MONITORING



NOTES: DRAWING COMPILED FROM LIDAR DATA, PROPERTY LINE DAT PHOTOS AS PROVIDED BY THE CLIENT, NTS MAP 82 O/01 TITLI AND 82 O/08 TITLED "CROSSFIELD" AND SITE RECONNAISSAN	ED "CALGARY"
LEGAL DESCRIPTION: W 1/2 SEC 31 TWP 026 RGE 03 W5M ROCKY VIEW COUNTY, ALBERTA	
THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY LOCATIONS MAY VARY AND NOT ALL STRUCTURES AR	
MOUNTAIN ASH LIMITED PARTNE SUMMIT PIT	RSHIP
NW & SW 31-26-03-W5M ROCKY VIEW COUNTY, ALBER	TA
GROUNDWATER MONITORING F	PLAN
GROUNDWATER RESPONSE P	LAN
Date: January 10, 2023	Drawing No.
Project No. 212.06650.00007	1
SLR	

# Appendix A Monitoring Well Construction Logs

Groundwater Monitoring Plan

Summit Pit Project

Mountain Ash Limited Partnership

SLR Project No. 212.06650.00007

May 11, 2023



					CLIENT: Summit Aggregates Resource	BC	DREHO	LE	LOG	1.4
	SL	.K			PROJECT: Hydrogeological Assessment NW 31-026-3 W5M Alberta		MW1			
	ONSULTIN	NG (CA	NADA)	LTD.	PROJECT No. 203.50065.00001	SURFACE ELEVATION:		1	680066	5.4
SAMPLE TYPE	₽	эrу	й			TEST DATA	WELL	WATER LEVEL		
ЪГЕ	PLE	SCOVE	TYF		SOIL DESCRIPTION	SPT Count	L L L	ERL	WELL COMPLETION	
SAM	SAMPLE ID	% Recovery	SOIL TYPE			♦ % Moisture	VELI	NAT	NOTES	
	07		0)							╉
									stickup, above	-
									ground steel protector	ŀ
				тог	Ground Surface			/	protector	╞
				Clay	y, some silt, occasional gravel, rootlets, brown, moist, soft 🖉			A PA		
			•.	∥ ∖to fi	rm 0.5 /			Z	backfilled with drill	
				San	ndy, gravelly (fine to coarse grained) clay, light brown, dry,			Z	cuttings	
	WP1			very	y hard		ALEAN CARONOLANA CARONOLANA ALEAN CARONOLANA			
							50) 50	ž		-
							·──₽			F
										-
							▁▁▋▌			
			•.							
										-
										ŀ
			ЩЦ	SAN	ND AND GRAVEL 6.1					ŀ
	WP2			Fine	e to medium grained sand, fine to coarse grained gravel,					
	-				l graded, light brown to orangey brown, dry, compact with asional hard, calcified bands					ŀ
					1					-
				]						
				]	1					ĺ
									budratad barterit-	
				]					hydrated bentonite chips	
					-		· — — · 📕 🛛			
				]						
										-
					-					ŀ
				1	-					
DRILI	LING ME		<u></u>	Becker	Hammer Notes: GRAB SAM	PLE			<u> </u>	
BILI	L DATE:	30	Septen	nber 201	14 LOGGED BY: RT			She	et 1 of 2	

		CI			CLIENT: Summit Aggregates Resource PROJECT: Hydrogeological Assessment	B					
	SIR				NW 31-026-3 W5M Alberta	BOREHOLE NO: SURFACE ELEVATION:	MV 1293			01 <sup>TM COORDIN</sup> 568286 680066	
Ì						TEST DATA			1		
	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	SOIL DESCRIPTION	■SPT Count ◆ % Moisture		WELL COMPLETION	WATER LEVEL	WELL COMPLETION NOTES	ELEVATION (m)
i } -		δ Ι	~	ŏ				≥ŏ	3		-
- 4											12 - - -
- - 5-					GRAVEL 14.63 Medium to coarse grained, sandy, light brown, moist, compact with occasional hard bands					50 mm solid PVC pipe	-12
		WP3			Below 15.2 m: Occasional cobbles		[				- 12 -
-					Below 16.8 m: Wet					GW = 16.40 mbg (2Oct2014)	- - -12
7 - -											-12
3-										50 mm 010 slot	- - -12
- 										PVC pipe	- - - -12
- - -		WP4			SAND 19.5 Medium to coarse grained, grey brown, wet, very loose						-
-		WDE		•••••	SANDSTONE 21.03						-12
2		WP5 WP6			Fine grained, brown, grey, wet, weak Below 21.6 m: Weathered, clayey, silty, soft					bentonite chips	12 
-			-	<u></u>	End of borehole at 22.3 m 22.3				<b> </b>		-
					Well Completion Details: Screened interval from 16.5 m to 21.0 m below surface Elevation at top of pipe (TOP) = 1294.240 m						
					Groundwater Information: Depth to groundwater from TOP = 17.11 m (20ct2014)						
	DRIL	LLING ME	THO	D:	Becker Hammer Notes: GRAB SAM	PLE					
		LL DATE:	30	) Senter	nber 2014 LOGGED BY: RT				01	et 2 of 2	

					CLIENT: Summit Aggregate	s Resource	BC	)REF	10	LE	LOG	14
	SL	.R			PROJECT: Hydrogeological As NW 31-026-3 W5M	Alberta	BOREHOLE NO:	MW	/14	4-1	02 <sup>TM COORDIN</sup> 568228	1ATE 80 N
LR Ç	ONSULTIN	G (CA	NADA) L	.TD.	PROJECT No. 203.50065.00001		SURFACE ELEVATION:	1283.2			680791	1.6 E
YPE	0	>					TEST DATA		WELL COMPLETION	WATER LEVEL		
SAMPLE TYPE	SAMPLE ID	Recovery	SOIL TYPE		SOIL DESCRIPTION		■SPT Count		LETI	LE 2	WELL	
MPI	MPL	Rec	UL T				<ul> <li>♦ % Moisture</li> </ul>	Ē	ÅP	ATEF	WELL COMPLETION NOTES	
SA	SA	%	So				<ul> <li>✓ /₀ INDISTUTE</li> </ul>	14/1	30 80	۸	NOTES	i
												-1
											stickup, above	+'
					Created Conferen						ground steel protector	
-+			<u>71 %</u> . 71	TO	Ground Surface PSOIL							÷
			ΠП		ndy, occasional gravel, dark brown, i	rootlets, moist					silica sand	-
			•		<b>AY TILL</b> y, sandy clay, some gravel, brown, n	noist verv hard		. •				-
				Ont	y, sandy slay, some graver, slown, n							Ŀ
												-
												ŀ
												╞
	WP7							· 4			hydrated bentonite	Ŀ
											chips	F
												ŀ
						-		· — — ·				F
												-
												F
			ЩЦ	SAI		3.96		- — _ <sub>D</sub> ç	4 29	2		ŀ
	WP8			Mee	dium to coarse grained, well graded	, gravelly (fine to						F
				_coa	rse, rounded), occasional cobble, b	rown, moist 4.57		Ŕ		2		ŀ
			$^{\circ}$	We	AVEL AND SAND Il graded, fine to coarse gravel and v	well graded, fine to		K.		5		-
			,0 C	coa	rse sand, occasional cobble, rounde	ed, moist				5		E
	WP9		$\circ$							9		-
												ŀ
												╞
											backfilled with drill	F
					ND AND GRAVEL e grained, trace medium, trace coars	6.4 se sand. Fine to					cuttings	╞
	WP10			coa	rse, rounded gravel, red, moist				CANCANCANCANCANCANCANC	2		F
									IR			F
				_					R			ŀ
				Fro dry	m 7.6 to 7.9 m: Rounded, medium to	o coarse gravel, sandy,			K			ŀ
				~' j				· – – P	R			Ŀ
												╞
												ŀ
						-		<del>R</del>	Ŕ			╞
											hydrated bentonite	ŀ
											chips	-
											50 mm solid PVC	ŀ
									Ľ.		pipe	+
									目			ŀ
			00 00/		AVEL orly graded, medium, rounded, sand	10.7			Ë.			╞
	WP11		20	coa	ting on gravel, black and dark brown	n staining			目			ŀ
			,0 a	Bel	ow 11.3 m: Fine to coarse grained g	ravel, rounded, sandy,						-
			$\frac{1}{2}$	iine	e, dark brown, moist				ŧ.			ŀ
	WP12		,0 C			-						-
			$^{\circ}$						E.			-
			<u>,00</u>						目		50 mm 010 slot PVC pipe	ŀ
	LING MET		$\mathcal{O}(\mathcal{O})$	Becker	Hammer	Notes: GRAB SAMP	IF		Ц.		1.12.2	ŀ
			•	DOUVEI		Notes: GRAB SAMP						

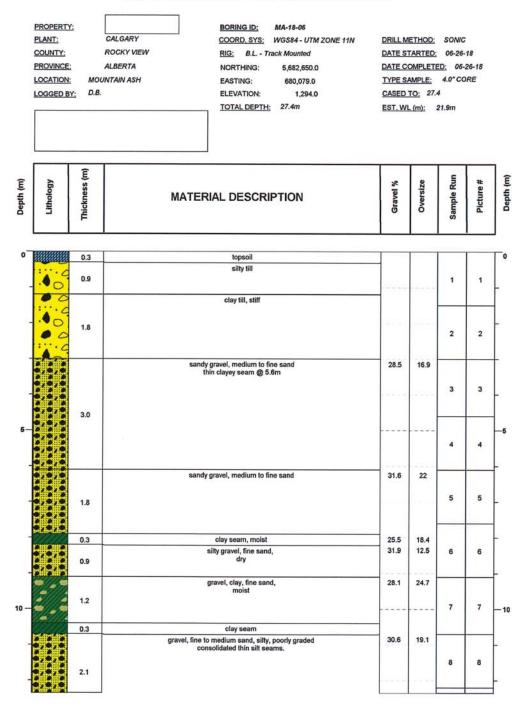
					CLIENT: Summit Aggi	regates Resource		BO	REHC	LE	LOG	
		SL	.R		NW 31-026-3	ical Assessment W5M Alberta			<b>/W1</b> 283.26 r	4-1	02 <sup>TM COORDIN 568228</sup>	ATES 30 N
DEPTH (m)	SAMPLE TYPE	CONSULTIN DI BAMBLE ID	% Recovery	SOIL TYPE	TD. PROJECT No. 203.50065.00			SURFACE ELEVATION: 1 TEST DATA •SPT Count • % Moisture	WELL WELL	1	WELL COMPLETION NOTES	ЕLEVATION (m)
		WP13			GRAVEL AND SAND Fine to medium, trace coarse, ro medium, trace coarse sand, occ Below 13.7 m: Increasing cobble	ounded gravel. Fine, trace casional cobble, dry	2.8					 1270 - - - - - - 1269 - -
15-		WP14 WP15			<b>SANDSTONE</b> Weak, fine grained, silty, dry From 15.5 to 15.8 m: Higher clay		4.93				silica sand	- - 1268 - -
16-					Becoming more competent belo	w 15.8 m					bentonite chips	- - 1267
					End of borehole at 16.5 m Well Completion Details: Screened interval from 10.4 m to Elevation at top of pipe (TOP) =	o 14.9 m below surface 1284.060 m						
ОКЕНО	DRIL	LING ME		):	Becker Hammer	Notes: GRAB	SAM	PLE		_	1	
	DRIL	L DATE:	1 (	October	2014 LOGGED BY: MH					She	et 2 of 2	

	CI			CLIENT:	Summit Aggregates Resource Hydrogeological Assessment	D					147
	SL	R		1	IVGrogeological Assessment IW 31-026-3 W5M Alberta 203.50065.00001					03 <sup>TM COORDIN</sup> 568310 68073	
	NSULTIN	G (CA	NADA) L	D.   PROJECT NO. A	203.30003.00001	SURFACE ELEVATION: TEST DATA			1	0007	
SAMPLE TYPE	9	very	ЪЕ					WELL COMPLETION	WATER LEVEL		
MPLI	SAMPLE ID	% Recovery	SOIL TYPE	SC	DIL DESCRIPTION	SPT Count	:	MPL	TER	WELL COMPLETION NOTES	
SAI	SAI	1%	SO			◆ % Moisture		¥S	WA	NOTES	_
											-
										stickup, above ground steel protector	-
			<u>., 1</u> 7 71	TOPSOIL	Ground Surface						┽
			<u>1/</u> <u>x1/</u>		e sand, rootlets, dark brown, moist					silica sand	-
				CLAY TILL	0 ace rounded gravel, grey, moist, very ha	.61					ļ
				softer below 2.4 m	ace rounded graver, grey, moist, very na	iu,					ŀ
											ŀ
											ŀ
			•.								┝
										hydrated bentonite chips	-
v	VP16										-
			♦.								
				Below 6.4 m: Brow							
				DEIOM 0.4 M: BLOM	11		12	4 04			
				SAND AND GRAV		.01	<del>k</del>				
				Very fine, trace coa rounded gravel. So	arse sand. Medium to coarse grained, one silt, red/brown, dry						
							K				
		¢	, <u>v</u> C	GRAVEL AND SAM		.53					
				Fine to medium, (the fine sand, brown, r	race coarse) gravel. Poorly graded, very noist						
			$^{\circ}$								
			0.			·	F				
v	VP17										
			$^{\circ}O^{\circ}$	Below 10.7 m: Incr	easing gravel						
			$\mathcal{O}$								
			,00								
							Read				
			,0° ,0°								
DRILLI	ING MET	HOD	: :	ecker Hammer	Notes: GRAB	SAMPLE	<u>6</u>	a by	4	1	1

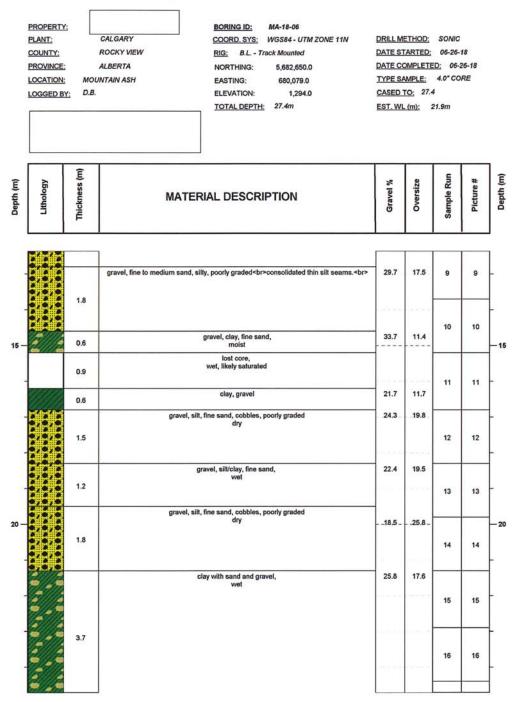
		~			CLIENT: Summit Aggregates Resource	BC	OREHO	LE	LOG	
	SIP				PROJECT: Hydrogeological Assessment NW 31-026-3 W5M Alberta TD. PROJECT No. 203.50065.00001	BOREHOLE NO: SURFACE ELEVATION:	<b>MW1</b> 1299.81 m	<b>1-1</b> า	103 56831 6807	ATES 00 N 39 E
						TEST DATA				
(m) +	SAMPLE TYPE	SAMPLE ID	% Recovery	ΥPE	SOIL DESCRIPTION	■SPT Count	WELL	WATER LEVEL	WELL	ELEVATION (m)
DEPTH (m)	AMPI	AMPI	% Rec	SOIL TYPE		◆ % Moisture	VELL	VATE	WELL COMPLETION NOTES	ILEVA
13·		s s		600	Below 12.8 m: Increasing gravel, some cobble					-
	-			000					50 mm solid PVC	-
				100					pipe	- -1286
14					Below 14.0 m: Decreasing gravel, no cobble					-
				60%						ŀ
15-										-128
				$\frac{1}{2}$						ŀ
	]			00						-
16-	-			00				9		-1284
	1			100						F
				000	Below 16.8 m: Decreasing gravel					- -1283
17	1			[0]	Solow role in Decretating graver					F
										ŀ
18-				$\frac{1}{2}$						-1282
				000						-
				Polo						
19-		WP18		100						- 120
	-				SAND AND GRAVEL 19.2 Poorly graded, very fine sand. Medium with trace fine and					-
					trace coarse gravel. Occasional cobble, red/brown, moist					-1280
20-								5		-
										-
21.										-1279
					Below 21.3 m: Increasing gravel					-
22								5		
23								5		E
	-									-127
1	-				Below 23.2 m: 0.08 m clay lens			_		-
	-							<b>T</b>	GW = 23.49 mbg (2Oct2014)	-
24	1									-127
										-
									50 mm 010 slot PVC pipe	- -127
25										ŀ
		WP19			Below 25.3 m: Wet gravel, very angular					F
26- 26-						L				-1274
	-									ŀ
	-									-
	1 DRII	LLING ME	 THOI	D:	Becker Hammer Notes: GRAB SAM	I IPLE	<u> .'  .'</u>			-1273
	DRII	LL DATE:	1 (	October				CL	at 0 of 0	
	וורוש			2010000				She	et 2 of 3	

						CLIENT: Summit Aggregat	es Resource		BC	)RE	HO	LE	LOG	
		SL	R			PROJECT: Hydrogeological A NW 31-026-3 W5M	Assessment			ΜV	V14	l-1	03 568310	ATES
	SIRC			ΝΔΠΔ		PROJECT No. 203.50065.00001	i Alberta		BOREHOLE NO: SURFACE ELEVATION:		.81 m		68073	
									TEST DATA					
Ê	Ľ	₽	ery	щ					TEOT DATA		TIO	Ξ		NO
Η	FE	PLE	ecov	Ϊ		SOIL DESCRIPTION			SPT Count		L	ER	WELL COMPLETION	VATI
DEPTH (m)	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE					<ul> <li>% Moisture</li> </ul>		WELL	WATER LEVEL	NOTES	ELEVATION (m)
27-		0)						-				_		-
													silica sand	-
		WP20 WP21		× × × × × >		ATHERED SILTSTONE y and silt, some sand, grey with re	d atriational maint	27.4					hydrated bentonite chips	-
					Bel	ow 27.7 m: Siltstone, grey, dry		27.7					•	
					Enc	d of borehole at 27.7 m								
					We	Il Completion Details:								
					Scr	eened interval from 22.6 m to 27.1	m below surface							
					Ele.	vation at top of pipe (TOP) = 1300	.720 11							
					Gro	oundwater Information: oth to groundwater from TOP = 24	40 m (20 ot 2014)							
					Det	511100 groundwater from $10F = 24$	.40 111 (20012014)							
/15														
21/1/15														
2DT														
E.C														
ISTU														
MC														
I V5.														
CAN														
SLR														
L L L														
001.0														
5.00														
5006														
203.														
LE)														
ISTU														
SLR BOREHOLE LOG (MOISTURE) 203:50065.00001.GPJ SLR_CAN V5.2 MOISTURE.GDT														
LOG														
	DRIL	LING ME	THO	D:	Becker	r Hammer	Notes: GRA	B SAM	PLE					
	ייסח		1 (	October	2014	LOGGED BY: MH	-							
SLF	URIL	L DATE:	10	Juober	2014							She	et 3 of 3	

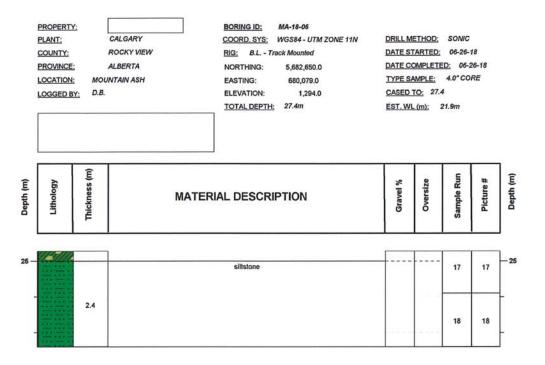
1 OF 3



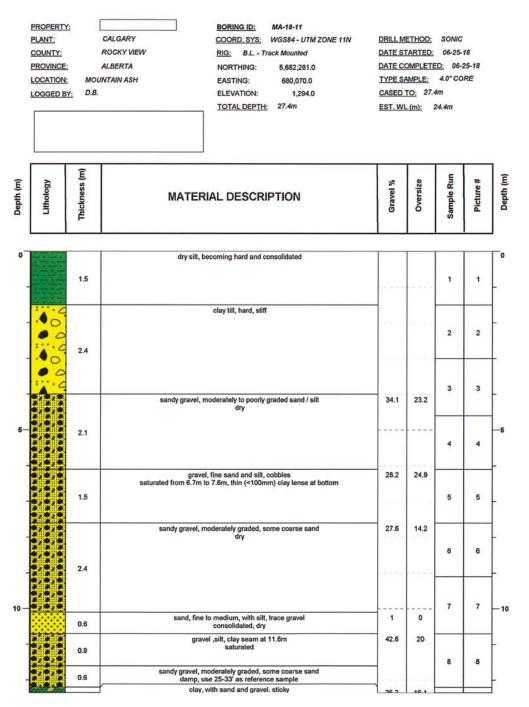
2 OF 3



3 OF 3



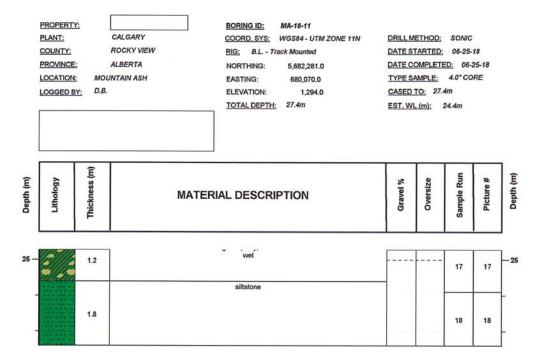
1 OF 3



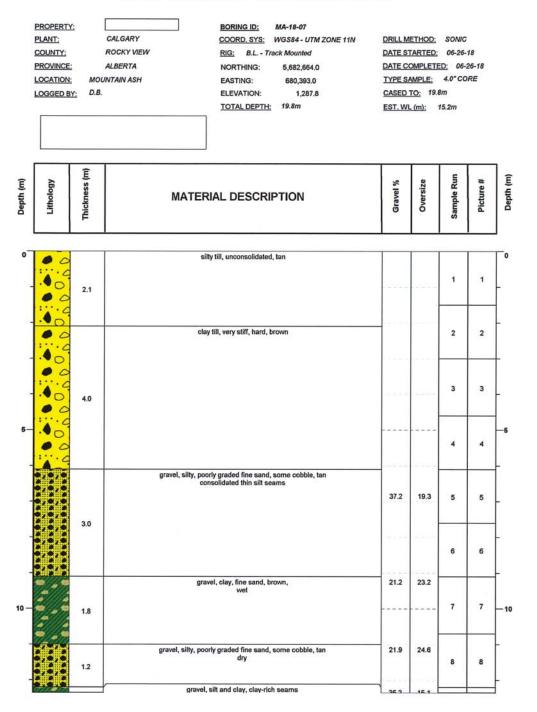
2 OF 3

PLAN COUR PROV	NTY: VINCE:	CALGARY ROCKY VIEW ALBERTA OUNTAIN ASH B.	BORING ID: MA-18-11 COORD. SYS: WGS84 - UTM ZONE 11N RIG: B.L Track Mounted NORTHING: 5,682,281.0 EASTING: 680,070.0 ELEVATION: 1,294.0 TOTAL DEPTH: 27.4m	DRILL MI DATE ST DATE CC TYPE SA CASED T EST. WL	ARTED: MPLETE MPLE: TO: 27.4	06-25- <u>D:</u> 06-: 4.0" CO	18 25-18	
Lithology	Thickness (m)	MAT	ERIAL DESCRIPTION	Gravel %	Oversize	Sample Run	Picture #	Depth (m)
1	7///	8	clay, with sand and gravel. sticky					]
	1.5					9	9	F
	1.5	gr	avel, silty to sandy, damp at bottom	34.4	18	10	10	
111 110	1.8		gravel, higher clay content, damp	27.6	17.6	11	11	
	3.0		gravel, sand, silt consolidated	23.3	24.4	12	12	
				25.2	_17.6_	13	13	-
	1.2	gravel,	silt, sand, clay seams (<100mm thick)			14	14	-2
		coarse	gravel, some sand, sill, poorly graded consolidated, dry	20.3	22.3	15	15	
0101010						16	16	
9	49		gravel, clay, sand	28.6	26.5			1

