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15 October 2021
File: WM571

Box 1, Site 202 RR2
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Attn: Mr. Devin Chobanik
Land Developer

Dear Sir:

Subject: Preliminary Hydrogeologic Investigation
Proposed Subdivision
Located on SE 01-19-21-W2M
Near Regina, Saskatchewan

1 Introduction

Mr. Chobanik proposes to develop a 5 lot subdivision on a portion of SE 01-19-21-W2M. The site is located southeast of Lumsden and adjacent Highway 734. A regional location plan showing the study location is shown in Drawing WM571-1. Drawing WM571-2 presents a local site plan showing the proposed development.

The proposed development will include independent water supply with groundwater wells. The Rural Municipality (RM) of Lumsden has requested a report confirming the presence of a suitable groundwater source for the proposed development as well as the existing surrounding users. Specifically, item 9(2.1) of the RM's Subdivision Regulations state that:

9(2.1) An approving authority may require an applicant to provide the following information identifying a sufficient source of potable water for any subdivision containing parcels intended for residential use or identifying a source of suitable quality water for use requiring significant supplies of water:

(a) in the case of a ground water supply located within the subdivision or to be developed for the parcels in the subdivision, an engineering report of sufficient tests to prove the adequacy and quality of the source.

WaterMark Consulting Ltd. was commissioned on in Spring 2021 to assist Mr. Chobanik with the investigation to address the RM's concerns. The hydrogeologic investigation is presented herein.

The specific objectives of the hydrogeologic investigation are:

- To determine the physical, hydraulic and geochemical properties of the aquifer and confirm its suitability for groundwater use for the proposed development;
- To interpret typical well installations and confirm its suitability for the proposed development; and,

- To ensure the proposed development does not negatively impact neighbouring well users.

The following scope of work was developed to achieve the above objectives:

- Collect and summarize all regionally mapped geologic and hydrogeologic information of the study area including mapping, water well driller records, geological mapping, etc.;
- Characterize the regional and local geologic setting based upon the available mapped and water well information;
- Document all private wells and yard sites within 3.2 km of the subject property;
- Drill, log the subsurface geology, and construct a new water supply well;
- Conduct a pump test on the new well, using an existing water supply well as an observation well.
- Sample the well water and analyze with respect to potable water quality standards;
- Interpret the aquifer and well hydraulic properties;
- Assess the short and long termed sustainability of the aquifer to supply water for the proposed development;
- Predict and assess the impacts of the development on existing neighbouring well users; and,
- Provide recommendations for well design, pump capacity, and other considerations for groundwater supply development.

2 Project Overview

Mr. Chobanik proposes to develop a 28 ha. parcel of land into five residential lots. The parcel of land comprises the half of SE 01-19-21-W2M south of the CNR right of way. A local site plan is provided in Drawing WM571-2. Lot 1 has been developed in the southwest corner of the subdivision, including a water supply well. This well is discussed in Section 4.1.

The water supply requirements for the proposed developments are based on an average requirement of 450 L/day (100 imperial gallons per day) per person; 4 persons per household; 5 households overall. This equates to 1,800 L/day per household and 9,000 L/day for the subdivision as a whole. Private well users commonly operate their wells intermittently at a flow rate of roughly 0.8 L/s (10 Igpm); consistent with an operating duration of 40 minutes per day per household.

The geochemistry of the aquifer was also tested and compared to current drinking water standards. Measured concentrations must not exceed the standards established in the *Saskatchewan Municipal Drinking Water Guidelines*.

3 Regional Setting

3.1 Regional Geology

The site is located approximately 8 km southeast of Lumsden on a lacustrine plain with very little relief. Ground elevation is approximately 563 mASL across the site. The geologic and

hydrogeologic setting of the study area was defined from on-site drilling, available geologic mapping, and from knowledge of the region. A regional geological cross section is provided in Drawing WM571-3.

The geologic stratigraphy is comprised of roughly 10 m of lacustrine clay at surface underlain by a thick sequence of glacial till including the younger Saskatoon Group till and the older Sutherland Group till. Collectively, these glacial and post-glacial sediments are estimated to be in the order of 40 to 65 m thick.

The Saskatoon Group is interpreted to be present from surface to a depth of approximately 20 m below the site consisting of roughly 10 m of lacustrine clay underlain by roughly 10 m of clay-rich till. Various sand deposits occur within the Saskatoon Group, some of which form regional aquifers of interest as discussed in Section 3.2 below. Sutherland Group till occurs beneath the Saskatoon Group sediments. This till deposit is approximately 15 m to 20 m thick, unoxidized (i.e. unfractured) and occurs at depths generally below 540 mASL in the region. Channelized intraglacial sand and gravel deposits occur sporadically within this deeper unit.

Pre-glacial bedrock valleys have been mapped in the region, however not below the study area. Where these pre-glacial valleys occur, a relatively thick sequence of pre-glacial granular sediment, known as the Empress Group deposits, commonly partially infill the valleys. Where present, we expect the coarse sediments to occur below depths of 50 m. Empress Group sediments have not been mapped at the subject property, however they have been encountered to the east and south of the property and it is possible that the margins of this deposit underlie the site.

The bedrock surface underlies the Empress Group deposit, or Sutherland Group sediments where the Empress Group deposits are absent. The bedrock surface occurs between 525 mASL to 500 mASL in the region, corresponding to a depth of roughly 40 to 65 m. The bedrock surface is comprised of Bearpaw Formation shale, an Upper Cretaceous non-calcareous silty clay shale devoid of groundwater resources.

3.2 Regional Groundwater Resources

Regional mapping has identified several aquifers in the region:

- Saskatoon Group Aquifers are the shallowest aquifers underlying the site and are reliably present in the area. For this reason, they are the preferred groundwater source for the proposed development. The Saskatoon Group Aquifers are:
    - The Condie Aquifer is mapped to the northwest of the property at depths in the 10 m range, with thicknesses also in the order of 10 m.
    - The Upper and Lower Floral Aquifers are mapped within the subject property. The Upper Floral Aquifer is mapped at a depth of roughly 15 m to 20 m with a thickness in the order of 5 m.

Regional mapping suggests that the sand units comprising the Condie Aquifer and the Upper Floral Aquifer may actually converge in the vicinity of the site at a depth between 10 m to 15 m. The field investigation confirmed the presence of sand and gravel underlying the site with an upper surface ranging in depth from 11.6 m to 15.6 m depth and in the order of 4.5 m thick.

- Sutherland Group Aquifer is present in the region, although it is not believed to occur below the site. This aquifer has been mapped to the northeast and southwest, generally at depths greater than 40 m.

- Empress Group Aquifer is also present in the region and not believed to occur below the site. This aquifer has been mapped to the south and southeast of the subject property, also at depths generally greater than 50 m.

3.3 Climate

Temperature and precipitation Normal data was taken from Environment Canada data measured at Regina, Saskatchewan between 1981 and 2010. Evaporation data was taken from PFRA data also collected in Regina between 1911 and 2004. Climate Normals are summarized in Table 3.1.

The mean annual precipitation for the Regina area is 390 mm, with the majority of rainfall occurring between the months of May and September. Over the course of a typical year, the annual precipitation is comprised of 309 mm of rainfall and 81 mm (water equivalent) of snowfall.

Table 3.1
Climate Normals for Study Area

Parameter	Month												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature													
Daily Average (°C)	-14.7	-11.7	-4.8	4.8	11.3	16.2	18.9	18.1	11.8	4.3	-5.2	-12.4	3.1
Daily Maximum (°C)	-9.3	-6.4	0.4	11.6	18.5	22.8	25.8	25.5	19.1	11	0.1	-7.1	9.3
Daily Minimum (°C)	-20.1	-17	-9.9	-2	4.1	9.5	11.9	10.7	4.6	-2.4	-10.5	-17.7	-3.2
Precipitation													
Rainfall (mm)	0.6	0.8	5.1	18.1	47.6	70.9	66.9	44.8	32.1	18.3	3.1	0.5	308.9
Snowfall (cm)	19.4	11.4	18.8	6.9	3.6	0	0	0	0.7	6.9	13	19.5	100.2
Precipitation (mm)	15.3	9.4	19.7	24.1	51.4	70.9	66.9	44.8	32.8	24.5	14.2	15.7	389.7
Gross Evaporation													
Minimum (mm)	0	0	0	32.4	105.7	118.2	125.5	132.5	88	36.9	0	0	721
Maximum (mm)	0	0	0	93.9	218.8	287.7	271.1	274.1	168.9	93.3	0	0	1311
Average (mm)	0	0	0	58	152	170.3	188.9	184.5	126.5	60.8	0	0	941
Net Evaporation (mm)	-15.3	-9.4	-19.7	33.9	100.6	99.4	122	139.7	93.7	36.3	-14.2	-15.7	551.3

Notes: Temperature & precipitation data collected from Environment Canada Station at Regina, SK (1981-2010)
Gross Evaporation data collected from PFRA Station at Regina, SK (1911-2004)

3.4 Neighbouring Private Wells

There are 117 publicly available water well driller records (WWDR) available within 3.2 km of the boundaries of the proposed development. Of these, 58 are categorized as withdrawal wells, including 49 domestic, 6 municipal, 1 industrial and 2 recreational. The withdrawal wells are listed in Table 3.2 and shown graphically in Drawing WM571-4. All of the supply wells are completed in Quaternary sediments. A rough delineation of the data suggests 22 wells in the Condie Aquifer, 29 wells in Floral Group Aquifers and 7 wells in Sutherland or Empress Group Aquifers.

Table 3.2
Neighboring Well Users

WWDR	Distance (km)	Owner	Water Use	Well Use	Aquifer *
Within 800 m radius					
214452	on site	CHOBANIK	Domestic	Withdrawal	Floral
98265	0.03	HOWSE	Domestic	Withdrawal	Floral
99439	0.2	SCHOTZ	Domestic	Withdrawal	Floral
115028	0.3	LUMSDEN	Municipal	Withdrawal	Condie
239673	0.4	SCHNEIDER	Domestic	Withdrawal	Floral
49554	0.4	HINTON	Domestic	Withdrawal	Floral
89820	0.6	SCHICK	Domestic	Withdrawal	Floral
100884	0.6	DIELSCHNEIDER	Domestic	Withdrawal	Condie
216491	0.6	WOZNIAK	Domestic	Withdrawal	Condie
208871	0.6	KUZYK	Domestic	Withdrawal	Floral
89198	0.6	THOMPSON	Domestic	Withdrawal	Sutherland/Empress
43233	0.6	HINTON	Domestic	Withdrawal	Floral
45206	0.6	HINTON	Domestic	Withdrawal	Floral
Within 1.6 km radius					
116107	0.9	FLOWING SPRINGS GC	Recreation	Withdrawal	Floral
213412	0.9	FLOWING SPRINGS GC	Recreation	Withdrawal	Floral
11710	1.2	MURRAY	Domestic	Withdrawal	Floral
86147	1.2	GIELIS	Domestic	Withdrawal	Floral
115031	1.2	LUMSDEN	Municipal	Withdrawal	Condie
62226	1.3	BROWN	Domestic	Withdrawal	Floral
209861	1.3	WALTER	Domestic	Withdrawal	Condie
83715	1.3	HARKER	Domestic	Withdrawal	Condie
225048	1.3	DAKINE HOMEBUILDE	Industrial	Withdrawal	Floral
92344	1.3	NICHOLS	Domestic	Withdrawal	Condie
114320	1.3	MCGEOUGH	Domestic	Withdrawal	Condie
114321	1.3	BARTH	Domestic	Withdrawal	Condie
111131	1.3	SCHLOSSER	Domestic	Withdrawal	Condie
84610	1.3	PETERS	Domestic	Withdrawal	Sutherland/Empress
208699	1.6	BROWN	Domestic	Withdrawal	Floral
Within 3.2 km radius					
216204	1.7	LUMSDEN	Municipal	Withdrawal	Condie
229214	1.7	WEBFAM DEVELOPMI	Municipal	Withdrawal	Floral
229213	1.7	WEBFAM DEVELOPMI	Municipal	Withdrawal	Floral
206576	1.7	GEROCK	Domestic	Withdrawal	Sutherland/Empress
115034	1.8	LUMSDEN	Municipal	Withdrawal	Condie
11707	2.1	GEROCK	Domestic	Withdrawal	Floral
81901	2.1	STEWART	Domestic	Withdrawal	Floral
116104	2.1	HILLIER	Domestic	Withdrawal	Floral
111905	2.1	ENGLISH	Domestic	Withdrawal	Condie
43234	2.1	GEROCK	Domestic	Withdrawal	Sutherland/Empress
117820	2.1	PORTH	Domestic	Withdrawal	Sutherland/Empress
234322	2.1	FAHLMAN	Domestic	Withdrawal	Sutherland/Empress
84488	2.4	W H ENGLISH & SONS	Domestic	Withdrawal	Floral
235443	2.4	FRANKL	Domestic	Withdrawal	Floral
96727	2.4	THIBAULT	Domestic	Withdrawal	Condie
105539	2.4	FAIRFORD	Domestic	Withdrawal	Condie
99095	2.6	ROTH	Domestic	Withdrawal	Condie
52135	2.8	VOSS	Domestic	Withdrawal	Floral
228197	2.8	REGINA FISH & GAME	Domestic	Withdrawal	Floral
94707	2.8	BANGSUND	Domestic	Withdrawal	Floral
103964	2.8	ENGLISH	Domestic	Withdrawal	Sutherland/Empress
11826	2.9	ULMER	Domestic	Withdrawal	Condie
88696	2.9	GILLMORE	Domestic	Withdrawal	Condie
90546	2.9	GILMOR	Domestic	Withdrawal	Floral
218621	2.9	GILMOUR	Domestic	Withdrawal	Condie
97898	2.9	COOK	Domestic	Withdrawal	Condie
107355	2.9	ULMER	Domestic	Withdrawal	Condie
7940	2.9	DALY	Domestic	Withdrawal	Floral
92780	2.9	DALY	Domestic	Withdrawal	Floral
9197	3.0	ENGLISH	Domestic	Withdrawal	Condie

4 Site Investigation

4.1 Existing Well

Mr. Chobanik drilled and installed a water well on the site in 2015 as a water supply for Lot 1 in the southwest corner of the proposed subdivision. That well is referred to in this document as PW1 and its location is shown in Drawing WM571-2. The well is completed in a Saskatoon Group aquifer, likely the Regina Aquifer, which was encountered at a depth of 11.6 m to 15.2 m and screened at the 13.5 to 15.0 m interval. The WWDR for PW1 is attached as Appendix A.

