Pumping Test Report

31 Church Street South Development
Alma, Ontario

Project 10056-2

1. INTRODUCTION

Hydrogeology Consulting Services Inc. (HCS) was retained by Exact Construction LTD to conduct three pumping tests of three domestic supply wells located at 31 Church Street in Alma, Ontario. The domestic supply wells will be used to service three residential dwellings within a proposed 15-lot residential subdivision. The location of the subject property and supply wells are shown on Drawing 1 in Appendix A.

1.1 Previous Studies

Previous investigation of the subject property includes the following:

- Scoped Hydrogeological Assessment (HCS, May 2, 2022);
- Geotechnical Investigation (CMT Engineering Inc., December 18, 2020).

The scoped hydrogeological assessment report describes soil stratigraphy and shallow groundwater beneath the subject property, along with assessment of the potential impact of proposed in-ground sewage effluent leaching beds. The scoped hydrogeological assessment should be read in conjunction with this report.

1.2 Scope of Work

On September 30, 2022 a door-to-door well survey of properties within 500 m of the subject property was completed to gather information on existing water supply wells in proximity to the subject property. The three supply wells at 31 Church Street South (MECP Well Tag Numbers A357595, A357596 & A299778) and six neighbouring water supply wells at 10 Church Street South (Unknown Well Number); 12 Church Street South (A020155); 27 Alma Queen Street South (6712559); 31 Alma Queen Street South (6712605); 32 Alma Queen Street South (6710987), and 47 Peel Street West (A030082) were subsequently instrumented with electronic pressure transducers (dataloggers) on October 31, 2022 (two days before the commencement of the first pumping test) to continuously record water levels in the wells before, during, and after the pumping tests.

Three six-hour pumping tests were carried out on the three on-site wells. The tests were carried out on November 2, 4, and 5, 2022 at average pumping rates of 37.8 Litres per minute (L/min) per well. Well A357596 was pumped on November 2; Wells A357595 & A357596 were pumped simultaneously on November. 4; and Wells A357595, A357596 & A299778 were pumped simultaneously on November 5. Pumping test details are provided in Table 1 below.

Table 1: Well Information

Pumping Test Date	Pumping Well(s)	Average Pumping Rate (L/min)
Nov 2, 2022	A357596	37.8
Nov 4, 2022	A357595 & A357596	37.8 + 37.8 = 75.6 Combined
Nov 5, 2022	A357595, A357596 & A299778	37.8 + 37.8 + 37.8 = 113.4 Combined

During each test, water levels in the three on-site supply wells plus the six neighbouring observation wells (located approximately 105-130 m away from the pumping well(s)) were continuously monitored using dataloggers as well as with periodic manual water level measurements using an electronic water level tape. Upon completion of each pumping test the water levels in all pumping and observation wells were monitored to observe water level recovery.

Two water chemistry samples were obtained from on-site pumping well A357596 after one hour and five hours of the pumping test on November 4, 2022. In addition, two water chemistry samples from neighbouring off-site wells were collected on November 5, 2022 – one from 10 Church St. South (dug well; unknown well number) and one from 31 Alma Queen St. South (Well #6712605). The samples from the on-site pumping well were taken directly from the discharge hose, and samples from the neighbouring off-site wells were taken from household fixtures. All samples were collected in appropriate laboratory supplied containers, stored in a cooler, and delivered to the ALS Environmental laboratory in Waterloo, Ontario for analysis of potability-related parameters and compared to Ontario Drinking Water Quality Standards (ODWQS).

2. STUDY AREA PHYSIOGRAPHY AND GEOLOGY

2.1 Site Description

The subject property is located in a mixed agricultural and residential area within the Community of Alma, Township of Mapleton, Ontario. As shown on the attached Drawing 1, the approximately 6.8 hectare property is currently undeveloped, consisting of agricultural fields, treed areas, and shrubs. Residential properties are located to north and east of the site, with agricultural and commercial properties to the south and west.

According to Grand River Conservation Authority (GRCA) mapping, the surface topography of the subject property slopes to the southeast from approximately 446 mASL (metres above sea level) at the northwestern property boundary to 437.5 mASL at the southeastern property boundary.

2.2 Physiography

As described in the scoped hydrogeology report for the property (HCS, 2022) the subject property is located within the undrumlinized Till Plains physiographic unit (Chapman and Putnam, 2007) which consists of glacially deposited fine-grained silty clay till soils, found more commonly to be in plain (or valley) formation rather than a drumlinized (hilly) formation. Neighbouring the property to the south and east is the Spillways physiographic unit, indicating an area of larger-grained soils from glacial river deposits. The property lies within the Stratford Till Plain physiographic region, consisting of a broad plain of relatively uniform silty clay (till) soils.

2.3 Geology

Quaternary Geology Mapping of Southern Ontario (OGS, 2000) indicates that the subject property is underlain by Tavistock Till consisting of clay to silt-textured till derived from glaciolacustrine deposits or shale. Overburden soil stratigraphy from on-site water supply wells (A357595, A357596 & A299778) and neighbouring observation wells consists of a thin layer of topsoil, underlain by clay (till) of varying consistency extending to approximately 29-60 m below ground surface (mBGS). The clay till is underlain by a layer of gravel and sand at least 2.7-8.8 m thick. The water well records are provided in Appendix B for reference.

Paleozoic Geology mapping (Armstrong and Dodge, 2007) indicates the Guelph Formation dolostone bedrock underlies the overburden deposits in the area. Water Well Records from nearby properties obtained from the Ministry of Environment, Conservation, and Parks (MECP) Water Well Record (WWR) online database indicate overburden deposits in the area are approximately 49.7 m thick on average.

Karst mapping of Southern Ontario (Brunton and Dodge, 2008) also indicates that the property is within an area of potential karst.

2.4 Hydrogeology

The water well records from the on-site supply wells indicate an overburden aquifer is located approximately 53.6-61 mBGS (depth where water found). The water-bearing gravel layeris at least 2.7-8.8 m thick and is overlain by clay (till) deposits. As shown on Table 2 below, comparison of each wells' screened interval vs. static water level measurements indicates the aquifer is under confining pressure. The well locations are shown on the appended Drawing 2.

Table 2: Measured Water Levels

Well Tag No.	Screened Interval (mBGS)	Ground Surface Elevation (mASL)	2-Nov-2022	
			Water Level (mBGS)	Water Level (mASL)
A357595	59.4 – 60.7	444*	6.04	437.96*
A357596	59.7 – 61.0	444*	5.18	438.82*
A299778	53.03 – 54.25	444*	2.10	441.9*

mBGS – metres Below Ground Surface
mASL – metres Above Sea Level

* - Ground Surface Elevation is interpolated from GRCA mapping, and is considered approximate.

According to Ontario Source Protection Information Atlas (OSPIA) mapping, the property is located within the West Montrose-Grand River Watershed. Locally, shallow groundwater within this watershed would be expected to flow generally south-eastwards towards the Grand River.

3. WATER TAKING REQUIREMENT CALCULATIONS

The typical daily water demand for a private residence can be calculated as the product of the daily water requirement per person, and the "likely number of persons per well", as described in MECP Procedure D-5-5 (MOE, now MECP, 1996). For a single-family residence, the likely number of persons is calculated as the number of bedrooms plus one. For the purpose of calculating water supply requirements it is conservatively assumed that the each proposed single-family dwelling will include four bedrooms. As such, the daily water demands for the on-site wells A357595, A357596, and A299778 have been calculated as follows:

$$V_{Daily} = PPR \times (BDRMS + 1)$$

Where:

V_{Daily} = The daily water demand of the proposed residence

PPR (Per Person Water Requirement) = 450 L/day (MOE, 1996)

BRDMS (Number of Bedrooms) = 4+1

The daily water demand volume is calculated as 2,250 L/day for each proposed single family residential dwelling.

The peak water demand for a residence must also be considered when evaluating well capacity. The peak water demand is assumed to occur twice per day for 60 minutes (once in the morning and once in the evening), for a total of 120 minutes per day (MOE, 1996). As such, the peak demand rate (Q_{Peak}) for the residence has been calculated as follows:

$$Q_{Peak} = V_{Daily} / 120 \text{ minutes/day}$$

The peak water demand volume is calculated as 18.75 L/min for the existing and proposed residences. The above estimates exclude lawn watering or other outdoor use requirements.

Therefore, in order for supply wells A357595, A357596, and A299778 to service the proposed single family homes on their respective lots, each must be able to sustain a pumping rate of 18.75 L/min for at least two hours, and must be able to provide a minimum water volume of at least 2,250 L/day.

Extrapolating these number to the entire 15-lot subdivision, the peak water demand would be 281.25 L/min for two hours and 33,750 L/day.

4. SUPPLY WELL PUMPING TESTS

In order to determine whether wells A357595, A357596, and A299778 have the capacity to sustain the water demands for their corresponding lots within the proposed development on the subject property, three six-hour pumping tests were carried out over November 2, 4, and 5, 2022.

Pumping wells A357595, A357596, and A299778 and the six neighbouring observation wells (located approximately 105-330 m away from the pumping wells) were instrumented with electronic pressure transducers (dataloggers) prior to commencement of the pumping tests to continuously record changes in groundwater levels before, during, and after the tests.