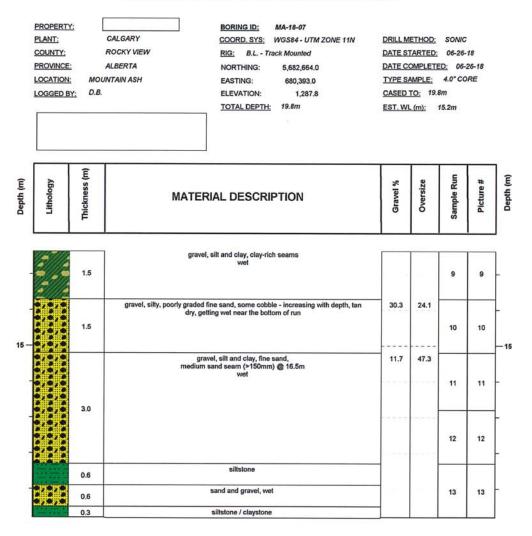
3 OF 3



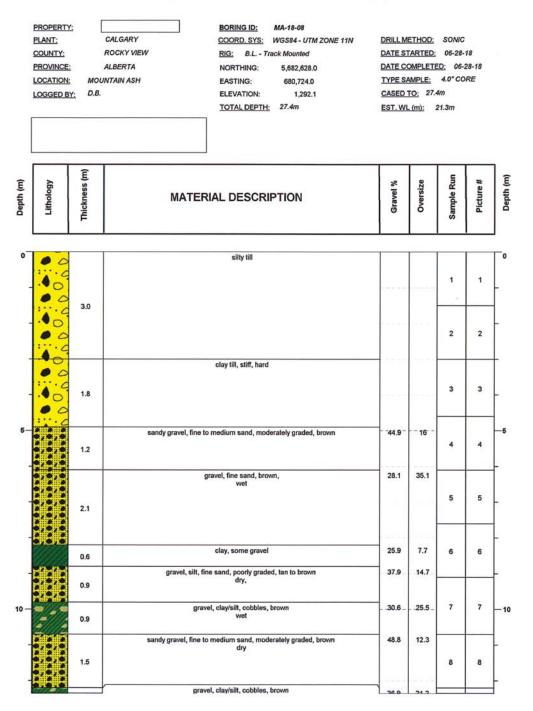
1 OF 2



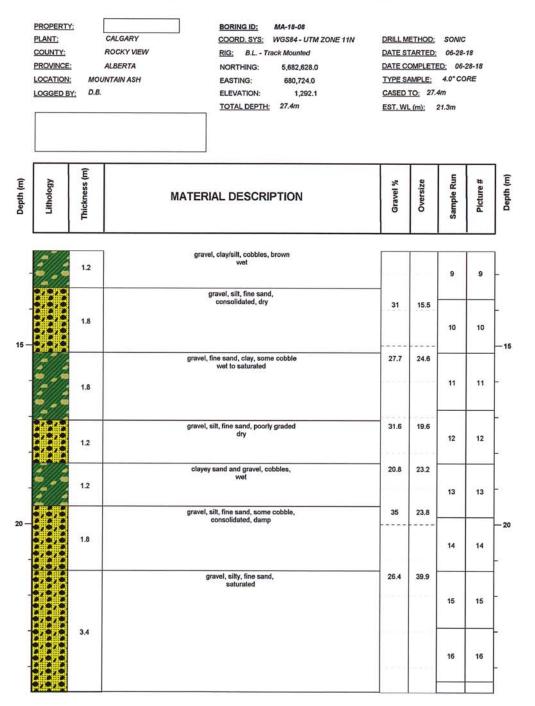
2 OF 2



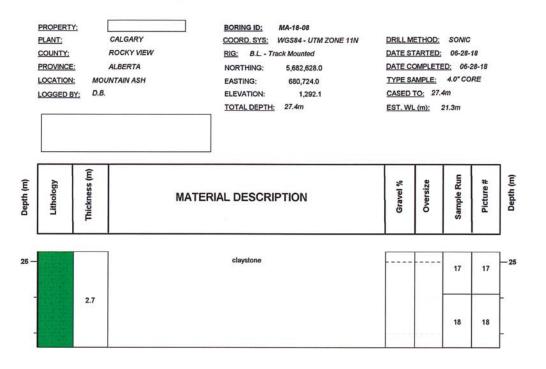
1 OF 3



2 OF 3



3 OF 3



		CI					imited Partnership	<b>)</b>	B	JRE	HC	)LE		14-
		SL	K			PROJECT: Proposed Sum NW 31-026-03 V	NIC PIC V5M Cochrane, AB		BOREHOLE NO:				08UTM COORDIN 6803	JA I 380
1		ONSULTING	G (CA	NADA) L	TD.	PROJECT No. 212.06650.0000	3		SURFACE ELEVATION:	1293			5682	182
_	SAMPLE TYPE		Х					-	TEST DATA		WELL	WATER LEVEL		
(וווו) הו אפט	⊢  щ	SAMPLE ID	% Recovery	SOIL TYPE		SOIL DESCRIPTIO	N		SPT Count		LEI	۳ ۳	WELL	
	MPI	MPI	Rec	אר ד					<ul> <li>♦ % Moisture</li> </ul>		MP	ATE!	COMPLETION NOTES	
5	SA	SA	%	sc							¥8	∣≯		_
														-
-	1													-
													above ground steel protector	ľ
0-						Ground Sur	face				LL			
					CLA Fine	<b>∖Y TILL</b> ∋ trace gravel, dark grey brown, r	ninor sample recover	v drv						
						, alloo g. arol, allin g. of 2. onli, i		,, <b>.</b> ,						
-														
-				•										-
1-								-		· — — ·				-
-				•	@1	.5 m: Some fine to coarse grave	l						hydrated bentonite	
													chips	
								ſ						
-	-													
3-	-			•				ŀ		· — — ·				
-														
-	1				SAN			3.35						
-	1				Fine	e to coarse sand and gravel, brov	vn, ary					X		
4-											NONONONN	) A		
												) A		
												A		
-				<u>, v</u> c	SAN	NDY GRAVEL		4.57				<b>n</b>		
-				$^{\circ}$	Med	<b>NDY GRAVEL</b> lium to coarse gravel, coarse sar	nd, brown, dry					Ŕ		
5-										· — — ·		A D		
				$\circ$								A D		
-												R		
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9-	יוואט	LING METH		<u>°0°</u>	onic/Ode	Y	Notes: GF	RAB SAMF				x		
			.00.	30		<i>//</i> /	Gr	VAD SAIVIF						
		L DATE:	lur	e 3, 201	•	LOGGED BY: NY							et 1 of 4	

		C			CLIENT: Mountain Ash Limited Partnersh	nip	BC	OREHOLE		147
		SL	.K		PROJECT: Proposed Summit Pit NW 31-026-03 W5M Cochrane, A	AB	BOREHOLE NO:	MW19-1	08UTM COORDIN 6803	1AT 386
;	SLR C	CONSULTIN	Ģ (CA	NADA) L			SURFACE ELEVATION:	1293.64 m	56821	
	ΥPE	_					TEST DATA	JA JA		
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		SL	R		PROJECT: Proposed Summit NW 31-026-03 W5I	M Cochrane, AB	BOREHOLE NO:	M۷	V19	9-1	LOG 08 <sup>UTM COORDINA</sup> 6803	ATE \$86
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					CLIENT: Mountain Ash Limited Partnership	nited Partnership BC					
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		ONSULTIN	G (CAI	NADA) L	TD. PROJECT No. 212.06650.00003		1271.68 r		6806	679 E	
DEPTH (m)	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE	SOIL DESCRIPTION	SPT Count	WELL	WATER LEVEL	WELL COMPLETION	ELEVATION (m)	
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1				•••••••••••••••••••••••••••••••••••••••	@ 1.5 m: Some fine gravel				hydrated bentonite chips	- -12 - - - - - - - - - - - - - - - - -	
3					SAND AND GRAVEL 3.66 Coarse sand, fine to coarse gravel, grey brown, dry					- - - - - - - - - - 12	
5-					GRAVELLY SAND 5.49 Fine to coarse gravel and sand, grey brown, dry					- - 12 -	
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						CLIENT:	Mountain Ash Lim	ited Partnership		BC	REH	OL	ΕI	LOG	
		SL	R			PROJECT:	Proposed Summit NW 31-026-03 W5	Pit M Cochrane, AB		BOREHOLE NO:			10	9 <sup>UTM COORDINA</sup> 568180	
		ONSULTIN	G (CA	NADA) L	TD.	PROJECT No	212.06650.00003			SURFACE ELEVATION:	1271.68	- 1		68067	
Ê	ТҮР	₽	ery.	붠						TEST DATA					) NOI
DEPTH (m)	SAMPLE TYPE	SAMPLE ID	% Recovery	SOIL TYPE			SOIL DESCRIPTION			SPT Count	WELL	COMPLETION		WELL COMPLETION NOTES	ELEVATION (m)
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		CI			CLIENT: Mountain Ash Limited Partnership PROJECT: Proposed Summit Pit	BOF	REHC	)LI		1475
		SL	K		NW 31-026-03 W5M Cochrane, AB				110 <sup>UTM COORDIN</sup> 56820	
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	Ē	LEI	cove	ΤΥΡ	SOIL DESCRIPTION	■ SPT Count			WELL COMPLETION	
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							Mountain Ash Lim	ited Partners	ship	BOREHOLE LOG BOREHOLE NO: MW19-110 <sup>UTM COORDINATES</sup> 5682058 N							
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		C			CLIENT: Mountain Ash Lin PROJECT: Proposed Summi	hited Partnership	BC	DREHO	LE		UTM COORDINAT 5682058 680788 WELL COMPLETION NOTES			
		SLK			PROJECT: Proposed Summi NW 31-026-03 W5	M Cochrane, AB	BOREHOLE NO:	MW19	9-1	10 <sup>11 M COORDIN</sup> 56820	АГ )58			
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	~					CLIENT:	Mountain Ash Limi			BOREHOLE LOG					
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		ONSULTIN	G (CA	NADA) L	TD.	PROJECT No	212.06650.00003			SURFACE ELEVATION:	1291	1.14 m	1	6807	_
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SLR BOREHOLE LOG (MOISTURE) 212.06650.00003_100 SERIES_3-5JUNE2019.GPJ SLR_CAN V5.2 MOISTURE.GDT 12/6/19															
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# Appendix B Groundwater Hydrographs

Groundwater Monitoring Plan

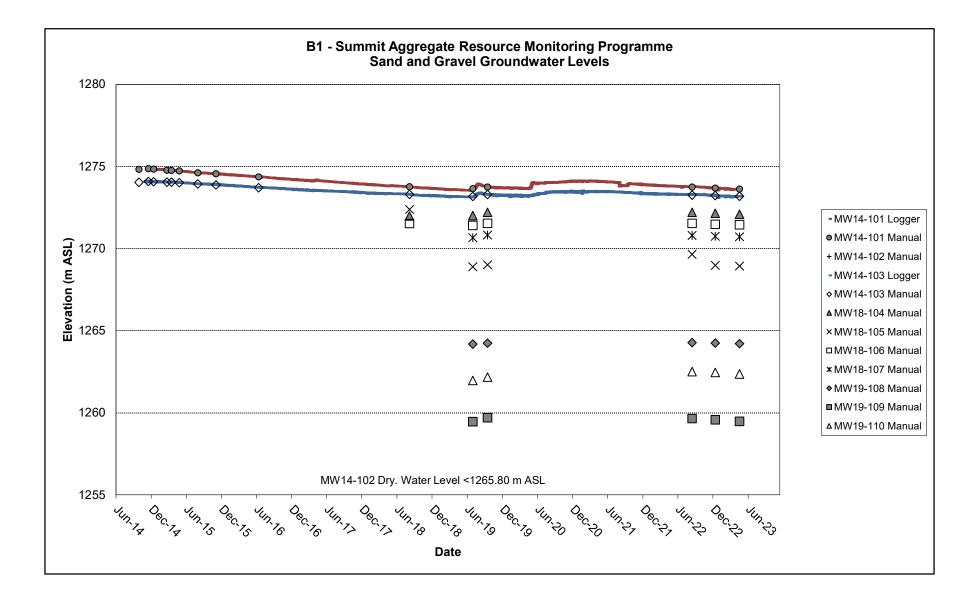
Summit Pit Project

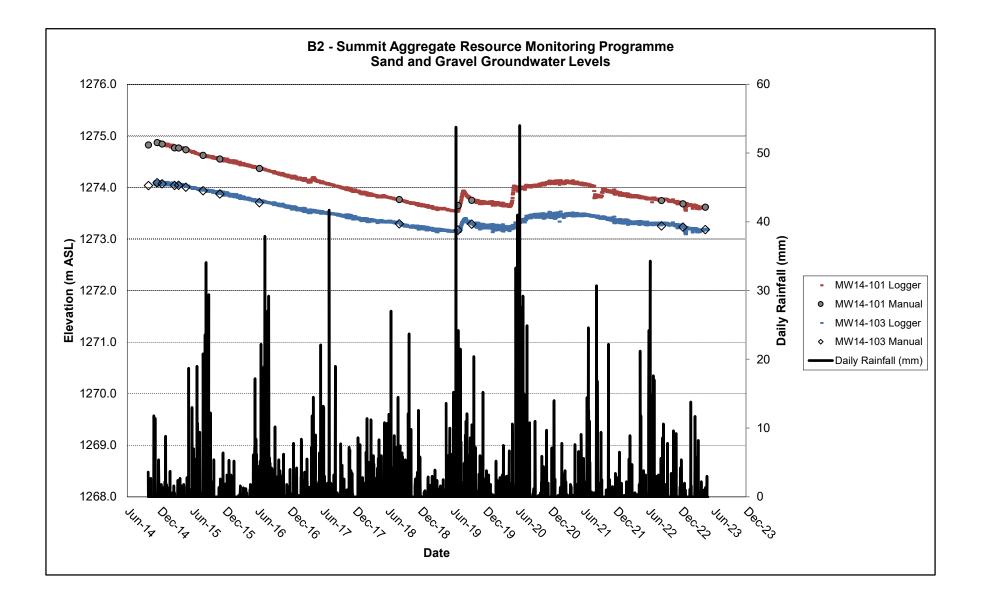
Mountain Ash Limited Partnership

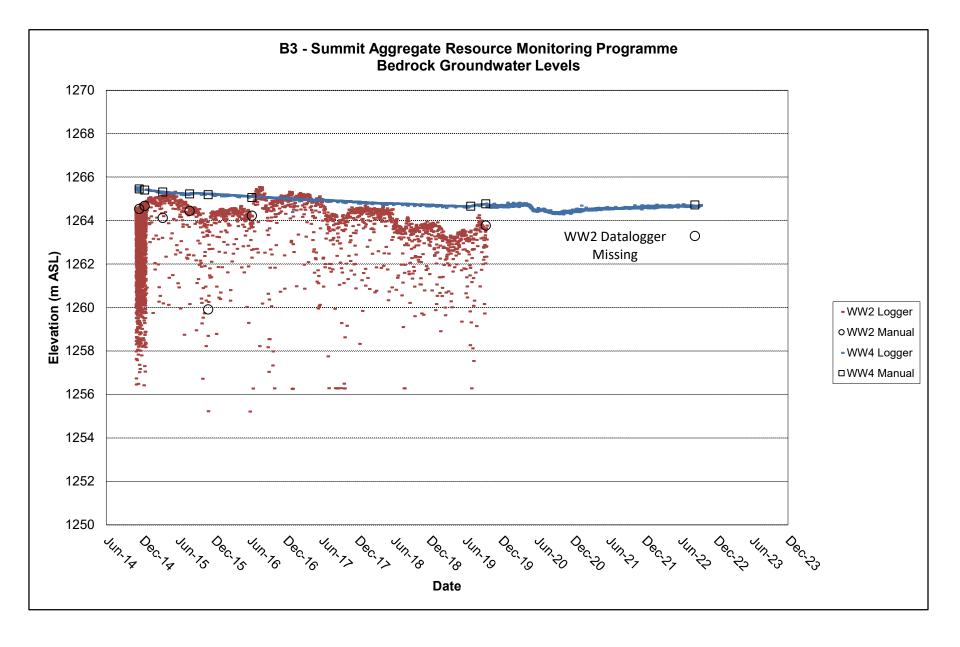
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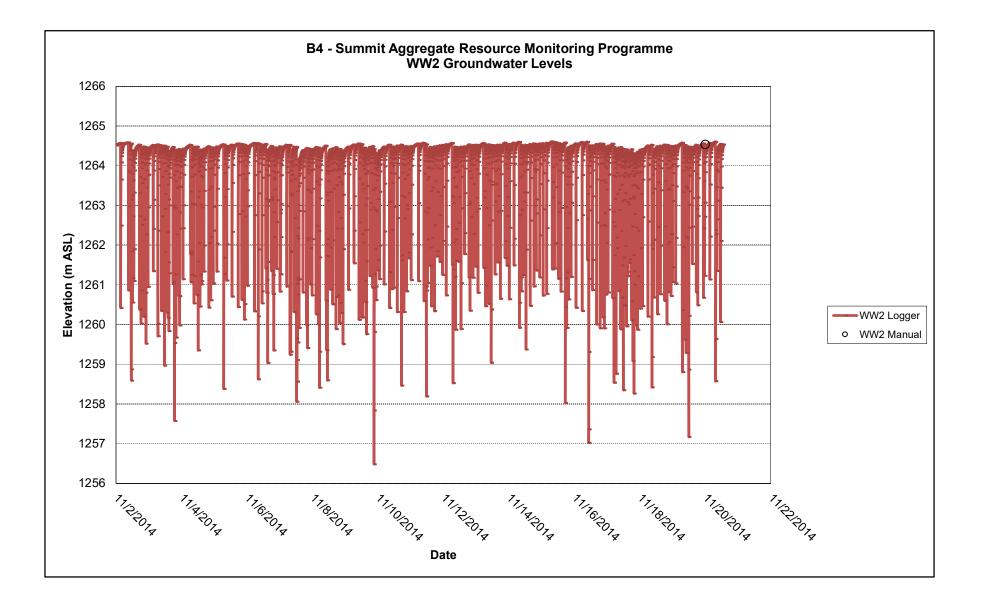
May 11, 2023

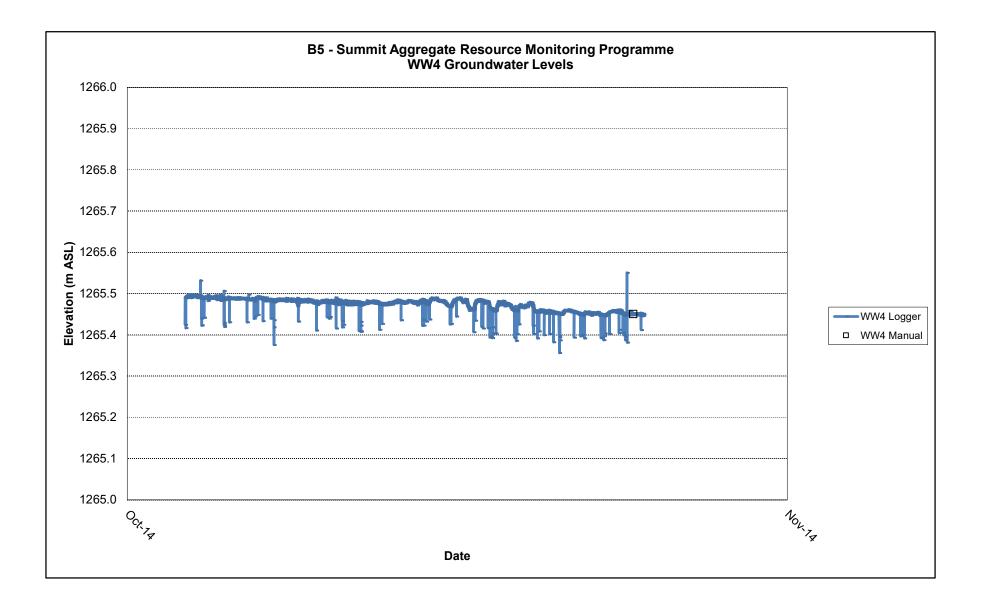












# Appendix C Alberta Water Well Records

Groundwater Monitoring Plan

Summit Pit Project

Mountain Ash Limited Partnership

SLR Project No. 212.06650.00007

May 11, 2023



Alberta

#### **Reconnaissance Report**

View in Imperial Export to Excel

#### **Groundwater Wells**

Please click the water Well ID to generate the Water Well Drilling Report.

GIC Well ID	LSD	SEC	тwр	RGE	м	DRILLING COMPANY	DATE COMPLETED	DEPTH (m)	TYPE OF WORK	USE	СНМ	LT	РТ	WELL OWNER	STATIC LEVEL (m)	TEST RATE (L/min)	SC_DIA (cm)
<u>350194</u>	SW	31	26	3	5	LOU'S WATER WELL DRILLING	1990-03-09	35.05	New Well	Domestic		9		DAVIDSON, D.W.	15.24	54.55	14.12
<u>360164</u>	SE	6	27	3	5	AERO DRILLING & CONSULTING LTD.	1991-10-08	73.15	New Well	Domestic		10		BARGETZI, ERNIE	33.53	136.38	14.12
<u>387449</u>	NE	36	26	4	5	PARSONS DRLG	1962-08-10	33.83	New Well	Unknown		9		BRISTOW, C.R.	21.95	72.74	0.00
<u>390998</u>	SE	6	27	3	5	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	1987-02-11	65.53	New Well	Domestic & Stock		11		STRANGE, R.	45.72	36.37	16.84
<u>390999</u>	SE	6	27	3	5	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	1987-11-19	73.15	New Well	Stock		15		STRANGE, R.	39.62	45.46	16.84
<u>391000</u>	4	6	27	3	5	DIVERSIFIED DRILLING & EXPLORATION CO.	1984-11-07	40.23	New Well	Domestic & Stock	1	7		CIRCLE J RANCHES	28.96	68.19	13.97
<u>391598</u>	NW	31	26	3	5	PARSONS DRILLING		39.62	New Well	Domestic & Stock				MURRAY, R.J.			17.78
<u>391599</u>	NE	31	26	3	5	KRIEGER DRILLING LTD.		49.38	New Well- Decommissioned	Investigatio n		14		PARKER, G.L.	0.00		0.00
<u>391600</u>	NE	31	26	3	5	KRIEGER DRILLING LTD.	1981-10-14	27.43	New Well- Decommissioned	Domestic		9		PARKER, G.L.			0.00
<u>395786</u>	NE	31	26	3	5	PARSONS DRILLING	1981-11-19	62.48	New Well	Domestic & Stock		21		PARKER, G.L.	48.77	68.19	17.78
<u>395793</u>	NE	31	26	3	5	UNKNOWN DRILLER		62.48	Chemistry	Domestic				KIRK, S.			0.00
<u>494773</u>	NE	36	26	4	5	ALKEN BASIN DRILLING LTD.	1999-11-16	30.48	New Well	Stock		4	9	GOETJEN, MORRIE	22.25	63.65	13.97
<u>498400</u>	NW	31	26	3	5	MEDICINE VALLEY WATER WELLS	2001-05-14	74.68	New Well	Domestic		14	24	GIBBS, DAVE	10.82	9.09	13.97
<u>1022436</u>	9	36	26	4	5	AARON DRILLING INC.	2014-05-05	30.48	New Well	Investigatio n		6		LAFARGE CANADA INC			16.81
<u>1475698</u>	16	31	26	3	5	M&M DRILLING CO. LTD.	2003-01-14	39.62	New Well	Domestic		10	24	QUICK WAY FARMS LTD	32.00	45.46	14.13
<u>1475699</u>	15	31	26	3	5	M&M DRILLING CO. LTD.	2003-01-17	53.95	New Well	Domestic		10	24	QUICK WAY FARMS LTD	32.64	24.55	14.13
<u>2095665</u>	SW	6	27	3	5	UNKNOWNDRILLINGCOMP11		25.60	Well Inventory	Domestic & Stock		1		CIRCLE J RANCHES LTD			

# Water Well Drilling Report

View in Imperial Export to Excel

350194

GoA Well Tag No. Drilling Company Well ID

GIC Well ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public databas Date Report Received 1990/03/16 Well Identification and Location Measurement in Metric Address Postal Code Owner Name Town Province Country TOL OWO DAVIDSON, D.W. P.O. BOX 970 COCHRANE 1/4 or LSD SEC TWP RGE W of MER Block Additional Description Location Lot Plan SW 31 026 03 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.259801 Longitude -114.414277 m m from How Elevation Obtained How Location Obtained m from Not Verified Not Obtained **Drilling Information** Method of Drilling Type of Work Cable Tool New Well Proposed Well Use Domestic Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate 0.00 L/min Water Depth from Lithology Description Water Removal Rate (L/min) Static Water Level (m) ground level (m) Bearing Test Date 54.55 6.10 Boulders 1990/03/09 15.24 10.67 Sand & Gravel Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth End Date Start Date 12.19 Sand 35.05 m 1990/03/02 1990/03/09 15.24 Gravel **Borehole** 18.29 Gray Shale Diameter (cm) From (m) To (m) 22.86 Light Green Shale 0.00 0.00 35.05 28.96 Green Shale Surface Casing (if applicable) Well Casing/Liner 32.00 Green Shale Steel Steel Size OD : 14.12 cm Size OD : 11.43 cm 35.05 Green Shale 0.478 cm 0.318 cm Wall Thickness : Wall Thickness : Bottom at : 15.24 m Top at : 13.72 m Bottom at : 35.05 m Perforations Diameter or Slot Hole or Slot Slot From (m) To (m) Width(cm) Length(cm) Interval(cm) 22.86 35.05 0.318 25.40 Perforated by Torch Annular Seal Driven Placed from 0.00 m to 15.24 m Amount Other Seals At (m) Type Screen Type Size OD : 0.00 cm From (m) To (m) Slot Size (cm) Attachment Bottom Fittings Top Fittings Pack Grain Size Type 0.00 Amount Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name LOU'S WATER WELL DRILLING