4.2 Drilled Well

On 14 July 2021 WaterMark Consulting Ltd. oversaw the drilling, construction, and development of a second well on the Lot 2 property. This well, referred to as PW2, was constructed for two purposes: 1) to confirm the presence, quantity, and quality of groundwater resources at the proposed development site; and 2) to be used as a water supply well in future development of Lot 2, pending the necessary approvals.

The well was drilled by Solie Drilling Ltd., of Balgonie, Saskatchewan, and the shallow geology logged by WaterMark Consulting Ltd. personnel. The bore hole log for PW2 is appended to this document. The well is interpreted to be in the Regina Aquifer which was encountered at a depth of roughly 14.5 m to 19.0 m and screened at the 16.0 m to 19.0 m interval. Drawing WM571-5 shows the well construction.

4.3 Pumping Test

WaterMark Consulting Ltd. conducted a pumping test on PW2 on 16 July 2021. For the test, PW2 was pumped for six hours at an average constant flow rate of 1.34 L/s (21.2 Igpm) and water depth was recorded both at PW2 and at an observation well (PW1) located nominally 145 m away. After six hours of steady rate pumping, the aquifer recovery was measured for one hour at PW2. The raw data from the pump test is provided in Appendix B. A plot of the measured drawdown for the duration of the pump test is show in Figure 1.

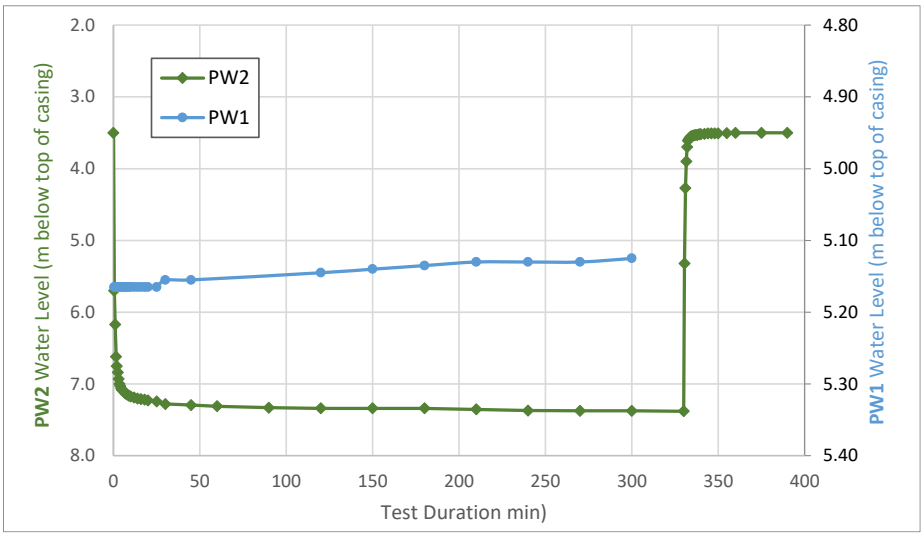


Figure 1 – Measured depth to water at PW2 (left axis) and PW1 (right axis) during steady rate pump test

Groundwater in the production well (PW2) exhibited normal behavior during the pump test, however groundwater levels at the monitoring well (PW1) actually increased slightly during the pumping test. In the absence of external influences we would PW1 to have a similar, albeit dampened, drawdown curve as PW2. External influences resulted in a rise in the PW1 water levels and are discussed further in Section 5.1.

5 Discussion

5.1 Extent of Aquifer

We interpret the site to be near the southwest edge of the Floral Aquifer. Water wells PW1 and PW2 confirm the presence of the aquifer in the southwest corner of the site in Lots 1 and 2. Based on regional mapping we interpret the aquifer to extend west and north of these wells through the entire subdivision.

5.2 Pumping Test Trends

Drawdown within the pumping well (PW2) indicated a total drawdown of 3.88 m after 330 minutes of operating at 1.34 L/s. After roughly 90 minutes of recovery the residual drawdown in PW2 was 0.10 m, indicating the well was 97% recovered. Over this same pumping interval the observation well, located 145 m away identified a rise in the water level of 0.04 m. The two (2) water supply wells are completed into the same aquifer as shown in Drawing WM571-3.

The rising water level in the observation well is not indicative of a typical hydraulic response. It is obvious that the observation well was responding to a secondary and more influential factor which caused an overall recovery in the piezometric surface at the observation point. Using typical aquifer properties we would expect drawdown in the range of 5 cm to 10 cm, yet the actual response was a recovery of 5 cm during the pumping test. Although unusual, this response is generally indicative of a large and healthy aquifer.

5.3 Aquifer Hydraulic Properties

The aquifer characteristics were determined from the pumping test data. The Theis method of analysis was used to evaluate the measured rate of drawdown and recovery within production well PW2 and to characterize various aquifer properties. Detailed results of the PW2 pump test analysis are presented in Appendices C and D. The analysis found the aquifer and production well to have the following properties:

- Transmissivity: 300 m^2/day
- Storativity: $2x10^{-4}$
- Hydraulic conductivity: $2x10^{-4}$ m/s
- PW2 Well losses: 1.7 m at flow rate of 1.34 L/s

Transmissivity describes the degree to which an aquifer allows water to flow through it. Storativity is a dimensionless measure of the volume of water that will be discharged from an aquifer per unit area of the aquifer and per unit reduction in hydraulic head. Hydraulic conductivity is a measure of how quickly water can pass through soil. The aquifer transmissivity, storativity and hydraulic conductivity determined from the PW2 well are indicative of a coarse sand and gravel aquifer capable of sustaining a moderate to high yielding well.

Well losses are created by inefficient hydraulic connection between the well and surrounding aquifer and by turbulent flow entering the well screens and are a property of the well itself, rather than the aquifer. Quantifying well losses is critical for establishing sustainable well yields since head loss from both aquifer drawdown and well losses must be less than the available drawdown at the well site.

Figure 2 shows the measured drawdown data at PW1 and PW2 and the theoretical drawdown based on Theis equations using the values listed above.

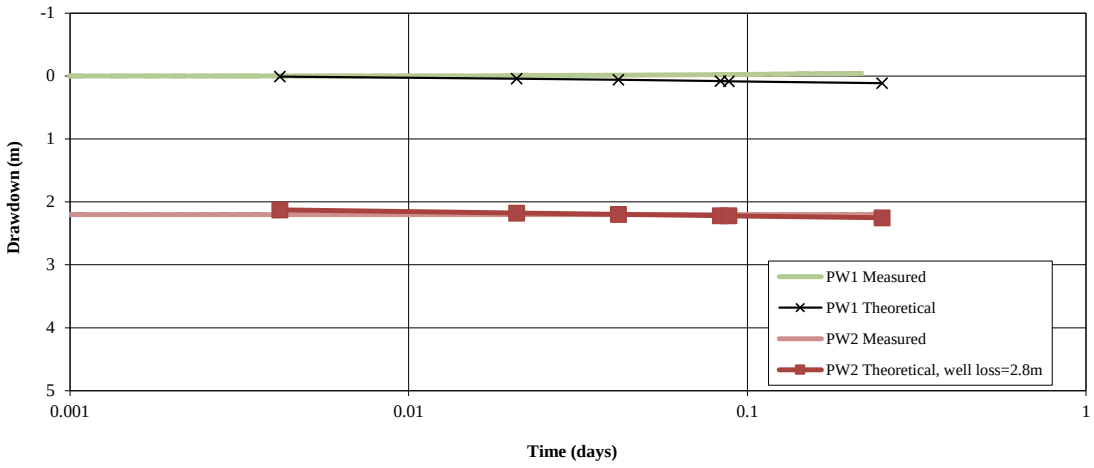


Figure 2 – Measured and Theoretical drawdown at the production well (PW2) and observation well (PW1)

Drawdown occurring within the production well (PW2) correlates excellently with the theoretical drawdown. The divergence between the theoretical and measured drawdown at the observation well (PW1) is attributed to the regional impacts of neighboring wells, as previously discussed.

5.4 Estimated Well Performance

The expected performance of water supply wells for the proposed development was assessed using the aquifer and well properties established in the previous section and anticipated water withdrawal rates which are discussed in Section 2. Two scenarios were considered for this assessment. First, short term drawdown was estimated for a single well pumping 0.8 L/s (10 Igpm) for the daily operating period (i.e. 40 minutes). The second scenario estimates drawdown in the long term for a sustained withdrawal rate of 0.11 L/s (1.39 Igpm), which represents the average long term withdrawal rate for the entire subdivision. The second scenario effectively estimates the localized drawdown due to cyclic operation of five (5) individual wells.

The first scenario is modelled in Figure 3, which shows the anticipated aquifer drawdown at various distances from the production well during a short term pumping surge. The figure shows a 1 week period, however sustained pumping at 0.76 L/s is most likely to occur in the order of hours, not days.

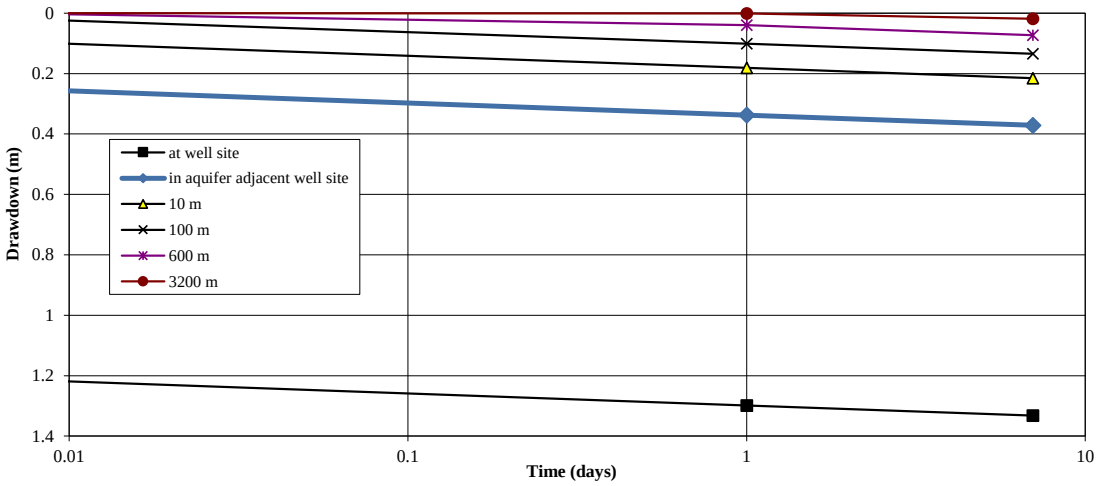


Figure 3 – Short termed theoretical drawdown at various radial distances from production well operating at 0.76 L/s (10 Igpm) over a 1-week period

The proposed development area has an available drawdown exceeding 10 m. The hydraulic response shown in Figure 3 suggest the water supply well is capable of a sustained 0.8 L/s yield. Typical operation will be in the order of 40 minutes per day. Occasional extended use may occur and is sustainable and radial drawdown is minimal.

The second scenario addresses long termed and regional impacts of the proposed subdivision's groundwater withdrawal. The anticipated radial impacts of extracting an average of 0.11 L/s (2,000 Igpd) for 20 years are shown in Figure 4.