For the neighbouring observation wells, dataloggers were installed on October 31, 2022 (2 days before the commencement of the first pumping test). As such, background water level fluctuations in the observation wells could be assessed and compared with water level changes during the pumping tests. It should be noted that the background measurements for the neighbouring supply wells show several sharp drops in water level followed by rapid recoveries which are expected to correspond to periods when the supply well was being used by the residence.

Upon completion of each pumping test the water levels in all pumping and observation wells were monitored to observe water level recovery.

A summary of the well construction information for each well is provided in Table 3 below and the MECP well records are included in Appendix B.

Table 3: Well Information

Well Name	Well Type	Well Depth (mBGS)	Casing Stickup (m)
A357595 (Pumping Well)	Overburden	61.6	0.91
A357596 (Pumping Well)	Overburden	61.3	0.91
A299778 (Pumping Well)	Overburden	54.25	0.91
10 Church Street S. (Off-Site Observation Well; Unknown Well Number)	Overburden (Dug)	3.9	0.37
12 Church Street S. (Off-Site Observation Well; A020155)	Overburden	57	0.16
27 Alma Queen Street S. (Off-Site Observation Well; 6712559)	Overburden	50	0.86
31 Alma Queen Street S. (Off-Site Observation Well; 6712605)	Overburden	48.5	0.76
32 Alma Queen Street S. (Off-Site Observation Well; 6710987),	Overburden	31.1	0.51
47 Peel Street W. (Off-Site Observation Well; A030082)	Overburden	62.2	0.56

mBGS – metres Below Ground Surface
mASL – metres Above Sea Level

Where a corresponding well record cannot be found in the MECP well database (wells with unknown tag #s), the well depth was measured during datalogger installation

During the six-hour pumping tests, the average pumping rate was approximately 37.8 L/min for each supply well being pumped.

For each test, the pumping rate was periodically verified by manual flow measurement using a stopwatch and calibrated vessel, and remained relatively constant throughout the duration of the test. All discharge from the pumping tests were directed to the ground surface on the subject property a minimum of 30 m from each well. Based on the subsurface stratigraphy shown on the appended Well Logs there is significant hydraulic isolation between the ground surface and the overburden aquifer screened by the supply wells; therefore, it is reasonable to conclude

there was no recharge of the aquifer during the pumping test resulting from pumping test discharge.

Water levels in the pumping wells and observation wells were also periodically manually monitored with an electronic water level meter in addition to the dataloggers installed in the wells.

Two water chemistry samples were obtained from on-site pumping well A357596 after one hour and five hours of the pumping test on November 4, 2022. In addition, two water chemistry samples from neighbouring off-site wells were collected on November 5, 2022; one from 10 Church St. South (dug well; unknown well number) and one from 31 Alma Queen St. South (Well #6712605). The samples from the pumping well were taken directly from the discharge hose, and samples from the neighbouring off-site wells were taken from household fixtures. All samples were collected in appropriate laboratory-supplied containers, placed in a cooler, and transported to ALS Environmental Laboratories (ALS) in Waterloo, Ontario for analysis of potability-related parameters and compared to Ontario Drinking Water Quality Standards (ODWQS) parameters for reference purposes.

4.1 On-Site Supply Well A357596 Pumping Test – November 2, 2022

4.1.1 Pumping Well A357596, and Specific Capacity Calculations

Figure 1 in Appendix C shows the water level in pumping well A357596 declined by approximately 0.21 m (from 5.18 to 5.39 mBGS) over the six-hour pumping test on November 2, 2022 at an average pumping rate of 37.8 L/min.

Measurements of the static water level in pumping well A357596 (5.18 mBGS) prior to pumping and the depth to the pump intake (approximately 12.19 m) indicate the well had a maximum available drawdown (head) of 7.01 m. The pumping test drawdown of 0.21 m represents approximately 3% of the pumping well's maximum available drawdown at a pumping rate of approximately 37.8 L/min for six-hours.

It is noted that well efficiency is not linear, and that as drawdown increases (i.e. as pumping rates increase) a well's efficiency would be expected to decrease. Additionally, while the maximum available drawdown is discussed above, a practical drawdown limit should be assumed as 0.5 to 1.0 m above a pump intake screen to ensure that suction is not lost, and air is not drawn into the system. The practical drawdown limit was not exceeded during the pumping test.

The total six-hour extraction volume at 37.8 L/min was approximately 13,608 L over the six-hour pumping test.

Once pumping had ceased, the water level recovery in pumping well A357596 was monitored for approximately 1.5 hours. The water level recovered to approximately 62% of the pre-test water level during the recovery period.

The specific capacity of the pumping well is calculated as:

$$SC = \frac{Q}{s}$$

where Q = pumping rate (L/min)
s = Drawdown (m)

As such, at 37.8 L/min the specific capacity of A357596 is 180 L/min/m.

4.1.2 Observation Well A357595

As shown on the appended Figure 2, water level in the on-site observation well A357595 declined by approximately 0.19 m (from 5.67 to 5.86 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min.

Measurements of the static water level in the observation well A357595 (5.67 mBGS) prior to pumping and the depth to the pump intake (approximately 12.19 m) indicate the well had a maximum available drawdown (head) of 6.52 m. The water level drawdown measured in the observation well of 0.19 m represents approximately 2.9% of the well's maximum available drawdown. The drawdown of 2.9% occurred at a distance of approximately 40 m from pumping well A357596.

Once pumping had ceased, the water level recovery in observation well A357595 was monitored for 0.75 hours. The water level recovered to approximately 34% of the pre-test water level.

4.1.3 Observation Well A299778

As shown on the appended Figure 3, water level in the on-site observation well A299778 declined by approximately 0.12 m (from 1.93 to 2.05 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min.

Measurements of the static water level in the observation well A299778 (1.93 mBGS) prior to pumping and the depth to the pump intake (approximately 28 m) indicate the well had a maximum available drawdown (head) of 26.07 m. The water level drawdown measured in the observation well of 0.12 m represents approximately 0.5% of the well's maximum available drawdown. The drawdown of 0.5% occurred at a distance of 100 m from pumping well A357596.

Once pumping had ceased, the water level in observation well A299778 recovered to approximately 46% of the pre-test water level after 2 hours.

4.1.4 Observation Well at 10 Church St. South (Dug Well, Unknown Well Number)

As shown on the appended Figure 4, water levels in neighbouring observation well at 10 Church St. S declined by approximately 0.32 m (from 1.03 to 1.35 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min. It is important to note; however, that as shown on Figure 4 a similar pattern of drawdown occurred on October 31 and November 1 (prior to the pumping test). It is therefore expected that the drawdown observed during the pumping test actually corresponds to residential well usage by the homeowner rather than influence from the pumping test

Based on the subsurface geology beneath the subject property, it is very unlikely the deep aquifer screened by the on-site supply wells is hydraulically connected to the shallow aquifer utilized by the dug well at 10 Church Street South.

Measurements of the static water level in the supply well at 10 Church St. S (1.03 mBGS) prior to pumping and the depth to the pump intake (assumed to be approximately the bottom of the dug well, measured at 3.88 m) indicate the well had a maximum available drawdown (head) of 2.85 m. The water level drawdown measured in the observation well of 0.32 m represents approximately 11.2% of the well's maximum available drawdown. The drawdown of 11.2% occurred at a distance of 110 m from pumping well A357596.

It is important to note the water level change in the observation well is similar to the observed fluctuation prior to the pumping test as shown on the appended Figure 4, and that the shallow dug well would be expected to be hydraulically isolated from the deeper overburden aquifer screened by the pumping well. As discussed in Section 4.2.4 below the results from the two-well pumping test clearly illustrate no connection between the pumping test and drawdown in the 10 Church Street South dug well; therefore, it is concluded no drawdown occurred during the single-well pumping test that can be attributed to the pumping test itself.

4.1.5 Observation Well at 12 Church St. South (A020155)

As shown on the appended Figure 5, water levels in neighbouring observation well A020155 declined by approximately 0.16 m (from 5.15 to 5.31 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min.

Measurements of the static water level in the well A020155 (5.15 mBGS) prior to pumping and the assumed depth of the pump intake (15.24 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.09 m. The water level drawdown measured in the observation well of 0.16 m represents approximately 1.6% of the well's

maximum available drawdown. The drawdown of 1.6% occurred at a distance of 135 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 75% of the pre-test water level after 7.5 hours.

4.1.6 Observation Well at 27 Alma Queen St. South (6712559)

As shown on the appended Figure 6, water levels in neighbouring observation well 6712559 declined by approximately 0.15 m (from 1.28 to 1.43 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min.

Measurements of the static water level in the well 6712559 (1.28 mBGS) prior to pumping and the depth of the pump intake (12.19 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.91 m. The water level drawdown measured in the observation well of 0.15 m represents approximately 1.4% of the well's maximum available drawdown. The drawdown of 1.4% occurred at a distance of 230 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 67% of the pre-test water level after 7.5 hours.