Certification No 1

### Water Well Drilling Report View in Imperial GIC Well ID S50194

Alberta		The driller supplies	the data contair	ed in this report.	I ne Province	e disclaims re	sponsibility fo	or its	Drilling Company	Well ID	
		accuracy. The infor	mation on this re	port will be retain	ned in a publi	ic database.			Date Report Rece		1990/03/16
Vell Identification	and Locati	on								Mea	surement in Me
Dwner Name DAVIDSON, D.W.		Address P.O. BOX	970 COCHRA	NE	Town			Province	Country	/	Postal Code T0L 0W0
ocation 1/4 or SW	LSD SE 31		<i>RGE</i> 03	W of MER 5		Block	Plan		nal Description		
Aeasured from Bou				GPS Coordina Latitude 51		•			Elevation		m
	m fro			How Location		Longh	-114.4	14211	How Elevation C		111
	m fro	m		Not Verified	Obtained				Not Obtained	Diamed	
dditional Informa	ation									Mea	surement in Me
Distance From Top					,	EL 0 1					
Is Artesian Flow		1 /			/s						
Kate_		L/min		0.00.1/.:			Describe		Depth		
Recommended Pu	mp Rate			0.00 L/min	Pump 	Installed			Depth	m	
Recommended Pu	mp Intake De	pth (From TOC)		0.00 m	Type			Make	Model (Output	H.P.	
										5/	
Did you Encounte	er Saline Wai		DS) Gas						Completion		
Did you Encounte	er Saline Wat					m	Geo	physical Log Submitted to	Completion g Taken c ESRD		
Did you Encounte Additional Comm						m	Geo	physical Log Submitted to	Completion g Taken c ESRD		
						m	Gec	physical Log Submitted to Potability cen From C	g Taken g Taken SERD Sul	bmitted to	ESRD
Additional Comn /ield Test	nents on Wel		Gas			m Sample Co	Gec ollected for F	physical Log Submitted to Potability cen From C Dept	Completion g Taken o ESRD Sui Ground Level h to water level	bmitted to	ESRD
Additional Comn Tield Test Test Date	nents on Wel		Gas	Depth		m Sample Co	Gec	physical Log Submitted to Potability ken From C Dept	g Taken g Taken SERD Sul	bmitted to	ESRD
Additional Comm field Test Test Date 1990/03/09	nents on Wel Star 12:0	t Time	Gas	Depth		m Sample Co	Gec ollected for F	physical Log Submitted to Potability ken From C Dept	g Taken g Taken o ESRD Sul Ground Level h to water level Elapsed Time	bmitted to	ESRD
Additional Comm /ield Test Test Date 1990/03/09 Method of Water I	nents on Wel Star 12:0 Removal Type <u>Bailer</u>	t Time 0 AM	Gas Static V	Depth		m Sample Co	Gec ollected for F	physical Log Submitted to Potability ken From C Dept	g Taken g Taken o ESRD Sul Ground Level h to water level Elapsed Time	bmitted to	ESRD
Additional Comn <b>'ield Test</b> Test Date 1990/03/09 <b>Method of Water I</b> Removal	nents on Wel Star 12:0 Removal Type <u>Bailer</u> Rate	t Time 0 AM 54.55 L/min	Gas Static V	Depth		m Sample Co	Gec ollected for F	physical Log Submitted to Potability ken From C Dept	g Taken g Taken o ESRD Sul Ground Level h to water level Elapsed Time	bmitted to	ESRD
Additional Comn <b>'ield Test</b> Test Date 1990/03/09 <b>Method of Water I</b> Removal	nents on Wel Star 12:0 Removal Type <u>Bailer</u> Rate	t Time 0 AM 54.55 L/min	Gas Static V	Depth		m Sample Co	Gec ollected for F	physical Log Submitted to Potability ken From C Dept	g Taken g Taken o ESRD Sul Ground Level h to water level Elapsed Time	bmitted to	ESRD
Additional Comm <b>'ield Test</b> Test Date 1990/03/09 <b>Method of Water I</b> Removal Depth Withdrawn	nents on Wel Star 12:0 Removal Type <u>Bailer</u> Rate From	t Time 0 AM 54.55 L/min 0.00 m	Gas Static V	Depth		m Sample Co	Gec ollected for F	physical Log Submitted to Potability ken From C Dept	g Taken g Taken o ESRD Sul Ground Level h to water level Elapsed Time	bmitted to	ESRD
Additional Comm /ield Test Test Date 1990/03/09 Method of Water I	nents on Wel Star 12:0 Removal Type <u>Bailer</u> Rate From eriod was < 2	t Time 0 AM 54.55 L/min 0.00 m	Gas Static V	Depth		m Sample Co	Gec ollected for F	physical Log Submitted to Potability ken From C Dept	g Taken g Taken o ESRD Sul Ground Level h to water level Elapsed Time	bmitted to	ESRD

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certific 1
Company Name LOU'S WATER WELL DRILLING	Сору с

cation No

of Well report provided to owner Date approval holder signed

Government

# Water Well Drilling Report

View in Imperial Export to Excel

GIC Well ID 360164 GoA Well Tag No. The driller supplies the data contained in this report. The Province disclaims responsibility for its Drilling Company Well ID accuracy. The information on this report will be retained in a public databas Date Report Received 1991/10/24 Well Identification and Location Measurement in Metric Address Town Postal Code Owner Name Province Country BARGETZI, ERNIE 233 RATCLIFF PLACE SE, CALGARY SEC TWF W of MER 1/4 or LSD RGE Block Plan Additional Description Location Lot SE 06 027 03 2 9110979 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Longitude -114.405998 Elevation Latitude 51.274744 m m from How Elevation Obtained How Location Obtained m from Not Verified Not Obtained **Drilling Information** Method of Drilling Type of Work Rotarv New Well Proposed Well Use Domestic Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate 136.38 L/min Water Depth from Lithology Description Water Removal Rate (L/min) Static Water Level (m) ground level (m) Bearing Test Date 9.45 Till & Clay 1991/10/08 136.38 33.53 21.64 Gravel Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth Start Date End Date 25.30 Brown Shale 73.15 m 1991/10/08 1991/10/08 34.75 Gray Shale **Borehole** Gray Sandstone 39.62 Diameter (cm) From (m) To (m) 44.20 Gray Shale 0.00 0.00 73.15 51.82 Gray Sandstone Surface Casing (if applicable) Well Casing/Liner 59.74 Gray Shale Steel Steel Size OD : 14.12 cm Size OD : 11.43 cm 66.75 Gray Sandstone 0.396 cm Wall Thickness : 0.620 cm Wall Thickness : 73.15 Gray Shale Bottom at : 24.99 m Top at : 18.29 m Bottom at : 73.15 m Perforations Diameter or Slot Hole or Slot Slot From (m) To (m) Width(cm) Length(cm) Interval(cm) 36.58 67.06 0.157 15.24 Perforated by Torch Annular Seal Drive Shoe Placed from 0.00 m to 24.99 m Amount Other Seals At (m) Type Screen Type Size OD : 0.00 cm From (m) To (m) Slot Size (cm) Attachment Bottom Fittings Top Fittings Pack Grain Size Type

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name AERO DRILLING & CONSULTING LTD.

Certification No 1

Amount

0.00

# Water Well Drilling ReportView in Imperial<br/>GIC Well ID<br/>GoA Well Tag No.Export to Excel<br/>360164

Albei	ta 🗖	The d accur	riller supplies acy. The info	the data con rmation on thi	tained in this reports reports a second s	rt. The Provinc ained in a publ	e disclaims re lic database.	esponsibility for	its	GoA Well Tag No. Drilling Company W Date Report Receiv		1991/10/24
Well Identificat	tion and Lo	ocation								-	Mea	surement in Met
<mark>Owner Name</mark> BARGETZI, ER№	NIE		Address 233 RATC	LIFF PLAC	E SE, CALGAR	Town Y			Province	Country		Postal Code
Location 1/4 SE	4 or LSD	SEC 06	<i>TWP</i> 027	RGE 03	W of MER 5		Block 2	9110979	Additio	nal Description		
Measured from I	1	f m from m from			GPS Coordii Latitude How Locatio Not Verified	51.274744 on Obtained	0	es (NAD 83) tude <u>-114.40</u>	5998	Elevation How Elevation Ob Not Obtained		<u>m</u>
Additional Info	rmation										Mea	surement in Me
Distance From Is Artesian Flo	W		_			I.	s Flow Cont	trol Installed				
Rai	te		L/min									
Recommended Recommended			From TOC)		136.38 L/min 0.00 m	n Pump Type	o Installed		Make	Depth Model (Output R	H.P.	
2				20)	Depti	7		vveli Disinte	ectea opon	Completion		
Additional Co					Depti		<u>m</u>	Geop S	hysical Log ubmitted to	Completion g Taken b ESRD Subr		
							<u>m</u>	Geop S Illected for Po	hysical Log iubmitted to otability	g Taken D ESRD Subr	mitted to	ESRD
	omments on		9	Gas			m Sample Co	Geop S Illected for Po	hysical Log cubmitted to btability en From C Dept E	g Taken b ESRD Subr	mitted to Meas	
Yield Test Test Date 1991/10/08 Method of Wat	omments on ter Remova Type <u>Ai</u> oval Rate wn From	Start Time 12:00 AM II ir 13 3	9 6.38 L/min 9.62 m	Gas Statio	Depth c Water Level 33.53 m		m Sample Co	Geop S ollected for Po Take	hysical Log cubmitted to btability en From C Dept E	g Taken Subr Second Level h to water level Bapsed Time	mitted to Meas	ESRD
Yield Test Test Date 1991/10/08 Method of Wat Remo Depth Withdraw	ter Remova Type <u>Ai</u> oval Rate wn From	9 Well Start Time 12:00 AM 11 ir 13 3 s < 2 hours	9 6.38 L/min 9.62 m	Gas Statio	Depth c Water Level 33.53 m		m Sample Co	Geop S ollected for Po Take	hysical Log cubmitted to btability en From C Dept E	g Taken Subr Second Level h to water level Bapsed Time	mitted to Meas	ESRD

Contractor Certification Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER Certification No 1 Company Name AERO DRILLING & CONSULTING LTD.

Copy of Well report provided to owner Date approval holder signed

Government

# Water Well Drilling Report

View in Imperial Export to Excel

GIC Well ID 387449 GoA Well Tag No. The driller supplies the data contained in this report. The Province disclaims responsibility for its Drilling Company Well ID accuracy. The information on this report will be retained in a public database Date Report Received Well Identification and Location Measurement in Metric Address Postal Code Owner Name Town Province Country BRISTOW, C.R. COCHRANE 1/4 or LSD SEC TWP W of MER RGE Block Plan Additional Description Location Lot NE 36 026 04 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.267032 Longitude -114.426119 1292.35 m m from How Location Obtained How Elevation Obtained m from Map Estimated **Drilling Information** Method of Drilling Type of Work Cable Tool New Well Proposed Well Use Unknown Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate 0.00 L/min Water Depth from Lithology Description Water Removal Rate (L/min) Static Water Level (m) ground level (m) Bearing Test Date 21.95 4.88 Yellow Clay 1962/08/10 72.74 21.03 Gravel Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth Start Date End Date 23.77 Fine Grained Sand 33.83 m 1962/08/10 25.91 Yellow Clay **Borehole** 26.82 Blue Clay Diameter (cm) From (m) To (m) 27.13 Hard Shale 0.00 0.00 33.83 28.04 Sand Surface Casing (if applicable) Well Casing/Liner 32.00 Blue Shale & Sandstone Ledges Size OD : 0.00 cm Size OD : 0.00 cm 33.83 Gray Shale 0.000 cm 0.000 cm Wall Thickness : Wall Thickness : 0.00 m Bottom at : Top at : 0.00 m Bottom at : 0.00 m Perforations Diameter or Slot Hole or Slot Slot From (m) To (m) Width(cm) Length(cm) Interval(cm)

Perforated by

Annular Seal				
Placed from	0.00 m to	0.00 m		
Amount				
Other Seals				
Тур	e		At (m)	
Screen Type				
Size OD :	0.00 cm			
From (m)	То	(m)	Slot Size (cm)	_
Attachment				
Top Fittings		Bottom Fitt	ings	

Pack Туре

Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name PARSONS DRLG

Certification No 1

Copy of Well report provided to owner Date approval holder signed

Grain Size

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID GoA Well Tag No. Drilling Company Well ID

View in Imperial Export to Excel

387449

ag No. pany Well ID Received

		ion on this report will be retained			Date Report Recei	i i i i i i i i i i i i i i i i i i i
Well Identification an	nd Location					Measurement in Met
Owner Name BRISTOW, C.R.	Address COCHRANE		Town	Province	e Country	Postal Code
Location 1/4 or LS NE		RGE W of MER 04 5	Lot Block	Plan Additi	ional Description	
Measured from Bounda	ary of m from m from		es in Decimal Degree 67032 Longite btained		Elevation How Elevation Or Estimated	
Additional Informatio	n					Measurement in Me
Is Artesian Flow	Casing to Ground Level			ol Installed Describe		
Recommended Pump		0.00 L/min				m
1	Intake Depth (From TOC)			Make		H.P Rating)
	Gas	Depth	m	Geophysical L	og Taken	
Additional Commen	ats on Well			Submitted	to ESRD	
	ats on Well			Submitted	to ESRD	mitted to ESRD
	nts on Well Start Time 12:00 AM	Static Water Level 21.95 m	Sample Co	Submitted lected for Potability	to ESRD Sub	mitted to ESRD
Yield Test Test Date 1962/08/10 Method of Water Ren Ty <sub>l</sub> Removal Ra	Start Time 12:00 AM	Static Water Level	Sample Co	Submitted lected for Potability Taken From Dej	to ESRD Sub Ground Level oth to water level Elapsed Time	mitted to ESRD
Yield Test Test Date 1962/08/10 Method of Water Rei Tyi Removal Ra Depth Withdrawn Fro	Start Time 12:00 AM noval be Bailer te <u>72.74 L/mi</u> n	Static Water Level	Sample Co	Submitted lected for Potability Taken From Dej	to ESRD Sub Ground Level oth to water level Elapsed Time	mitted to ESRD
Yield Test Test Date 1962/08/10 Method of Water Rei Tyi Removal Ra Depth Withdrawn Fro	Start Time 12:00 AM noval pe Bailer te 72.74 L/min m 0.00 m d was < 2 hours, explain why	Static Water Level	Sample Co	Submitted lected for Potability Taken From Dej	to ESRD Sub Ground Level oth to water level Elapsed Time	mitted to ESRD

Contractor Certification
Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name PARSONS DRLG

Government

of Alberta

Certification No 1

# Water Well Drilling Report

View in Imperial Export to Excel

390998

GoA Well Tag No.

GIC Well ID

	The driller supplies the data cor accuracy. The information on the	tained in this report. The Provinci is report will be retained in a pub	ce disclaims responsibility for lic database.		rilling Company Well ID ate Report Received	1987/03/05
Well Identification and Lo	ocation					easurement in Metric
<i>Owner Name</i> STRANGE, R.	Address P.O. BOX 981 COCH	Town		Province	Country	Postal Code T0L 0W0
Location 1/4 or LSD SE	SEC         TWP         RGE           06         027         03	W of MER Lot 5	Block Plan	Additional	Description	
	f m from m from	GPS Coordinates in Dec Latitude 51.274744 How Location Obtained Not Verified	cimal Degrees (NAD 83) Longitude114.40	05998 E	Elevation How Elevation Obtained	
Drilling Information						
Method of Drilling Rotary Proposed Well Use Domestic & Stock		<b>Type of Work</b> New Well				
Formation Log	Me	easurement in Metric	Yield Test Summary	y	M	easurement in Metric
Depth from Water ground level (m) Bearing	Lithology Description		Recommended Pump Test Date Wat	Rate cer Removal Ra	27.28 L/min Ite (L/min) Stati	c Water Level (m)
7.62	Till		1987/02/11	36.37		45.72
10.36	Gravel		Well Completion		M	easurement in Metric
11.58	Silty Clay		Total Depth Drilled Fi	inished Well D	,	End Date
17.68	Weathered Shale		65.53 m		1987/02/10	1987/02/11
27.43	Shale		Borehole			
39.62	Sandstone		Diameter (cm) 0.00	H	From (m)	To (m) 65.53
48.77	Shale		Surface Casing (if ap	plicable)	Well Casing/Line	r
60.96	Sandstone		Steel	40.04	Plastic	40.70
62.48	Shale		Size OD : Wall Thickness :	16.84 cm 0.478 cm	Size OD : Wall Thickness :	
63.70	Sandstone		Bottom at :	18.29 m	Top at :	
65.53	Shale				Bottom at :	
			Perforations         From (m)       To (m)         47.24       59.44         Perforated by       Ma         Annular Seal       Driven         Placed from	0.000	Slot Length(cm)	
Contractor Certification						

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name ALBERTA SOUTHERN EXPLORATION DRILLING LTD.

Certification No 1

# Water Well Drilling Report View in Imperial GIC Well ID God Well Tag No

f Albe	erta 🗖				ained in this report.	The Province disclain led in a public databa	ns responsibility f		GIC Well ID GoA Well Tag Drilling Compa Date Report R	any Well ID	390998 1987/03/05
Well Ident	ification and L	ocation								Me	asurement in Metri
Owner Nan STRANGE,			Address P.O. BOX	981 COCHF	RANE	Town		Province	Сои	intry	Postal Code T0L 0W0
Location	1/4 or LSD SE	SEC 06	<i>TWP</i> 027	RGE 03	W of MER 5				onal Description		
Measured f	rom Boundary o	of m from m from				tes in Decimal Dec 274744 Lo Obtained		·	Elevation How Elevatio Not Obtained	n Obtained	<u>m</u>
Additional	Information									Me	asurement in Metr
	rom Top of Cas n Flow					Is Flow C	Control Installe	d			
	Rate		L/min								
	nded Pump Rai	te			27.28 L/min	Pump Installe			Depth	m	
Recomme	nded Pump Inta	ake Depth (I	From TOC)		62.48 m	Туре		Make			
Did you l	Encounter Salir	ne Water (>4				m m			n Completion		
				Gas	Depth	III		Submitted t	g Taken o ESRD		
Addition	al Comments o	n Well				Sample	Collected for	Potability		Submitted t	o ESRD
Addition Yield Test		n Well				Sample			Ground Level		o ESRD

			Iditell		Measurement in Metho
Test Date	Start Time	Static Water Level		Depth to water level	
1987/02/11	12:00 AM	45.72 m	Drawdown (m)	Elapsed Time Minutes:Sec	Recovery (m)
Method of Water Re					
Ty	pe Air				
Removal Ra	ate 36.37 L/m	in			
Depth Withdrawn Fro	om 0.00 m	-			
If water removal perio	od was < 2 hours, explain	wby	-		
n water removal pene					

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certificat 1
Company Namo	Convof

ALBERTA SOUTHERN EXPLORATION DRILLING LTD.

tion No

Copy of Well report provided to owner Date approval holder signed

Government

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# Government Water Well Drilling Report View in Imperial Export to Excel

Albert	a 🗖						ice disclaims respo	nsibility for it	GoA ts Drillir	Well ID Well Tag No ng Company Report Rec	y Well II	390999 ) 1987/12/02
Well Identificati	on and Lo	ocation							Buio			leasurement in Me
<i>Owner Name</i> STRANGE, R.			Address P.O. BOX	981 COCH	IRANE	Tow	ז		Province	Count		Postal Code T0L 0W0
Location 1/4 SE	or LSD	SEC 06	<i>TWP</i> 027	<i>RGE</i> 03	W of MER 5	Lot	Block I	Plan	Additional De	escription		
Measured from E	Boundary of				GPS Coord	51.274744 on Obtained	cimal Degrees (i Longitude		Hov	vation v Elevation Obtained		
Drilling Informa	tion											
<b>Method of Drillin</b> Rotary					<b>Type of Wo</b> New Well	ork						
P <b>roposed Well (</b> Stock	Jse											
Formation Log				Me	easurement in	Metric	Yield Test S	ummary			N	leasurement in Me
Depth from pround level (m)	Water Bearing	Lithology	y Description	n			Recommende Test Date		Rate 31. r Removal Rate	82 L/min (L/min)	Stat	ic Water Level (m)
5.79		Till					1987/11/19	)	45.46			39.62
8.84		Gravel					Well Comple	_			N	leasurement in Me
9.75		Till							ished Well Dept	h Start Da		End Date
16.76			Sandstone				73.15 m		,	1987/11		1987/11/19
20.12			indstone				Borehole					
30.48		Shale	indstone				Diamete	er (cm)	Fror	n (m)		To (m)
							0.0	0	0	.00		73.15
36.88		Sandst	one				Surface Casi	ing (if app	licable)	Well Casi	ing/Line	er
39.62		Shale					Steel	οn·	16.84 cm	Plastic	ize OD .	12.70 cm
40.23			andstone				Wall Thickne			Wall Thi		
50.29		Shale							11.89 m			9.14 m
51.82		Sandst	one				Dotton		11.00 111		ttom at	
58.22		Shale					Perforations			20	tion at	
64.01		Shale							Diameter or			
71.32	Yes	Water E	Bearing Sand	dstone			From (m)	To (m)	Slot Width(cm)	Slot Length(c	·m)	Hole or Slot
73.15		Shale					From (m) 39.62	73.15	0.157	Length(C	,111)	Interval(cm) 15.24
							Perforated by Annular Seal Placed fror Amour Other Seals	Driven	9.00 m <i>to</i>	9.75 r 		t (m)
							Screen Type	Туре			F	.t (m)
								OD :	0.00 cm			
							From	(m)	То	(m)		Slot Size (cm)
							Attachm	ient				
							Top Fitti	ngs		Bottom	Fittings	
							Pack				-	
							Туре			Grain Si	ize	
							Amount					

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name

ALBERTA SOUTHERN EXPLORATION DRILLING LTD.