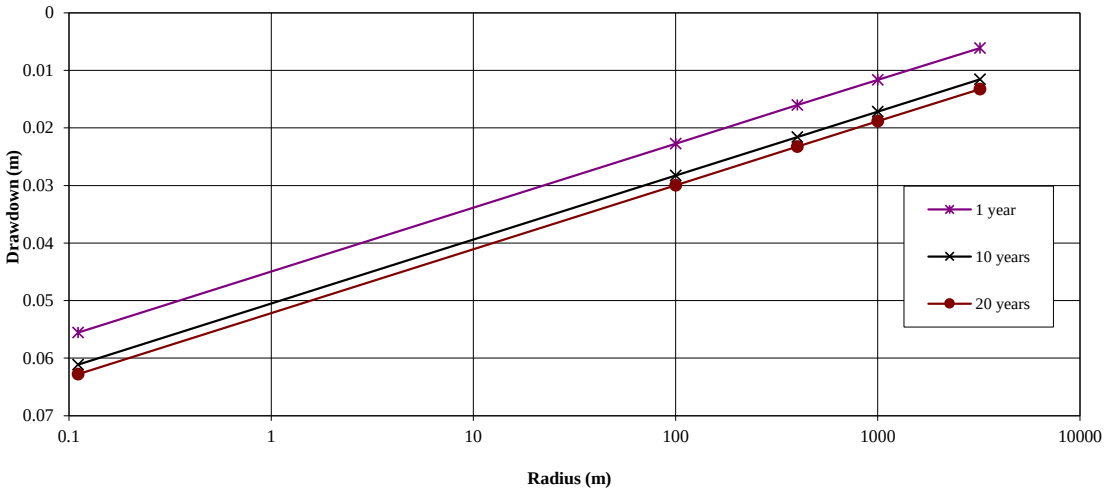


Figure 4 – Long termed theoretical drawdown at various radial distances proposed development with cumulative well operations averaging 0.11 L/s (2000 Igpd)

Figure 4 demonstrates that long term operation of water supply wells to meet the demands of the proposed development would result in aquifer drawdown less than 5 cm at radial distances of 100 m and greater, which effectively includes all off site well users. Available drawdown in this aquifer is in the order of 10 m and therefore the radial drawdown is inconsequential.

5.5 Aquifer Sustainability

To evaluate an aquifer and well sustainable yield, three primary elements must be considered; the aquifer must have sufficient aquifer transmissivity to permit the long termed supply of water, the well must have sufficient hydraulic characteristics to permit long termed drawdown, and the aquifer must have suitable size to ensure the rate of aquifer replenishment balances the extraction rates. The first two elements were evaluated in the previous section and it was determined that the aquifer is capable of sustainably providing the required yield for the proposed development with minor to negligible well interference impacts on site and off site. The final element addressing aquifer replenishment is discussed below.

The anticipated demand for the proposed development is 1,800 L/day per household, and 9,000 L/day for the proposed development. The rate of aquifer recharge is a percentage of the annual precipitation. Assuming 5% of annual precipitation infiltrates into the aquifer, which is a reasonable estimate, the surface area required to balance the subdivision's water demands is 8,400 m^2. This equates to a radius of roughly 23 m around each well.

A rough estimate of water usage from the subdivision and all neighboring Floral Aquifer wells in the 3.2 km radius around the site suggests that water extraction is less than 10% of the annual recharge rate which demonstrates that the aquifer is not strained.

5.6 Water Quality

Water samples were collected from PW2 following well construction. Table 5.1 summarizes the measured concentrations of analytes for which there are quality guidelines. The full laboratory results are presented in Appendix E.

Table 5.1
Water Quality Summary - PW2

Analyte	Unit	PW2 2021-07-16	SK Municipal Water Guidelines *
Major Ions & Physical Parameters			
Chloride	mg/L	10.4	250 (AO)
Nitrate (as N)	mg/L	<0.200	45 (MAC)
Sulfate (as SO4)	mg/L	473	500 (AO)
Hardness (as CaCO3)	mg/L	683	800 (AO)
pH	pH units	7.79	6.5-9.0 (AO)
TDS (calculated)	mg/L	1110	1500 (AO)
Alkalinity, bicarbonate (as HCO3)	mg/L	**525**	500 (AO)
Dissolved Metals			
Arsenic (As)-Dissolved	mg/L	0.00696	0.025 (MAC)
Barium (Ba)-Dissolved	mg/L	0.0114	1 (MAC)
Boron (B)-Dissolved	mg/L	0.336	5 (IMAC)
Cadmium (Cd)-Dissolved	mg/L	<0.0000100	0.005 (MAC)
Chromium (Cr)-Dissolved	mg/L	<0.00100	0.05 (MAC)
Copper (Cu)-Dissolved	mg/L	0.00272	1 (AO)
Iron (Fe)-Dissolved	mg/L	**0.442**	0.3 (AO)
Lead (Pb)-Dissolved	mg/L	<0.000100	0.01 (MAC)
Magnesium (Mg)-Dissolved	mg/L	79.7	200 (AO)
Manganese (Mn)-Dissolved	mg/L	**0.898**	0.05 (AO)
Selenium (Se)-Dissolved	mg/L	<0.000100	0.01 (MAC)
Sodium (Na)-Dissolved	mg/L	104	300 (AO)
Uranium (U)-Dissolved	mg/L	0.00314	0.02 (MAC)
Zinc (Zn)-Dissolved	mg/L	0.0067	5 (AO)

* MAC = max allowable concentration; IMAC = interim max. allowable concentration; AO = aesthetic objective. http://www.saskh2o.ca/pdf/epb507.pdf

Bolded values exceed Saskatchewan municipal drinking water guidelines.

The groundwater was found to be mineralized, with few exceedances of aesthetic objectives (bicarbonate, manganese and iron) and no exceedances of maximum allowable concentrations. Overall, the groundwater chemistry was found to be suitable for human consumption and hygienic use. The elevated levels of bicarbonate, manganese and iron over guideline limits are not

detrimental to human health and can easily be lowered with a standard household reverse osmosis system.

6 Conclusions & Recommendations

6.1 Conclusions

Mr Chobanik has proposed a 5-lot subdivision development on a portion of SE 01-19-21-W2M. As a condition of gaining the necessary approvals for development from the RM of Lumsden, an engineers report is required to confirm the presence and suitability of a groundwater supply to service the lots.

Office study and a drilling investigation has identified a Floral Group Aquifer underlying the subject property. A water supply well, PW1, was established on the proposed subdivision in 2015 within this aquifer. A total of 58 water supply wells were identified within 3.2 km of the study area, 44 of which are interpreted to be completed in a Floral Group Aquifer.

A second water supply well (PW2) was drilled roughly 145 m east of PW1 and completed in the same formation at approximately the same depth. A pump test was performed at PW2 and the data analyzed to characterize the aquifer properties. The analysis found that the aquifer has a transmissivity of 300 m^2/day, a storativity of $3x10^{-4}$ and a hydraulic conductivity of $3x10^{-4}$ m/s. Well losses were estimated at 1.7 m during the pump test, for which pumping was maintained around 1.34 L/s for 6 hours. Available drawdown at PW2 is in the order of 11.5 m.

Further analysis demonstrated that well interference would be minimal for five (5) water supply wells operating in the proposed subdivision to meet the expected household demands. It has been shown that each well can easily supply a typical household demand even with extended use operation with a recharge radius around 25 m per well. The cumulative long termed drawdown to the aquifer due to cyclic operation of the five wells is less than 5 cm at 100 m radius. No neighboring wells will be detrimentally influenced. Furthermore, the regional groundwater extraction from the Floral Aquifer is estimated to be less than 10% of the recharge rate. Both the wells and the aquifer are sustainable.

Groundwater was sampled at PW2 and submitted for laboratory analysis. The water was found to be mineralized, with concentrations of iron, magnesium and bicarbonate exceeding the aesthetic objectives of water quality guidelines, but there are no exceedances of the maximum allowable concentrations. In effect, this indicates that the water is safe for human consumption and hygienic use but homeowners may opt to treat the water to remove some minerals.

Specifically addressing Section 9(2.1.a) of the RM of Lumsden Subdivision Regulations, the investigation found that there is an adequate and quality source of potable groundwater accessible within the subdivision that can sustainably meet the expected water supply demands of the proposed development.

6.2 Recommend Well Design

Pending the necessary approvals to proceed with the development, we recommend the installation of three additional wells on Lots 3, 4 and 5. The exact location of the wells will depend on site layout constraints however it should be noted that maintaining a spacing of 50 m or greater is recommended to minimize well interference. We recommend a well design similar to that of PW2 as shown in Drawing WM571-5, with slight modifications depending on site specific geology. These wells will not require licensing.

7 Closure

The information within this report was prepared for the exclusive use of Mr. Chobanik. Any use of this report by a third party, without the consent of Mr. Chobanik or WaterMark Consulting Ltd. is prohibited.

The methods used in this report follow accepted engineering standards and practices. The conditions experienced at the site may vary. If any additional information becomes available which impacts the findings of this investigation, please forward it to us so that we may re-evaluate our conclusions and recommendations.

If you have any questions or comments, please do not hesitate to call.

Yours truly,

WaterMark Consulting Ltd

PROFESSIONAL ENGINEER
DAVID T. TRATCH
MEMBER 9445
2021 10 15
YR. MN. DAY
SASKATCHEWAN

Association of Professional Engineers & Geoscientists of Saskatchewan

CERTIFICATE OF AUTHORIZATION

Watermark Consulting Ltd.

Number C1203

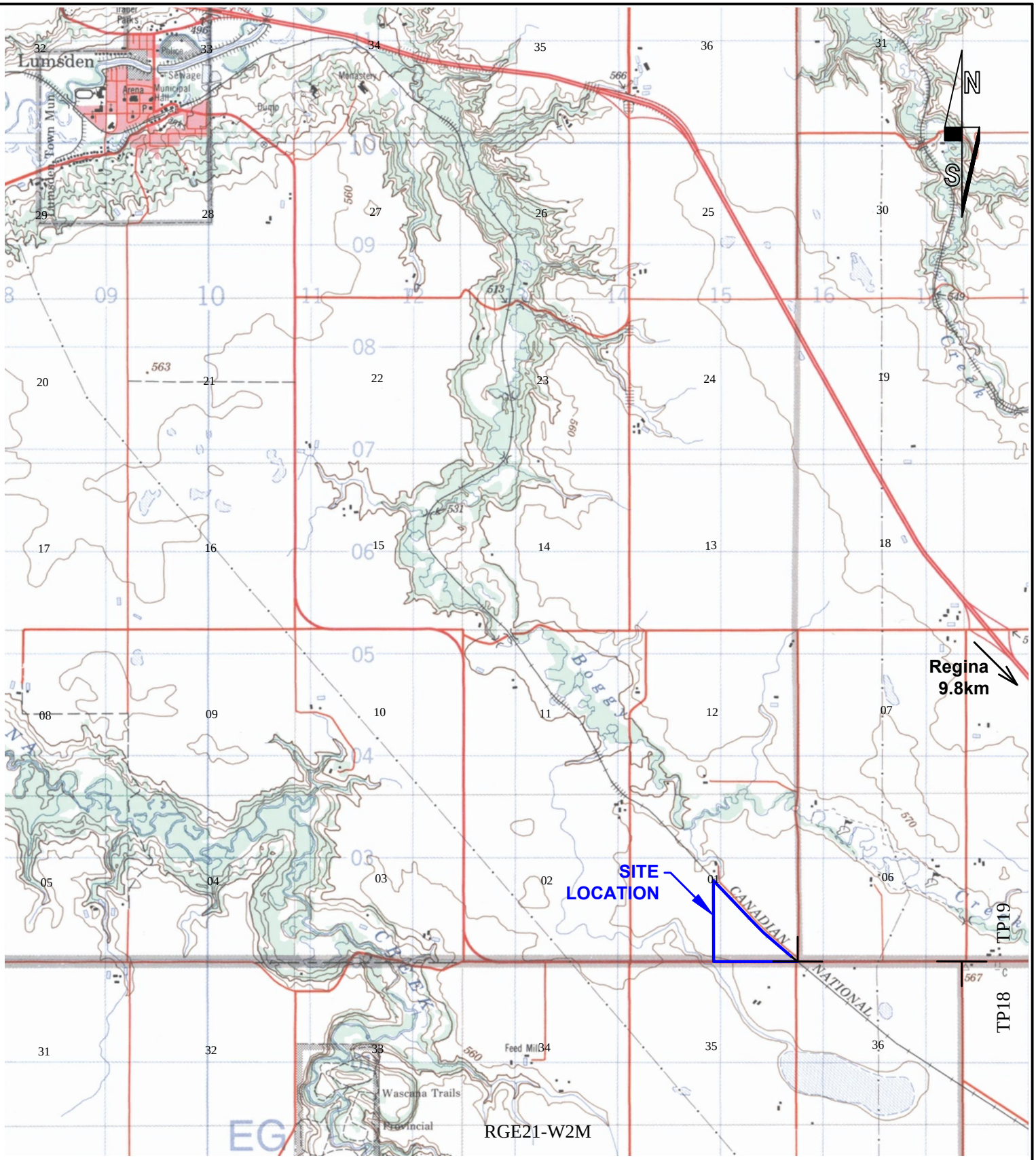
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
GeoEnvironmental	09445	

DRAWINGS

WaterMark
CONSULTING LTD.