4.1.7 Observation Well at 31 Alma Queen St. South (6712605)

As shown on the appended Figure 7, water levels in neighbouring observation well 6712605 declined by approximately 0.15 m (from 1.15 to 1.3 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min.

Measurements of the static water level in the well 6712605 (1.15 mBGS) prior to pumping and the depth of the pump intake (12.19 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 11.04 m. The water level drawdown measured in the observation well of 0.15 m represents approximately 1.47% of the well's maximum available drawdown. The drawdown of 1.47% occurred at a distance of 250 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 73% of the pre-test water level after 7.5 hours.

4.1.8 Observation Well at 32 Alma Queen St. South (6710987)

As shown on the appended Figure 8, water levels in neighbouring observation well 6710987 rose by approximately 0.02 m (from 0.86 to 0.84 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min. It is important to note; however, the pattern of sharp drawdown and rapid recovery that occurred in the well over the two days prior to the pumping

test. This pattern is expected to represent residential usage of the supply well by the homeowners; therefore, the rise in water level in the well during the 6-hour pumping test is expected to be a result of residential usage of the well and not an impact from the pumping test.

Measurements of the static water level in the well 6710987 (0.86 mBGS) prior to pumping and the depth of the pump intake (21.34 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 20.48 m. No drawdown occurred in the well, which is located approximately 215 m from pumping well A357596.

4.1.9 Observation Well at 47 Peel St. (A030082)

As shown on the appended Figure 9, water levels in neighbouring observation well A030082 declined by approximately 0.14 m (from 7.43 to 7.57 mBGS) over the six-hour pumping test at a pumping rate of approximately 37.8 L/min.

Measurements of the static water level in the well A030082 (7.43 mBGS) prior to pumping and the depth of the pump intake (30.48 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 23.05 m. The water level drawdown measured in the observation well of 0.14 m represents approximately 0.6% of the well's maximum available drawdown. The drawdown of 0.6% occurred at a distance of 145 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 79% of the pre-test water level after 7.5 hours.

4.2 Simultaneous Pumping Tests of On-Site Supply Wells A357595 and A357596 – November 4, 2022

4.2.1 Pumping Well A357595, and Specific Capacity Calculations

The appended Figure 10 (Appendix C) shows the water level in pumping well A357595 declined by approximately 1.35 m (from 5.74 to 7.09 mBGS) over the six-hour simultaneous pumping test of wells A357595 and A357596 on November 4, 2022. Both wells were pumped at an average rate of 37.8 L/min each, for a combined pumping rate of 75.6 L/min.

Measurements of the static water level in pumping well A357595 (5.74 mBGS) prior to pumping and the depth to the pump intake (approximately 12.19 m) indicate the well had a maximum available drawdown (head) of 6.45 m. The pumping test drawdown of 1.35 m represents approximately 20.9% of the pumping well's maximum available drawdown at a combined pumping rate of approximately 37.8 L/min for six-hours.

It is noted that well efficiency is not linear, and that as drawdown increases (i.e. as pumping rates increase) a well's efficiency would be expected to decrease. Additionally, while the

maximum available drawdown is discussed above, a practical drawdown limit should be assumed as 0.5 to 1.0 m above a pump intake screen to ensure that suction is not lost, and air is not drawn into the system. The practical drawdown limit was not exceeded during the pumping test.

The total six-hour extraction volume at 37.8 L/min per well was approximately 13,608 L per well (27,216 L total) over the six-hour pumping test.

Once pumping had ceased, the water level recovery in pumping well A357595 was monitored for approximately 1 hour. The water level recovered to approximately 87% of the pre-test water level.

The specific capacity of the pumping well is calculated as:

$$SC = \frac{Q}{s}$$

where Q = pumping rate (L/min)
s = Drawdown (m)

As such, at 37.8 L/min (75.6 L/min total) the specific capacity of A357595 is 28 L/min/m.

4.2.2 Pumping Well A357596, and Specific Capacity Calculations

The appended Figure 11 (Appendix C) shows the water level in pumping well A357596 declined by approximately 0.37 m (from 5.17 to 5.54 mBGS) over the six-hour simultaneous pumping test of wells A357595 and A357596 on November 4, 2022.

Measurements of the static water level in pumping well A357596 (5.17 mBGS) prior to pumping and the depth to the pump intake (approximately 12.19 m) indicate the well had a maximum available drawdown (head) of 7.02 m. The pumping test drawdown of 0.37 m represents approximately 5.3% of the pumping well's maximum available drawdown at a pumping rate of approximately 37.8 L/min for six-hours.

It is noted that well efficiency is not linear, and that as drawdown increases (i.e. as pumping rates increase) a well's efficiency would be expected to decrease. Additionally, while the maximum available drawdown is discussed above, a practical drawdown limit should be assumed as 0.5 to 1.0 m above a pump intake screen to ensure that suction is not lost, and air is not drawn into the system. The practical drawdown limit was not exceeded during the pumping test.

The total six-hour extraction volume at 37.8 L/min per well was approximately 13,608 L per well (27,216 L total) over the six-hour pumping test.

Once pumping had ceased, the water level recovery in pumping well A357596 was monitored for approximately 1.5 hours. The water level recovered to approximately 70% of the pre-test water level.

The specific capacity of the pumping well is calculated as:

$$SC = \frac{Q}{s}$$

where Q = pumping rate (L/min)
s = Drawdown (m)

As such, at 37.8 L/min (75.6 L/min total) the specific capacity of A357596 is 102.2 L/min/m.

4.2.3 Observation Well A299778

As shown on the appended Figure 12, water level in the on-site observation well A299778 declined by approximately 0.28 m (from 5.25 to 5.53 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min.

Measurements of the static water level in the observation well A299778 (5.25 mBGS) prior to pumping and the depth to the pump intake (approximately 28 m) indicate the well had a maximum available drawdown (head) of 22.75 m. The water level drawdown measured in the observation well of 0.28 m represents approximately 1.2% of the well's maximum available drawdown. The drawdown of 1.2% occurred at a distance of 95 m from pumping well A3575965 and 100 m from pumping well A357596.

Once pumping had ceased, the water level in observation well A299778 recovered to approximately 51% of the pre-test water level after 2 hours.

4.2.4 Observation Well at 10 Church St. South (Dug Well, Unknown Well Number)

As shown on the appended Figure 13, water levels in neighbouring observation well at 10 Church St. South rose initially and then declined to approximately 0.02 m (from 1.12 to 1.14 mBGS) below the starting water level over the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min.

As noted previously, based on the subsurface geology beneath the subject property, it is very unlikely the deep aquifer screened by the on-site supply wells is hydraulically connected to the shallow aquifer utilized by the dug well at 10 Church Street South.

Measurements of the static water level in the supply well at 10 Church St. S (1.12 mBGS) prior to pumping and the depth to the pump intake (assumed to be approximately the bottom of the dug well, measured at 3.88 m) indicate the well had a maximum available drawdown (head) of

2.76 m. The water level drawdown measured in the observation well of 0.02 m represents approximately 0.7% of the well's maximum available drawdown. The drawdown of 0.7% occurred at a distance of 115 m from pumping well A3575965 and 110 m from pumping well A357596. However, it should be noted that the drawdown observed in the testing period did not exceed drawdown observed during background measurements between October 31, 2022 and the start of the pumping test on November 2, 2022 (Figure 4), and rose for the majority of the test (Figure 13).

Once pumping had ceased, the water level in the well declined an additional 0.04 m (1.18 m) approximately 8 hours after the end of the test. This decline is expected to be a result of residential well usage by the homeowner.

As discussed previously in Section 4.1.4 it is important to note the shallow dug well would be expected to be hydraulically isolated from the deeper overburden aquifer screened by the pumping well. Comparing the results of the single-well pumping test to the two-well pumping test clearly indicates no correlation between the pumping tests and drawdown in the dug well at 10 Church Street South; therefore, it is concluded no drawdown occurred in the dug well as a result of the pumping test.

4.2.5 Observation Well at 12 Church St. South (A020155)

As shown on the appended Figure 14, water levels in neighbouring observation well A020155 declined by approximately 0.33 m (from 5.22 to 5.55 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min.

Measurements of the static water level in the well A020155 (5.22 mBGS) prior to pumping and the assumed depth of the pump intake (15.24 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.02 m. The water level drawdown measured in the observation well of 0.33 m represents approximately 3.3% of the well's maximum available drawdown. The drawdown of 3.3% occurred at a distance of 110 m from pumping well A3575965 and 135 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 73% of the pre-test water level after 8 hours.

4.2.6 Observation Well at 27 Alma Queen St. South (6712559)

As shown on the appended Figure 15, water levels in neighbouring observation well 6712559 declined by approximately 0.32 m (from 1.36 to 1.68 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min.

Measurements of the static water level in the well 6712559 (1.36 mBGS) prior to pumping and the depth of the pump intake (12.19 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.83 m. The water level drawdown measured in

the observation well of 0.32 m represents approximately 3% of the well's maximum available drawdown. The drawdown of 3% occurred at a distance of 250 m from pumping well A3575965 and 230 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 72% of the pre-test water level after 8 hours.