Certification No 1

The driller supplies the data contained in this report. The Province disclaims responsibility for its

GIC Well ID GoA Well Tag No. Drilling Company Well ID

View in Imperial Export to Excel

390999

act	uracy. The information on t	his report will be reta	ained in a publi	ic database.			Date Report Receiv	
Well Identification and Location								Measurement in Metric
Owner Name STRANGE, R.	Address P.O. BOX 981 COCI	HRANE	Town			Province	Country	Postal Code T0L 0W0
Location 1/4 or LSD SEC SE 06	TWP         RGE           027         03	W of MER 5		Block	Plan		nal Description	
Measured from Boundary of m from m from		GPS Coordii Latitude <u>5</u> How Locatio Not Verified	51.274744	•			Elevation How Elevation Ob Not Obtained	
Additional Information Distance From Top of Casing to G	ound Level	cm						Measurement in Metric
Is Artesian Flow Rate			ls		trol Installed Describe			
Recommended Pump Rate Recommended Pump Intake Depth		31.82 L/mii	n Pump	Installed			Depth	
Did you Encounter Saline Water Additional Comments on Well WATER OCCURES AT 130-132' @	Gas	Deptf	<u>ר</u>	<u>m</u>	Geoj	ohysical Log Submitted to	g Taken D ESRD	
Yield Test					Tak		Ground Level	Measurement in Metric
Test Date         Start Ti           1987/11/19         12:00 A		tic Water Level 39.62 m		Draw	down (m)	E	<i>h to water level</i> Elapsed Time Minutes:Sec	Recovery (m)
Method of Water Removal Type <u>Air</u> Removal Rate Depth Withdrawn From If water removal period was < 2 ho	0.00 m							
Water Diverted for Drilling								
Water Source	An	nount Taken	-			Diversio	on Date & Time	

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1	
Company Name ALBERTA SOUTHERN EXPLORATION DRILLING LTD	Copy of Well report provided to owner	Date approval holder signed

Government

of Alberta

Location

# Water Well Drilling Report

View in Imperial Export to Excel

GIC Well ID

391000

Static Water Level (m)

28.96

Measurement in Metric End Date

1984/11/07

To (m)

40.23

11.43 cm 0.318 cm

0.00 m

40.23 m

Hole or Slot Interval(cm) 25.40

At (m)

Slot Size (cm)

GoA Well Tag No. The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database. Drilling Company Well ID Date Report Received 1984/12/05 Well Identification and Location Measurement in Metric Address Town Postal Code Owner Name Province Country CIRCLE J RANCHES **RR2, COCHRANE** 1/4 or LSD SEC TWP W of MER Additional Description RGE Block Plan Lot 04 06 027 03 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Latitude 51.272936 Longitude -114.420414 Elevation m m from How Elevation Obtained How Location Obtained m from Мар Not Obtained **Drilling Information** Method of Drilling Type of Work New Well Cable Tool Proposed Well Use Domestic & S Formation Measurement in Metric

Domestic & Stor	:k							
Formation Log	1		Measurement in Metric	Yield Test S	Summar	у		Mea
Depth from ground level (m	Water ) Bearing	Lithology Description		Recommende Test Date		Rate (		Static V
3.05		Yellow Clay		1984/11/07	7	68.19		
7.32		Cemented Gravel		Well Compl	etion			Меа
19.51		Gravel				inished Well Dep	oth Start Da	
20.12		Cemented Gravel		40.23 m			1984/10	/15
29.87		Gravel & Boulders		Borehole				
32.92		Brown Shale & Sandstone			er (cm)		om (m)	
40.23	Yes	Brown Water Bearing Sands	tone	0.0 Surface Cas			0.00 Well Casi	ng/Linor
		5		Steel	ing (ir ap	opiicable)	Steel	ng/Liner
				Size	OD :	13.97 cm	Si	ze OD :
				Wall Thickn	ess :	0.620 cm	Wall Thio	ckness :
				Botton	n at :	31.09 m		Top at :
							Bot	tom at :
				Perforations				
				From (m)	<b>T</b> = ()	Diameter or Slot	Slot	H H
				From (m) 33.53	To (m) 39.62		Length(c	m) I
					Driven			<u>n</u>
					Type	2		At (
				From Attachn	OD : (m) nent	Т		
				Top Fitte	ings		Bottom I	Fittings
				<b>Pack</b> Type Amount			Grain Si.	ze

#### Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name **DIVERSIFIED DRILLING & EXPLORATION CO.** 

Certification No 1

View in ImperialExport to ExcelGIC Well ID391000GoA Well Tag No.391000

Alberta 🗖	The driller supplies th accuracy. The inform	ne data contained in this report. T nation on this report will be retaine	he Province disclaims re ed in a public database.	sponsibility for its	GoA Well Tag No. Drilling Company W Date Report Receiv	
Well Identification and Lo	cation					Measurement in Met
Owner Name CIRCLE J RANCHES	<i>Address</i> RR2, COCH	IRANE	Town	Province	e Country	Postal Code
Location 1/4 or LSD 04	SEC TWP 06 027	03 5	Lot Block		onal Description	
	n from n from		es in Decimal Degree 272936 Longit Obtained	· · · · · · · · · · · · · · · · · · ·	Elevation How Elevation Ob Not Obtained	
Additional Information						Measurement in Met
Distance From Top of Casir Is Artesian Flow			Is Flow Conti	rol Installed		
Rate	L/min			Describe		
Recommended Pump Rate Recommended Pump Intake	-	0.00 L/min 0.00 m	Pump Installed Type	Make		H.P.
Did vou Encounter Saline	Water (~1000 ppm TD	DS) Depth	m	Well Disinfected Lino	Model (Output R	
	G	DS) Depth Das Depth	m	Well Disinfected Upo Geophysical Lo Submitted Ilected for Potability	n Completion og Taken to ESRD	
Additional Comments on Yield Test	G	bas Depth	m	Geophysical Lo Submitted i Ilected for Potability Taken From	n Completion og Taken to ESRD	mitted to ESRD <u>Yes</u>
Additional Comments on Yield Test Test Date	G Well		m Sample Co	Geophysical Lo Submitted i Ilected for Potability Taken From Dep	n Completion og Taken to ESRD Subr Ground Level	mitted to ESRD <u>Yes</u>
Additional Comments on Yield Test Test Date 1984/11/07 Method of Water Removal Type Ba	G Well Start Time 12:00 AM iler 68.19 L/min 32.00 m < 2 hours, explain why	bas Depth Static Water Level 28.96 m	m Sample Co	Geophysical Lo Submitted i Ilected for Potability Taken From Dep	n Completion og Taken to ESRD Subr Ground Level th to water level Elapsed Time	nitted to ESRD <u>Yes</u> Measurement in Met

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1	
Company Name DIVERSIFIED DRILLING & EXPLORATION CO.	Copy of Well report provided to owner	Date approval holder signed

Government

# Water Well Drilling ReportView in Imperial<br/>GIC Well ID<br/>GoA Well Tag No.Export to Excel<br/>391598

	The driller supplies the data con accuracy. The information on the				sponsibility fo	r its	Drilling Company W Date Report Receiv	
Well Identification and Locati	ion							Measurement in Metric
Owner Name MURRAY, R.J.	Address 511 19ST NW, CALG	ARY	Town			Province	Country	Postal Code
Location 1/4 or LSD SE NW 31		W of MER 5	Lot	Block	Plan	Additior	nal Description	
Measured from Boundary of m fro m fro		How Location	.267033		es (NAD 83) ude <u>-114.4</u>		How Elevation Ob	1290.83 m
		Мар				I	Estimated	
Drilling Information Method of Drilling Cable Tool		<b>Type of Work</b> New Well	r					
Proposed Well Use Domestic & Stock								
Formation Log	Ме	asurement in N	letric	Yield Tes	t Summar	y		Measurement in Metric
Depth from Water Lit ground level (m) Bearing	hology Description			Recomme Test Da	nded Pump ate Wat		L/min Rate (L/min)	Static Water Level (m)
				39.62 m Borehole Diam Surface C Steel Wall Thic Bot Perforation From (m 31.09 Perforated Annular S Placed	th Drilled       F         neter (cm)       0.00         asing (if approximation of a sing (if a sing	Diamete Slot Width( 0.000	er or Complete Complete Slot Complete Slot Length(com)	OD : 12.70 cm ess : 0.000 cm p at : 0.00 m n at : 39.62 m Hole or Slot
				Attac Top I Pack	ze OD : om (m) :hment Fittings	0.00 cn	To (m) Bottom Fitt	At (m)

#### Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name PARSONS DRILLING Certification No 1

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID GoA Well Tag No. Drilling Company Well ID Date Report Received

View in Imperial Export to Excel

391598

. Well ID

ate Report Received	
	Measurement

Well Identification and Lo	ocation					Measurement in Metric
Owner Name MURRAY, R.J.	Address 511 19ST N	W, CALGARY	Town	Province	Country	Postal Code
Location 1/4 or LSD NW	SEC         TWP           31         026	RGE W of MER 03 5			nal Description	
	n from n from		tes in Decimal Degree .267033 Longit Obtained	· · · · · · · · · · · · · · · · · · ·	Elevation How Elevation Ol Estimated	
Additional Information						Measurement in Metric
Distance From Top of Casi Is Artesian Flow Rate		cm		rol Installed Describe		
Recommended Pump Rate		L/min	Pump Installed		Depth	m
Recommended Pump Intak	e Depth (From TOC)	m	Туре	Make	Model (Output I	H.P.
	144					Rating)
Did you Encounter Saline			m	Well Disinfected Upon Geophysical Log Submitted to	g Taken	
Additional Comments on	Well		Sample Co	llected for Potability	Sub	mitted to ESRD
Yield Test				Taken From G	Ground Level	Measurement in Metric
Test Date	Start Time	Static Water Level m				
Method of Water Remova			_			
Removal Rate	L/min					
Depth Withdrawn From	<u>m</u>					
If water removal period was	s < 2 hours, explain wh	Ŷ				
Water Diverted for Drillin	q					
Water Source		Amount Taken L		Diversio	n Date & Time	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name PARSONS DRILLING

Government

of Alberta

Certification No
1

## Water Well Drilling Report

View in ImperialExport to ExcelGIC Well ID391599GoA Well Tag No.391599

Location  Address P.O. BOX 123 COCI SEC TWP RGE 31 026 03  of m from m from M from  Lithology Description Gray Clay Brown Clay Brown Sandy Clay Brown Sandy Clay Brown Sandy Clay	W of MER Lot 5	Block Plan Add cimal Degrees (NAD 83) Longitude -114.402748 Yield Test Summary Recommended Pump Rate Test Date Water Remo	TOL OV ditional Description Elevation1295.40 m How Elevation Obtained Estimated
P.O. BOX 123 COCI SEC TWP RGE 31 026 03 of m from m from m from M Coci Coci Coci M M M M M M M M M M M M M	HRANE W of MER Lot 5 GPS Coordinates in Dec Latitude 51.267033 How Location Obtained Map Type of Work New Well-Abandoned	Block Plan Add cimal Degrees (NAD 83) Longitude -114.402748 Yield Test Summary Recommended Pump Rate Test Date Water Remo	TOL OV ditional Description Elevation1295.40 m How Elevation Obtained Estimated  Measurement in 0.00 L/min
31 026 03  of m from m from M from M M M M M M M M M M M M M M M M M M M	5 GPS Coordinates in Dec Latitude 51.267033 How Location Obtained Map Type of Work New Well-Abandoned	cimal Degrees (NAD 83) Longitude -114.402748 Vield Test Summary Recommended Pump Rate Test Date Water Remo	Elevation <u>1295.40 m</u> How Elevation Obtained Estimated Measurement in 0.00 L/min
m from m from W V V V V V V V V V V V V V V V V V V	Latitude <u>51.267033</u> How Location Obtained Map Type of Work New Well-Abandoned	Longitude <u>-114.402748</u> Yield Test Summary Recommended Pump Rate _ Test Date Water Remo	How Elevation Obtained Estimated Measurement in 0.00 L/min
m from m from Kithology Description Topsoil Gray Clay Brown Clay	How Location Obtained Map <i>Type of Work</i> New Well-Abandoned	Yield Test Summary         Recommended Pump Rate         Test Date       Water Removes	How Elevation Obtained Estimated Measurement in 0.00 L/min
Lithology Description Topsoil Gray Clay Brown Clay	Map <i>Type of Work</i> New Well-Abandoned	Yield Test Summary         Recommended Pump Rate         Test Date       Water Removed	Estimated Measurement in 0.00 L/min
Lithology Description Topsoil Gray Clay Brown Clay	<i>Type of Work</i> New Well-Abandoned	Recommended Pump Rate	Measurement in
Lithology Description Topsoil Gray Clay Brown Clay	New Well-Abandoned	Recommended Pump Rate	0.00 L/min
Lithology Description Topsoil Gray Clay Brown Clay	New Well-Abandoned	Recommended Pump Rate	0.00 L/min
Lithology Description Topsoil Gray Clay Brown Clay		Recommended Pump Rate	0.00 L/min
Lithology Description Topsoil Gray Clay Brown Clay	easurement in Metric	Recommended Pump Rate	0.00 L/min
Lithology Description Topsoil Gray Clay Brown Clay		Recommended Pump Rate	0.00 L/min
Topsoil Gray Clay Brown Clay		Test Date Water Remo	
Gray Clay Brown Clay			
Brown Clay		1981/10/10	0.00
		Well Completion	Measurement i
Brown Sandy Clay		Total Depth Drilled Finished	
		49.38 m	
Sandy Gravel		Borehole	
Medium Grained Gravel		Diameter (cm)	From (m) To (m) 0.00 49.38
Fine Grained Gravel			
Sandstone			
Fine Grained Sand			
Fine Grained Gravel			
Shale		Bottom at : 0.00	<u>0 m</u> Top at : 0.00 m Bottom at : 0.00 m
Dark Shale		Perforations	
Clay & Shale			neter or
Unknown			Slot         Slot         Hole or Slot           dth(cm)         Length(cm)         Interval(cm)
		Perforated by	
		Annular Seal Driven	
			n to 0.00 m
			At (m)
		Type	
		Screen Type	
			) cm
		From (m)	To (m) Slot Size (cm)
			Bottom Fittings
		· · · ·	Douom Fillings
			Grain Siza
			Grain Size
	L	Amount	
	Fine Grained Gravel         Sandstone         Fine Grained Sand         Fine Grained Gravel         Shale         Dark Shale         Clay & Shale	Fine Grained Gravel         Sandstone         Fine Grained Sand         Fine Grained Gravel         Shale         Dark Shale         Clay & Shale         Unknown	Inedultification of anel         Fine Grained Gravel         Sandstone         Fine Grained Sand         Fine Grained Gravel         Shale         Dark Shale         Clay & Shale         Unknown         From (m)         To (m)         Wail         Perforations         Clay & Shale         Unknown         From (m)         To (m)         Wail         Screen Type         Size OD :         O.00         From (m)         Attachment         To p Fittings         Pack         Type         Amount

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name KRIEGER DRILLING LTD. Certification No 1

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID GoA Well Tag No. Drilling Company Well ID Date Report Received

View in Imperial Export to Excel

391599

							Measure	ment in Metric
NE	Town			Province	C	Country		Postal Code T0L 0W0
W of MER 5	Lot	Block	Plan	Additic	onal Descripti	ion		
GPS Coord	linates in Decii	mal Degree	s (NAD 83)					
Latitude	atitude 51.267033 Longitude -114.40274				Elevation		1295.40 m	
How Locati	ion Obtained				How Eleva	ation Obt	ained	
Мар					Estimated			
							Measure	ment in Metric
cm								
0.11	Is	Flow Cont	rol Installed					

	m from	Map	Jamed		Estimated	Oblamed
		1 map			1 Eoumatou	
Additional Informa	ation					Measurement in Metric
Distance From Top	o of Casing to Ground Level	cm				
Is Artesian Flow			Is Flow Con	trol Installed		
Rate	L/min			Describe		
Recommended Pu	mp Rate	0.00 L/min	Pump Installed		Depth	m H.P
Recommended Pu	mp Intake Depth (From TOC)	0.00 m	Туре	Make		H.P.
					Model (Output	t Rating)
Did you Encounte	er Saline Water (>4000 ppm TDS)		m	Well Disinfected L	Jpon Completion	
	Gas	Depth	m	Geophysica		
				Submitt	ed to ESRD	
			Sample C	ollected for Potability	/ Si	ubmitted to ESRD
Additional Comn	nents on Well					
DRILLER REPORT	S MED HARD WATER, NO SPE	CS FOR SURFACE CASIN	G			
Yield Test				Taken Fro	m Ground Level	Measurement in Metric
	0				Depth to water level	
Test Date 1981/10/10	Start Time 12:00 AM	Static Water Level 0.00 m	Draw	/down (m)	Elapsed Time Minutes:Sec	Recovery (m)
Method of Water I	Removal					
	Type Air					
Removal	Rate L/min					
Depth Withdrawn						
If water removed as	eriod was < 2 hours, explain why		_			
n water removal pe	nou was < 2 nours, expiain why					
Water Diverted fo	r Drilling					
Water Source	0	Amount Taken		Div	ersion Date & Time	
		L		DIV	oroion Dato & millo	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name KRIEGER DRILLING LTD.

Government

of Alberta

Owner Name

PARKER, G.L

Location

Well Identification and Location

1/4 or LSD

NE

Measured from Boundary of

Address

TWP

026

SEC

31

m from

P.O. BOX 123 COCHRANE

RGE

03

Certification No 1

# Water Well Drilling Report

GIC Well ID GoA Well Tag No.

View in Imperial Export to Excel

391600

The driller supplies the data contained in this report. The Province disclaims responsibility for its Drilling Company Well ID accuracy. The information on this report will be retained in a public databas Date Report Received 1981/11/25 Well Identification and Location Measurement in Metric Address Postal Code Town Owner Name Province Country TOL OWO PARKER, G.L. P.O. BOX 123 COCHRANE 1/4 or LSD SEC TWP RGE W of MER Block Plan Additional Description Location Lot NE 31 026 03 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.267033 Longitude -114.402748 1295.40 m m from How Location Obtained How Elevation Obtained m from Map Estimated **Drilling Information** Type of Work Method of Drilling Plugged 1981/10/14 New Well-Abandoned Rotarv Plugged with Unknown Proposed Well Use Amount Domestic Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate L/min Water Depth from Lithology Description Water Removal Rate (L/min) Static Water Level (m) ground level (m) Bearing Test Date 0.30 Topsoil 10.06 Sandy Till Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth Start Date End Date 17.68 Clay & Shale 27.43 m 1981/10/11 1981/10/14 20.12 Clay & Gravel **Borehole** 21.03 Shale Diameter (cm) From (m) To (m) 22.86 Clay & Silt 0.00 0.00 27.43 24.08 Gray Clay Surface Casing (if applicable) Well Casing/Liner 26.82 Clay & Gravel Size OD : Size OD : 0.00 cm 0.00 cm 27.43 Lost Circulation 0.000 cm Wall Thickness : 0.000 cm Wall Thickness : 0.00 m 0.00 m Bottom at : Top at : 0.00 m Bottom at : Perforations Diameter or Slot Hole or Slot Slot Width(cm) Length(cm) Interval(cm) From (m) To (m) Perforated by Annular Seal Placed from 0.00 m to 0.00 m Amount Other Seals At (m) Type Screen Type Size OD : 0.00 cm From (m) To (m) Slot Size (cm) Attachment Top Fittings Bottom Fittings Pack Туре Grain Size Amount

#### Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name KRIEGER DRILLING LTD.

Certification No 1

### Water Well Drilling Report View in Imperial GIC Well ID Sector 391600

f Alb	erta 🗖				ntained in this report. his report will be retair			esponsibility for		GoA Well Tag I Drilling Compar Date Report Re	ny Well ID	1981/11/25
Well Iden	tification and L	ocation									Me	asurement in Metric
Owner Na PARKER,			Address P.O. BOX	123 COCH	IRANE	Town			Province	Cour	ntry	Postal Code T0L 0W0
Location	1/4 or LSD NE	SEC 31	<i>TWP</i> 026	RGE 03	W of MER 5	Lot	Block	Plan	Addition	nal Description		
Measured	from Boundary o	of m from m from			GPS Coordina Latitude <u>51</u> How Location Map	.267033	•	es (NAD 83) tude <u>-114.40</u> 2	2748	Elevation How Elevation Estimated		40 m
Additiona	I Information										Ме	asurement in Metric
	From Top of Cas an Flow Rate				cm	ls F	low Cont	rol Installed Describe				
	ended Pump Rat	е			L/min m					Depth	m	
1 COOMING		ine Dopin	(110111100)			1900			Marte		ut Rating)	
Did you	Encounter Salin	e Water (:		TDS) Gas			m m	Geop	'			
Additio	nal Comments o	n Well				Sá	ample Co	ellected for Po	tability		Submitted t	o ESRD
Yield Tes	t							Take	n From G	Fround Level	Ме	asurement in Metric

Test Date	Start Time	Static Water Level m		
Method of Water I	Removal		_	
	Туре			
Removal	Rate L/m	nin		
Depth Withdrawn I	From m			

Water Source

Government

Of

Amount Taken

L

Diversion Date & Time

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name KRIEGER DRILLING LTD. Certification No 1

#### Water Well Drilling Report

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of Albert	ta 🗖	The	driller supplies iracy. The infor	the data cor mation on th	ntained in this repo is report will be ret	ort. The Provin tained in a put	ce disclaims re blic database.	esponsibility	y for its	GoA Well Tag I Drilling Compa Date Report Re	ny Well II	D 1982/02/02
Well Identificati	ion and L	ocation				•						Aeasurement in Metric
Owner Name PARKER, G.L.		oouton	Address P.O. BOX	123 COCH	IRANE	Town	7		Province	Cour		Postal Code
Location 1/4 NE	or LSD	SEC 31	<i>TWP</i> 026	RGE 03	W of MER 5	Lot	Block	Plan	Additio	nal Description		
Measured from E	Boundary o	f			GPS Coordi		-			Elsus (is a		
		m from			Latitude			tude -114	4.402748	Elevation How Elevation		
		m from			Map	on Obtained				Not Obtained		FU
Drilling Informa	tion											
Method of Drillin				1	Type of Wo	ork						
Cable Tool					New Well							
Proposed Well												
Domestic & Stock					a a constant in	Matria	Viald Ta					As a summer such im Mathia
Formation Log	1	_			easurement in	Wetric	Yield Tes			0.00 1/min		leasurement in Metric
Depth from ground level (m)	Water	Litholog	y Description	n			Test D		<i>mp Rate</i> Nater Removal			tic Water Level (m)
1.83	bearing	Brown	Clay & Bould	lers			1981/1		68.1		500	48.77
3.35		_	lay & Boulde				Well Cor				Ν	leasurement in Metric
3.96		Boulde						•		I Depth Start L		End Date
10.97		_	Clay & Grave	el			62.48 m			1981/		1981/11/19
13.72		Grave					Borehole					
15.54		Brown					Diar	neter (cm	ו)	From (m)		To (m)
21.64		Grav Ha	ard Shale				Overfa e e f	0.00	(	0.00		62.48
23.16			ard Sandston	e			Surface C Steel	asing (ii	f applicable)	Steel	sing/Line	er
25.30		Gray S						ize OD :	17.78 cr		Size OD	: <u>12.70 cm</u>
26.82			andstone				Wall Thi	ckness :	0.587 cr	n Wall Th	hickness	: 0.556 cm
27.74		Gray S					Во	ttom at :	13.72 m		Top at	: 0.00 m
28.65			andstone							В	Bottom at	: 62.48 m
29.26			oft Sandstone	ــــــــــــــــــــــــــــــــــــــ			Perforati	ons	Diamete			
30.78			ard Sandston						Slot		t	Hole or Slot
34.75			rm Shale	-			From (m 48.16	) To ( 61.			(cm)	Interval(cm) 40.64
36.88			ard Sandston	e								40.04
43.89			rm Shale	-			Perforate	d by	Torch			
45.11			ard Sandston	e			Annular					
54.86		Gray S							0.00 m	to 13.72	m	
56.39	Yes	-	ater Bearing	Sandstone	<u>.</u>		Other Sea	nount				
62.48		Gray S	-				Ourier Sea		ype		/	At (m)
		,							/			
							Screen T	vpe				
								ize OD :	0.00 cr	n		
								rom (m)		 To (m)		Slot Size (cm)
								chment		D //	<b></b>	
								Fittings		Botton	1 Fittings	
							Pack				<u>.</u>	
							Туре		0.00	Grain	Size	
							Amoun	[	0.00			
Contractor Cer	tification											
Name of Journey UNKNOWN NA		onsible for	drilling/cons	truction of	well			Certificat	tion No			
Company Name								-	Well report pro	vided to owner	Date a	pproval holder signed
PARSONS DRIL	LING										0	rr

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The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be ratained in a public database

GIC Well ID GoA Well Tag No. Drilling Compar

View in Imperial Export to Excel

395786

ny Well ID	
eceived	1982/02/02

					Date Report Receive	d 1982/02/02
Well Identification and	Location					Measurement in Metri
Owner Name PARKER, G.L.	Address P.O. BOX 123 CO	CHRANE	Town	Province	Country	Postal Code
Location 1/4 or LSD NE	SEC TWP RGE 31 026 03	5		Plan Additio	nal Description	
Measured from Boundary	of m from m from	GPS Coordinate Latitude 51.2 How Location Or Map		(NAD 83) e114.402748	Elevation How Elevation Obta Not Obtained	
Additional Information						Measurement in Metr
Distance From Top of Ca Is Artesian Flow Rate		cm		Installed Describe		
Recommended Pump Ra		0.00 L/min 60.96 m			Depth	Ч.Р.
					Model (Output Rai	ting)
Additional Comments			<u>m</u>		g Taken o ESRD	
Yield Test				Taken From C		Measurement in Metr
Test Date 1981/11/19	Start Time S 12:00 AM	tatic Water Level 48.77 m	Drawdov	wn (m) E	th to water level Elapsed Time Minutes:Sec	Recovery (m)
Removal Rate Depth Withdrawn From	Bailer 68.19 L/min					
·						
Water Diverted for Dril	-					
Water Source		Amount Taken L		Diversio	on Date & Time	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name PARSONS DRILLING