WM571 Site Plan.dwg



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07 OCT 21	WMB	ALG	1:50,000	WM571	WM571-1

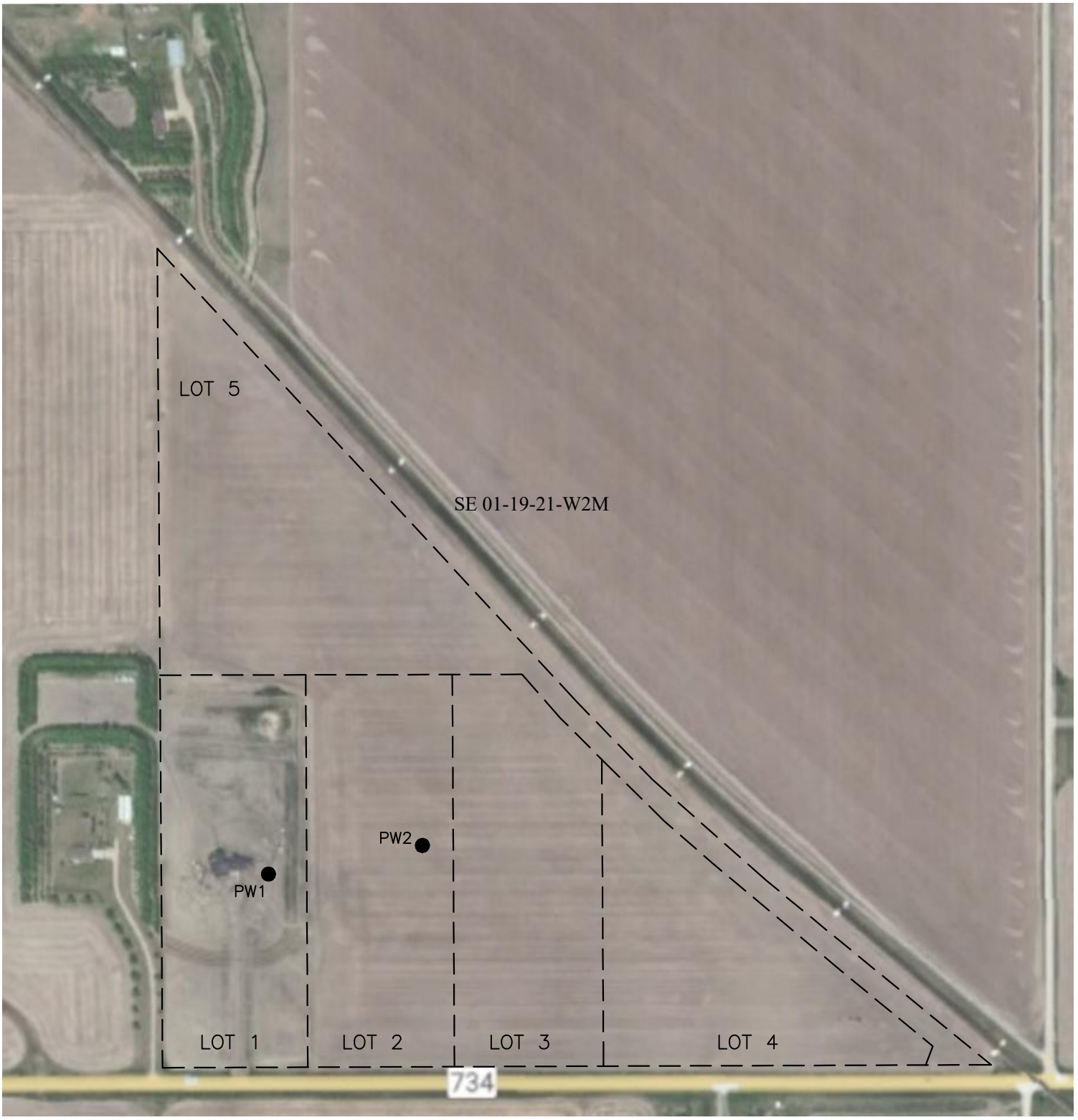
WaterMark CONSULTING LTD.

CLIENT: D. CHOBANIK

PROJECT: HYDROGEOLOGIC INVESTIGATION

TITLE: REGIONAL LOCATION PLAN

WM571 Site Plan.dwg



NOTE: BACKGROUND IMAGE SOURCE – GOOGLE EARTH

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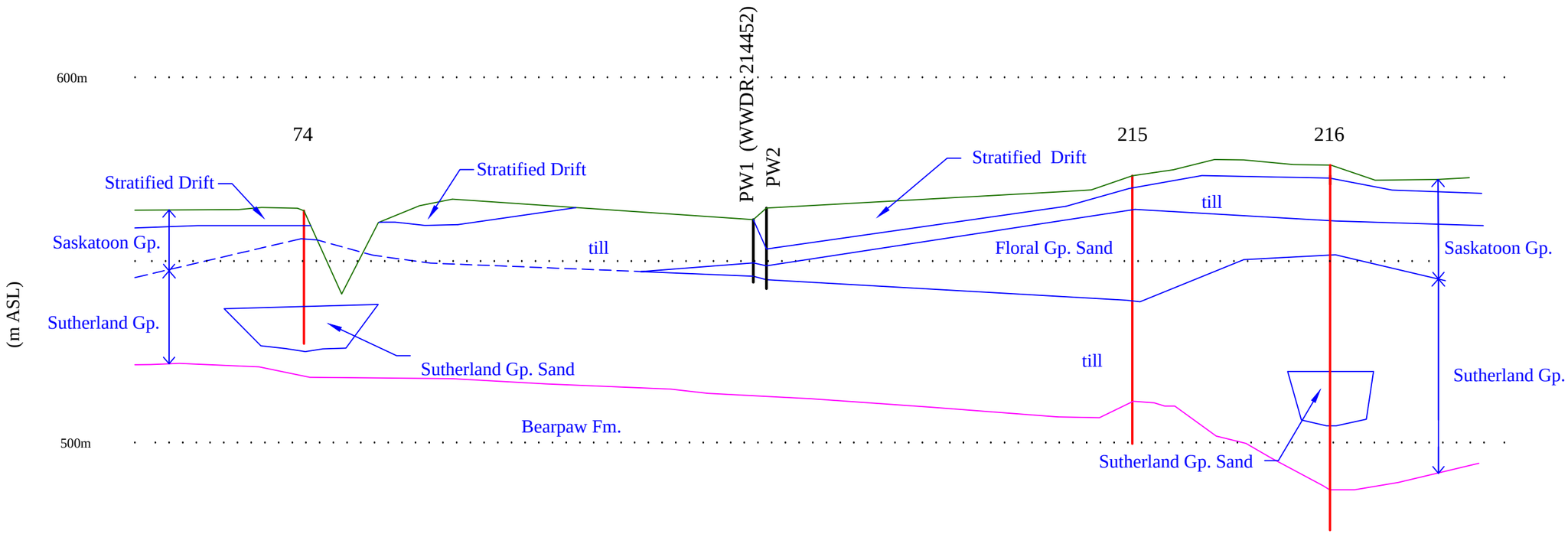
15 OCT 21	WMB	ALG	1:5,000	WM571	WM571-2

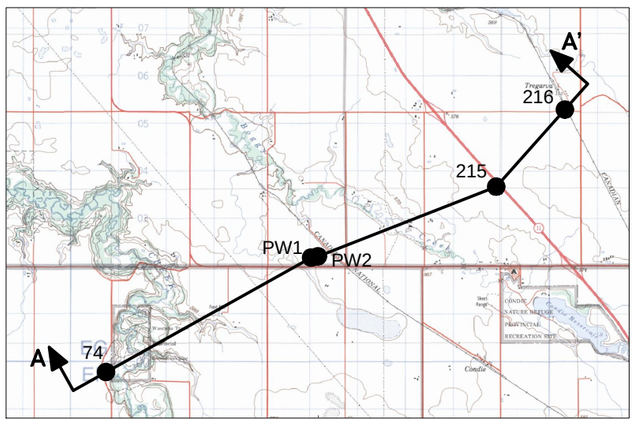
WaterMark CONSULTING LTD.

CLIENT: D. CHOBANIK

PROJECT: HYDROGEOLOGIC INVESTIGATION

TITLE: LOCAL SITE PLAN





SCALE: 1:125,000

REGIONAL CROSS SECTION A-A'

HORIZONTAL SCALE: 1:50,000
VERTICAL SCALE: 1:1,250

WaterMark CONSULTING LTD.

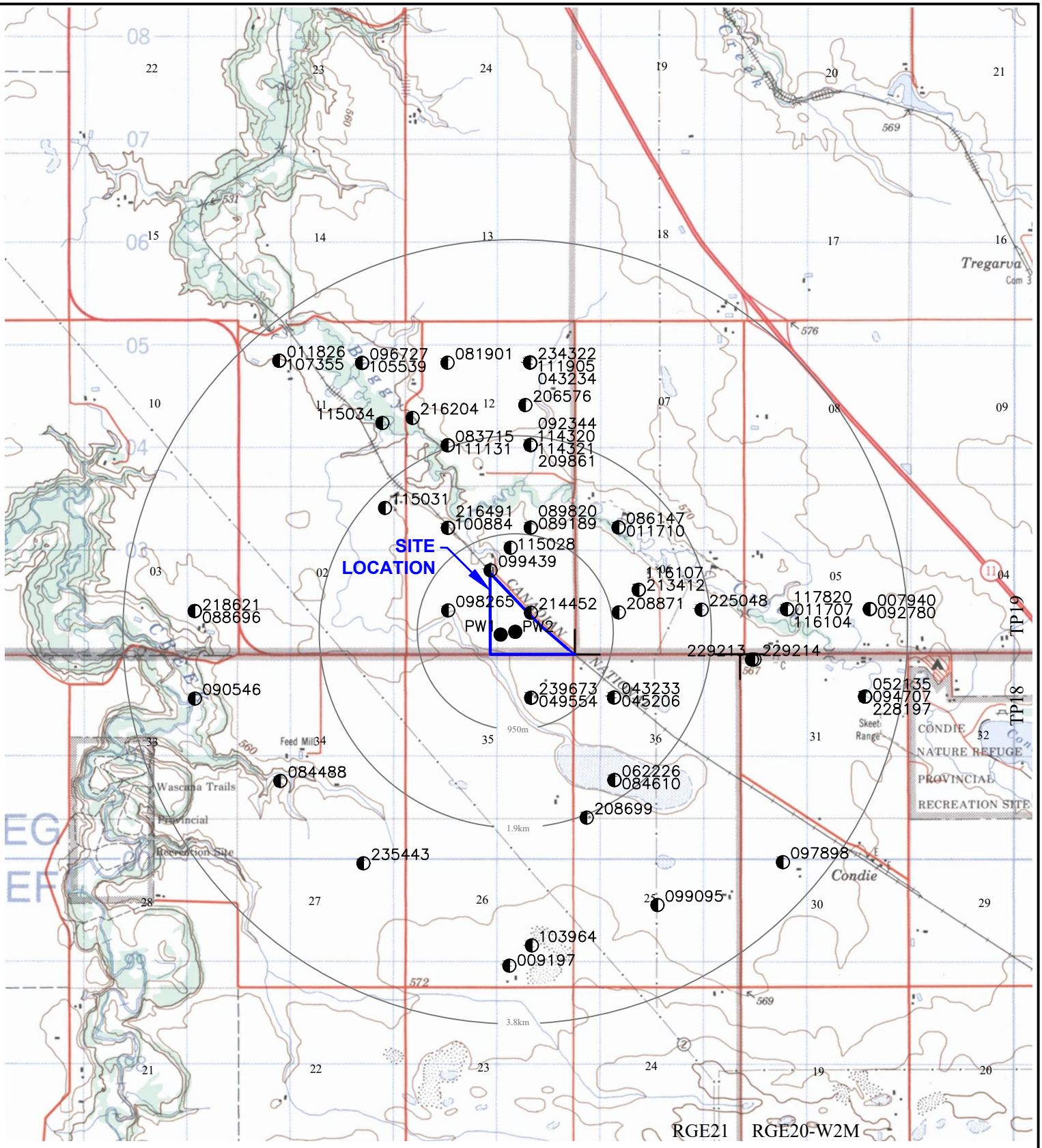
DATE: 15 OCT 21	DRAWN BY: WMB	APPROVED BY: ALG
SCALE: AS NOTED	FILE NO: WM571	DRAWING NO: WM571-3