4.2.7 Observation Well at 31 Alma Queen St. South (6712605)

As shown on the appended Figure 16, water levels in neighbouring observation well 6712605 declined by approximately 0.33 m (from 1.21 to 1.54 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min.

Measurements of the static water level in the well 6712605 (1.21 mBGS) prior to pumping and the depth of the pump intake (12.19 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.98 m. The water level drawdown measured in the observation well of 0.33 m represents approximately 3% of the well's maximum available drawdown. The drawdown of 3% occurred at a distance of 275 m from pumping well A3575965 and 250 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 67% of the pre-test water level after 8 hours.

4.2.8 Observation Well at 32 Alma Queen St. South (6710987)

As shown on the appended Figure 17 water levels in neighbouring observation well 6710987 showed no change in water level at the start and end of the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min. Several sharp declines in the water level, followed by quick water level rises were observed during the test, are related to water use in the residential dwelling on 32 Alma Queen St. S. These declines were all within background fluctuations, and are commonly observed in this well (Figure 8, Figure 17).

Measurements of the static water level in the well 6710987 (0.97 mBGS) prior to pumping and the depth of the pump intake (21.34 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 20.37 m. Based on Figure 17 is it concluded no drawdown occurred in the well, which is located approximately 250 m from pumping well A3575965 and 215 m from pumping well A357596, due to influence of the pumping test; or, any drawdown which occurred was masked by drawdown during residential usage.

4.2.9 Observation Well at 47 Peel St. (A030082)

As shown on the appended Figure 18, water levels in neighbouring observation well A030082 declined by approximately 0.33 m (from 7.49 to 7.82 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 75.6 L/min.

Measurements of the static water level in the well A030082 (7.49 mBGS) prior to pumping and the depth of the pump intake (30.48 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 22.99 m. The water level drawdown measured in the observation well of 0.33 m represents approximately 1.4% of the well's maximum available drawdown. The drawdown of 1.4% occurred at a distance of 105 m from pumping well A3575965 and 145 m from pumping well A357596.

Once pumping had ceased, the water level in the well recovered to approximately 73% of the pre-test water level after 8 hours.

4.3 Simultaneous Pumping Tests of On-Site Supply Wells A357595, A357596, and A299778 – November 5, 2022

4.3.1 Pumping Well A357595, and Specific Capacity Calculations

The appended Figure 19 (Appendix C) shows the water level in pumping well A357595 declined by approximately 1.47 m (from 5.82 to 7.29 mBGS) over the six-hour simultaneous pumping test of wells A357595, A357596, and A299778 on November 5, 2022. All three wells were pumped at an average rate of 37.8 L/min each, for a combined pumping rate of 113.4 L/min.

Measurements of the static water level in pumping well A357595 (5.82 mBGS) prior to pumping and the depth to the pump intake (approximately 12.19 m) indicate the well had a maximum available drawdown (head) of 6.37 m. The pumping test drawdown of 1.47 m represents approximately 23.1% of the pumping well's maximum available drawdown at a pumping rate of approximately 37.8 L/min for six-hours.

It is noted that well efficiency is not linear, and that as drawdown increases (i.e. as pumping rates increase) a well's efficiency would be expected to decrease. Additionally, while the maximum available drawdown is discussed above, a practical drawdown limit should be assumed as 0.5 to 1.0 m above a pump intake screen to ensure that suction is not lost, and air is not drawn into the system. The practical drawdown limit was not exceeded during the pumping test.

The total six-hour extraction volume at 37.8 L/min per well was approximately 13,608 L per well (40,824 L total) over the six-hour pumping test.

Once pumping had ceased, the water level recovery in pumping well A357595 was monitored for approximately 1.5 hours. The water level recovered to approximately 84% of the pre-test water level.

The specific capacity of the pumping well is calculated as:

$$SC = \frac{Q}{s}$$

where Q = pumping rate (L/min)
s = Drawdown (m)

As such, at 37.8 L/min (113.4 L/min total) the specific capacity of A357596 is 25.7 L/min/m, correlating relatively well with the specific capacity calculated for the 2-well pumping test.

4.3.2 Pumping Well A357596, and Specific Capacity Calculations

The appended Figure 20 (Appendix C) shows the water level in pumping well A357596 declined by approximately 0.54 m (from 5.15 to 5.69 mBGS) over the six-hour simultaneous pumping test of wells A357595, A357596, and A299778 on November 5, 2022.

Measurements of the static water level in pumping well A357596 (5.15 mBGS) prior to pumping and the depth to the pump intake (approximately 12.19 m) indicate the well had a maximum available drawdown (head) of 7.04 m. The pumping test drawdown of 0.54 m represents approximately 7.7% of the pumping well's maximum available drawdown at a combined pumping rate of 113.4 L/min for six-hours.

It is noted that well efficiency is not linear, and that as drawdown increases (i.e. as pumping rates increase) a well's efficiency would be expected to decrease. Additionally, while the maximum available drawdown is discussed above, a practical drawdown limit should be assumed as 0.5 to 1.0 m above a pump intake screen to ensure that suction is not lost, and air is not drawn into the system. The practical drawdown limit was not exceeded during the pumping test.

The total six-hour extraction volume at 37.8 L/min per well was approximately 13,608 L per well (40,824 L total) over the six-hour pumping test.

Once pumping had ceased, the water level recovery in pumping well A357596 was monitored for 2 hours. The water level recovered to approximately 63% of the pre-test water level.

The specific capacity of the pumping well is calculated as:

$$SC = \frac{Q}{s}$$

where Q = pumping rate (L/min)
s = Drawdown (m)

As such, at 113.4 L/min total the specific capacity of A357596 is 70 L/min/m, somewhat lower than the specific capacity calculated for the 2-well pumping test.

4.3.3 Pumping Well A299778, and Specific Capacity Calculations

As shown on the appended Figure 21 (Appendix C), water level in the on-site observation well A299778 declined by approximately 0.77 m (from 5.35 to 6.12 mBGS) over the six-hour simultaneous pumping test of wells A357595, A357596, and A299778 on November 5, 2022.

Measurements of the static water level in the observation well A299778 (5.35 mBGS) prior to pumping and the depth to the pump intake (approximately 28 m) indicate the well had a maximum available drawdown (head) of 22.65 m. The pumping test drawdown of 0.77 m represents approximately 3.4% of the pumping well's maximum available drawdown at a combined pumping rate of 113.4 L/min for six-hours.

It is noted that well efficiency is not linear, and that as drawdown increases (i.e. as pumping rates increase) a well's efficiency would be expected to decrease. Additionally, while the maximum available drawdown is discussed above, a practical drawdown limit should be assumed as 0.5 to 1.0 m above a pump intake screen to ensure that suction is not lost, and air is not drawn into the system. The practical drawdown limit was not exceeded during the pumping test.

The total six-hour extraction volume at 37.8 L/min per well was approximately 13,608 L per well (40,824 L total) over the six-hour pumping test.

Once pumping had ceased, the water level recovery in pumping well A299778 was monitored for 1.75 hours. The water level recovered to approximately 71% of the pre-test water level.

The specific capacity of the pumping well is calculated as:

$$SC = \frac{Q}{s}$$

where Q = pumping rate (L/min)
s = Drawdown (m)

As such, at 113.4 L/min total the specific capacity of A299778 is 49.1 L/min/m.

4.3.4 Observation Well at 10 Church St. South (Dug Well, Unknown Well Number)

As shown on the appended Figure 22, water levels in neighbouring observation well at 10 Church St. S declined by approximately 0.03 m (from 1.37 to 1.4 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 113.4 L/min. However, it is noted water levels in the well were declining for more than 2.5 hour prior to the commencement of the pumping test; and, water levels in the well generally rose during the last three hours of the pumping test.

As noted previously, based on the subsurface geology beneath the subject property, it is very unlikely the deep aquifer screened by the on-site supply wells is hydraulically connected to the shallow aquifer utilized by the dug well at 10 Church Street South.

As discussed previously in Sections 4.1.4 and 4.2.4 it is important to note the shallow dug well would be expected to be hydraulically isolated from the deeper overburden aquifer screened by the pumping well. Comparing the results of the single-well pumping test to the two-well pumping test and three-well pumping test clearly indicates no correlation between the pumping tests and drawdown in the dug well at 10 Church Street South; therefore, it is concluded no drawdown occurred in the dug well as a result of the pumping test.

4.3.5 Observation Well at 12 Church St. South (A020155)

As shown on the appended Figure 23, water levels in neighbouring observation well A020155 declined by approximately 0.48 m (from 5.32 to 5.80 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 113.4 L/min.

Measurements of the static water level in the well A020155 (5.32 mBGS) prior to pumping and the assumed depth of the pump intake (15.24 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 9.92 m. The water level drawdown measured in the observation well of 0.48 m represents approximately 4.8% of the well's maximum available drawdown. The drawdown of 4.8% occurred at a distance of 110 m from pumping well A3575965, 135 m from pumping well A357596, and 200 m from pumping well A299778.

Once pumping had ceased, the water level in the well recovered to approximately 50% of the pre-test water level after 1.25 hours.