Government

of Alberta 🗖

Certification No 1

# Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database

GIC Well ID GoA Well Tag No. Drilling Company Well ID

View in Imperial Export to Excel

395793

		· ·		Date Report Re	
Well Identification and Location					Measurement in Metric
Owner Name KIRK, S.	Address P.O. BOX 1295 COCH	Town		Province Cour	ntry Postal Code T0L 0W0
Location 1/4 or LSD SEC NE 31	<i>TWP RGE</i> 026 03	W of MER Lot 5	Block Plan	Additional Description	
Measured from Boundary of m from m from		GPS Coordinates in Dec Latitude 51.267033 How Location Obtained Not Verified	imal Degrees (NAD 83) Longitude <u>-114.402</u>	2748 Elevation How Elevation Not Obtained	
Drilling Information					
Drilling Information Method of Drilling Unknown Proposed Well Use Domestic		Type of Work Chemistry			
Formation Log	Me	asurement in Metric	Yield Test Summary		Measurement in Metric
	ogy Description		Recommended Pump F		Static Water Level (m)
			Well Completion Total Depth Drilled Fire 62.48 m Borehole	nished Well Depth Start L	Measurement in Metric Date End Date
			Diameter (cm) 0.00 Surface Casing (if app	From (m) 0.00 Diicable) Well Ca	To (m) 62.48 sing/Liner
			Size OD : Wall Thickness : Bottom at : Perforations	0.000 cm Wall Th 0.00 m	Size OD :         0.00 cm           hickness :         0.000 cm           Top at :         0.000 m           tottom at :         0.00 m
			From (m) To (m)	Diameter or Slot Slot Width(cm) Length	
			Perforated by Annular Seal Placed from Amount Other Seals Type	0.00 m to	m At (m)
			Screen Type Size OD : From (m) Attachment Top Fittings Pack Type Amount	To (m)	Slot Size (cm)
Contractor Certification Name of Journeyman responsible for UNKNOWN NA DRILLER	or drilling/construction of v	vell	Certification	No	

Company Name

UNKNOWN DRILLER

View in ImperialExport to ExcelGIC Well ID395793GoA Well Tag No.Image: Constraint of the second se

f Alb	erta 🗖	The accu	driller supplies uracy. The infor	the data cor mation on th	ntained in this repo is report will be ret	ort. The Provinc tained in a pub	ce disclaims roblic database.	esponsibility for	or its	GoA Well Tag No. Drilling Company V Date Report Recei	Well ID	15793
Well Ident	ification and L	ocation									Measu	urement in Metri
<mark>Owner Nan</mark> KIRK, S.	ne		Address P.O. BOX	1295 COC	HRANE	Town	1		Province	Country		Postal Code T0L 0W0
Location	1/4 or LSD NE	SEC 31	<i>TWP</i> 026	RGE 03	W of MER 5	Lot		Plan		nal Description		
Measured f	rom Boundary o	of				linates in Dec						
		m from			-	51.267033 on Obtained		itude -114.4	102748	Elevation How Elevation O		<u>m</u>
		m from			Not Verified					Not Obtained	olained	
Additional	Information										Measu	rement in Metr
Distance F	From Top of Cas	sing to Grc	ound Level		cm							
Is Artesia	n Flow					I	Is Flow Con		1			
	Rate		L/min					Describe	9			
Recomme	nded Pump Rat	te			L/mi	in Pumj	p Installed			Depth	m	
Recomme	nded Pump Inta	ake Depth	(From TOC)		m	Туре	е		Make		Н.Р.	
										Model (Output I	Rating)	
Did you	Encounter Salin	ne Water (:	>4000 ppm T	DS)	Dept	h	m	Well Disir	nfected Upon	Completion		
			(	Gas	Dept	h	m	Geo	ophysical Log	g Taken		
									Submitted to	o ESRD		
Addition	al Comments o	n Well					Sample Co	ollected for I	Potability	Sub	omitted to E	SRD
Yield Test								Ta	ken From C	Ground Level	Measu	rement in Metr
Test Date		Start Tin	пе	Stati	ic Water Level m							
Method o	f Water Remov											
	Removal Rate											
Depth Wit	hdrawn From		m									
lf water rei	moval period wa	as < 2 hou	rs, explain wl	ıy								
Water Div	erted for Drilli	ng										
Water Sour	rce			Am	ount Taken	1			Diversio	on Date & Time		

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name UNKNOWN DRILLER

Government

Certification No 1

# Water Well Drilling Report

View in Imperial Export to Excel GIC Well ID 494773 GoA Well Tag No. The driller supplies the data contained in this report. The Province disclaims responsibility for its Drilling Company Well ID accuracy. The information on this report will be retained in a public databas Date Report Received 1999/11/25 Well Identification and Location Measurement in Metric Address Postal Code Owner Name Town Province Country RR1, AIRDRIE GOETJEN, MORRIE CANADA T4B 2A3 SEC TWP W of MER Additional Description 1/4 or LSD RGE Block Plan Location Lot NE 36 26 4 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.267032 Longitude -114.426119 m m from How Location Obtained How Elevation Obtained m from Not Verified Not Obtained **Drilling Information** Type of Work Method of Drilling Rotarv New Well Proposed Well Use Stock Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate 36.37 L/min Lithology Description Water Depth from Water Removal Rate (L/min) Static Water Level (m) ground level (m) Bearing Test Date 3.05 Brown Clay 1999/11/16 63.65 22.25 23.16 Coarse Grained Gravel Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth Start Date End Date 29.26 Yes Water Bearing Gravel 30.48 m 1999/11/15 1999/11/16 30.48 Brown Shale **Borehole** Diameter (cm) From (m) To (m) 0.00 0.00 30.48 Surface Casing (if applicable) Well Casing/Liner Steel Size OD : 13.97 cm Size OD : 0.00 cm 0.620 cm 0.000 cm Wall Thickness : Wall Thickness : Bottom at : 28.04 m Top at : 0.00 m Bottom at : 0.00 m Perforations Diameter or Slot Hole or Slot Slot From (m) To (m) Width(cm) Length(cm) Interval(cm) Perforated by Annular Seal Driven & Bentonite Placed from 0.00 m to 28.04 m Amount Other Seals At (m) Type Screen Type Size OD : 0.00 cm From (m) To (m) Slot Size (cm)

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name ALKÉN BASIN DRILLING LTD.

Certification No 1

Attachment

Top Fittings

Pack

Туре Amount

Copy of Well report provided to owner Date approval holder signed

Bottom Fittings

Grain Size

GIC Well ID GoA Well Tag No.

View in Imperial Export to Excel

494773

Submitted to ESRD

f Alb	erta 🗖				tained in this report. s report will be retain		e disclaims re	esponsibility fo	or its	GIC Well ID GoA Well Ta Drilling Com Date Repor	ag No. Ipany Well ID	494773 ) 1999/11/25
Well Ident	ification and I	Location									М	easurement in Metri
Owner Nan GOETJEN,			Address RR1, AIRD	RIE		Town			Province		ountry ANADA	Postal Code T4B 2A3
Location	1/4 or LSD NE	SEC 36	<i>TWP</i> 26	RGE 4	W of MER 5	Lot	Block	Plan	Additio	nal Descripti	on	
Measured I	from Boundary	of m from m from			GPS Coordina Latitude 51 How Location Not Verified	1.267032	•				tion Obtained	
Additional	Information										М	easurement in Metr
Distance F Is Artesia		sing to Grou			cm	l:	s Flow Con	trol Installed Describe				
Recomme	nded Pump Ra	te			36.37 L/min	Pump	) Installed			Depth		n
Recomme	nded Pump Inta	ake Depth (	From TOC)							,		
												)
Did you	Encounter Salir	ne Water (>	4000 ppm Tl	DS)	Depth		m	Well Disin	fected Upon	Completion		
		·		Gas Yes				Geo		g Taken		

Sample Collected for Potability

Additional Comments on Well DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 2'.

Government

Yield Test			Taken	Measurement in Metrie					
Test Date	Start Time	Static Water Level	Depth to water level						
1999/11/16	12:00 AM	22.25 m	Drawdown (m)	Elapsed Time Minutes:Sec	Recovery (m)				
				1:00	26.82				
Method of Water I	Removal			24.38					
	Type Air		3:00 23.1						
Removal	Rate 63.65 L/m	ain		4:00	22.71				
				5:00	22.56				
Depth Withdrawn	From 30.48 m	_		6:00	22.40				
				7:00	22.25				
If water removal pe	eriod was < 2 hours, explain	why		8:00	22.25				
				10:00	22.25				

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time

Contractor	Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name ALKEN BASIN DRILLING LTD. Certification No

1

Copy of Well report provided to owner Date approval holder signed

# Water Well Drilling Report

View in Imperial Export to Excel

498400

GoA Well Tag No. Drilling Company Well ID

GIC Well ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database. Date Report Received 2001/06/22 Well Identification and Location Measurement in Metric Address Postal Code Town Owner Name Province Country P.O. BOX 1773 SPRUCE VIEW GIBBS, DAVE T0M 1V0 1/4 or LSD SEC TWP W of MER Block RGE Lot Plan Additional Description Location NW 31 026 03 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.267033 Longitude -114.414280 m m from How Elevation Obtained How Location Obtained m from Not Verified Not Obtained **Drilling Information** Method of Drilling Type of Work New Well Cable Tool Proposed Well Use

		Measurement in Metric
Water Bearing	Lithology Description	
	Brown Clay & Rocks	
	Gray Sandstone	
	Gray Shale	
	Gray Sandy Shale	
	Gray Shale	
	Gray Sandstone	
	Gray Shale	
	Blue Shale	
	Gray Silty Shale	
	Gray Shale	
	Gray Sandstone	
	Gray Shale	
	Gray Sandy Shale	
	Gray Shale	
		BearingBrown Clay & RocksGray SandstoneGray ShaleGray Shale

Yield Test Sum	nmary			Ν	leasurement in l	<b>Metric</b>
Recommended F						
Test Date			e (L/min)	Sta	tic Water Level (m)	)
2001/05/14		9.09			10.82	
Well Completic	on			Ν	leasurement in l	<b>Metric</b>
Total Depth Drille	ed Finis	shed Well Dep			End Date	
74.68 m			2001	/05/07	2001/05/14	
Borehole						
Diameter (	Diameter (cm) From 0.00 0				To (m) 74.68	
Surface Casing			0.00	asing/Lin		
Steel	(ii appi		Plastic	asing/Lin	ei	
Size OD	:	13.97 cm		Size OD	: 11.43 cm	
Wall Thickness	::	0.620 cm	Wall	Thickness	0.602 cm	
Bottom at	t:	24.69 m		Top at	: <u>19.81 m</u>	
				Bottom at	: 74.68 m	
Perforations		Diamatan an				
		Diameter or Slot	Slo	ot	Hole or Slot	
From (m) T	o (m)	Width(cm)	Lengt	h(cm)	Interval(cm)	
24.69 7	74.68	0.635			20.32	
Perforated by	Saw					
Annular Seal	Driven					
Placed from	0.	.00 m to	24.6	9 m		
Amount						
Other Seals						
	Туре		_		At (m)	
Screen Type						
		0.00 cm				
From (m	1)	Т	ō (m)		Slot Size (cm)	
Attachmen	t					
				m Fittings		•
Pack				0		_
Туре			Grain	Size		
Amount			- Crain			

Contractor Certification

Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER

Company Name MEDICINE VALLEY WATER WELLS

Certification No 1

# Government Water Well Drilling Report View in Imperial Export to Excel

Alberta 🗖				tained in this repor is report will be reta				its	GoA Well Tag Drilling Comp Date Report	bany Well I	D 2001/06/22
Vell Identification and L	ocation									N	leasurement in M
Dwner Name GIBBS, DAVE		Address P.O. BOX	1773 SPRL	JCE VIEW	Town			Province	Со	ountry	Postal Co T0M 1V0
ocation 1/4 or LSD NW	SEC 31	<i>TWP</i> 026	RGE 03	W of MER 5	Lot	Block	Plan	Additio	nal Descriptio	n	
leasured from Boundary o	of m from m from				51.267033		ees (NAD 83) itude <u>-114.41</u>	4280	Elevation How Elevati Not Obtaine	ion Obtaine	
dditional Information										N	leasurement in M
Distance From Top of Cas Is Artesian Flow					ls		trol Installed				
Rate		L/min					Describe				
Recommended Pump Rat Recommended Pump Inta	te			9.09 L/mir	n Pump	Installed		Make	Depth	H.F	m ?
					-				Model (Ou	itput Rating	g)
Did you Encounter Salin	ne Water (>		DS) Gas		ו נ	m m	Well Disinfe Geop	ected Upon hysical Log	Completion		
Additional Comments of DRILLER REPORTS DIST		OM TOP OF	CASING	TO GROUND LE		Sample C					d to ESRD
DRILLER REPORTS DIST	TANCE FR						Take		Ground Leve	I N	Aeasurement in M
DRILLER REPORTS DIST		e		TO GROUND LE c Water Level 10.82 m			Take	Depti		I N	
DRILLER REPORTS DIST Teld Test Test Date 2001/05/14	Start Tim 12:00 AN	e		c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00	I N	Aeasurement in M Recovery (m) 54.32
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Method of Water Remov	Start Tim 12:00 AN	e		c Water Level				Depti	h to water leve ilapsed Time Minutes:Sec	I N	Aeasurement in N Recovery (m)
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type E	Start Tim 12:00 AM Bailer	ne 1	Stati	c Water Level				Depti	h to water leve ilapsed Time Minutes:Sec 1:00 2:00 3:00 4:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate	Start Tim 12:00 AM	9.09 L/min	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate	Start Tim 12:00 AM	ne 1	Stati	c Water Level				Depti	h to water leve Iapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate Depth Withdrawn From	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.88 52.40 52.09 51.82 51.58 51.19
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate Depth Withdrawn From	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate Depth Withdrawn From	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 14:00 16:00 20:00 25:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate Depth Withdrawn From	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00 25:00 30:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09 44.84
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00 25:00 30:00 35:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.81 50.38 50.05 49.50 48.05 46.09 44.84 43.08
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00 25:00 30:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09 44.84
DRILLER REPORTS DIST ield Test Test Date 2001/05/14 Wethod of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve lapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00 25:00 30:00 40:00 50:00 60:00	I N	Acasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09 44.84 43.08 41.53 39.01 36.32
DRILLER REPORTS DIST Test Date 2001/05/14 Method of Water Remov Type E Removal Rate Depth Withdrawn From	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 14:00 16:00 20:00 25:00 30:00 35:00 40:00 50:00 60:00 75:00	I N	Acasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 48.05 46.09 44.84 43.08 41.53 39.01 36.32 33.19
DRILLER REPORTS DIST         'ield Test         Test Date         2001/05/14         Method of Water Remove         Type E         Removal Rate _         Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 14:00 16:00 20:00 25:00 30:00 35:00 40:00 50:00 60:00 75:00 90:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09 44.84 43.08 41.53 39.01 36.32 33.19 30.57
DRILLER REPORTS DIST field Test Test Date 2001/05/14 Method of Water Remov Type <u>E</u> Removal Rate _ Depth Withdrawn From _	Start Tim 12:00 AM al Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 14:00 16:00 20:00 25:00 30:00 35:00 40:00 50:00 60:00 75:00	I N	Acasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 48.05 46.09 44.84 43.08 41.53 39.01 36.32 33.19
DRILLER REPORTS DIST Tield Test Test Date 2001/05/14 Method of Water Remov Type E Removal Rate Depth Withdrawn From If water removal period water Period water removal period water Method of Water Removal period water Period Water Removal period water Method of Water Removal period water Depth Withdrawn From	Start Tim 12:00 AM Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00 25:00 30:00 35:00 40:00 50:00 60:00 75:00 90:00 105:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09 44.84 43.08 41.53 39.01 36.32 33.19 30.57 28.79
DRILLER REPORTS DIST         'ield Test         Test Date         2001/05/14         Method of Water Remove         Type E         Removal Rate _         Depth Withdrawn From _	Start Tim 12:00 AM Bailer	9.09 L/min 0.00 m	Stati	c Water Level				Depti           Image:	h to water leve Elapsed Time Minutes:Sec 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 12:00 14:00 16:00 20:00 25:00 30:00 35:00 40:00 50:00 60:00 75:00 90:00 105:00	I N	Aeasurement in N Recovery (m) 54.32 53.77 53.28 52.88 52.40 52.09 51.82 51.58 51.19 50.81 50.38 50.05 49.50 48.05 46.09 44.84 43.08 41.53 39.01 36.32 33.19 30.57 28.79

Contractor Certification Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER Certification No 1 Company Name Copy of Well report provided to owner Date approval holder signed MEDICINE VALLEY WATER WELLS

# Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID GoA Well Tag No. Drilling Company Well ID

Drilling Company Well ID Date Report Received

View in ImperialExport to ExcelGIC Well ID1022436

Date Report Received 2014/09/24 Well Identification and Location Measurement in Metric Address Postal Code Owner Name Town Province Country LAFARGE CANADA INC T2C 5G9 115 QUARRY PARK BLVD CALGARY ALBERTA CANADA 1/4 or LSD SEC TWP W of MER Additional Description RGE Block Plan Location Lot 9 36 26 4 5 GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.265686 Longitude -114.424418 m m from How Location Obtained How Elevation Obtained m from Hand held autonomous GPS 20-30m Hand held autonomous GPS 20-30m **Drilling Information** Type of Work Method of Drilling Rotary - Air New Well Proposed Well Use Investigation Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate L/min Water Depth from Lithology Description Water Removal Rate (L/min) ground level (m) Bearing Static Water Level (m) Test Date 0.30 Topsoil 4.27 Brown Moist Clay Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth Start Date End Date 25.30 Gravel 30.48 m 28.35 m 2014/05/01 2014/05/05 28.35 Moist Gravel Borehole 29.26 Sandstone Diameter (cm) From (m) To (m) 30.48 Shale 20.02 0.00 25.60 15.56 25.60 30.48 Surface Casing (if applicable) Well Casing/Liner Steel 16.81 cm Size OD : Size OD : cm Wall Thickness : Wall Thickness : 0.478 cm cm m Bottom at : 25.60 m Top at :

Perforations

From (m)	To (m)	Diameter or Slot Width(cm)	Slot Length(cm)	Hole or Slot Interval(cm)

Bottom at :

m

Penoraleu by				
Annular Seal	Cement/Grout			
Placed from	0.00 m	to	25.60	m
Amount	150.00	Gallons		
Other Seals				

 Type
 At (m)

 Driven
 25.60

 Screen Type
 Stainless Steel

 Size OD :
 14.12 cm

 From (m)
 To (m)
 Slot Size (cm)

 26.21
 27.43
 0.025

FIOIII (III)		10 (11)	SIOL SIZE (CIII)
26.21		27.43	0.025
Attachment	Telescop	ed	
Top Fittings	Packer	Bottom Fitt	tings Tail Pipe
Pack			
Type Natural		Grain Size	

Amount

 Contractor Certification

 Name of Journeyman responsible for drilling/construction of well
 Certification No

 CHRIS QUINLAN
 48135A

 Company Name
 Copy of Well report provided to owner

 AARON DRILLING INC.
 Date approval holder signed

# Government of Alberta Water Well Drilling Report View in Imperial GIC Well ID 1022436

Diversion Date & Time

2014/04/29 8:00 AM

	erta 🗖	accu			ained in this reports reports will be ret				r its	GoA Well Tag No. Drilling Company \ Date Report Recei	Well ID
Well Ident	ification and L	ocation									Measurement in Met
Owner Nan LAFARGE	1 <del>0</del> CANADA INC		Address 115 QUAR	RY PARK E	BLVD	Towr CALC	GARY		Province ALBERTA	Country CANAD	
Location	1/4 or LSD 9	SEC 36	TWP 26	RGE 4	W of MER 5	Lot	Block	Plan	Addition	al Description	
Measured f		of m from m from				51.265686 n Obtained	Long	ees (NAD 83) itude <u>-114.42</u> m		Elevation How Elevation Ol Hand held autono	
Additional	Information										Measurement in Met
Distance F Is Artesia	rom Top of Cas n Flow	ing to Gro	ound Level		91.44 cm		ls Flow Cor	ntrol Installed			
	Rate							Describe			
Recomme	nded Pump Rat				L/mi	n Pum	p Installed			Depth	
Recomme	nded Pump Inta	ke Depth	(From TOC)		m	Тур	e		Make	Depth Model (Output F	H.P
Did you l	Encounter Salin	e Water (:		DS) Gas		ז ז		Geo		Completion <u>Yes</u> Taken ESRD	
	al Comments of ST PERFORME		TERLINE RE	SOURCES			Sample C	ollected for P	Potability	Sub	mitted to ESRD

Yield Test			Taken From Ground Level	Measurement in Metric
Test Date	Start Time	Static Water Level m		
Method of Water R	<b>Removal</b> Fype			
' Removal F		nin		
Depth Withdrawn F	rom m	_		
lf water removal per	riod was < 2 hours, explain	why		
Water Diverted for	Drilling			

Amount Taken

L

9092.18

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well CHRIS QUINLAN	Certification No 48135A	
Company Name AARON DRILLING INC.	Copy of Well report provided to owner Yes	Date approval holder signed 2014/09/24