CLIENT: D. CHOBANIK

PROJECT: HYDROGEOLOGIC INVESTIGATION

TITLE: REGIONAL CROSS SECTION

WM571 Site Plan.dwg



LEGEND

- WELL LOCATION
- WWDR# WELL LOCATION

DATE:	DRAWN BY:	APPROVED BY:	SCALE:	FILE NO:	DRAWING NO:
15 OCT 21	WMB	ALG	1:50,000	WM571	WM571-4

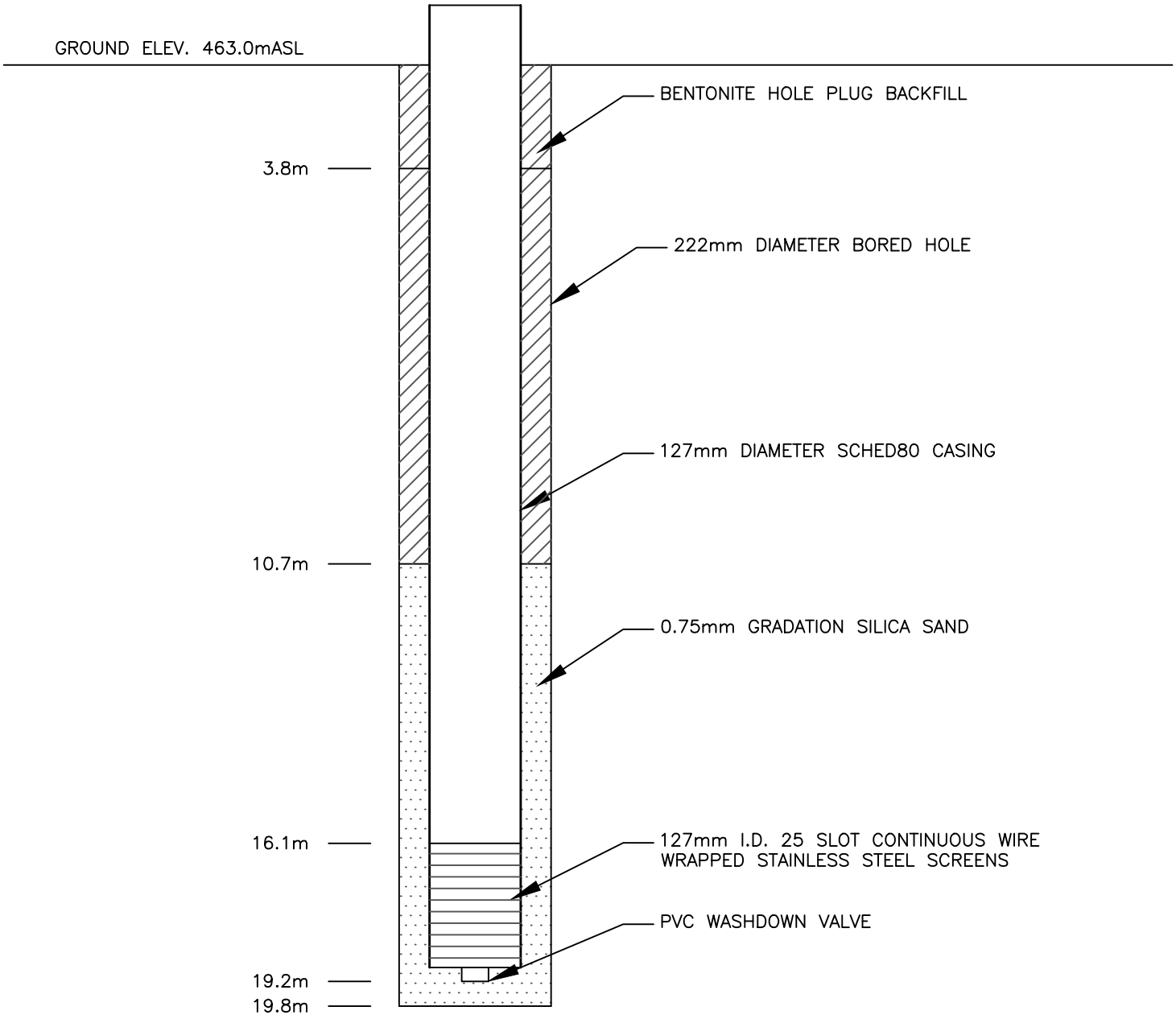
WaterMark CONSULTING LTD.

CLIENT: D. CHOBANIK

PROJECT: HYDROGEOLOGIC INVESTIGATION

TITLE: NEIGHBOURING LOCATION PLAN

WM571 WELL CONSTRUCTION DETAILS.dwg



NOTE: ALL DEPTHS ARE MEASURED BELOW GROUND SURFACE.

DATE:	DRAWN BY:	APPROVED BY:	SCALE:	FILE NO:	DRAWING NO:
15 OCT 21	WMB	AJG	NTS	WM571	WM571-5

WaterMark CONSULTING LTD.

CLIENT: D. CHOBANIK

PROJECT: HYDROGEOLOGIC INVESTIGATION

TITLE: PW2 WELL CONSTRUCTION DETAIL

BOREHOLE LOGS

WaterMark
CONSULTING LTD.

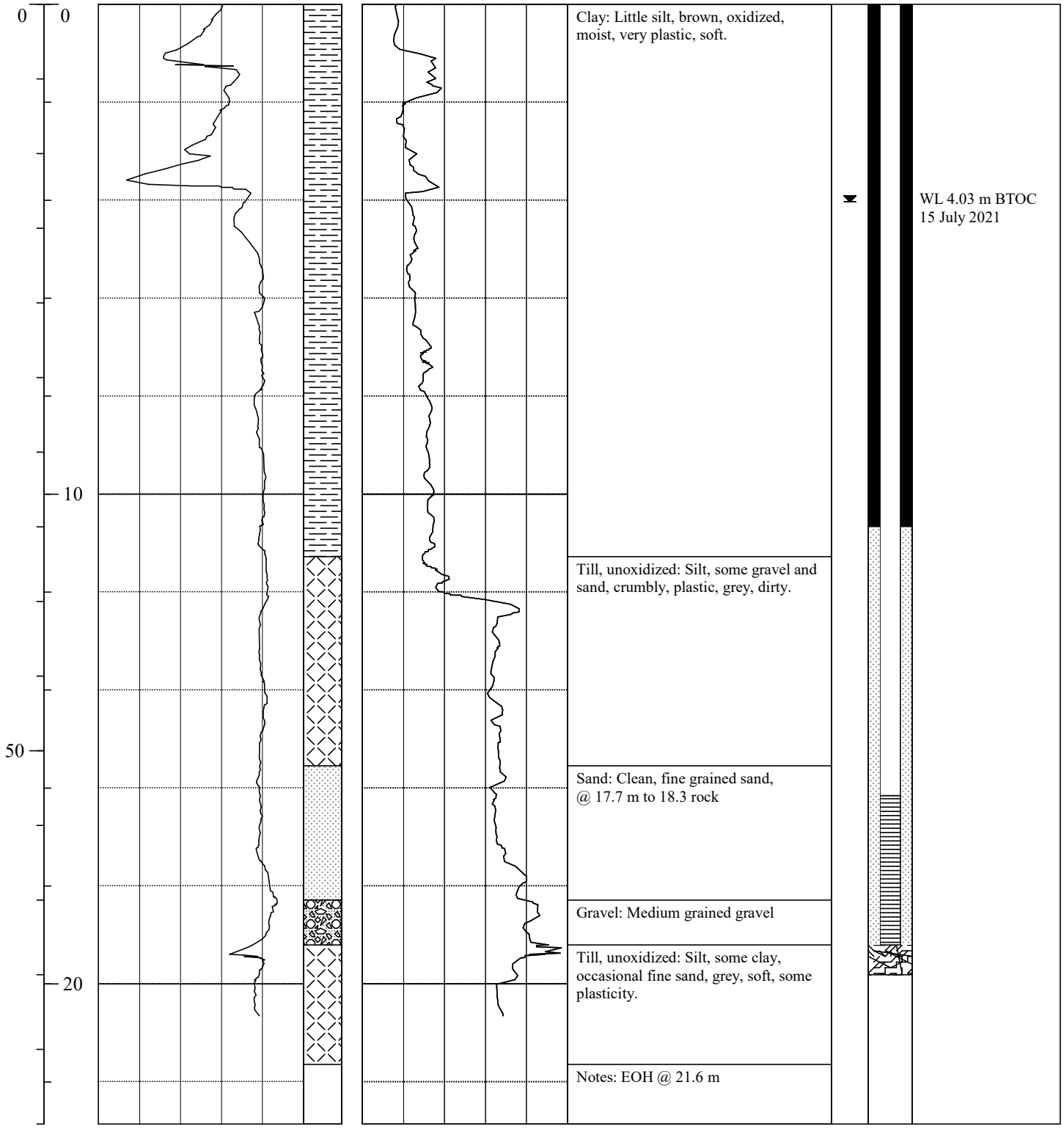
WM rotary th 500 Apr2020.ldfk

WaterMark CONSULTING LTD.

BORE HOLE LOG

Client:	Chobanic	Northing:	5,602,424 m	**BORE HOLE:**	**PW2**
Project:	Chobanic Well Investigation	Easting:	13U 515,139 m		
Location:	SE-01-19-21-W2M	Ground Elevation:	563 mASL	Drilling Contractor:	Solie Drilling
Project Number:	WM571	Top of Pipe Elevation:	563.4 mASL	Drill:	Failing 1200
Date Drilled:	14-July-21	Logged By:	LJZ	Drilling Method:	Rotary

Depth (feet) (metres)	Spontaneous Potential: 20 mV per division; Water Cond. = - µS/cm; - to +	Stratigraphy	Sample	Resistivity: 20 ohm per division; Mud Cond. = - µS/cm; 0 to 100	Lithologic Description	Piezometer Construction Details
0 / 0					Clay: Little silt, brown, oxidized, moist, very plastic, soft.	
10					Till, unoxidized: Silt, some gravel and sand, crumbly, plastic, grey, dirty.	
50					Sand: Clean, fine grained sand, @ 17.7 m to 18.3 rock	
					Gravel: Medium grained gravel	
20					Till, unoxidized: Silt, some clay, occasional fine sand, grey, soft, some plasticity.	
					Notes: EOH @ 21.6 m	



APPENDIX A

WATER WELL DRILLER REPORTS

WaterMark CONSULTING LTD.

Water Well Driller's Report

5-Oct-2021
WSaskWWDR01

Well Name: **CHOBANIK** WWDR #: **214452**

Well Location

Land Location	**SE-01-019 -21 -W2**	Location of Well (in Quarter)	
LSD	**00**	**0** ft from N/S Boundary	
Reserve		**0** ft from E/W Boundary	
RM:	**189**		
NTS Map:	**72I10**	Major Basin:	**05**
Elevation (ft)	**1837**	SubBasin:	**23**
Aquifer			

Well Information

Driller	**STAUBER DRILLING INC**
Completion Date	**2015.11.24**
Hole #	**00000001**
Install Method	**Drilled**
Borehole Depth (ft)	**55**
Bit Dia (in)	**7.8**
Water Level	**0**
Flowing Head	**0**
Water Use	**Domestic**
Well Use	**Withdrawal**
Completion Method	**Well Screen And Gravel Pack**
E-Log	**No**

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
50	**47**	**5**	**P.V.C.**
0	**0**	**0**	
0	**0**	**0**	

Well Screens

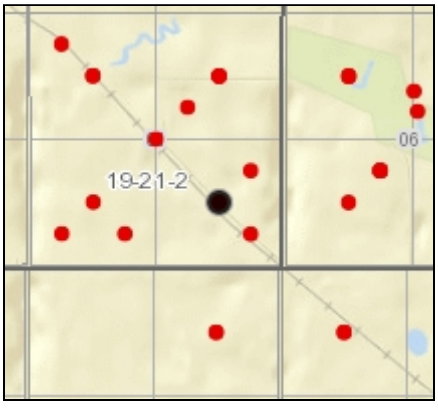
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
5	**50**	**5**	**20**	**Stainless Steel**
0	**0**	**0**	**0**	
0	**0**	**0**	**0**	

Pump Test

Draw Down	**0**	ft
Duration	**3**	hrs
Pumping Rate	**8**	igpm
Temperature	**0**	deg. F
Rec. Pumping Rate	**8**	igpm

Lithology List

Depth (ft):	Material	Colour	Description
5	Till	Brown	Unknown
38	Till	Grey	Unknown
50	Sand	Unknown	Coarse
55	Till	Grey	Unknown



APPENDIX B

PUPMING TEST DATA

WaterMark CONSULTING LTD.