4.3.6 Observation Well at 27 Alma Queen St. S (6712559)

As shown on the appended Figure 24, water levels in neighbouring observation well 6712559 declined by approximately 0.47 m (from 1.46 to 1.93 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 113.4 L/min.

Measurements of the static water level in the well 6712559 (1.46 mBGS) prior to pumping and the depth of the pump intake (12.19 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.73 m. The water level drawdown measured in the observation well of 0.47 m represents approximately 4.4% of the well's maximum available drawdown. The drawdown of 4.4% occurred at a distance of 250 m from pumping well A3575965, 230 m from pumping well A357596, and 325 m from pumping well A299778.

Once pumping had ceased, the water level in the well recovered to approximately 55% of the pre-test water level after 2 hours.

4.3.7 Observation Well at 31 Alma Queen St. S (6712605)

As shown on the appended Figure 25, water levels in neighbouring observation well 6712605 declined by approximately 0.49 m (from 1.31 to 1.80 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 113.4 L/min.

Measurements of the static water level in the well 6712605 (1.31 mBGS) prior to pumping and the depth of the pump intake (12.19 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 10.88 m. The water level drawdown measured in the observation well of 0.49 m represents approximately 4.5% of the well's maximum available drawdown. The drawdown of 4.5% occurred at a distance of 275 m from pumping well A3575965, 250 m from pumping well A357596, and 325 m from pumping well A299778.

Once pumping had ceased, the water level in the well recovered to approximately 55% of the pre-test water level after 2.25 hours.

4.3.8 Observation Well at 32 Alma Queen St. S (6710987)

As shown on the appended Figure 26 water levels in neighbouring observation well 6710987 exhibited several sharp declines in the water level followed by quick water level recover both prior to and during the pumping test, related to residential water use by the homeowner. These declines were all within background fluctuations, and are commonly observed in this well.

The measured water level at the start and the end of the pumping test was almost identical after the six-hour pumping test at a combined pumping rate of approximately 113.4 L/min.

Measurements of the static water level in the well 6710987 (1.36 mBGS) prior to pumping and the depth of the pump intake (21.34 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 19.98 m. Based on Figure 26 is it concluded no drawdown occurred in the well, which is located approximately 250 m from pumping well A3575965, 215 m from pumping well A357596, and 330 m from pumping well A299778, due to influence of the pumping test; or, any drawdown which occurred was masked by drawdown during residential usage.

4.3.9 Observation Well at 47 Peel St. (A030082)

As shown on the appended Figure 27, water levels in neighbouring observation well A030082 declined by approximately 0.48 m (from 7.59 to 8.07 mBGS) over the six-hour pumping test at a combined pumping rate of approximately 113.4 L/min.

Measurements of the static water level in the well A030082 (7.59 mBGS) prior to pumping and the depth of the pump intake (30.48 mBGS – indicated by the MECP WWR) indicate the well had a maximum available drawdown (head) of 22.89 m. The water level drawdown measured in the observation well of 0.48 m represents approximately 2.1% of the well's maximum available drawdown. The drawdown of 2.2% occurred at a distance of 105 m from pumping well A3575965, 145 m from pumping well A357596, and 130 m from pumping well A299778.

Once pumping had ceased, the water level in the well recovered to approximately 56% of the pre-test water level after 2.5 hours.

4.4 Pumping Test Data Analysis

The time-drawdown graphs for each pumping well on the appended Figures 28-33 were analyzed to calculate aquifer transmissivity and hydraulic conductivity using the equations developed by Jacob[1], as follows:

Time-Drawdown: $T = \frac{0.183Q}{\Delta s}$

Hydraulic Conductivity: $K = \frac{T}{B}$

where T = aquifer transmissivity (m^2/day)
Q = pumping rate = 54.4 m^3/day per well (37.8 L/min average per well)
Δs = drawdown per log cycle from semi-log graphs
K = hydraulic conductivity (m/day)
B = saturated aquifer thickness at well (gravel layer)
A357595: 3.7 m
A357596: 8.8 m
A299778: 2.7 m
As none of the supply wells fully penetrated the gravel and sand aquifer, it is conservatively assumed the aquifer thickness is 9 m for the purposes of these calculations

Based on the on-site well records the gravel aquifer commences at depths of approximately 51.5-57.9 mBGS and extends to at least 61.5 mBGS. The saturated aquifer thickness is reasonably estimated as 9 m based on the on-site well records.

[1] **Powers, J.P. et al. 2007.** ***Construction Dewatering and Groundwater Control, New Methods and Applications. 3rd Edition*****. John Wiley and Sons, Inc.**

Table 8 below summarizes the transmissivity and hydraulic conductivity values calculated from the six-hour pumping tests. For the three pumping wells transmissivity was conservatively calculated assuming the individual well pumping rate of 37.8 L/min.

For the three-wells-combined analysis transmissivity was calculated assuming the total pumping rate of 113.4 L/min, and using the minimum and maximum Δs values from the three individual wells.

Table 8: Pumping Test Estimated Transmissivity Values –Six-Hour Pumping Tests

Well Name	Analysis	Δs	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	(m/sec)
Pumping Well A357596	Time-DDN Pumping (datalogger)	0.08	124.4	13.8	1.6×10^{-4}
	Time-DDN Pumping (datalogger) Simultaneous Pumping with A357595	0.19	52.4	5.8	6.7×10^{-5}
	Time-DDN Pumping (datalogger) Simultaneous Pumping with A357595 & A299778	0.26	38.3	4.3	4.9×10^{-5}
Pumping Well A357595	Time-DDN Pumping (datalogger) Simultaneous Pumping with A357596	0.16	62.2	6.9	7.9×10^{-5}
	Time-DDN Pumping (datalogger) Simultaneous Pumping with A357596 & A299778	0.27	36.9	4.1	4.7×10^{-5}
Pumping Well A299778	Time-DDN Pumping (datalogger) Simultaneous Pumping with A357595 & A357596	0.27	36.9	4.1	4.7×10^{-5}
All Three Wells Combined	Time-DDN Pumping (datalogger)	0.08 (min)	373.5	41.5	4.8×10^{-4}
All Three Wells Combined	Time-DDN Pumping (datalogger)	0.27 (max)	110.7	12.3	1.4×10^{-4}

While the Jacob (or Cooper-Jacob) method described above is optimized for analysis of pumping test data where the well is completed at the base of the confined aquifer (i.e., a fully penetrating well), independent evaluation of the Jacob method (Halford et al, 2006) has determined:

> Interpretation of single-well tests with the Cooper-Jacob method remains more reasonable than most alternatives. Error and bias as a function of vertical anisotropy, partial penetration, specific yield, and interpretive technique were investigated for transmissivities that ranged from 10 to 10,000 m^2/d. Cooper-Jacob transmissivity estimates in confined aquifers were affected minimally by partial penetration, vertical anisotropy, or analyst.

For the purposes of this report, it is concluded the Jacob (or Cooper-Jacob) method described above is reasonable to apply to the supply wells on which the pumping tests were performed.

Using a transmissivity value of 36.9 – 124.4 m^2/day for the individual wells, and an assumed saturated aquifer thickness of 9 m, the estimated hydraulic conductivity of the granular overburden aquifer is 4.1 – 13.8 m/day, or 4.7 x 10^{-5} – 1.6 x 10^{-4} m/sec, indicating a relatively moderately high to high permeability for the supply wells and good correlation between the wells and between the pumping tests.

Using a transmissivity value of 110.7 – 373.5 m^2/day for all four wells combined and the same saturated aquifer thickness of 9 m, the estimated hydraulic conductivity of the granular overburden aquifer is 12.3 – 41.5 m/day, or 1.4 – 4.8 x 10^{-4} m/sec, indicating a relatively high permeability and correlating reasonably well with the hydraulic conductivity values for individual pumping wells.

Despite the wide range of transmissivity values, the hydraulic conductivity values obtained from both individual wells and the combination of all four wells show a good correlation. It is expected the higher transmissivity values calculated using the combined pumping rate are more representative of the actual aquifer conditions.

By comparison, if a larger saturated aquifer thickness was assumed the corresponding hydraulic conductivity value would be smaller. Conversely, if a smaller saturated aquifer thickness was assumed the corresponding hydraulic conductivity value would be even larger. It is unlikely the hydraulic conductivity of the aquifer would be higher than the calculated range; therefore, the assumed saturated aquifer thickness is concluded to be reasonable.

The estimated hydraulic conductivity values from all pumping wells correlate reasonably well with each other, and correlate reasonably well with published hydraulic conductivity ranges fractured limestone bedrock (Freeze and Cherry, 1979).

4.5 Pumping Test Summary

The results of the pumping test indicate supply wells A357595, A357596, and A299778 are capable of sustained pumping at rates of 37.8 L/min each or more.

Additionally, the pumping test results show that at sustained, combined, pumping rates of approximately 75.6-113.4 L/min, the influence of pumping on neighbouring wells was minimal. At the highest combined pumping rate of 113.4 L/min, the maximum drawdown observed at 47 Peel St. W (the closest to the pumping wells at 105 m from A357595) during the combined three-well pumping test was 0.48 m (or 2.1% of the available drawdown in well A030082). In all other off-site wells the maximum drawdown measured during the combined three-well pumping test was 0.49 m (or 4.5% of the available drawdown in observation well 6712605) at a distance of 230-325 m from the pumping wells.