Water Source

CITY OF CALGARY

### Government of Alberta

## Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its

GIC Well ID GoA Well Tag No. Drilling Company Well ID

View in Imperial Export to Excel

1475698

Well Identification and Location       Measurement in M         Owner Name       Address       Town       Province       Country       Postal Coc         QUICK WAY FARMS LTD       P.O. BOX 1719       BROOKS       AB       CA       T1R 1C5         Location       1/4 or LSD       SEC       TWP       RGE       W of MER       Lot       Block       Plan       Additional Description       16       31       026       03       5         Measured from Boundary of m from m from       GPS Coordinates in Decimal Degrees (NAD 83) Latitude 51.267444       Longitude -114.400639 How Location Obtained       Elevationm       m         How Location Obtained Hand held autonomous GPS 20-30m       Not Obtained       Not Obtained         Drilling Information       Type of Work New Well       Not Obtained       Not Obtained         Proposed Well Use Domestic       Measurement in Metric       Yield Test Summary       Measurement in Metric         Popth from ground level (m)       Water Bearing       Lithology Description       Test Date       Water Removal Rate (L/min)       Static Water Level (m)         2.13       Clay       Clay       Clay       Clay       Static Water Level (m)       Static Water Level (m)			accu	aracy. The inform	mation on thi	s report will be retained in a pu	blic database.		Date Report Re	
Dames Name         Address         Town         Province         County         Phase Coc           USCRW VF ARMS         V OR DEX YF ORE         EXC OF AND ADDRESS         Address         Tite 105           USCRW VF ARMS         0.00         0.3         5         Elock         Plan         Address         Tite 105           USCRW VF ARMS         0.00         0.3         5         Elock         Plan         Address         Tite 105           Vessured from Boundary of m tom         m tom         CPS Coordinates in Decimal Degrees (PAD 28)         Elevation         m         m           Latitude 51228144         Longitude -114.400030         Elevation         me         How Elevation Obtained           Proposed Will Use         Fige of Work         New Weil         New Weil         New Veil           Proposed Will Use         Type of Work         New Weil         Elevation         Measurement in M           21.03         Clay & Grevel         Measurement in M         Elevation         Elevation         Elevation           23.16         Clay - State         State Obset         State Obset         State Obset         State Obset           33.57         Sandstone         Sandstone         State Obset         State Obset         State Obset	Well Identification	on and I c	cation							
DUCK WAY FAMAS LTD     P.O. BOX (1719)     BROOKS     AB     CA     T1R 105       location     14 01.20     SE     TWP     REE     Lot     Block     Plon     Additional Description       16     33     026     03     S     CPS Conducts in Description     Meditional Description       16     m from     m from     CPS Conducts in Description     Event in Meditional Description     Meditional Description       17     Max Location Statewed     Lot     Block     Plan     Additional Description       17     Data Max     Lot     Block     Plan     Additional Description       18     Data Max     Lot     Block     Plan     Additional Description       19     Data Max     Type of Work     New Well     New Well       21.03     Clay & Gravel     Type of Work     New Well     Statt Water Level (m)       21.13     Clay     Glay     Glay     Statt Clay     200.301/13       21.24     Gray Shale     Statt Data     Data     200.3031/10     200.301/14       22.82     Gray Shale     Statt Data     Data     200.3031/10     200.301/14       23.10     Shale     Statt Data     Data     Data     Data       33.10     Shale     Shal			oution	Address		Тож	n	Province	Cour	
16         31         0.26         0.3         5           Vessured from Boundary of mitrom         CPS Concinates in Decimal Degrees (NAD 83) Latitude 51.28744         Langitude 114.400639         Elevation         m           mitrom         CPS Concinates in Decimal Degrees (NAD 83) Latitude 51.28744         Langitude 114.400639         Elevation         m           Maint Concination         Type of Work New Well         Type of Work New Well         New Eventson Obtained         New Eventson Obtained           Proposed Well Use Domatic         Type of Work New Well         New Well         New Well         New Well           21.3         Clay & Gravel         New Well Concentration New Concentration New Concentration New Concentration New Concentration New Concentration         New Well Concentration New Concentrating New Concontent New Concentrating New Concentrating New Concen	QUICK WAY FAR			P.O. BOX 1		BRC	OKS	AB	CA	
immon       Linkido 5128744       Longitude /114.400539       Evention and the determinant of the evention and the evention		or LSD				5			nal Description	
Image     How Location Obtained Hand held autonomous GPS 20-30m     How Elevation Obtained Not Obtained       Drilling Information Wethod of Drilling Straty     Type of Work New Weil     Type of Work New Weil       Promation Log     Measurement in Metric Drinestic     Triefeld Test Summary     Measurement in Metric Test Date       Promation Log     Measurement in Metric Drinestic     Measurement in Metric Test Date     Measurement in Metric Test Date     Measurement in Metric Test Date       21.3     Cay     36.37 Limin Test Date     Measurement in Metric Test Date     Measurement in Metric Test Date       23.13     Cay     36.37 Limin Test Date     Measurement in Metric Test Date     Measurement in Metric Test Date       35.35     Cary Shale     Gray Shale     Bornhole     Bornhole       31.70     Sandstone     Sand Date     End Date       31.70     Sandstone     Sand Date     Sand Date       31.70     Sandstone     Sand Date     Sand Date       33.53     Statele     Sand Date     Sand Date       33.62     Shale     Date     Well Caning/Line       33.62     Shale     Date for To (m)     Sate OD :       Perforations     Well Caning/Line     Measurement in Metric       33.62     Shale     Date for the sate     Meastrip/Line       Stare O	Measured from B	oundary of					• · ·	· · · ·	_	
Hand held autonemous GPS 20-30m         Net Obtained           Drilling Information         Type of Work New Well         Type of Work New Well           Proposed Well Use Domestic         Measurement in Metric (m) Bearing         Yield Test Summary         Measurement in M Recommended Pump Rate         36.37 L/min Test Date           21.03         Clay & Gravel         Vield Test Summary         Measurement in M Recommended Pump Rate         36.37 L/min Test Date         Measurement in M 2003/01/15         45.46         32.00           21.03         Clay & Gravel         Measurement in M 23.16         Clay         Measurement in M 2003/01/10         2003/01/10         2003/01/10         2003/01/10         2003/01/14           28.65         Gray Shale         Borehole         Diameter (cm)         Torin (m)         To (m)         20.30/11/0         2003/01/14           39.62         Shale         Starbe Ob:         14.13 cm;         Size OD:         cm           39.62         Shale         Shale         Size OD:         cm         Minown           39.62         Shale         Starb OD:         14.13 cm;         Size OD:         cm           Well Casing/Liner         Uhknown         Size OD:         cm         m         Minown           39.62         Shale         Size OD:		r	n from					114.400639		
Diffing Information     Type of Work       Mendod of Drilling Yapposed Well Use Domestic     Measurement in Metric       Series     Measurement in Metric       21:03     Clay       21:03     Clay       21:03     Clay       26:82     Gray Shale       26:82     Gray Shale       27:03     Sandstone       31:39     Gray Shale       31:30     Sandstone       31:70     Sandstone       33:53     Shale       35:97     Sandstone       39:62     Shale       Shale     Size OD :       Meal Thickness :     O.478 cm       Boton at :		r	n from							i Obtained
Wethed of Drilling Noposed Well Use Zemeside       Type of Work New Well         "Poposed Well Use Zemeside       Search and the search and t						Hand held autonomous	GPS 20-30m		Not Obtained	
Wethed of Drilling Noposed Well Use Zemeside       Type of Work New Well         "Poposed Well Use Zemeside       Search and the search and t	Drilling Informat	ion								
Domestic     Image: Construction     Measurement in Metric       Formation Log     Water pround level (m)     Water Measurement in Metric     Yield Test Summary     Measurement in M Rescommended Pump Rate     36.37 Lmin       21.03     Clay & Gravel     Measurement in M     Measurement in M       21.03     Clay & Gravel     Measurement in M       23.16     Clay     Grave State     Measurement in M       26.82     Grave Shale     Measurement in M       31.39     Grave Shale     Borshole       31.39     Grave Shale     Diameter (cm)     From (m)     To (m)       35.97     Sandstone     State OD:     m       32.00     35.97     Sandstone     State OD:     m       33.962     Shale     Diameter or     State OD:     m       Bottom at:     35.97     Sandstone     State OD:     m       32.00     State OD:     m     State OD:     m       Bottom at:     State OD:     m     Meal Thickness:     m       Bottom at: <t< td=""><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	0									
Depth from ground level (m)       Water Bearing       Lithology Description       Recommended Pump Rate36.37 L/min Test Date Water Removal Rate (L/min)       Static Water Level (m) 2003/01/15         21.03       Clay & Gravel       Well Completion       Measurement in M 7olal Depth Drilled Finished Well Depth       Static Water Level (m) 2003/01/10       2003/01/10<	-	lse								
Construction         Description           2.1.3         Clay           2.1.3         Clay           2.1.3         Clay & Gravel           2.1.4         Clay & Gravel           2.1.5         Clay           2.1.6         Clay           2.1.7         Clay & Gravel           2.1.8         Gray Shale           3.1.70         Sandstone           3.1.70         Sandstone           3.5.3         Shale           3.5.97         Sandstone           3.9,62         Shale             Vert Interval         Size OD           Well ChaingLiner         Unknown           Well ChaingLiner         Unknown           3.9,62         Shale         Size OD <td>Formation Log</td> <td></td> <td></td> <td></td> <td>Me</td> <td>asurement in Metric</td> <td>Yield Test Sur</td> <td>nmary</td> <td></td> <td>Measurement in Me</td>	Formation Log				Me	asurement in Metric	Yield Test Sur	nmary		Measurement in Me
rotund level (m) learing Test Date Water Removal Rate (L/min) Static Water Level (m) 2.1.03 Clay & Gravel 21.03 Clay & Gravel 23.16 Clay 23.16 Clay 26.82 Gray Shale 26.82 Gray Shale 23.170 Sandstone 33.53 Shale 33.53 Shale 33.52 Shale 33.62 Shale 34.72 Mithode 35.97 Mithode 35.97 Mithode 35.97 Mithode 35.97 Mithode 35.97 Mithode 35.97 Mithode 36.01 Mithode 36.01 Mithode 36.01 Mithode 36.01 Mithode 37.90 Mithod	Depth from	Water	Litholoc	gy Descriptior	1		Recommended	Pump Rate	36.37 L/min	
21.03       Clay & Gravel         23.16       Clay         23.16       Clay         26.82       Gray Shale         26.82       Gray Shale         31.39       Gray Shale         31.30       Gray Shale         33.53       Shale         33.53       Shale         35.97       Sandstone         39.62       Shale         39.62       Shale         96.62       O:         1000       Total Depth Drilled Finished Well Depth Start Date         2003/01/14       Boethole         Diameter (cm)       To (m)         31.30       Gray Shale         31.70       Sandstone         33.53       Shale         Steel D:       Unknown         Stee O:       14.13 cm         Well Thickness:       0.478 cm         Wall Thickness:       0.478 cm         Bottom at:       m							Test Date	Water Removal	Rate (L/min)	Static Water Level (m)
23.16       Clay	2.13		Clay				2003/01/15	45.4	6	32.00
23.16       Clay       Total Daph Drilled Finished Well Depth Start Date       End Date         26.82       Gray Sande       39.62       2003/01/10       2003/01/14         28.65       Gray Sandy Shale       Diameter (cm)       Total Daph Drilled Finished Well Depth Start Date       End Date         31.39       Gray Shale       Diameter (cm)       100       30.62         33.53       Shale       Stred Do:       14.13 cm       Size OD:       mm         33.62       Shale       Size OD:       14.13 cm       Size OD:       mm         Bottom at:       35.97       Sandstone       Size OD:       14.13 cm       Size OD:       mm         39.62       Shale       Size OD:       14.13 cm       Size OD:       mm         Bottom at:       35.97 m       Top at :       m         Perforations       Bottom at :       m       Perforations         From (m)       To (m)       Will thickness :       Cm       Mineter or         Side       Diameter or       Side       Diameter or       Side       Side         Perforated by       Torch       Annular Seal       Driven & Bentonite       Placed from       Minount       Other Seals       Top Hitings       Minut       Side Sid	21.03		Clay 8	k Gravel			Well Completi	on		Measurement in Me
28.62       Gray Sandy Shale         28.65       Gray Sandy Shale         31.39       Gray Sandy Shale         31.70       Sandstone         33.53       Shale         35.97       Sandstone         39.62       Shale         Vertication of the second of the seco	23.16		Clay						Depth Start D	Date End Date
26.03       Gray Shale         31.39       Gray Shale         31.70       Sandstone         33.53       Shale         35.97       Sandstone         39.62       Shale         Diameter (cm) From (m) To (m) 39.62         Surface Casing (if applicable)         Well Casing/Liner         Unknown         Size OD : 14.13 cm         Size OD : 0.078 cm         Well Casing/Liner         Unknown         Size OD : 14.13 cm         Well Casing/Liner         Well Casing/Liner         Well Casing/Liner         Unknown         Size OD : 14.13 cm         Well Casing/Liner         Offer Casing (if applicable)         Well Casing/Liner         Dintervalons         Dinterva	26.82		Gray S	hale			39.62 m		2003/0	)1/10 2003/01/14
31.70       Sandstone       39.62         31.70       Sandstone       Surface Casing (if applicable)       Well Casing/Liner         35.97       Sandstone       Size OD :       14.13 cm       Size OD :       om         39.62       Shale       Size OD :       14.13 cm       Size OD :       om       om         Wall Thickness :       0.478 cm       Wall Thickness :       om       m       Bottom at :       m         Bottom at :       35.97 m       Top at :       m       m       Bottom at :       m         Bottom at :       35.97 m       Slot       Slot       Hole or Slot       Interval(cm)       Interval(cm)         39.62       Shale       Diameter or       Slot       Slot       Hole or Slot       m         Perforations       Diameter or       Slot       Slot       Interval(cm)       Interval(cm)         32.00       35.97       0.318       25.40       Diameter or       Slot       Slot       Slot       Slot       Mole or Slot         Perforated by       Torch       Annular Seal       Driven & Bentonite       Placed from       0.00 m       1.31.39 m       Slot       Slot Size (cm)         Amount       Othor Seals       Size OD :       <	28.65		Gray Sa	andy Shale			Borehole			
31.70       Sandstone         33.53       Shale         35.97       Sandstone         39.62       Shale             Wall Thickness:       0.478 cm         Wall Thickness:       0.478 cm         Bottom at:       35.97         Shale       Wall Thickness:         Other and the state of the s	31.39		Gray S	ihale						
33.53       Shale       Unknown         35.97       Sandstone       Size OD :	31.70		Sands	tone						
33.62       Shale         Wall Thickness :       0.478 cm       Wall Thickness :       cm         Bottom at :       35.97 m       Top at :       m         Bottom at :       35.97 m       Bottom at :       m         Bottom at :       35.97 m       Top at :       m         Bottom at :       0iameter or       Slot       Hole or Slot         From (m)       To (m)       Width(cm)       Length(cm)       Interval(cm)         32.00       35.97       0.318       25.40         Perforated by       Torch       Annular Seal       Driven & Bentonite         Placed from       0.00 m       to       31.39 m         Amount	33.53		Shale				-	(II applicable)		
39.62       Shale         39.62       Shale         Wall Thickness :       0.478 cm         Bottom at :       35.97 m         Bottom at :       35.97 m         Bottom at :       m <td>35.97</td> <td></td> <td>Sands</td> <td>stone</td> <td></td> <td></td> <td>Size OL</td> <td>): 14.13 cr</td> <td><u>n</u> 3</td> <td>Size OD : cm</td>	35.97		Sands	stone			Size OL	): 14.13 cr	<u>n</u> 3	Size OD : cm
Bottom at :       35.97 m       Top at :       m         Bottom at :       m       Bottom at :       m         Perforations       Stot       Stot       Hole or Slot         From (m)       To (m)       Vidth(cm)       Length(cm)       Interval(cm)         32.00       35.97       0.318       25.40         Perforated by       Torch         Annular Seal       Driven & Bentonite         Placed from       0.00 m       to         Other Seals       Type       At (m)         Screen Type       Size OD :       cm         Size OD :       cm       From (m)       To (m)         Attachment       Top Fittings       Bottom Fittings         Pack       Type Unknown       Grain Size							Wall Thickness	s: 0.478 cr	n Wall Th	nickness : cm
Perforations         From (m)       To (m)       Diameter or Slot       Slot       Hole or Slot         32.00       35.97       0.318       25.40         Perforated by       Torch         Annular Seal       Driven & Bentonite         Placed from       0.00 m       to         Amount       0.00 m       to         Other Seals       Type       At (m)         Screen Type       Slot Size (cm)         Attachment       Top Fittings       Bottom Fittings         Type       Unknown       Grain Size							Bottom a	<i>t :</i> 35.97 m		
From (m)       To (m)       Slot       Hole or Slot         32.00       35.97       0.318       25.40         Perforated by       Torch         Annular Seal       Driven & Bentonite         Placed from       0.00 m       to       31.39 m         Amount							Deufenetiene		B	ottom at : m
Slot       Slot       Hole or Slot         From (m)       To (m)       Width(cm)       Length(cm)       Interval(cm)         32.00       35.97       0.318       25.40         Perforated by       Torch         Annular Seal       Driven & Bentonite         Placed from       0.00 m       11.39 m         Amount							Perforations	Diamete	or or	
Perforated by       Torch         Annular Seal       Driven & Bentonite         Placed from       0.00 m to       31.39 m         Amount								Slot Fo (m) Width(	Slot cm) Length	(cm) Interval(cm)
Placed from 0.00 m to 31.39 m         Amount         Other Seals         Type       At (m)         Screen Type         Size OD :Cm         From (m)       To (m)         Slot Size (cm)         Attachment									0	
Placed from 0.00 m to 31.39 m         Amount         Other Seals         Type       At (m)         Screen Type         Size OD :Cm         From (m)       To (m)         Slot Size (cm)         Attachment							Annular Seal	Driven & Bentonit	9	
Amount         Other Seals         Type       At (m)         Screen Type         Size OD :Cm         From (m)       To (m)         Slot Size (cm)         Attachment         Top Fittings       Bottom Fittings         Pack         Type Unknown       Grain Size										m
Type       At (m)         Screen Type         Size OD :       cm         From (m)       To (m)       Slot Size (cm)         Attachment							Amount			
Screen Type         Size OD :         From (m)       To (m)         Slot Size (cm)         Attachment         Top Fittings       Bottom Fittings         Pack         Type Unknown       Grain Size							Other Seals		-	
Size OD :Cm         From (m)       To (m)         Attachment         Top Fittings       Bottom Fittings         Pack         Type Unknown       Grain Size								Туре		At (m)
From (m)     To (m)     Slot Size (cm)       Attachment										
Top Fittings     Bottom Fittings       Pack       Type     Unknown       Grain Size										Slot Size (cm)
Top Fittings     Bottom Fittings       Pack       Type Unknown     Grain Size							A 44 1			
Pack       Type Unknown     Grain Size									Dotto	Fittings
Type Unknown Grain Size								3	Βοποη	r Filuliys
Amount Unknown										Size
							Amount	Unknowr	1	
		ification								

Name of Journeyman responsible for drilling/construction of well WILLIAM PENROD

Company Name

M&M DRILLING CO. LTD.

Certification No A000187 Copy of Well report provided to owner Date approval holder signed

## Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its

GIC Well ID GoA Well Tag No. Drilling Company Well ID

View in Imperial Export to Excel

1475698

accuracy. The information	Ion on this report will be retained in a pub	lic database.	Date Report Rece	ved
Well Identification and Location				Measurement in Metric
Owner Name Address	Town	r	Province Country	
QUICK WAY FARMS LTD P.O. BOX 171				T1R 1C5
QUICK WAT FARMS LTD P.U. BUX 171			AB CA	TIR IC5
Location 1/4 or LSD SEC TWP	RGE W of MER Lot	Block Plan	Additional Description	
16 31 026	03 5		,	
	GPS Coordinates in Dec	imal Degrees (NAD 83)		
Measured from Boundary of		<b>U</b> ( )	20 Eloyation	-
m from	Latitude <u>51.267444</u>	Longitude -114.4006	39 Elevation	m
m from	How Location Obtained		How Elevation O	btained
	Hand held autonomous	2PS 20-30m	Not Obtained	
		31 3 20-3011		
Additional Information				Measurement in Metric
Additional information				Measurement in Metric
Distance From Top of Casing to Ground Level	60.96 cm			
		a Flow Control Installed		
Is Artesian Flow		s Flow Control Installed		
Rate L/min		Describe		
		1	6	
Recommended Pump Rate	36.37 L/min Pump	o Installed	Depth	m
Recommended Pump Intake Depth (From TOC)	35.05 m Type	- Λ	Nake	H.P.
· · · · · · · ·			Madal (Output)	Poting
			Model (Output i	Rating)
Did you Encounter Saling Water (> 4000 ppm TDS	Dopth	m Wall Disinfact	ad Upon Completion	
Did you Ericounier Saine Water (>4000 ppm 1DS	Deptin	III Well Distrilect		
Did you Encounter Saline Water (>4000 ppm TDS Gas	S Depth	m Geophy	sical Log Taken	
			omitted to ESRD	
		Sample Collected for Pota	bility Sub	mitted to ESRD
Additional Comments on Well				
FIELD TEST HARD WATER TDS 250, GPS # 51.20	571333, N-51-16.0-2.8, W-114-24-	2.3, -114.40038333, BOR	EHOLE DIAMETER 8.75" T	O 103' & 6.25" TO 130'
· · · · · -				
Yield Test		Taken	From Ground Level	Measurement in Metric
			Depth to water level	
Test Date Start Time	Static Water Level	Drawdown (m)	Elapsed Time	Recovery (m)
2003/01/15 12:00 AM	32.00 m	Diawdown (m)		Recovery (III)
		22.20	Minutes:Sec	22.01
Method of Water Removal		32.39	1:00	32.81
		32.59	2:00	32.69
Type Pump		32.69	3:00	32.65
Removal Rate 45.46 L/min		32.75	4:00	32.61
		32.83	5:00	32.60
Depth Withdrawn From 35.05 m		32.85	6:00	32.56
		32.89	7:00	32.51
If water removal period was < 2 hours, explain why		32.90	8:00	32.49
		32.92	9:00	32.47
		32.94	10:00	32.45
		32.99	12:00	32.40
		33.02	14:00	32.37
		33.05	16:00	32.34
		33.08	20:00	32.34
		33.13	25:00	32.28
		33.06	30:00	32.26
		33.19	35:00	32.23
		33.24	40:00	32.21
		33.27	50:00	32.20
		33.28	60:00	32.16
		33.31	75:00	32.12
		33.32	90:00	32.10
		33.34	105:00	32.09
		33.35	120:00	32.06
				- · · -
Mator Divorted for Drilling				
Water Diverted for Drilling				
	Amount Taken		Diversion Date & Time	
Water Diverted for Drilling Water Source	Amount Taken L		Diversion Date & Time	

Contractor Certification Name of Journeyman responsible for drilling/construction of well WILLIAM PENROD Company Name M&M DRILLING CO. LTD.

Certification No A000187

Copy of Well report provided to owner Date approval holder signed

Government

of Alberta

### Government of Alberta

## Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID GoA Well Tag No.

View in Imperial Export to Excel

1475699

Drilling Company Well ID

Well Identification	on and Lo	cation					Date Report Recei	Measurement in Metric
Owner Name		Address		Tow	7	Province	Country	
QUICK WAY FAR	MS LTD	P.O. BOX	( 1719		OKS	AB	CA	T1R 1C5
Location 1/4 15	or LSD	SEC         TWP           31         026	<i>RGE</i> 03	W of MER Lot 5	Block Pla	STOCK	al Description WELL	
Measured from B	n	n from n from		GPS Coordinates in De Latitude <u>51.267556</u> How Location Obtained Hand held autonomous	Longitude <u>-</u>	114.405667	Elevation How Elevation Ob Not Obtained	
Drilling Informat Method of Drillin Rotary Proposed Well U Domestic	ıg			<b>Type of Work</b> New Well				
Formation Log			Me	asurement in Metric	Yield Test Sun	nmarv		Measurement in Metric
	Watar	Lithology Description			Recommended		27.28 L/min	
Depth from ground level (m)	Water Bearing	Lithology Descripti	UII		Test Date	Water Removal F		Static Water Level (m)
2.44	, j	Clay & Rocks			2003/01/20	24.55		32.64
27.43		Lost Circulation G	ravel		Well Completion			Measurement in Metric
28.96		Shattered Shale				led Finished Well	Depth Start Date	
32.92		Brown Sandstone			53.95 m		2003/01/1	2003/01/17
34.75		Gray Sandstone			Borehole			
45.72		Shale & Sandstor	ne Ledges		Diameter ( 22.23		From (m) 0.00	To (m) 53.95
47.24	Yes	Water Bearing Sa			Surface Casing		0.00 Well Casing	
50.29	Yes	Water Bearing Sha	ale		Steel		Plastic	
50.90	Yes	Water Bearing Sa	ndstone			): 14.13 cm	-	e OD : 11.43 cm
53.95		Shale			Wall Thickness		-	
					Bottom at	it : 30.18 m	-	op at : 23.47 m om at : 53.95 m
						Diameter Slot Fo (m) Width(c 50.90 0.635	Slot m) Length(cm	Hole or Slot Interval(cm) 25.40
								_
						Туре		At (m)
					Screen Type Size OD From (m Attachmen		– To (m)	Slot Size (cm)
					Top Fittings <b>Pack</b>	S	Bottom Fi	ttings
					Type Unknow	wn Unknown		9
					, anount	GUNUOWI		

#### Contractor Certification

Name of Journeyman responsible for drilling/construction of well WILLIAM PENROD

Company Name M&M DRILLING CO. LTD.