WM571 Pump Test Data **Jul-21**

Chobanik Hydrogeological Investigation

PW2 (producing well)			PW2 (producing well)			PW1 (observation well)		
Test Duration (min)	Depth to Water (m)	Drawdown (m)	Test Duration (min)	Depth to Water (m)	Drawdown (m)	Test Duration (min)	Depth to Water (m)	Drawdown (m)
0	3.40	0.00	336	3.54	0.14	0	5.17	0.00
0.5	5.70	2.30	337	3.53	0.13	0.5	5.17	0.00
1	6.17	2.77	338	3.53	0.13	1	5.17	0.00
1.5	6.62	3.22	339	3.52	0.12	1.5	5.17	0.00
2	6.75	3.35	340	3.52	0.12	2	5.17	0.00
2.5	6.84	3.44	342	3.52	0.12	2.5	5.17	0.00
3	6.93	3.53	344	3.51	0.11	3	5.17	0.00
3.5	7.00	3.60	346	3.51	0.11	3.5	5.17	0.00
4	7.03	3.63	348	3.51	0.11	4	5.17	0.00
4.5	7.07	3.67	350	3.51	0.11	4.5	5.17	0.00
5	7.09	3.69	355	3.51	0.11	5	5.17	0.00
6	7.10	3.70	360	3.50	0.10	6	5.17	0.00
7	7.14	3.74	375	3.50	0.10	7	5.17	0.00
8	7.15	3.75	390	3.50	0.10	8	5.17	0.00
9	7.17	3.77				9	5.17	0.00
10	7.18	3.78				10	5.17	0.00
12	7.19	3.79				12	5.17	0.00
14	7.21	3.81				14	5.17	0.00
16	7.21	3.81				16	5.17	0.00
18	7.22	3.82				18	5.17	0.00
20	7.23	3.83				20	5.17	0.00
25	7.25	3.85				25	5.17	0.00
30	7.28	3.88				30	5.16	-0.01
45	7.30	3.90				45	5.16	-0.01
60	7.31	3.91				120	5.15	-0.02
90	7.33	3.93				150	5.14	-0.03
120	7.34	3.94				180	5.14	-0.03
150	7.34	3.94				210	5.13	-0.04
180	7.34	3.94				240	5.13	-0.04
210	7.36	3.96				270	5.13	-0.04
240	7.37	3.97				300	5.13	-0.04
270	7.38	3.98						
300	7.38	3.98						
330	7.38	3.98						
330.5	5.32	1.92						
331	4.27	0.87						
331.5	3.90	0.50						
332	3.70	0.30						
332.5	3.61	0.21						
333	3.59	0.19						
333.5	3.57	0.17						
334	3.56	0.16						
334.5	3.55	0.15						
335	3.55	0.15						

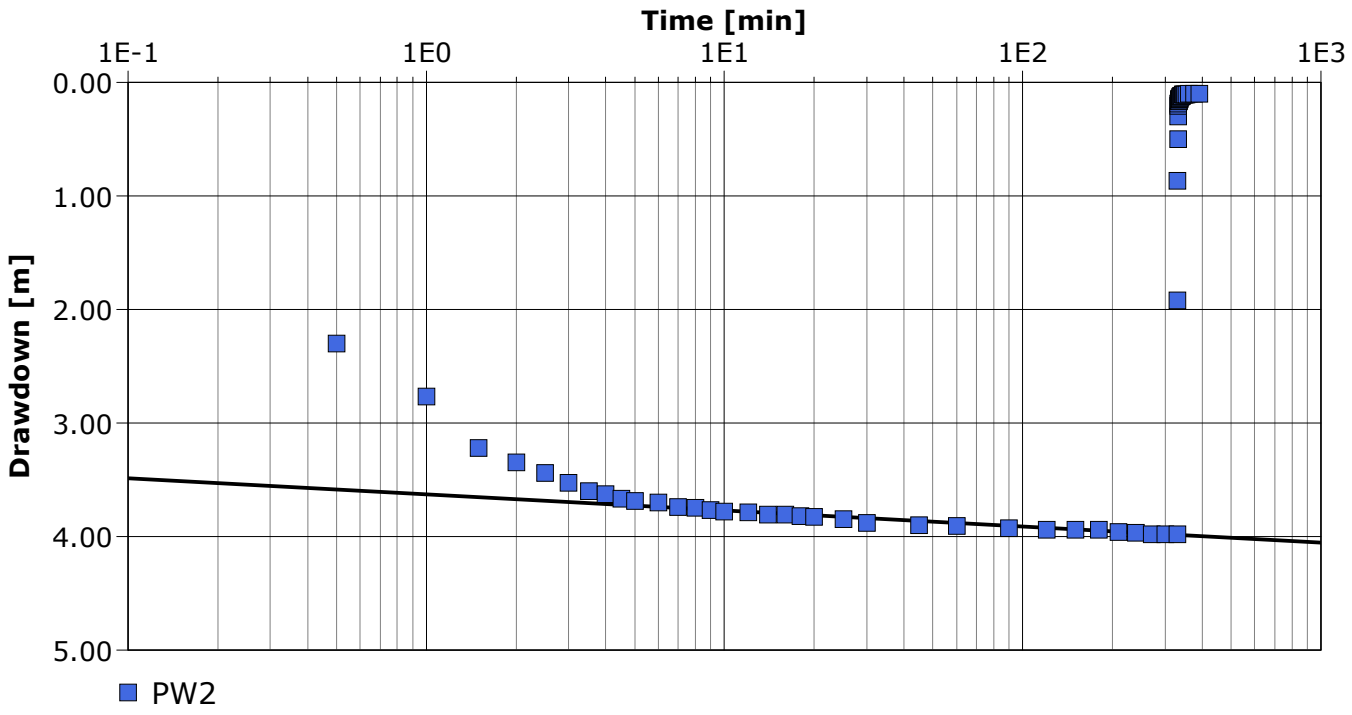
APPENDIX C

AQUIFERTEST ANALYSES

WaterMark CONSULTING LTD.

	Pumping Test Analysis Report
	Project: Hydrogeologic Investigation
	Number: WM571
	Client: Chobanic

Location:	Pumping Test: PW2	Pumping Well: PW2
Test Conducted by: ALG		Test Date: 2021-10-06
Analysis Performed by: ALG	PW2 Cooper Jacob	Analysis Date: 2021-10-12
Aquifer Thickness: 3.65 m	Discharge: variable, average rate 1.34 [l/s]	

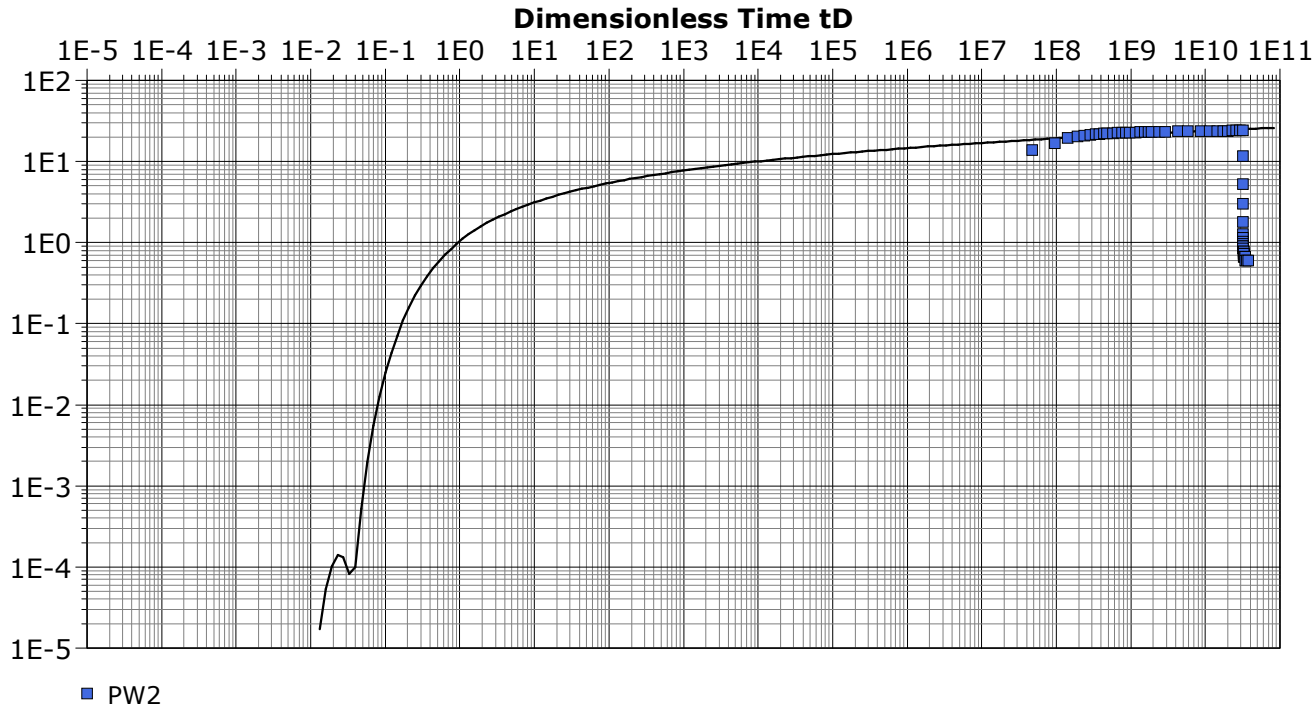


Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
PW2	1.49×10^{2}	4.09×10^{1}	1.73×10^{-24}	0.06	

	Pumping Test Analysis Report
	Project: Hydrogeologic Investigation
	Number: WM571
	Client: Chobanic

Location:	Pumping Test: PW2	Pumping Well: PW2
Test Conducted by: ALG		Test Date: 2021-10-06
Analysis Performed by: ALG	PW2 Theis	Analysis Date: 2021-10-15
Aquifer Thickness: 3.65 m	Discharge: variable, average rate 1.34 [l/s]	

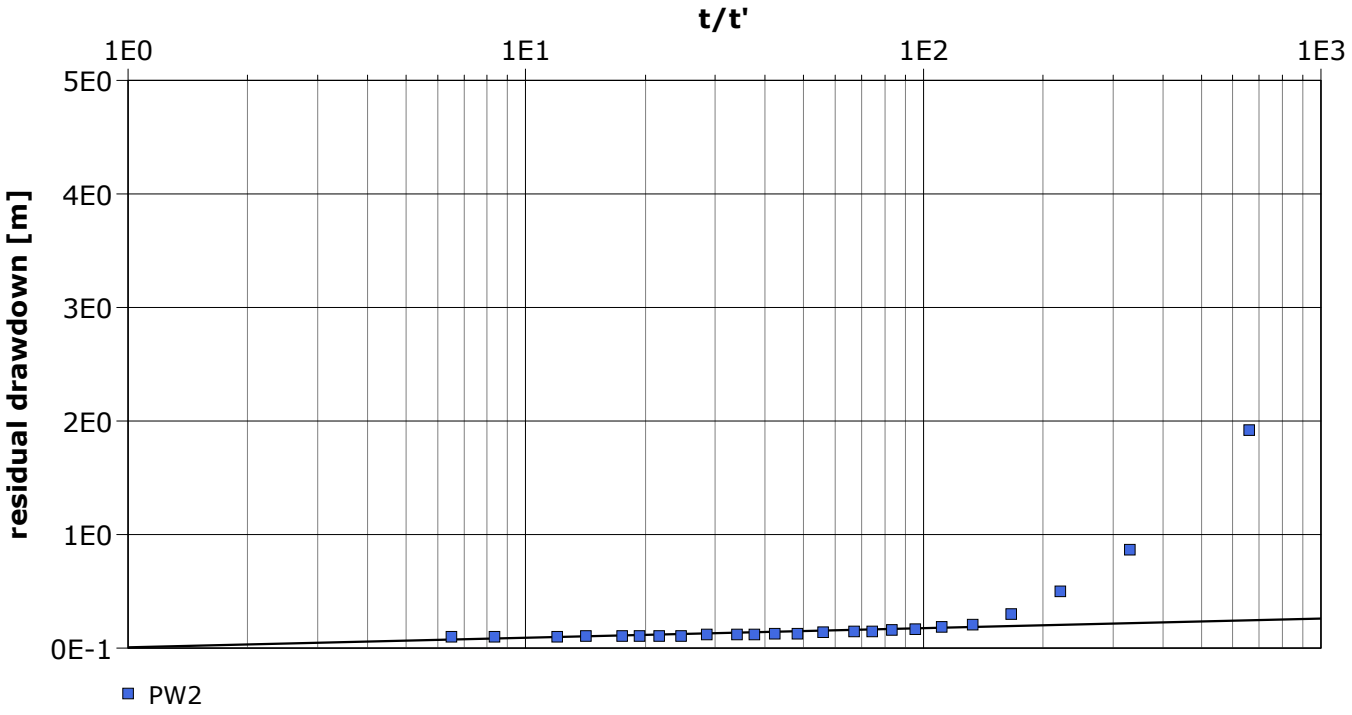


Calculation using Theis

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
PW2	5.56×10^{1}	1.52×10^{1}	1.00×10^{-7}	0.06	

	Pumping Test Analysis Report
	Project: Hydrogeologic Investigation
	Number: WM571
	Client: Chobanic

Location:	Pumping Test: PW2	Pumping Well: PW2
Test Conducted by: ALG		Test Date: 2021-10-06
Analysis Performed by: ALG	PW2 Theis Recovery	Analysis Date: 2021-10-15
Aquifer Thickness: 3.65 m	Discharge: variable, average rate 1.34 [l/s]	



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Radial Distance to PW [m]	
PW2	2.52×10^{2}	6.92×10^{1}	0.06	

Pumping Test Analysis Report

Project: Hydrogeologic Investigation

Number: WM571

Client: Chobanic

Location:	Pumping Test: PW2	Pumping Well: PW2
Test Conducted by: ALG		Test Date: 2021-10-06
Aquifer Thickness: 3.65 m	Discharge: variable, average rate 1.34 [l/s]	