Drawdown within the shallow dug well at 10 Church St. S (unknown well number), was not influenced by the pumping wells screened in the deeper overburden aquifer.

In all cases, the influence of pumping at the combined three-well pumping rate of 113.4 L/min for six-hours (a total extraction volume of approximately 40,824 Litres) resulted in less than 5% drawdown of the available head (drawdown) in all off-site observation wells; and, resulted in 23.1% or less drawdown of the available head (drawdown) in the three supply wells, and less than 10% drawdown of the available head (drawdown) in two of the three supply wells.

While 95% recovery of the supply wells was not achieved within the recovery monitoring periods (up to 2.0 hours for the three-well combined pumping test), significant recovery occurred during that time period and recovery was continuing to occur when the monitoring ceased. Recovery monitoring of on-site and off-site wells during the three-well simultaneous pumping test indicated significant recovery occurring over a relatively short time period (2.25 hours or less). It is important to consider the drawdown effects from the single, two-well, and three-well pumping tests were the results of six hours of continuous pumping for each test. During normal household usage observed in the off-site monitoring wells prior to commencement of the pumping tests no long-duration water usage occurred. It is expected during normal household usage supply wells provide water at rates significantly lower than 37.8 L/min per well, and for significantly shorter durations than 6-hours of continuous pumping. It is reasonable to expect the proposed 15 supply wells on the proposed 15 lots will have an influence on groundwater resources available beneath the subject property and neighbouring properties, based on the available drawdown measured in on-site and off-site supply wells and based on expected typical well usage rates and durations, the data from the pumping tests conducted on the three on-site wells indicates the influence of the proposed development on the groundwater aquifer utilized by on-site and off-site supply wells will be minimal and not result in significant impacts to on-site or off-site well water quantity over time.

Drawdown can be theoretically calculated and compared with measured drawdown in order to estimate expected conditions under the proposed pumping rates and durations.

Using the Theis Equation:

$$H - Ho = QW(u)/4\pi T$$

and

$$u = r^2 S/4Tt$$

where:

$H-H_0$ = Drawdown *(m)*

Q = steady state pumping rate *(m^3/sec)*

= 113.4 L/min *(from the combined pumping test)*

= 1.89 L/sec

= 0.025 m^3/sec

T = Confined aquifer transmissivity *(m^2/sec)*

= 241.2 m^2/day *(average calculated transmissivity from the combined well calculations)*

= 2.80 x 10^{-3} m^2/sec

r = radius from pumping well *(m)*

= 105 m *(for reference purposes based on the distance to observation well at 47 Peel St)*

S = Storativity

= S_s*b

where

S_s=specific storage

= *pg*(α +n*B*)

Where

p= mass density of water *(1000 kg/m^3)*

g = gravitational acceleration *(9.8 m/sec^2)*

α = aquifer compressibility *(assumed 1 x 10^{-9} m^2/N for gravel/sand)*

n = porosity *(assumed 0.3 for gravel/sand)*

B = compressibility of water *(4.4 x 10^{-10} m sec^2/kg)*

= 1.11 x 10^{-5}

b=aquifer thickness *(assumed 9 m)*

$= 1.11 \times 10^{-5} * 9$

$= 9.98 \times 10^{-5}$

t = time *(seconds)*

= 6 hours (*pumping test duration)*

= 21,600 seconds

$u = (105^2 * 9.98 \times 10^{-5}) / (4 * 2.80 \times 10^{-3} * 21{,}600)$

$= 1.10/242.1$

$= 0.0045$

W(u) = Theis well function

= 4.84 *(a function of u, from Wenzel, 1942)*

Therefore: $H\text{-}H_0 = (0.025 * 4.84)/(4 * 3.1415 * 2.80 \times 10^{-3})$

$= 0.023/0.035$

$= 0.64$ m

The Theis equation shows at a pumping volume of 113.4 L/min, after six hours, at a radius of 105 m from the pumping wells theoretical drawdown would be 0.64 m.

Table V below summarizes the theoretical calculated drawdown after 6 hours of pumping at 113.4 L/min vs. actual measured drawdown.

Table V: Drawdown vs. Distance – 6-Hour Calculated vs. Actual

Distance from Pumping Well	Calculated Drawdown at 113.4 L/min (m)	Actual Drawdown at 113.4 L/min (m)
105 m	0.64	0.48

When compared to the actual pumping test results we see while the drawdowns are not identical the two measurements correlate well. The theoretical calculations somewhat overestimate drawdown (actual drawdown of 0.48 m vs theoretical drawdown of 0.64 m at a 105 m radius). This may be due to factors such as using an average Transmissivity value; using an estimated aquifer thickness; heterogeneities within the subsurface; or, other assumed variables such as porosity, aquifer compressibility, etc.

4.5.1 Pumping Test Summary vs. Proposed Water Usage Requirements

The peak water demand for the 15-lot subdivision is calculated at 281.25 L/min for two hours or 33,750 L. If we assume a single supply well pumped this quantity over a two hour period for the purposes of assessing potential impact to off-site neighbouring properties:

Using the Theis Equation:

$$H - Ho = QW(u)/4\pi T$$

and

$$u = r^2 S/4Tt$$

where:

$H\text{-}H_0$ = Drawdown (m)

Q = steady state pumping rate (m^3/sec)

= 281.25 L/min

= 0.0047 m^3/sec

T = Confined aquifer transmissivity (m^2/sec)

= 242.1 m^2/day *(average calculated transmissivity from the combined well calculations)*

= 2.80 x 10^{-3} m^2/sec

r = radius from pumping well *(m)*

= 30 m *(for reference purposes based on anticipated minimum distance between on-site and off-site supply wells)*

S = Storativity

= S_s*b

where

S_s=specific storage

= *pg*(α +n*B*)

Where

p= mass density of water *(1000 kg/m^3)*

g = gravitational acceleration *(9.8 m/sec^2)*

α = aquifer compressibility *(assumed 1 x 10^{-9} m^2/N for gravel/sand)*

n = porosity *(assumed 0.3 for gravel/sand)*

B = compressibility of water *(4.4 x 10^{-10} m sec^2/kg)*

= 1.11×10^{-5}

b=aquifer thickness *(assumed 9 m)*

= $1.11 \times 10^{-5} * 9$

= 9.98×10^{-5}

t = time *(seconds)*

= 2 hours (*peak water demand)*

= 7,200 seconds

$u = (30^2 * 9.98 \times 10^{-5}) / (4 * 2{,}80 \times 10^{-3} * 7{,}200)$

= 0.089/80.7

= 0.0011

W(u) = Theis well function

= 6.26 *(a function of u, from Wenzel, 1942)*

Therefore: $H\text{-}H_0 = (0.0047 * 6.26)/(4 * 3.1415 * 2.80 \times 10^{-3})$

= 0.0293/0.035

= 0.83 m

The Theis equation shows at a pumping volume of 281.25 L/min (representing simultaneous pumping of all fifteen proposed wells), after two hours, at a radius of 30 m from the simulated single pumping well drawdown would be 0.83 m.

As this simulation very conservatively assumes the entire peak usage rate is pumped from a single well located 30 m away from the nearest receptor (rather than being spread across the 6.8 hectare property) it is reasonable to conclude based on the available drawdown in neighbouring wells located more than 30 m from the supply wells that a drawdown of 0.83 m or less would not result in a material impact to adjacent water supply wells.

The peak water demand for the 15-lot subdivision is calculated at 281.25 L/min for two hours, or 33,750 L/day. The three-well simultaneous pumping test demonstrated the ability to pump 113.4 L/min from three wells for six hours, and to pump 40,824 Litres over that time period, with no significant on-site or off site impacts. Based on the performance of the six-hour pumping test of three wells, it is reasonable to conclude a total of fifteen wells on the fifteen lots would be able to meet the peak water demand of the proposed subdivision.

4.6 Water Chemistry Analysis Results

Two water chemistry samples were obtained from on-site pumping well A357596 after one hour and five hours of the pumping test on November 4, 2022. In addition, two water chemistry samples from neighbouring off-site wells were collected on November 5, 2022; one from 10 Church St. South (dug well; unknown well number) and one from 31 Alma Queen St. South (Well #6712605). The samples from the pumping well were taken directly from the discharge hose, and samples from the neighbouring off-site wells were taken from household fixtures. All samples were collected in appropriate laboratory-supplied containers, placed in a cooler, and transported to ALS Environmental Laboratories (ALS) in Waterloo, Ontario for analysis of potability-related parameters and compared to Ontario Drinking Water Quality Standards (ODWQS) parameters for reference purposes. The water chemistry results are summarized in Table 1 in Appendix D.