Certification No A000187 Copy of Well report provided to owner Date approval holder signed

## Government Water Well Drilling Report View in Imperial Export to Excel GIC Well ID 1475699

Well Identification and Location       Address         Quick WAY FARMS LTD       P.O. BOX 11         Location       1/4 or LSD       SEC       TWP         15       31       026         Measured from Boundary of	RGE W of MER 03 5 GPS Coordinau Latitude <u>51</u> . How Location ( Hand held autor 60.96 cm 27.28 L/min 42.67 m Depth _ s Depth _	tes in Decimal Degrees ( 267556 Longitude Dotained nomous GPS 20-30m Is Flow Control Pump Installed Type        Sample Colled	STOC (NAD 83) le -114.405667 l Installed Describe Make Well Disinfected Upo Geophysical Li Submitted cted for Potability	CA ional Description CK WELL Elevation How Elevation Ob Not Obtained Depth Depth on Completion og Taken to ESRD Subr	m
DUICK WAY FARMS LTD       P.O. BOX 1         .ocation       1/4 or LSD       SEC       TWP         15       31       026         Aeasured from Boundary of	RGE W of MER 03 5 GPS Coordinau Latitude <u>51</u> . How Location ( Hand held autor 60.96 cm 27.28 L/min 42.67 m Depth _ s Depth _	BROOKS Lot Block tes in Decimal Degrees ( 267556 Longitude Dotained momous GPS 20-30m Is Flow Control Pump Installed Type	AB Plan Additi STOC (NAD 83) le -114.405667 l Installed Describe Make Well Disinfected Upo Geophysical Li Submitted cted for Potability	CA ional Description CK WELL Elevation How Elevation Ob Not Obtained Depth Depth on Completion og Taken to ESRD Subr	m
15       31       026         Measured from Boundary of m from       m from m from	03 5 GPS Coordinal Latitude 51. How Location ( Hand held auto 60.96 cm 27.28 L/min 42.67 m ) Depth _ s Depth _	tes in Decimal Degrees ( 267556 Longitude Dotained nomous GPS 20-30m Is Flow Control Pump Installed Type        Sample Colled	STOC (NAD 83) le -114.405667 l Installed Describe Make Well Disinfected Upo Geophysical Li Submitted cted for Potability	CK WELL  Elevation How Elevation Ob Not Obtained  Depth Depth Model (Output R on Completion og Taken 'to ESRD Subr	Measurement in M
m from         m from	Latitude 51. How Location ( Hand held auto 60.96 cm 27.28 L/min 42.67 m	267556 Longitude Obtained onomous GPS 20-30m Is Flow Control Pump Installed Type 	le <u>-114.405667</u>	How Elevation Ob Not Obtained	Measurement in M
m from         dditional Information         Distance From Top of Casing to Ground Level         Is Artesian Flow         Rate       L/min         Recommended Pump Rate         Recommended Pump Intake Depth (From TOC)         Did you Encounter Saline Water (>4000 ppm TE         G         Additional Comments on Well         FIELD TEST 300 TDS MOD HARD BAILED @ 7 I         SHATTERED SHALE (LOSS CIRCULATION),         ield Test         Test Date       Start Time         2003/01/20       12:00 AM         Wethod of Water Removal         Type       Pump         Removal Rate       24.55 L/min         Depth Withdrawn From       53.34 m         If water removal period was < 2 hours, explain why	How Location ( Hand held auto           60.96 cm           27.28 L/min           42.67 m           b)         Depth           s         Depth	Detained phomous GPS 20-30m Is Flow Control Pump Installed Type     	l Installed Describe Make Vell Disinfected Upo Geophysical L Submitted cted for Potability	How Elevation Ob Not Obtained	Measurement in M
dditional Information         Distance From Top of Casing to Ground Level         Is Artesian Flow         Rate       L/min         Recommended Pump Rate         Recommended Pump Intake Depth (From TOC)         Did you Encounter Saline Water (>4000 ppm TE         G         Additional Comments on Well         FIELD TEST 300 TDS MOD HARD BAILED @ 7 I         SHATTERED SHALE (LOSS CIRCULATION),         ield Test         Test Date       Start Time         2003/01/20       12:00 AM         Wethod of Water Removal         Type       Pump         Removal Rate       24.55 L/min         Depth Withdrawn From       53.34 m         If water removal period was < 2 hours, explain why	60.96 cm 27.28 L/min 42.67 m Depth s Depth _	Is Flow Control Pump Installed Type	Describe Make Vell Disinfected Upo Geophysical L Submitted cted for Potability	Depth Model (Output R on Completion og Taken to ESRD Subr	m H.P Rating) mitted to ESRD
Distance From Top of Casing to Ground Level Is Artesian Flow Rate L/min Recommended Pump Rate Recommended Pump Intake Depth (From TOC) Did you Encounter Saline Water (>4000 ppm TE G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED @ 7 I SHATTERED SHALE (LOSS CIRCULATION), field Test Test Date Start Time 2003/01/20 12:00 AM Method of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m If water removal period was < 2 hours, explain why Mater removal period was < 2 hours, explain why	27.28 L/min 42.67 m ) Depth _ s Depth _	Pump Installed Type    	Describe Make Vell Disinfected Upo Geophysical L Submitted cted for Potability	Depth Model (Output R on Completion og Taken to ESRD Subr	m H.P Rating) mitted to ESRD
Is Artesian Flow Rate L/min Recommended Pump Rate Recommended Pump Intake Depth (From TOC) Did you Encounter Saline Water (>4000 ppm TE G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED @ 7 I SHATTERED SHALE (LOSS CIRCULATION), FIELD TEST Test Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m If water removal period was < 2 hours, explain why	27.28 L/min 42.67 m ) Depth _ s Depth _	Pump Installed Type    	Describe Make Vell Disinfected Upo Geophysical L Submitted cted for Potability	Depth Model (Output R on Completion og Taken to ESRD Subr	mitted to ESRD
Rate       L/min         Recommended Pump Rate         Recommended Pump Intake Depth (From TOC)         Did you Encounter Saline Water (>4000 ppm TE         G         Additional Comments on Well         FIELD TEST 300 TDS MOD HARD BAILED @ 7 If         SHATTERED SHALE (LOSS CIRCULATION),         ield Test         Test Date       Start Time         2003/01/20       12:00 AM         Wethod of Water Removal         Type       Pump         Removal Rate       24.55 L/min         Depth Withdrawn From       53.34 m         If water removal period was < 2 hours, explain why	) Depth _ s Depth _	Pump Installed Type    	Describe Make Vell Disinfected Upo Geophysical L Submitted cted for Potability	Depth Model (Output R on Completion og Taken to ESRD Subr	mitted to ESRD
Did you Encounter Saline Water (>4000 ppm TE G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED @ 7 I SHATTERED SHALE (LOSS CIRCULATION), ield Test Test Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m If water removal period was < 2 hours, explain why	) Depth _ s Depth _	m W m Sample Collec	Vell Disinfected Upc Geophysical L Submitted cted for Potability	on Completion og Taken to ESRD Subr	mitted to ESRD
Did you Encounter Saline Water (>4000 ppm TE G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED @ 7 I SHATTERED SHALE (LOSS CIRCULATION), ield Test Test Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m If water removal period was < 2 hours, explain why	) Depth _ s Depth _	m W m Sample Collec	Vell Disinfected Upc Geophysical L Submitted cted for Potability	on Completion og Taken to ESRD Subr	mitted to ESRD
Did you Encounter Saline Water (>4000 ppm TE G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED @ 7 I SHATTERED SHALE (LOSS CIRCULATION), ield Test Test Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m If water removal period was < 2 hours, explain why	) Depth _ s Depth _	m W m Sample Collec	Vell Disinfected Upc Geophysical L Submitted cted for Potability	on Completion og Taken to ESRD Subr	mitted to ESRD
G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED © 7 I SHATTERED SHALE (LOSS CIRCULATION), ield Test Test Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m f water removal period was < 2 hours, explain why	s Depth _	m Sample Collec	Geophysical L Submitted cted for Potability	on Completion og Taken to ESRD Subr	mitted to ESRD
G Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED © 7 I SHATTERED SHALE (LOSS CIRCULATION), ield Test Test Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m f water removal period was < 2 hours, explain why	s Depth _	m Sample Collec	Geophysical L Submitted cted for Potability	og Taken to ESRD Subr	mitted to ESRD
Additional Comments on Well FIELD TEST 300 TDS MOD HARD BAILED @ 7 I SHATTERED SHALE (LOSS CIRCULATION), ield Test Fest Date Start Time 2003/01/20 12:00 AM Wethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m f water removal period was < 2 hours, explain why		Sample Collec	Submitted cted for Potability	to ESRD Subr	mitted to ESRD
TELD TEST 300 TDS MOD HARD BAILED @ 7 I         BHATTERED SHALE (LOSS CIRCULATION),         eld Test         Test Date       Start Time         1003/01/20       12:00 AM         Aethod of Water Removal         Type       Pump         Removal Rate       24.55 L/min         Depth Withdrawn From       53.34 m         f water removal period was < 2 hours, explain why	M, GPS # 51-16-03.2, W-		cted for Potability	Subr	
est Date Start Time 12:00 AM lethod of Water Removal Type Pump Removal Rate 24.55 L/min Depth Withdrawn From 53.34 m water removal period was < 2 hours, explain why ater Diverted for Drilling					
003/01/20       12:00 AM         Identified of Water Removal         Type Pump         Removal Rate       24.55 L/min         Depth Withdrawn From       53.34 m         Twater removal period was < 2 hours, explain why         Water removal period was < 2 hours, explain why         Vater Diverted for Drilling				Ground Level	Measurement in M
Type       Pump         Removal Rate       24.55       L/min         Depth Withdrawn From       53.34 m       description         f water removal period was < 2 hours, explain why	Static Water Level 32.64 m	Drawdov		Elapsed Time Minutes:Sec	Recovery (m)
Type       Pump         Removal Rate       24.55       L/min         Depth Withdrawn From       53.34 m       description         If water removal period was < 2 hours, explain why		35.0		1:00	36.99
Removal Rate       24.55 L/min         Depth Withdrawn From       53.34 m         f water removal period was < 2 hours, explain why		35.7		2:00 3:00	36.20 36.12
Depth Withdrawn From <u>53.34 m</u> f water removal period was < 2 hours, explain why f vater Diverted for Drilling		- 36.0		4:00	36.02
<sup>f</sup> water removal period was < 2 hours, explain why /ater Diverted for Drilling		36.2		5:00	35.91
'ater Diverted for Drilling		36.3		6:00	35.79
'ater Diverted for Drilling		36.4		7:00 8:00	35.72 35.61
ő		31.2		9:00	35.45
ő		36.8		10:00	35.41
<sup>0</sup>		36.9	96	12:00	35.29
<del>,</del>		37.1	11	14:00	35.16
<del>,</del>		36.9		16:00	35.05
<del>,</del>		37.4		20:00	34.88
<del>,</del>		37.5		25:00	34.75
<del>,</del>		37.7		30:00 35:00	34.59 34.50
<del>,</del>		38.0		40:00	34.40
<del>,</del>		38.2		50:00	34.27
<del>,</del>		38.4		60:00	34.14
<del>,</del>		38.7		75:00	34.03
ő		38.9		90:00	33.91
ő		39.0		105:00	33.83
ő		39.2	24	120:00	33.74
'ater Source					
	Amount Taken		Divers	sion Date & Time	
ontractor Certification ame of Journeyman responsible for drilling/constr			ertification No		

Company Name

M&M DRILLING CO. LTD.

Printed on 12/24/2014 10:51:21 AM

Copy of Well report provided to owner Date approval holder signed

### Government of Alberta

## Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its

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GoA Well Tag No. Drilling Company Well ID

GIC Well ID

1556533

	accuracy. The information on the	iis report will be retained in a pu	DIIC UAIADASE.	C	Date Report Received	2014/06/04
Well Identification and Lo						Measurement in Metric
Owner Name SOUTH ROCK LTD	Address P.O. BOX 460	Towr MED	י ICINE HAT	Province ALBERTA	Country CANADA	Postal Code T1A 7G2
Location 1/4 or LSD 4	SEC         TWP         RGE           32         26         3	W of MER Lot 5	Block Plan		al Description ATION HOLE #5	
	f m from m from	GPS Coordinates in De Latitude 51.258118 How Location Obtained Differential corrected ha	Longitude -114.	.396505	Elevation 127 How Elevation Obtaine Differential corrected h	
Drilling Information						
Method of Drilling Rotary - Mud		<b>Type of Work</b> Other				
<b>Proposed Well Use</b> Monitoring						
Formation Log	М	easurement in Metric	Yield Test Summa	ary	Ν	leasurement in Metric
Depth from Water ground level (m)	Lithology Description		Recommended Pun Test Date W	np Rate /ater Removal R	L/min ate (L/min) Sta	tic Water Level (m)
0.30	Black Topsoil					
6.40	Brown Clay		Well Completion		Ν	leasurement in Metric
11.89	Gray Gravel		Total Depth Drilled 13.72 m	Finished Well L 13.72 m	Depth Start Date 2014/05/08	End Date 2014/05/08
13.72	Gray Shale		Borehole	13.72111	2014/05/08	2014/05/08
U	NV	AL	Diameter (cm) 14.29 Surface Casing (if Size OD : Wall Thickness : Bottom at : Perforations From (m) To (r Perforated by Annular Seal Ben Placed from Amount Other Seals Ty Screen Type Slot	applicable) cm cm m Diameter Slot Width(cr tonite Chips/Tat 0.91 m to 300.00 Pc pe	Wall Thickness Top at Bottom at or Slot Length(cm)	: 6.35 cm : 0.516 cm : -0.91 m
Contractor Certification			Size OD :	6.35 cm	To (m) 13.72 ng Bottom Fittings Grain Size 10-	

NIEMANS DRILLING (1980) LTD.

Company Name

Page: 1 / 2

Date approval holder signed

2014/06/04

Copy of Well report provided to owner

Yes

## Government Water Well Drilling Report View in Imperial Export to Excel GIC Well ID 1556533

f Albe	erta 🗖				ntained in this repo his report will be re			esponsibility for	r its	GoA Well Tag N Drilling Compan Date Report Rec	y Well ID	2014/06/04
Well Identi	fication and Lo	ocation									Me	asurement in Metri
Owner Nam SOUTH RO	e CK LTD		Address P.O. BOX	460		Town MEDI			Province ALBERTA			Postal Code T1A 7G2
Location	1/4 or LSD 4	SEC 32	TWP 26	RGE 3	5	Lot			OBSER	al Description VATION HOLE #	<i>#</i> 5	
Measured fr		f m from m from			Latitude How Locatio		Longi	es (NAD 83) itude <u>-114.39</u> 55-10m		Elevation How Elevation Differential corr	Obtained	
Additional	Information										Ме	asurement in Metri
	rom Top of Casi n Flow Rate	-	_				's Flow Con	trol Installed Describe				
Recommer	nded Pump Rate	<u>)</u>			L/m	in Pum	o Installed					
Recommer	nded Pump Intak	ke Depth (	From TOC)		m	Туре	9		Make	Depth		
Did you E	Encounter Saline	e Water (>		DS) Gas		h		Geop		Completion <u>Yes</u> Taken	;	
	al Comments on		TALLED AN					ollected for P	otability	s	ubmitted t	to ESRD
				2 00110								
Yield Test Test Date		Start Tim	е	Sta	tic Water Level m			Tak	en From G	round Level	Me	asurement in Metr
	Water Remova Type Pemoval Rate		L/min									

If water removal period was < 2 hours, explain why

m

Depth Withdrawn From

Water Diverted for Drilling			
Water Source	Amount Taken	L	Diversion Date & Time
TOWN OF OKOTOKS	1818.44		2014/05/08 7:00 AM

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well CHAD NIEMANS	Certification No 46340A	
Company Name NIEMANS DRILLING (1980) LTD.	Copy of Well report provided to owner Yes	Date approval holder signed 2014/06/04

### Government of Alberta

## Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its

View in Imperial Export to Excel 1556534

GoA Well Tag No. Drilling Company Well ID

GIC Well ID

		acc	uracy. The inform	nation on th	is report will be retained in a	public database.	,	Date Report Receiv	
Well Identification	on and Lo	cation							Measurement in Metric
Owner Name SOUTH ROCK LI	TD		Address P.O. BOX 4	ŀ60		wn DICINE HAT	Province ALBERT/	Country CANADA	Postal Code T1A 7G2
Location 1/4	or LSD	SEC 32	TWP 26	RGE 3	W of MER Lot 5	Block Pla		nal Description	
4 Measured from B	oundary of		20	<u> </u>	GPS Coordinates in I	Decimal Degrees (NA		WATION WELL #0	
		n from			Latitude 51.25715	5 Longitude -	114.394328	Elevation	1277.00 m
	n	n from			How Location Obtain			How Elevation Ob	
					Differential corrected	handheld GPS 5-10m	n I	Differential correct	ed handheld GPS 5-10m
Drilling Informat	tion								
Method of Drillin Rotary - Mud					<i>Type of Work</i> Other				
Proposed Well U Monitoring	lse								
Formation Log				Me	asurement in Metric	Yield Test Sun	nmary		Measurement in Metric
Depth from ground level (m)	Water	Litholo	gy Descriptior	]		Recommended Test Date	Pump Rate Water Removal	L/min	Static Water Level (m)
5.79	Dearing	Brown	Sandy Clay &	Rocks					
8.84		Gray (	Gravel			Well Completion			Measurement in Metric
10.97		Gray S	Shale			Total Depth Drill 10.97 m	led Finished Wel 10.97 m	I Depth Start Date 2014/05/12	
						Borehole	10.97 11	2014/03/12	2014/03/12
						Diameter (	cm)	From (m)	To (m)
						14.29		0.00	10.97
						Surface Casing	(if applicable)	Well Casing Plastic	/Liner
					$\Lambda$	Size OE	):cr	<u>n</u> Size	OD : 6.35 cm
						Wall Thickness		m Wall Thickr	
				V I		Bottom a	<i>t</i> : m	_	pat: <u>-0.91 m</u>
						Perforations		Βοποι	mat: 10.97 m
							Diamete		
						From (m) T	Slot o (m) Width		Hole or Slot Interval(cm)
						Perforated by			
							Bentonite Chips/T		
						Placed from			-
						Amount Other Seals		Pounds	
						Other Seals	Туре		At (m)
						Screen Type	Slotted PVC		
						Size OE	6.35 cr		
						From (m	1)	To (m)	Slot Size (cm)
						Attachmen	t Attached To Ca	sing	
						Top Fitting	s Riser Pipe	Bottom Fitt	ings Plug
						Pack			
						Type Sand		Grain Size	10-20
						Amount	200.00 Pounds		
Contractor Cert		noible f	r drilling /	ruotion - f		0- "	ination Ma		
Name of Journey		ISIDIE †0	r ariiing/const	ruction of	well	46340	ication No )A		

NIEMANS DRILLING (1980) LTD.

Company Name

Page: 1 / 2

Date approval holder signed

Copy of Well report provided to owner

Yes

### Government Water Well Drilling Report

GIC Well ID GoA Well Tag No.

View in Imperial Export to Excel

1556534

f Alberta			data contained in this repo ion on this report will be ret			esponsibility fo	r its	GIC Well ID GoA Well Tag No. Drilling Company Date Report Rece	Well ID	556534 014/06/04
Well Identification	and Location	n							Meas	urement in Me
<mark>Owner Name</mark> SOUTH ROCK LTD		Address P.O. BOX 460		Town MEDIC	CINE HAT		Province ALBERTA	Country CANAD		Postal Code T1A 7G2
Location 1/4 or 4	LSD SEC 32		RGE W of MER 3 5	Lot	Block	Plan		nal Description	5	
Measured from Bou	ndary of			inates in Deci						
	m from		-	51.257155	Longi	tude -114.3	94328	Elevation		<u>m</u>
	m from		How Location			E 40-		How Elevation O		
			Differential of	corrected han	ianeia GPS	5-10m		Differential corre	cted nandni	eld GPS 5-10m
Additional Informa	ation								Meas	urement in Me
Distance From Top	of Casing to G	Ground Level	91.44 cm							
Is Artesian Flow				Is	s Flow Con	trol Installed				
Recommended Pu	mp Rate		L/mi	n Pump	Installed			Depth	m	
Recommended Pu	np Intake Dep	th (From TOC)					Make	,		
								Model (Output		
Did you Encount	er Saline Water	r (>4000 ppm TDS	) Dent	h	m	Well Disini	fected I Inon	Completion Yes		
Dia you Enoouna		Ga		h				Taken		
							Submitted to			
					Sampla Co		otability		bmitted to E	SRD
Additional Comn		CTOR CASING AN	ID CONCRETED INTO							<u> </u>
rield Test				_	_	Tak	en From G	round Level	Measu	urement in Me
Test Date	Start 7	Time	Static Water Level m							
Method of Water I	Туре									
Removal	Rate	L/min								
Depth Withdrawn	From	m								
lf water removal pe	eriod was < 2 h	ours, explain why								
Water Diverted fo	r Drilling									
Water Source TOWN OF OKOTO	KS		Amount Taken 2727.66	L				n Date & Time /12 7:00 AM		

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well CHAD NIEMANS	Certification No 46340A	
Company Name NIEMANS DRILLING (1980) LTD.	Copy of Well report provided to owner Yes	Date approval holder signed 2014/06/04

# Government

## Water Well Drilling Report View in Imperial Export to Excel

2014/05/13

Well Casing/Liner

Wall Thickness :

Slot

Length(cm)

Size OD

Top at :

Bottom at :

From (m)

cm

cm

m

Diameter or Slot

Width(cm)

Plastic

2014/05/13

To (m)

6.35 cm

0.518 cm

-0.91 m 12.19 m

Hole or Slot

Interval(cm)

f Alb	erta 🗖	The	driller supplies	the data con	tained in this reports report will be retained	t. The Provinc	ce disclaims re			GIC Well IE GoA Well T Drilling Cor Date Report	ag No. npany Well ID	1556535 2014/06/04
Well Ident	ification and	Location									Me	asurement in Metr
Owner Nar SOUTH RO			Address P.O. BOX	460	Town Province MEDICINE HAT ALBERTA					Country CANADA	Postal Code T1A 7G2	
Location	1/4 or LSD 4	SEC 32	<i>TWP</i> 26	RGE 3	W of MER 5	Lot	Block	Plan		nal Descript VATION W		
Measured	from Boundary	of m from m from			GPS Coordinates in Decimal Degrees (NAD 83) Latitude 51.255906 Longitude -114.392635 How Location Obtained						1273. ation Obtained	
Drilling Inf Method of Rotary - Mu	Drilling				<b>Type of Wor</b> Other	rk						
Proposed Monitoring												
Formation	n Log			Me	asurement in l	Metric	Yield Te	st Summa	ary		Me	easurement in Metr
Depth from ground leve			gy Descriptio	n			Recomme Test D	anded Purr ate W	np Rate /ater Removal		nin	: Water Level (m)
3.66		Brown	Clay & Rock	S								
11.28	3	Gray (	Gravel				Well Cor	npletion			Me	asurement in Metr
12.19	)	Gray S	Shale						Finished Well	- 1	art Date	End Date
									40 40		4 4 10 5 14 0	004 4/05/40

Perforated by

From (m)

Perforations

12.19 m

Borehole

Diameter (cm)

Size OD :

Bottom at .

Wall Thickness :

Surface Casing (if applicable)

### Annular Seal Bentonite Chips/Tablets

To (m)

12.19 m

Placed from	0.91 m	to	8.23 m	_	
Amount	250.00	Pounds	3		
Other Seals					
Туре			At (m)		
Screen Type Plastic Size OD :6.35 cm					
From (n 9.14			(m) .19	Slot Size (cm) 0.000	
	Attached To C				
Top Fittings Riser Pipe			Bottom Fitt	tings Plug	
Pack					
Type Sand			Grain Size	10-20	
Amount	200.00 Pounds				

Contractor Certification Name of Journeyman responsible for drilling/construction of well

Ur

**NVA** 

CHAD NIEMANS Company Name

NIEMANS DRILLING (1980) LTD.

Certification No 46340A Copy of Well report provided to owner Date approval holder signed 2014/06/04 Yes

Printed on 1/13/2015 4:52:27 PM

## Government Water Well Drilling Report View in Imperial Export to Excel

f Albo	erta 🗖			contained in this report. T this report will be retained					2014/06/04
Well Ident	ification and L	_ocation						Me	easurement in Metri
Owner Nan SOUTH RC		Addre P.O. B	ss OX 460		Town MEDICINE HAT		Province ALBERTA	Country CANADA	Postal Code T1A 7G2
Location	1/4 or LSD <b>4</b>	SEC TW/ 32 26	P RGE 3	5		Plan	OBSERVATION		
Measured f	rom Boundary o	of			es in Decimal Degre			1070	
		m from			255906 Long	tude -114.39		n <u>1273.</u>	
		m from		How Location (	ected handheld GPS	5 40		evation Obtained	ndheld GPS 5-10m
				Differential corr	ected nanoneid GPS	5-10m	I Different	tial corrected har	nanela GPS 5-10m
Additional	Information							Me	easurement in Metri
Distance F	From Top of Cas	sing to Ground Lev	el	91.44 cm					
Is Artesia	n Flow				Is Flow Con	trol Installed			
	Rate	L/min							
Recomme	nded Pump Rat	te		L/min	Pump Installed		Depth	m	1
Recomme	nded Pump Inta	ake Depth (From T	C)	m	Туре		Make	H.P.	
							Model	(Output Rating)	
Did you	Encounter Salin	ne Water (>4000 pp	om TDS)	Depth	m	Well Disinf	ected Upon Completic	on Yes	
			Gas		m		ohysical Log Taken		
			1 7				Submitted to ESRD		
					Sample C	ollected for P	otability	Submitted	to ESRD
Addition	al Comments o	n Well						_	
INSTALLE	D LOCKABLE I	PROTECTOR CAS	ING AND CO	ONCRETED INTO TH	IE GROUND.				
Yield Test						Tak	en From Ground Le	evel Me	easurement in Metrie
Test Date		Start Time	St	atic Water Level m					
	f <b>Water Remov</b> Type _ Removal Rate	ral	/min		_				
	hdrawn From		<u> </u>						

If water removal period was < 2 hours, explain why

Water Diverted for Drilling				
Water Source	Amount Taken	Diversion Date & Time		
TOWN OF OKOTOKS	1818.44 L	2014/05/12 7:00 AM		

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well CHAD NIEMANS	Certification No 46340A	
Company Name NIEMANS DRILLING (1980) LTD.	Copy of Well report provided to owner Yes	Date approval holder signed 2014/06/04

## Water Well Drilling Report

### View in Imperial Export to Excel

2095665

GoA Well Tag No. Drilling Company Well ID

GIC Well ID

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database. Date Report Received 2014/12/04 Well Identification and Location Measurement in Metric Address Postal Code Town Owner Name Province Country CIRCLE J RANCHES LTD COCHRANE RR 2 ALBERTA CANADA TOL OWO 1/4 or LSD SEC TWP RGE W of MER Block Additional Description Lot Plan Location SW 6 27 3 5 M. GILES GPS Coordinates in Decimal Degrees (NAD 83) Measured from Boundary of Elevation Latitude 51.274608 Longitude -114.417737 m m from How Elevation Obtained How Location Obtained m from Not Verified Not Obtained **Drilling Information** Method of Drilling Type of Work Unknown Well Inventory **Proposed Well Use** Domestic & Stock Formation Log Measurement in Metric Yield Test Summary Measurement in Metric Recommended Pump Rate L/min Water Lithology Description Depth from Water Removal Rate (L/min) Static Water Level (m) ground level (m) Bearing Test Date 25.60 Old Well Well Completion Measurement in Metric Total Depth Drilled Finished Well Depth Start Date End Date 25.60 m 1934/06/30 **Borehole** Diameter (cm) From (m) To (m) Surface Casing (if applicable) Well Casing/Liner Size OD : Size OD : cm cm Wall Thickness : cm Wall Thickness : cm m Bottom at : Top at : m Bottom at : m Perforations Diameter or Slot Hole or Slot Slot Width(cm) Interval(cm) To (m) Length(cm) From (m) Perforated by Annular Seal Placed from <u>m</u> to \_\_\_\_\_ m Amount Other Seals Туре At (m) Screen Type Size OD : cm From (m) To (m) Slot Size (cm) Attachment Top Fittings Bottom Fittings Pack Туре Grain Size Amount Contractor Certification Name of Journeyman responsible for drilling/construction of well Certification No UNKNOWN DRILLER11 11 Company Name Copy of Well report provided to owner Date approval holder signed