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [m²/d]	K [m/d]	S
1	PW2 Cooper Jacob	ALG	2021-10-12	Cooper & Jacob I	PW2	1.49×10^{2}	4.09×10^{1}	1.73×10^{-24}
2	PW2 Theis	ALG	2021-10-15	Theis	PW2	5.56×10^{1}	1.52×10^{1}	1.00×10^{-7}
3	PW2 Theis Recovery	ALG	2021-10-15	Theis Recovery	PW2	2.52×10^{2}	6.92×10^{1}	

APPENDIX D

THEIS DRAWDOWN ANALYSES

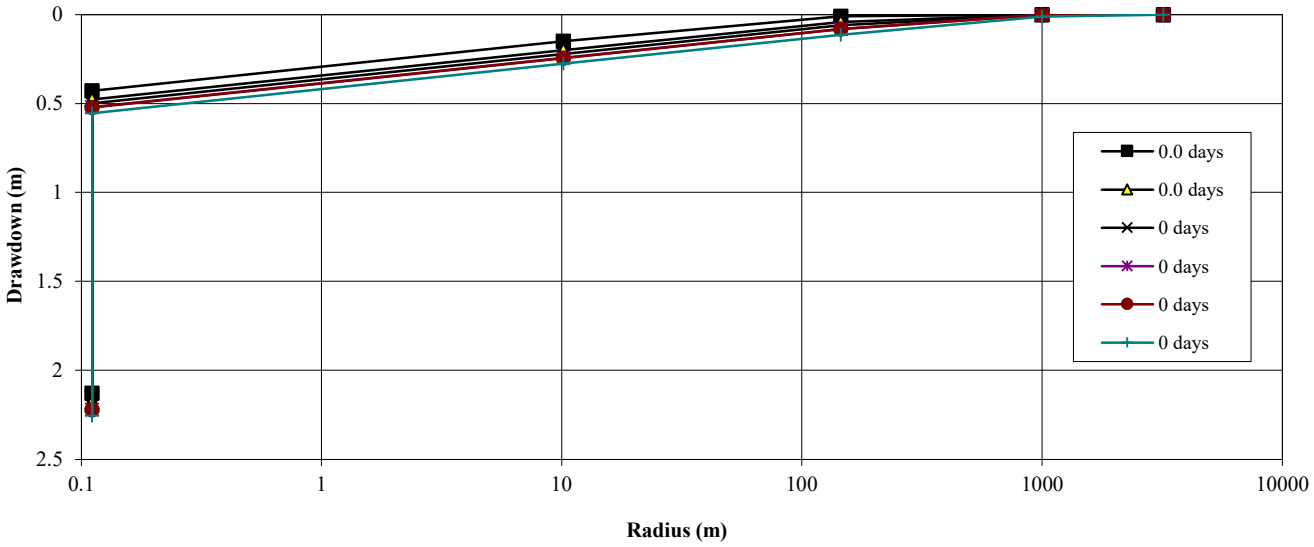
WaterMark CONSULTING LTD.

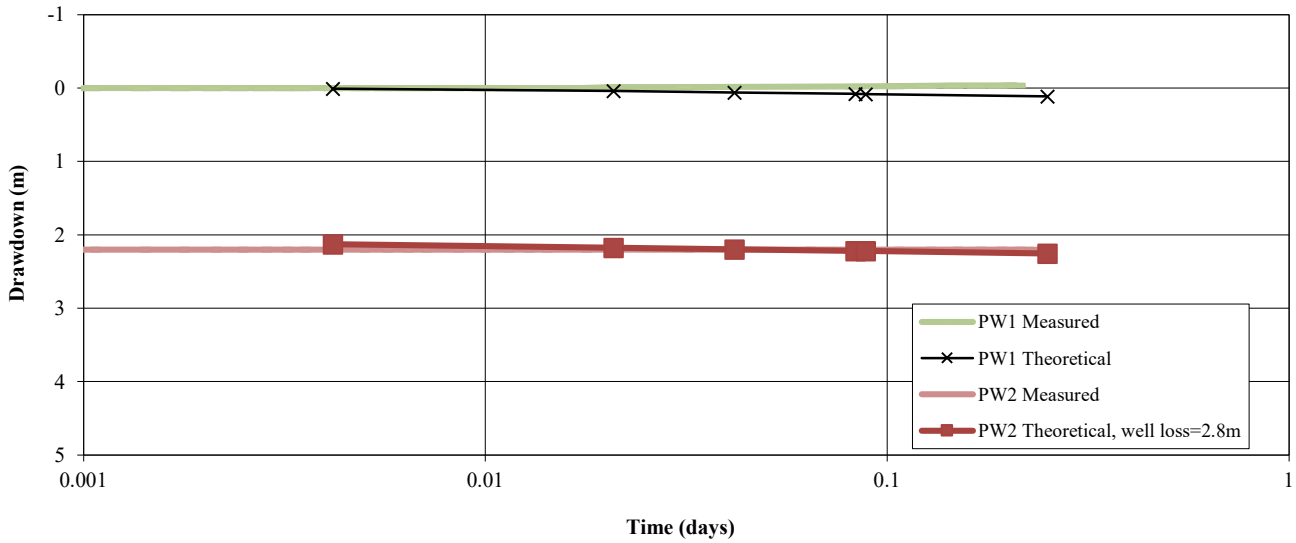
Theis Method (Confined) - Single Well Analysis

Description of Analysis:

Pump Well ID	PW2 Drawdown					
Flow Rate	17.7	Igpm	1.34	L/s		
Transmissivity	300	m^2/day	Aquifer Thickness	3.7	m	
Storativity	2.0E-04		Confined Aquifer? (y/n)	y		
Available Drawdown	11.5	m	well losses (m)	1.7		23%

Time (days)	Confined Aquifer Drawdown (m)	Radius (m) 0.1 m	0.1 m	10 m	145 m	1000 m	3200 m
	0.0 days	2.13	0.43	0.15	0.01	0	0
	0.0 days	2.18	0.48	0.20	0.04	0	0
	0 days	2.20	0.50	0.22	0.06	0.00	0
	0 days	2.22	0.52	0.24	0.08	0.00	0
	0 days	2.22	0.52	0.24	0.08	0.00	0
	0 days	2.25	0.55	0.28	0.11	0.01	0





WaterMark CONSULTING LTD.

Client D. Chobanik
Project Hydrogeological Characterization
Project No. WM571
Date 12-Oct-21

Theis Method (Confined) - Single Well Hydraulics, Variable Flow Rate

Description of Analysis:

Pump Well ID PW2 Recovery Data

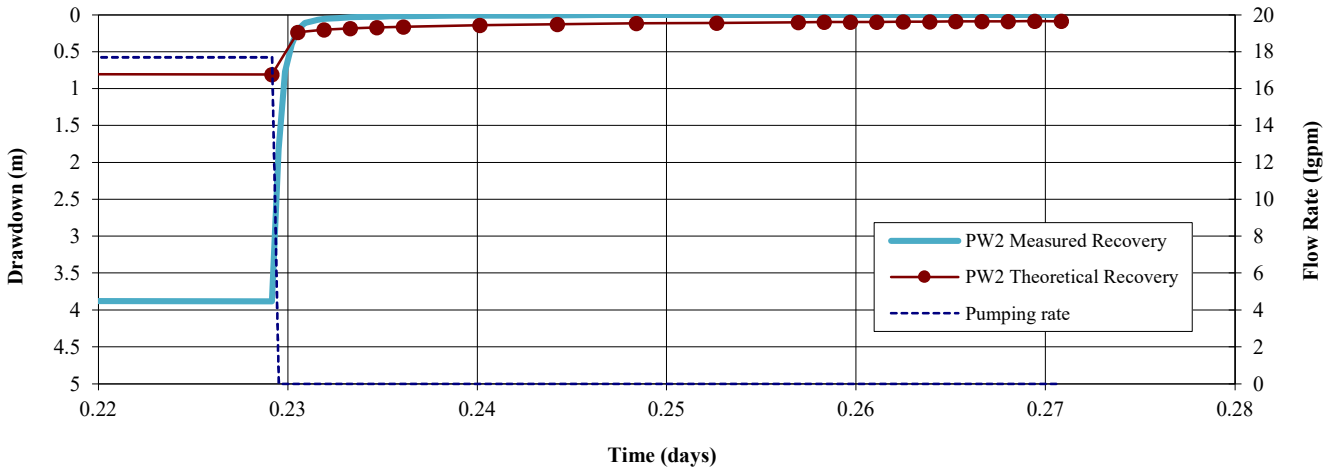
Transmissivity 200 m^2/day

Storativity 2.0E-04

Distance to Observation Point 0.111 m

Available Drawdown 11.5 m

	Flow Rate	18 Igpm	0 Igpm	0 Igpm	0 Igpm	0 Igpm	
	start time	0 days	0 days	0 days	0 days	0 days	
	end time	0 days	0 days	0 days	0 days	0 days	drawdown
Time (days)	0.001 days	0.56					0.56
	0.003 days	0.61					0.61
	0.009 days	0.66					0.66
	0.026 days	0.71					0.71
	0.077 days	0.76					0.76
	0.229 days	0.81					0.81
	0.231 days	0.81	-0.57				0.24
	0.232 days	0.81	-0.61				0.20
	0.233 days	0.81	-0.62				0.19
	0.235 days	0.81	-0.64				0.17
	0.236 days	0.81	-0.65				0.16
	0.240 days	0.81	-0.67	0.00			0.14
	0.244 days	0.81	-0.68	0.00			0.13
	0.248 days	0.81	-0.69	0.00			0.12
	0.253 days	0.81	-0.70	0.00			0.11
	0.257 days	0.81	-0.71	0.00			0.10
	0.258 days	0.81	-0.71	0.00	0.00		0.10
	0.260 days	0.81	-0.72	0.00	0.00		0.10
	0.261 days	0.82	-0.72	0.00	0.00		0.10
	0.262 days	0.82	-0.72	0.00	0.00		0.10
	0.264 days	0.82	-0.72	0.00	0.00		0.09
	0.265 days	0.82	-0.72	0.00	0.00	0.00	0.09
	0.267 days	0.82	-0.73	0.00	0.00	0.00	0.09
	0.268 days	0.82	-0.73	0.00	0.00	0.00	0.09



WaterMark CONSULTING LTD.