4.6.1 ODWQS Maximum Acceptable Concentration Exceedances

As shown in Appendix D the measured concentration of Total Coliforms in the 1-hour sample from on-site pumping well A357596 exceeded the ODWQS Maximum Acceptable Concentration (MAC) of zero (0). The well development during the 6-hour pumping test appears to have resolved this exceedance, as the 5-hour sample had no detectable concentration of Total Coliforms. It is important to note the well had not been chlorinated (disinfected) prior to commencement of the pumping test, and that the pumping test discharge was being routed through hoses that were not part of a normal (disinfected) household plumbing system.

The measured concentration of Total Coliforms in the sample from the neighbouring off-site well at 10 Church St. S (dug well, unknown well number) also exceeded the ODWQS Maximum Acceptable Concentration (MAC) of zero (0), with >200 CFU/100 mL reported. The measured concentration of Sodium in the neighbouring off-site well at 10 Church St. S (dug well, unknown well number) also exceeded the ODWQS Maximum Acceptable Concentration of 20 mg/L.This well is shallow (~3.9 m deep) and draws from a different aquifer than the deep on-site supply wells and other drilled neighbouring wells (typically >40 m below ground surface). As discussed previously, the shallow dug well is not expected to be hydraulically connected to the deeper overburden aquifer screened by the on-site supply wells. The homeowner has been notified of the water chemistry analysis results from their well.

4.6.2 ODWQS Aesthetic Objectives/Operational Guidelines Exceedances

In the on-site pumping well A357596, the measured concentrations of Colour, Hardness, and Iron exceeded ODWQS Aesthetic Objectives and Operational Guidelines (AO/OG). In the off-site neighbouring wells, Hardness exceeded ODWQS AO/OG at both 31 Alma Queen St. South and 10 Church St. South, and Total Dissolved Soils exceed ODWQS AO/OG at 10 Church St. South. While these parameters are not health related, high concentrations may impact the taste, odour, and appearance of water; may result in corrosion and mineral deposition; and may

hinder effective water treatment, disinfection, and distribution (MOE, 2006). It is expected readily-available residential water treatment systems can resolve all measured AO/OG exceedances in the groundwater utilized by the on-site water supply wells.

5. ASSESSMENT OF POTENTIAL IMPACTS

5.1 Water Users

Well Records from the MECP WWR database were reviewed to determine the number of supply wells present. As shown on the well records included in Appendix B, 120 wells are located within an approximate radius of 500 m from the supply wells on the subject property (including the six neighbouring supply wells used as observation wells during the pumping test). Nine of the wells are abandonment records, and twelve are identified as monitoring wells (wells classified as monitoring wells, or shallow wells with 2-inch diameters). These wells are excluded from further consideration. The remaining 99 wells are identified as domestic (94), commercial (2), industrial (2), and livestock (1) use supply wells. One well is completed in limestone bedrock at a depth of 78.3 m, and 98 wells are completed in overburden at depths between 7.6 and 72.2 m. The closest neighbouring water supply well is observation well A030082, located approximately 105-145 m from the on-site supply wells. The supply wells are plotted on the appended Drawing 3.

It is noted some of the wells plotted on Drawing 3 are located in areas where a well would not likely exist (they may be associated with neighbouring properties or be incorrectly located by the MECP WWR coordinates), and properties do not have a well associated with them (they may use cisterns; or, have wells with records that are not correctly entered into the MECP WWR database); however, the MECP coordinate data has been used in the absence of more accurate information.

5.2 Door-to-Door Well Survey

A door-to-door survey of properties within a 500 m radius of the subject property was conducted on September 30, 2022 to determine the locations and construction details of private water supply wells in the area. Due to COVID-19 related concerns in-person surveys were not conducted, and a copy of the survey was left along with a self-addressed stamped envelope. Thirty-seven properties were canvassed, with eleven surveys returned at the time of preparation of this report (Appendix D). The eleven wells are residential wells located at 10 Church Street S. (Unknown Well Number), 12 Church Street S. (A020155), 15 Alma Queen Street S. (Unknown Well Number), 27 Alma Queen Street S. (6712559), 31 Alma Queen Street S. (6712605), 32 Alma Queen Street S. (likely Well 6710987), 52 Alma Queen Street S. (Unknown Well Number), 19 Peel Street W. (Unknown Well Number), 47 Peel Street W. (A030082), 24 Alexander St. (Unknown Well Number), and 32 Elora Street S. (6712607). With the exception of the dug well at 10 Church Street, all of the wells are drilled to the deep overburden aquifer. It was reported

that the dug well at 10 Church Street has gone dry in the past. No previous issues with the drilled wells were reported in the survey responses, beyond sulfur and iron odours/tastes when the water is untreated.

5.2.1 Well Record Pumping Test Results

Pumping test results were recorded for ninety-nine neighbouring supply wells in the MECP WWR database. The pump test rates vary between 11.4 and 757.1 Litres per minute, with an average of 85.2 Liters per minute.

5.3 Policy Areas

Wellington County Source Water Protection mapping shows that the subject property is located within a Quantity Wellhead Protection Area (WHPA Q). This refers to an area where land use activities have the potential to affect the quantity of water that flows into the well.

Ontario Source Protection Information Atlas (OSPIA) mapping shows that the northeastern portion of the property is located within a Vulnerable Scoring Surface Water Area (VSSWA) with a vulnerability score of 4-7.9. The property is also located within an Intake Protection Zone 3 (IPZ-3) which overlaps with the VSSWA. Both of these areas appear to correlate with the area around the unnamed stream located to the north of the property. The property is not located within a Significant Groundwater Recharge Area (SGRA), or Highly Vulnerable Aquifer (HVA).

5.4 Impact Assessment Summary and Recommendations

As discussed previously in Section 4, the six-hour pumping tests of supply well A357595, A357596, and A299778 at average pumping rates of 37.8 L/min per well (for a combined rate of 113.4 L/min), resulted in a maximum drawdown of 1.47 m in A357595, 0.54 m in A357596, and 0.77 m in A299778. During the combined test, the drawdown observed in neighbouring wells ranged from 0-0.49 m (0-4.8% of the available drawdown of each well), located approximately 105-330 m away from the on-site pumping wells. Based on this information, no material impacts to existing neighbouring water supply wells (all of which are located more than 105 m away) resulted from sustained, combined pumping rate of 113.4 L/min at wells A357595, A357596, and A299778.

The information available from the pumping test, the MECP WWR database, OSPIA, and Grand River Conservation Authority mapping does not indicate potential for material impact to neighbouring water supply wells, surface water features, or municipal WHPAs from pumping of private residential supply wells on the subject property based on the pumping rates and durations discussed above.

As discussed in Section 4.5.1 above, calculated drawdown at a distance of 30 m after 2 hours of pumping at a rate of 281.25 L/min (simulating the peak-period water usage for the entire 15-lot subdivision) would be 0.83 m. This drawdown would not be expected to result in a material impact to neighbouring water supply wells located 30 m or from the proposed residential supply wells, particularly when considering this peak-period water usage will be distributed across the entire subdivision. Therefore, it is reasonable to conclude the proposed 15-lot development will not result in material impacts to off-site private water supply wells.

To minimize the potential for long-duration supply well use to impact neighbouring water supply wells it is recommended the fifteen proposed lots be subject to a condition that filling (or "topping up") of pools or similar structures using well water be prohibited. This type of condition is applied to developments on private services in other municipalities (such has Halton Region), and provides a conservative factor of safety to help maintain groundwater resources for normal residential household usage.

6. CLOSURE

Subsurface stratigraphy beneath the subject property consists of clay till underlain by a gravel aquifer at depths of 51.5-54.3 mBGS. Groundwater in the gravel aquifer is under confined conditions.

The six-hour pumping tests of supply wells A357595, A357596, and A299778 demonstrated that they have the capacity to yield at least 37.8 L/min each, with no material impacts to neighbouring water supply wells located at least 105 m away. The pumping test results demonstrate the ability of supply wells completed in the confined overburden granular aquifer to sustain rates of up to 113.4 L/min for durations of up to six hours without impacting neighbouring water supplies. Calculations of theoretical drawdown at peak-period water usage rates demonstrate that at a distance of 30 m from one simulated supply well providing peak-period demand for the entire proposed 15-lot subdivision, theoretical drawdown during the peak-period would be 0.83 m which does not represent a significant impact to neighbouring supply wells.

Water chemistry analysis showed Total Coliforms (1-hour sample only), Colour, Hardness, and Iron concentrations exceeded the ODWQS criteria limits for on-site supply well A357596, all of which can be treated with readily available water treatment systems.

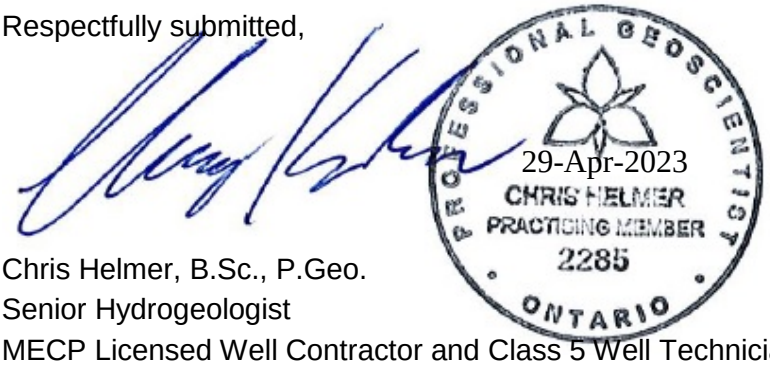
Based on the performance of the 6-hour simultaneous pumping test of three wells, it is reasonable to conclude a total of fifteen individual supply wells on the fifteen proposed lots would be able to meet the peak water demands of the proposed subdivision without impacting off-site private water supply wells.