UNKNOWNDRILLINGCOMP11

Government

of Alberta

## Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its

View in Imperial Export to Excel 2095665

GoA Well Tag No. Drilling Co

GIC Well ID

Tag No.	
ompany Well ID	
	004

accuracy. The information on th	s report will be retained in a public database.	Date Repor	t Received 2014/12/04
Well Identification and Location			Measurement in Metric
Owner NameAddressCIRCLE J RANCHES LTDRR 2	<i>Town</i> COCHRANE		Country Postal Code CANADA TOL 0W0
Location1/4 or LSDSECTWPRGESW6273	W of MER Lot Block 5	M. GILES	on
Measured from Boundary of m from m from	GPS Coordinates in Decimal Degree Latitude 51.274608 Longit How Location Obtained Not Verified	ude -114.417737 Elevation	m ation Obtained ned
Additional Information			Measurement in Metric
Distance From Top of Casing to Ground Level Is Artesian Flow RateL/min	Is Flow Cont	rol Installed Describe	
Recommended Pump Rate	L/min Pump Installed	Depth	m
Recommended Pump Intake Depth (From TOC)	m Type		
			Dutput Rating)
Did you Encounter Saline Water (>4000 ppm TDS) Gas		Well Disinfected Upon Completion	
Additional Comments on Well ORIGINAL WELL REPORT NOT IN GIC. THE FOLLOWING APPLICATION RECEIVED ON DECEMBER 04, 1984. OWI WERE GETTING 1 GPM CONSISTENTLY. OWNER REPO DEEP. ALREADY DRILLED ANOTHER WELL 391000.	G INFORMATION WAS TAKEN FROM I VER REPORTS THIS WELL WAS BAIL	ED OUT TO 4 FEET OF WATER, TO	DWATER TESTING PROGRAM OOK 1 DAY TO RECOVER,
Yield Test       Test Date     Start Time	c Water Level m	Taken From Ground Lev	el Measurement in Metric
Method of Water Removal Type			
Removal Rate L/min			
Depth Withdrawn From m			
If water removal period was < 2 hours, explain why			
Water Diverted for Drilling			
Water Source Am	ount Taken L	Diversion Date & Tir	ne

Contractor Certification
Name of Journeyman responsible for drilling/construction of well UNKNOWN DRILLER11
Company Name

UNKNOWNDRILLINGCOMP11

Government

of Alberta

Certification No

11

Copy of Well report provided to owner Date approval holder signed

## Appendix D Residential Well Assessment Questionnaires

Groundwater Monitoring Plan

Summit Pit Project

Mountain Ash Limited Partnership

SLR Project No. 212.06650.00007

May 11, 2023





Water Well Reconnaissance Survey

	SITE RECONNAISSANCE CHECKLIST
Project Name:	WATERAM AGGREGATE RESOURCE
Project Number:	203.50065.00001 SLR Staff: K.Tin
Street Address:	3 - MW31-26-3 WER - 35181 BIG HILL SPRINGS FOAD
Property Type:	Private Residence Commerical/Industrial Other
Person/Resident Interviewed:	THUE THORESON, BRUCE WATERMAN
Date of Visit:	29 OCT 2014 Time: 10115
1. Well Owner Information	
Name:	BRUCE WATCRMAN
Street Address:	,
Contact Number:	Home: Business: Cell:
Email Address:	
2. Well User/Occupant of the	he Residence Using the Well
	Same as Well Owner
If different from well owner ple	ease fill out details below:
Name:	JULIE THORESON
Street Address:	
Contact Number:	Home: Business: Cell:
Email Address:	* 
3. Well Details	
Well Location	Lot: NW 31-26-3 WSA Concession: Township:
3A. Well Use	· ·
Water Use: NO DRINKING	, Domestic: No. of people using water from the well:
WATER	Livestock: No. of livestock using water from the well: 7 Horses + Sheer + Gen
	Lawn Watering: Acres/area covered: Approximate Amount:
	Irrigation: Acres/area covered:Approximate Amount:

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	SLR
3A. Well Use Continued	
Additional Equipment:	Pool:  Jacuzzi/Hot Tub:  Landscape water feature/fountain:    Other:
Private waste and water dispo	sal: Type (ex. Speotic tank): SLOTIC TANK
System description:	1006 GAL TANK
Distance to Well	75@ft     Direction from well (N, S, E, or W)
Well is	Uphill Downhill Same Grade as the waste water system
3B. Well Construction Deta	ails
Construction/Installation Date:	LNKNOWN PRE-1960 Contractor:
Type of Installation:	Drilled Dug Dug Other:
Diameter:	6/8 wcm Well Depth (m): 2~ 400ft
Screen? WNKNOWN	YES NO MOE Record Number:
	Screen length (m)
	Depth to top of screen (m)
Is the well accesible for sampl	ing? YES NO Confirmed Inferred
If no provide details:	WELL HEAD APPROXIMATELY EF 2n BELOW EROND LEVEL IN A PIT
Location of measurement (top	of pipe (TOP), ground surface):
SLR staff member collecting the	ne measurement:
Date of <u>original</u> measurement:	Original/initial water level depth (m)
Subsequent water level measu	rements
	Date Depth (m)
a	Staff
3C. Pumping Equipment	
Pump Type:	Suction-lift  Pumping Capacity
	Positive-submergence Age
How is the pump lubricated?	
Depth of intake setting:	Original (m) Present (m) <u>100+ ft</u> Pumping Rate (L/s)
Storage Tank:	Type: <u>CISTERN</u> Capacity: 1000 GAL
Additional Features:	Chlorinator Water softener Water filter Filter type:
	WD TREATMENT

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x1/105

		2
a <sup>e</sup>	×	<u></u> .
ж.		SLR
4. Well History		
How long have you owned, operated or lived on t	his property?7 MGA	~~S
Have you ever experienced any <u>previous</u> problem		s in wen
If so, when?		
What was the cause of the previous problem:	Drought	_ Pump Failure
	Plugging	_ Increased usage
	Interference	Contamination
If the problem was contamination, what water qu	ality changes were apparent? (Note	e any differences in taste, odour, colour or clarity)
SAND IN CISTERN, PIPES	i etc	
What action was taken to overcome this problem	? harsner + CI	1022 ATED
What were the effects of this action?	CLEARED PROBLEM	BUT PROBLEM CAME BACK
Did you ever have your well?	deepend, YES	NO 🖌
	cleaned, YES 🗹 or a new	NO SUUCED
X	well YES	NO J
If so why?	2	2
Outline briefly any previous repairs or changes in	pumping equipment, and dates	
5. Sample Details - TAKEN From Kit	ECHEN TAP - (NO TREATA	NENT ON SITE)
Date: <u>29/10/14</u>	Sample Collected?	YES 🗹 NO 🗌
Sample Name/Number:	Number of Bottles:	2
Field Analysis Harness	s Iror	Conductivity
pF	I Temperature	o Other
6. Contact Details	e Î	
Permission for future monitoring?	YES 🖌 NO 🗌	
Well Aware Booklet:		
Perferred contact time/method:	call/contact ahead	site visit
Contact by:	email phone 🗹	perferred contact number:
preferred contact	time (evening, weekday, morning,	etc.): Awy TIME DURING DAY



Note: R= Residental B=Barn C=Commercial I=Irrigation

.

A=Agricultural (Not a Barn)

7. Well Location Sketch Notes: shown location of water well(s), septic tanks and beds, laneways/roads, fences, site buildings, north arrow, and any distinguishing site features. Include Legend. N insteam House To thomas 10 NIGNWAM mp To TRONGUS 0 Tienst 1 LEGEND 7 North Building o Well Septic Tank and Bed Roadways and Lanes

Photograph Number/Name

8. Site Photograph Log

Well GPS

Not to Scale

Description

Number of Photos Taken:



Water Well Reconnaissance Survey

	SITE RECON	NAISSANCE CHECKLIST	
Project Name:	WATERMAN AGER	EGATE RESOLACE	
Project Number:	203.50065.00001		
Street Address:	SE 31-26-3 WSI	ч	,
Property Type:	Private Residence	Commerical/Industrial Othe	r
Person/Resident Interviewed:	MRS PARKER		
Date of Visit:	PHONE CALL 10 DEC 2014	Time:16-30	
1. Well Owner Information			
Name:	MPS PARKER		
Street Address:	Box 123 5	6 31 26 3 WSH	1
Contact Number:	Home:	Business:	Cell:
Email Address:			
2. Well User/Occupant of t	ne Residence Using the Well		аланын алын алын алын алын алын алын алы
	Same as Well Owner		
If different from well owner ple	ase fill out details below:		
Name:			
Street Address:			6
Contact Number:	Home:	Business:	Cell:
Email Address:			
3. Well Details			1
Well Location	Lot: IN House Si	E 31-26-3 WSM Concession:	Township:
3A. Well Use	whites)		
Water Use:	Domestic:	No. of people using water from t	he well: 2
	Livestock:	No. of livestock using water from	the well: 100 HEAD CATTLE
	Lawn Watering:	Acres/area covered:	Approximate Amount:
	Irrigation:	Acres/area covered:	Approximate Amount:
3	ARTESIAN WELLS		

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					SLR
3A. Well Use Continued	-				
Additional Equipment:	Pool:	Jacuzzi/Hot	Tub:	Landscape wa	ter feature/fountain:
	Other:			38	
Private waste and water dispo	sal:	Type (ex. S	pectic tank): Sé ၉۲	ic TANK	
System description:	3				
Distance to Well	100 FE		Direction from well (N	, S, E, or W)	\$ DEPENDS ON WELL
Well is	Uphill 🗹 💡		Downhill	Same Grade	as the waste water system
3B. Well Construction Deta	ils				
Construction/Installation Date:	1920 5	75.0	_ Contractor:	OWNER	
Type of Installation:	Drilled	Dug 🗹	Other:		
Diameter:	6" or 8"		Well Depth (m):	20-25 f	EET
Screen?	YES 🗹	NO 🗌			DE Record Number:
	Screen length (m)		_		
	Depth to top of scr	een (m)			
Is the well accesible for sampli	ng?	YES	NO √	. Co	nfirmed Inferred
lf no provide details:	IN THE	hon	\$E		
Location of measurement (top	of pipe (TOP), groun	id surface):			
SLR staff member collecting th	e measurement:				
Date of <u>original</u> measurement:			_ Original/initial water	level depth (m)	
Subsequent water level measu	rements		<u>.</u>	·	6 down
	Date				
	Depth (m) Staff				
2 			II		
3C. Pumping Equipment	an a				
Pump Type:	Suction-lift	SUBMER	SIBLE	Pumping Capa	city
20 20	Positive-submerger	nce		Age	
How is the pump lubricated?					
Depth of intake setting:	Original (m)		Present (m)	Pu	mping Rate (L/s)
Storage Tank: 🛛 🚺	Туре:			Capacity:	
Additional Features: NO	Chlorinator MEN T		Water softener	Water filter 🗌	Filter type:

		SLR
4. Well History		
How long have you owned, operated or lived or Have you ever experienced any <u>previous</u> proble If so, when?	ms with your well?	
What was the cause of the previous problem:	Drought Pump Failure Plugging Increased usage Interference Contamination uality changes were apparent? (Note any differences in t	aste, odour, colour or clarity)
What action was taken to overcome this probler	n?	
What were the effects of this action?		
Did you ever have your well?	deepend,     YES     NO       cleaned,     YES     NO       or a new     YES     NO       well     YES     NO	
If so why?		
Outline briefly any previous repairs or changes i	n pumping equipment, and dates 1966/67 fv	rnf S
5. Sample Details		
Date: Sample Name/Number:	Sample Collected? YES NO	
Field Analysis Harnes	ss Iron H Temperature	Conductivity
6. Contact Details		
Permission for future monitoring? Well Aware Booklet:	YES NO - NOT MOTIN	AFTER XMAS
Perferred contact time/method: Contact by:	call/contact aheadsite visit email phone perferred contact nu	ımber:
preferred contac	t time (evening, weekday, morning, etc.):	

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### 7. Well Location Sketch

Notes: shown location of water well(s), septic tanks and beds, laneways/roads, fences, site buildings, north arrow, and any distinguishing site features. Include Legend.

			LEGEND
			↗ North □ Building
3			● Well 冊 Septic Tank and Bed
			Roadways and Lanes
			<u>Note:</u> R= Residental B=Barn
			C=Commercial I=Irrigation
Not to Scale			A=Agricultural (Not a Barn)
Well GPS	1	<u>£</u>	
8. Site Photograph Log			
Number of Ph	otos Taken:		
Photograph Number/Name	Description		

Water Well Reconnaissance Survey



	SITE RECONN	AISSANCE CHECKI	_IST	
Project Name:	WATGEMAN &	AGGLEGATE	Resonace	
Project Number:	203.50065.00001	SLR Staff:	R. Tim	
Street Address:	NE 31-26-3 .W	ISM		
Property Type:	Private Residence	Commerical/Industrial	Other	X
Person/Resident Interviewed:	CANVIN &	RAWN.	2	
Date of Visit:	29 007 2014	Time:	12:00	
1. Well Owner Information				
Name:	CALVIN RAWN			
Street Address:	As above			
Contact Number:	Home:	Business:	Cell: (	
Email Address:				
2. Well User/Occupant of t	he Residence Using the Well			
	Same as Well Owner			
If different from well owner pl	ease fill out details below:			
Name:				;
Street Address:				
Contact Number:	Home:	Business:	Cell:	
Email Address:				
3. Well Details	2)	о С		
Well Location	Lot: NE 31-26-3 WSM	Concession:	Township:	
3A. Well Use -2	wens			
Water Use:	Domestic:	No. of people using wa	ater from the well: 🔗 😤	(ww 2)
2	Livestock:	No. of livestock using	water from the well: 40 Norses	(ww3)
	Lawn Watering:	Acres/area covered: _	Approximate Amount:	<u></u>
	Irrigation:	Acres/area covered: _	Approximate Amount:	

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					SLR <sup>®</sup>
3A. Well Use Continued					
Additional Equipment:	Pool: Other:	Jacuzzi/Hot	Tub:	Landscape wate	r feature/fountain:
Private waste and water dispo	sal:	Type (ex. Sj	oectic tank): Se	Pric TANK	
System description:					<i>6</i> 9
Distance to Well	-300 ft	÷	Direction from well (	N, S, E, or W)	GAST
Well is	Uphill		Downhill	Same Grade 🔽	as the waste water system
3B. Well Construction Deta	ails				
Construction/Installation Date:			Contracto	r:	
Type of Installation:	Drilled 📝	Dug 🗌	Othe	r:	saren
Diameter:	6 war	_	Well Depth (m	): 177 + 13	SS A
Screen?	YES		a.	MOE	Record Number:
	Screen length (m)		-:		
	Depth to top of sc	reen (m)			
Is the well accesible for sampl	ing?	YES 🚺 (w	ω2) NO 🗹 (ω	ر عر	irmed Inferred
If no provide details:	WW3 BLO	cked @	27.5mbTop		12
Location of measurement (top	of pipe (TOP), grou	nd surface):	TOP		
SLR staff member collecting the	ne measurement:	Rober	T TILL		M.
Date of original measurement:	29/007/201	4	_ Original/initial wate	er level depth (m)	29.65 mb Tof (wwz)
Subsequent water level measu	<u>rements</u> – ωω 2	- 60666	r installed		
	Date Depth (m)				
	Staff				
3C. Pumping Equipment		342			
Pump Type:	Suction-lift	SUBM	GRSIBLE	Pumping Capacit	V streamer
	Positive-submerge	<u> </u>		Age	10 YRS + SYRS
How is the pump lubricated?	U		<u></u>		
Depth of intake setting:	Original (m)		Present (m)	1004 + 1254 iPum	ping Rate (L/s)
Storage Tank:	Туре:	CISTER	<b>v</b>		WWZ WW3 10 GAL (HOWSE) + "PSO GAL
Additional Features:	Chlorinator		Water softener 📝	Water filter 🗹	Filter type: MARTICICA
			house	Konse	

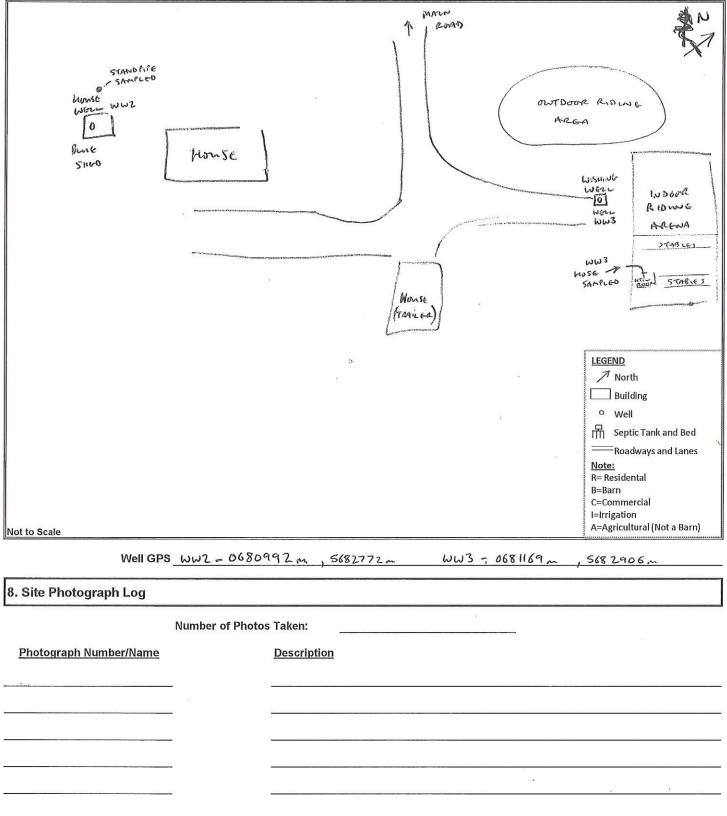
16 Mar.

-4 M								
							SLR	3
4. Well History								
How long have you owned, oper	ated or lived on t	his property?	?	10 41	25			
Have you ever experienced any j	<u>previous</u> problem	s with your v	vell?	NC	>			
If so, when?								
What was the cause of the previo	ous problem:	Drought			Pump Fa	ilure		•
		Plugging		and presented and	Increase	d usage 🥂	۹۹۰۰ 	
		Interference	ə	Management of the second	Contami	nation	100 LUNG	
If the problem was contamination	n, what water qua	lity changes	were a	pparent? (Not	e any differe	nces in taste	e, odour, colour	or clarity)
N/A								
What action was taken to overco	me this problem?	N/A	Q.				i	
What were the effects of this act	ion?	N/A						
Did you ever have your well?		deepend,	YES		NO 🔽			
		cleaned,	YES		NO 🗾	<i>(</i>		
		or a new well	YES		NO -	and the second		
h	f so why?							
Outline briefly any previous repai	irs or changes in	pumping equ	lipmen	, and dates	REPLAC	CED Hor	se hump	
5. Sample Details ωω2 - s	TANDFIRE AT BAI	ck of fump	Hous	e, ww3 - 1	HOSE in s	TABLES (N	O TREATMENT)	
	19 OCT 2014			ple Collected?		NO 🗌		
Sample Name/Number:b	$w_2 + w_3$	_	Num	ber of Bottles:	2 EACH			
Field Analysis	Harness			Iro	n		Conductivity	ST7 MS/cm
	рН	7.62	-	Temperatur	e_6.4°C	_	Other	
6. Contact Details		a) Al						
Permission for future monitoring	?	YES	NO					
Well Aware Booklet:	Safaran .							
Perferred contact time/method:		call/contact	ahead	1	site visit	]		
Contact by:		email	phone		perferred c	ontact num	oer:	<u> </u>
q 	referred contact f	ime (evening	l, week	day, morning,	etc.):	Durken G Hon A		AGA SON ABL

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### 7. Well Location Sketch

Notes: shown location of water well(s), septic tanks and beds, laneways/roads, fences, site buildings, north arrow, and any distinguishing site features. Include Legend.



Water Well Reconnaissance Survey



	SITE RECON	NAISSANCE CHECKLIST	
Project Name:	WATGEMAN AGG	REGATE RESOURCE	
Project Number:	203.50065.0000	SLR Staff: R.TILS	
Street Address:	5W 31-26-03	SWSM	
Property Type:	Private Residence	Commerical/Industrial Other_	
Person/Resident Interviewed:	JOHN NULGTEN	2	
Date of Visit:	30 OCTOBER 2014	Time: <u>11: 20</u>	
1. Well Owner Information			
Name:	JOHN NUGTER		
Street Address:	AS AGOVE	6	
Contact Number:	Home:	Business: C	ell:
Email Address:			
2. Well User/Occupant of th	he Residence Using the We	I	
	Same as Well Owner		
lf different from well owner ple	ase fill out details below:		
Name:			
Street Address:			
Contact Number:	Home:	Business: Co	ell:
Email Address:			
3. Well Details			
Well Location	Lot: 5W.31-26-03 W5M	Concession: To	wwnship:
3A. Well Use			-
Water Use:	Domestic:	No. of people using water from the	well: 3
	Livestock:	No. of livestock using water from th	e well: 25 CATTLE, 5 Houses
	Lawn Watering:	Acres/area covered:Ar	proximate Amount:
1	Irrigation:	Acres/area covered:Ar	pproximate Amount:
ii.			

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3A. Well Use Continued					
Additional Equipment:	Pool:	Jacuzzi/Ho	t Tub:	Landscape water fea	ture/fountain:
	Other:		in the Br	82	
Private waste and water dispo	sal:	Type (ex. S	pectic tank): Ser-	TIC TANKS (2	TANKS)
System description:	1 TANK	for hi	MSE + 1 G	in RENTON	house
Distance to Well		_	Direction from well (N	N, S, E, or W)	
Well is	Uphill 🗌		Downhill	Same Grade	as the waste water system
3B. Well Construction Deta	nils				
Construction/Installation Date:	1990		Contractor	: Lon's whiter	wer DRILLING
Type of Installation:	Drilled	Dug 🗌	Other	:	
Diameter:		=6	Well Depth 📢	: IISA-	
Screen?	YES 🖌	NO 🗌		MOE Rec	ord Number:
	Screen length (m)		— :	350	194
*	Depth to top of sc	reen (m)	1. <del></del>		
Is the well accesible for sampli	ng?	YES √	NO	Confirme	d 🗹 Inferred 🗌
If no provide details:					
Location of measurement (top	of pipe (TOP), grou	nd surface):	TOP		
SLR staff member collecting the	e measurement:	REBERT	r Tim		
Date of <u>original</u> measurement:	30 OCTOBER	2014	Original/initial wate	r level depth (m)	134 mb Toc
Subsequent water level measu	2 01 22 - 1422 - j	r	1		
	Date Depth (m)				
	Staff			·	
3C. Pumping Equipment					
Pump Type:	Suction-lift		C	Pumping Capacity	30 GAR/MIN
	Positive-submerge	ence	SUBMOKSIBLE	Age	2006
How is the pump lubricated?	·····			A CONTRACTOR OF A	
Depth of intake setting:	Original (m)		_ Present (m)	100ft ? Pumping	Rate (L/s)
Storage Tank:	Туре:	N/A		_ Capacity:	
Additional Features:	Chlorinator		Water softener	Water filter	Filter type:
		No	TREATMENT		

		SLR
4. Well History		
How long have you owned, operated or lived o Have you ever experienced any <u>previous</u> probl If so, when?	ems with your well? NO	
What was the cause of the previous problem:	Drought Pump Failure Plugging Increased usag Interference Contamination quality changes were apparent? (Note any differences i	
What action was taken to overcome this proble	m?	
What were the effects of this action? Did you ever have your well?	deepend, YES NO	:
lf so why?		
Outline briefly any previous repairs or changes	in pumping equipment, and dates	hune 2006
5. Sample Details		
Date: <u>אססד 2019</u> Sample Name/Number: <u>שש</u> Field Analysis Harne	Number of Bottles:	Conductivity_606_hS/cm
6. Contact Details		
Permission for future monitoring? Well Aware Booklet:	YES NO	
Perferred contact time/method: Contact by:	call/contact ahead site visit email phone perferred contact	t number:

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### 7. Well Location Sketch

Notes: shown location of water well(s), septic tanks and beds, laneways/roads, fences, site buildings, north arrow, and any distinguishing site features. Include Legend.

WIGHWAM 567 SWAMIT A SITE	6-64EGATE 5	-	1
	HILL SLORE HONSE BRRU DIWWQ		
	ал. С.	Survey	LEGEND
			↗ North Building
			o Well
			Septic Tank and Bed
			<u>Note:</u> R= Residental B=Barn C=Commercial I=Irrigation
Not to Scale			A=Agricultural (Not a Barn)
Well GPS 0680258	5682090		
8. Site Photograph Log			
Number of Photo	os Taken:		
Photograph Number/Name	<u>Description</u>		
		*	

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