Client D. Chobanik

Project Hydrogeological Characterization

Project No. WM571

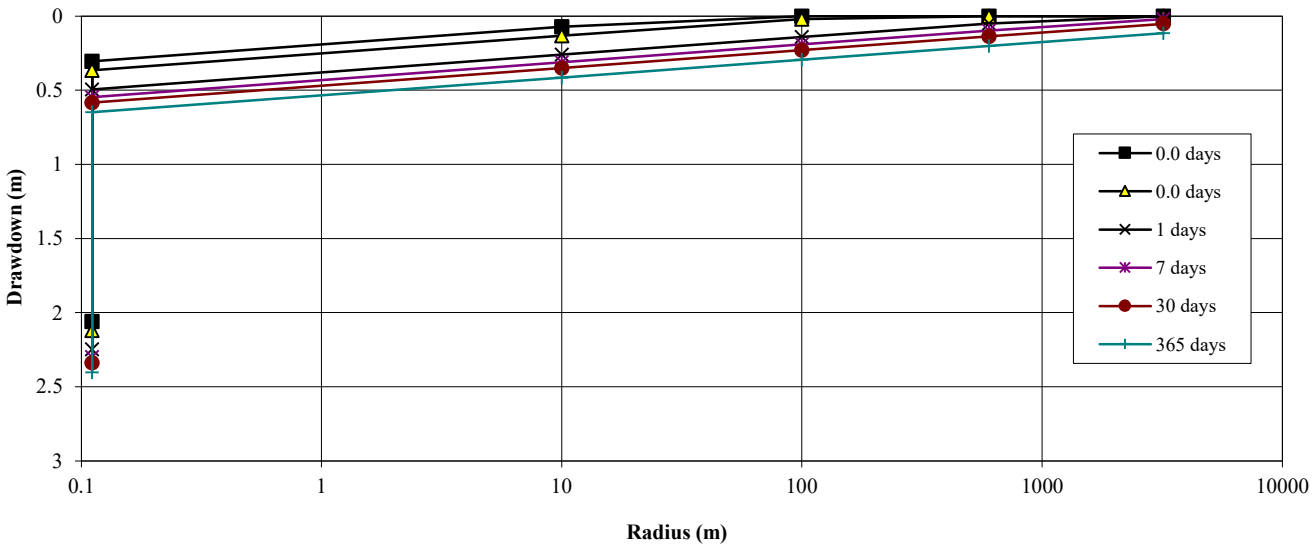
Date 12-Oct-21

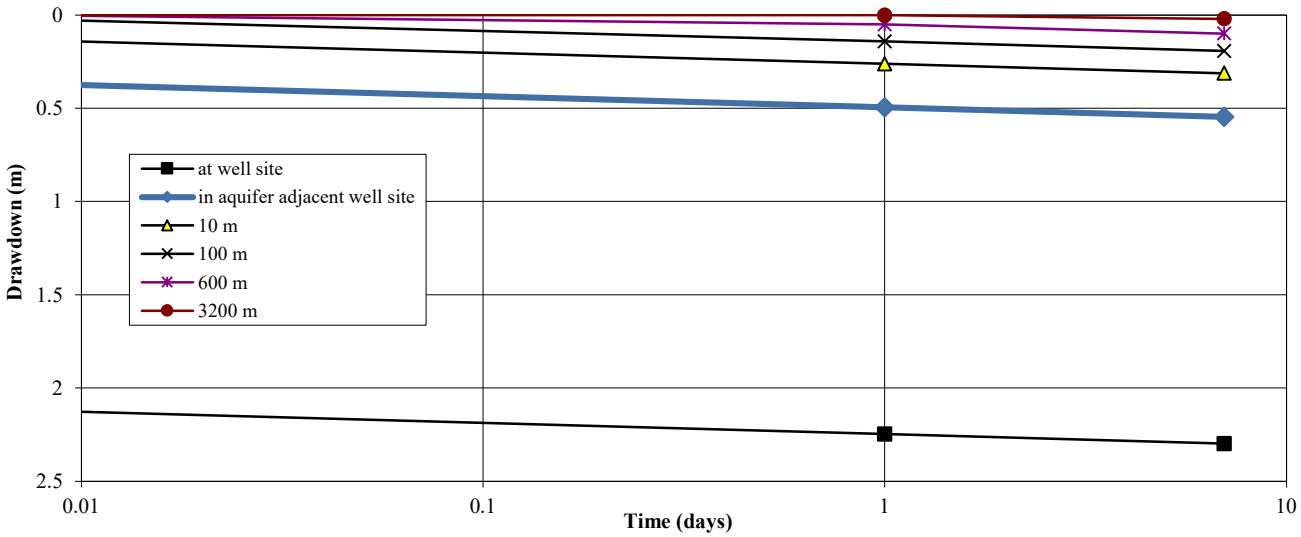
Theis Method (Confined) - Single Well Analysis

Description of Analysis:

Pump Well ID	PW2				
Flow Rate	10	Igpm	0.76	L/s	
Transmissivity	200	m^2/day	Aquifer Thickness	3.7	m
Storativity	2.0E-04		Confined Aquifer? (y/n)	y	
Available Drawdown	11.5	m	well losses (m)	1.75	22%

	Confined Aquifer Drawdown (m)	Radius (m) 0.1 m	0.1 m	10 m	100 m	600 m	3200 m
Time (days)	0.0 days	2.06	0.31	0.07	0.00	0	0
	0.0 days	2.12	0.37	0.13	0.02	0	0
	1 days	2.25	0.50	0.26	0.14	0.05	0.00
	7 days	2.30	0.55	0.31	0.19	0.10	0.02
	30 days	2.34	0.58	0.35	0.23	0.14	0.05
	365 days	2.40	0.65	0.41	0.29	0.20	0.11





WaterMark CONSULTING LTD.

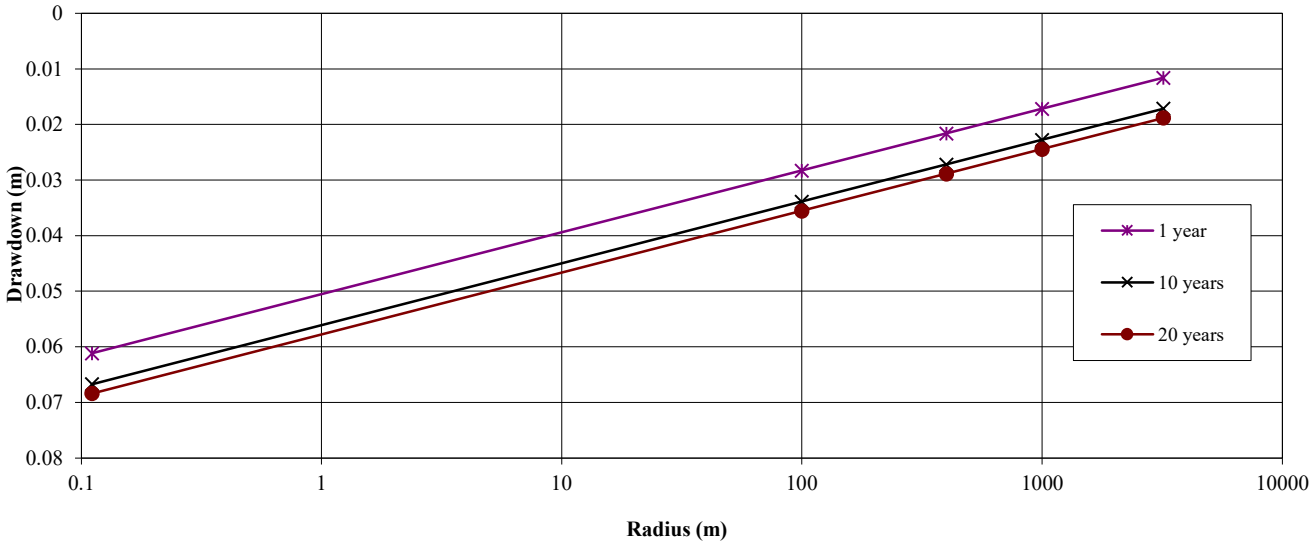
Client D. Chobanik
Project Hydrogeological Characterization
Project No. WM571
Date 12-Oct-21

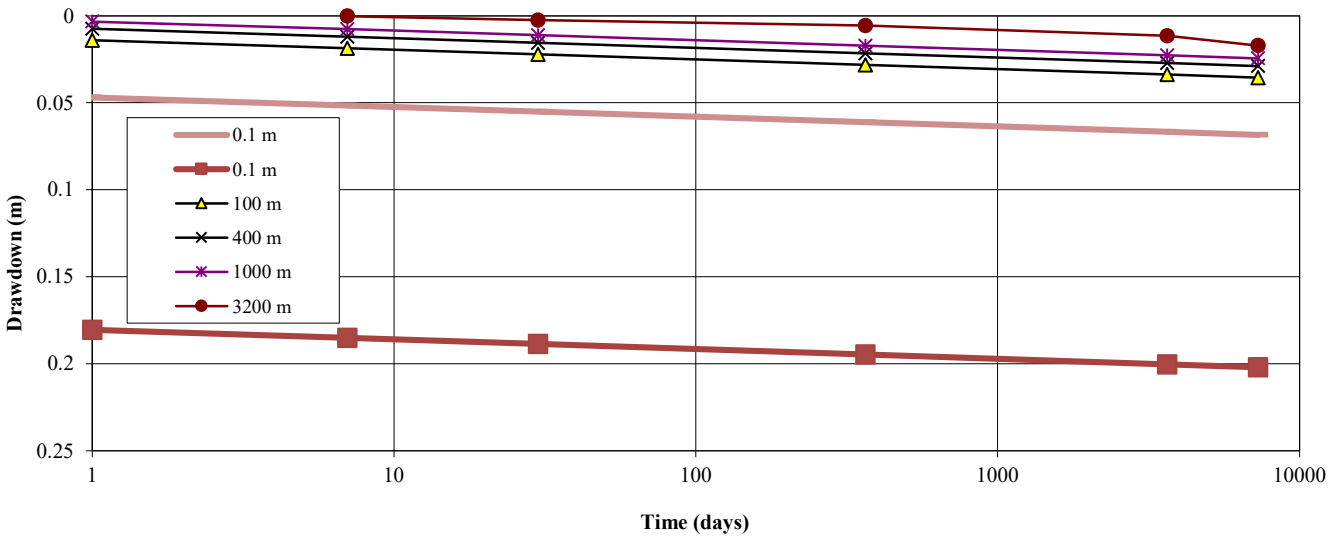
Theis Method (Confined) - Single Well Analysis

Description of Analysis:

Pump Well ID	PW2					
Flow Rate	1.39	Igpm	0.11	L/s		
Transmissivity	300	m^2/day	Aquifer Thickness	3.7	m	
Storativity	2.0E-04		Confined Aquifer? (y/n)	y		
Available Drawdown	11.5	m	well losses (m)	0.133612081		29%

	Confined Aquifer Drawdown (m)	Radius (m) 0.1 m	0.1 m	100 m	400 m	1000 m	3200 m
Time (days)	1.0 days	0.18	0.05	0.01	0.01	0.00	0.00
	7 days	0.19	0.05	0.02	0.01	0.01	0.00
	30 days	0.19	0.06	0.02	0.02	0.01	0.01
	365 days	0.19	0.06	0.03	0.02	0.02	0.01
	3650 days	0.20	0.07	0.03	0.03	0.02	0.02
	7300 days	0.20	0.07	0.04	0.03	0.02	0.02





WaterMark CONSULTING LTD.

Client D. Chobanik
Project Hydrogeological Characterization
Project No. WM571
Date 12-Oct-21

APPENDIX E

GROUNDWATER CHEMISTRY LABORATORY RESULTS

WaterMark CONSULTING LTD.

Results Summary RG2100276

Project	WM571
Report To	Anna Gagnon, Watermark Consulting Ltd.
Date Received	16-Jul-2021 11:11
Issue Date	23-Jul-2021 15:06
Amendment	0

Client Sample ID			PW2
Date Sampled			16-Jul-2021
Time Sampled			10:45
ALS Sample ID			RG2100276-001
Analyte	Lowest Detection Limit	Units	Sub-Matrix: Groundwater
Physical Tests (Matrix: Water)			
conductivity	2.0	µS/cm	1490
alkalinity, total (as CaCO3)	2.0	mg/L	430
hardness (as CaCO3), dissolved	0.50	mg/L	683
pH	0.10	pH units	7.79
solids, total dissolved [TDS], calculated	1.0	mg/L	1110
alkalinity, bicarbonate (as HCO3)	1.0	mg/L	525
alkalinity, carbonate (as CO3)	1.0	mg/L	<1.0
alkalinity, hydroxide (as OH)	1.0	mg/L	<1.0
Anions and Nutrients (Matrix: Water)			
chloride	0.50	mg/L	10.4
fluoride	0.020	mg/L	<0.200
nitrate (as N)	0.020	mg/L	<0.200
nitrate + nitrite (as N)	0.0500	mg/L	<0.224
nitrite (as N)	0.010	mg/L	<0.100
sulfate (as SO4)	0.30	mg/L	473
Ion Balance (Matrix: Water)			
anion sum	0.10	meq/L	18.7
cation sum	0.10	meq/L	18.4
ion balance (cation-anion difference)	0.010	%	0.809
ion balance (cations/anions ratio)	0.010	%	98.4
Dissolved Metals (Matrix: Water)			
aluminum, dissolved	0.0010	mg/L	<0.0020
antimony, dissolved	0.00010	mg/L	<0.00020
arsenic, dissolved	0.00010	mg/L	0.00696
barium, dissolved	0.00010	mg/L	0.0114
beryllium, dissolved	0.000020	mg/L	<0.000040

bismuth, dissolved	0.000050	mg/L	<0.000100
boron, dissolved	0.010	mg/L	0.336
cadmium, dissolved	0.0000050	mg/L	<0.0000100
calcium, dissolved	0.050	mg/L	142
cesium, dissolved	0.000010	mg/L	<0.000020
chromium, dissolved	0.00050	mg/L	<0.00100
cobalt, dissolved	0.00010	mg/L	0.00112
copper, dissolved	0.00020	mg/L	0.00272
iron, dissolved	0.030	mg/L	0.442
lead, dissolved	0.000050	mg/L	<0.000100
lithium, dissolved	0.0010	mg/L	0.136
magnesium, dissolved	0.0050	mg/L	79.7
manganese, dissolved	0.00500	mg/L	0.898
molybdenum, dissolved	0.000050	mg/L	0.00559
nickel, dissolved	0.00050	mg/L	0.00148
phosphorus, dissolved	0.050	mg/L	<0.100
potassium, dissolved	0.050	mg/L	7.63
rubidium, dissolved	0.00020	mg/L	0.00225
selenium, dissolved	0.000050	mg/L	<0.000100
silicon, dissolved	0.050	mg/L	12.3
silver, dissolved	0.000010	mg/L	<0.000020
sodium, dissolved	0.050	mg/L	104
strontium, dissolved	0.00020	mg/L	0.774
sulfur, dissolved	0.50	mg/L	160
tellurium, dissolved	0.00020	mg/L	<0.00040
thallium, dissolved	0.000010	mg/L	<0.000020
thorium, dissolved	0.00010	mg/L	<0.00020
tin, dissolved	0.00010	mg/L	<0.00020
titanium, dissolved	0.00030	mg/L	<0.00060
tungsten, dissolved	0.00010	mg/L	<0.00020
uranium, dissolved	0.000010	mg/L	0.00314
vanadium, dissolved	0.00050	mg/L	<0.00100
zinc, dissolved	0.0010	mg/L	0.0067
zirconium, dissolved	0.00030	mg/L	<0.00060
dissolved metals filtration location			Field

Qualifier Legend

DLDS	Detection Limit Raised: Dilution required due to high Dissolved