Based on the data from the pumping tests conducted on the three on-site wells the influence of the proposed development on the groundwater aquifer utilized by on-site and off-site residential supply wells will be minimal and not result in significant impacts to on-site or off-site well water quantity over time.

The recommended condition for the fifteen proposed lots (to prohibit filling of pools or similar structures using well water) will help maintain groundwater resources for normal residential household usage.

We trust that this report satisfies your present requirements, and we thank you for this opportunity to be of service. If you have any questions, or require further hydrogeological consulting services, please feel free to contact the undersigned directly.

Respectfully submitted,



Chris Helmer, B.Sc., P.Geo.
Senior Hydrogeologist
MECP Licensed Well Contractor and Class 5 Well Technician
www.hydrog.ca

7. LIMITATIONS AND USE

This report has been prepared for the exclusive use of the Client indicated in Section 1. Hydrogeology Consulting Services Inc. (HCS) and Chris F Helmer hereby disclaim any liability or responsibility to any person or party for any loss, damage, expense, fines, or penalties which may arise from the use of any information or recommendations contained in this report by anyone other than the Client.

The conclusions and recommendations provided in this report are not intended as specifications or instructions to contractors. Any use contractors may make of this report, or decisions made based on it, are the responsibility of the contractors.

In preparing this report HCS and Chris F Helmer have relied in good faith on information provided by individuals and companies noted in this report, and assumes that the information provided is factual and accurate. No responsibility is accepted for any deficiencies, misstatements, or inaccuracies contained in this report as a result of errors, omissions, misinterpretations, or fraudulent acts in the resources referenced, or of persons interviewed or consulted during the preparation of this report.

The report and its complete contents are based on data and information collected during investigations conducted by HCS and Chris F Helmer, or others where noted, and pertains solely to the conditions of the site at the time of the investigation, supplemented by historical information and data as described in this report. It is important to note that the investigation involves testing and sampling of the site at specific locations, and the conclusions in this report are based on the information gathered. Limitations of the data and information include the fact that conditions between and beyond the sampling locations may vary; that the assessment is dependent upon the accuracy of the analytical data generated through sample analysis; and that conditions or contaminants may exist for which no analyses have been conducted. Furthermore, no assurance is made regarding potential changes in site conditions and/or the regulatory regime (standards, guidelines, etc.), subsequent to the time of investigation.

The professional services provided for this project include only the hydrogeological aspects of the subsurface conditions at the site, unless otherwise stated specifically in the report. No other warranty or representation is either expressed or implied, as to the accuracy of the information or recommendations included or intended in this report.

8. REFERENCES

Armstrong, D.K. and Dodge, J.E.P. 2007. Paleozoic Geology of Southern Ontario, Ontario Geological Survey. Miscellaneous Release – Data 219.

Brunton, F.R. and Dodge, J.E.P. 2008. *Karst of southern Ontario and Manitoulin Island*; Ontario Geological Survey, Groundwater Resources Study 5.

Chapman, L.J. and Putnam, D.F. 2007. *Physiography of Southern Ontario, Ontario Geological Survey*. Miscellaneous Release – Data 228.

Grand River Conservation Authority (GRCA), 2023. Web GIS Application.

Freeze, R.A. and J.A. Cherry. 1979. *Groundwater*. Englewood Cliffs, New Jersey: Prentice-Hall. 614pp.

Kruseman, G.P. and De Ridder, N.A. 2000. *Analysis and Evaluation of Pumping Test Data. 2nd Edition. International Institute for Land Reclamation and Improvement.*

Ministry of Natural Resources and Forestry (MNRF), 2022. Make a Map: Natural Heritage Areas. Online GIS Mapping.

Ontario Geological Survey 2000. Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14---Revised.

Ontario Geological Survey. 2010. Surficial Geology of Southern Ontario; Ontario Geological Survey. Miscellaneous Release – Data 128-Rev.

Ontario Ministry of the Environment (MOE), 1996. Procedure D-5-5 – Technical Guideline for Private Wells: Water Supply Assessment.

Ontario Ministry of the Environment (MOE), 2006. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines.

Ontario Ministry of Environment, Conservation and Parks (MECP), 2022. Water Well Information System. Online GIS mapping.

Ontario Ministry of the Environment, Conservation and Parks (MECP), 2020. O. Reg. 169/03: Ontario Drinking Water Quality Standards.

APPENDIX A: DRAWINGS

Drawing 1 – Location Plan
Drawing 2 – Site Plan
Drawing 3 – MECP Water Well Records

LEGEND

Subject Property

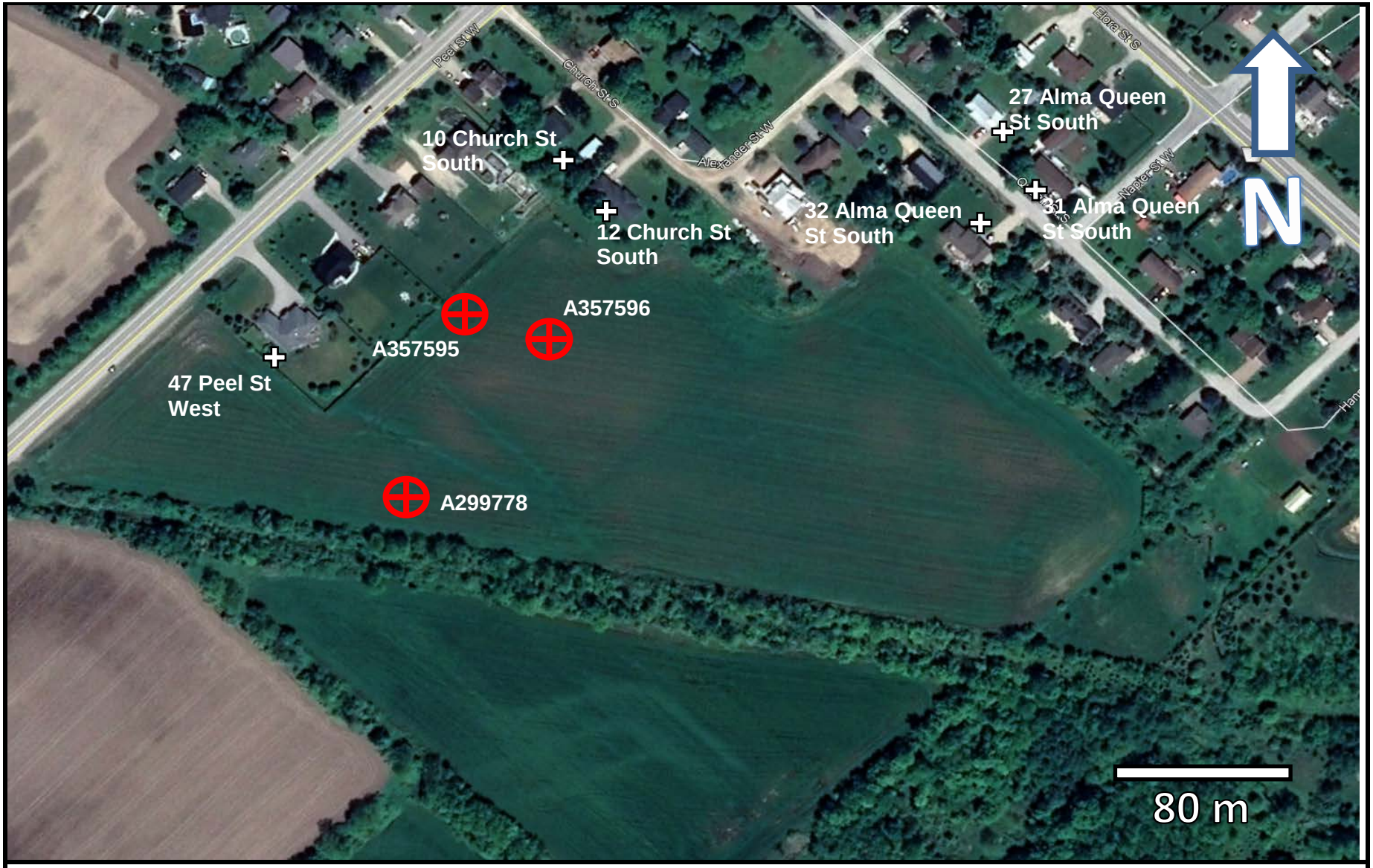
GRCAWetland Area

imagery from Grand River Conservation Authority © 2023

Drawing 1 - Location Plan
31 Church Street, Alma

HCS HYDROGEOLOGY CONSULTING SERVICES INC

Drawn:	CFH
Date:	04-Apr-23



imagery from Google Earth © 2023

LEGEND

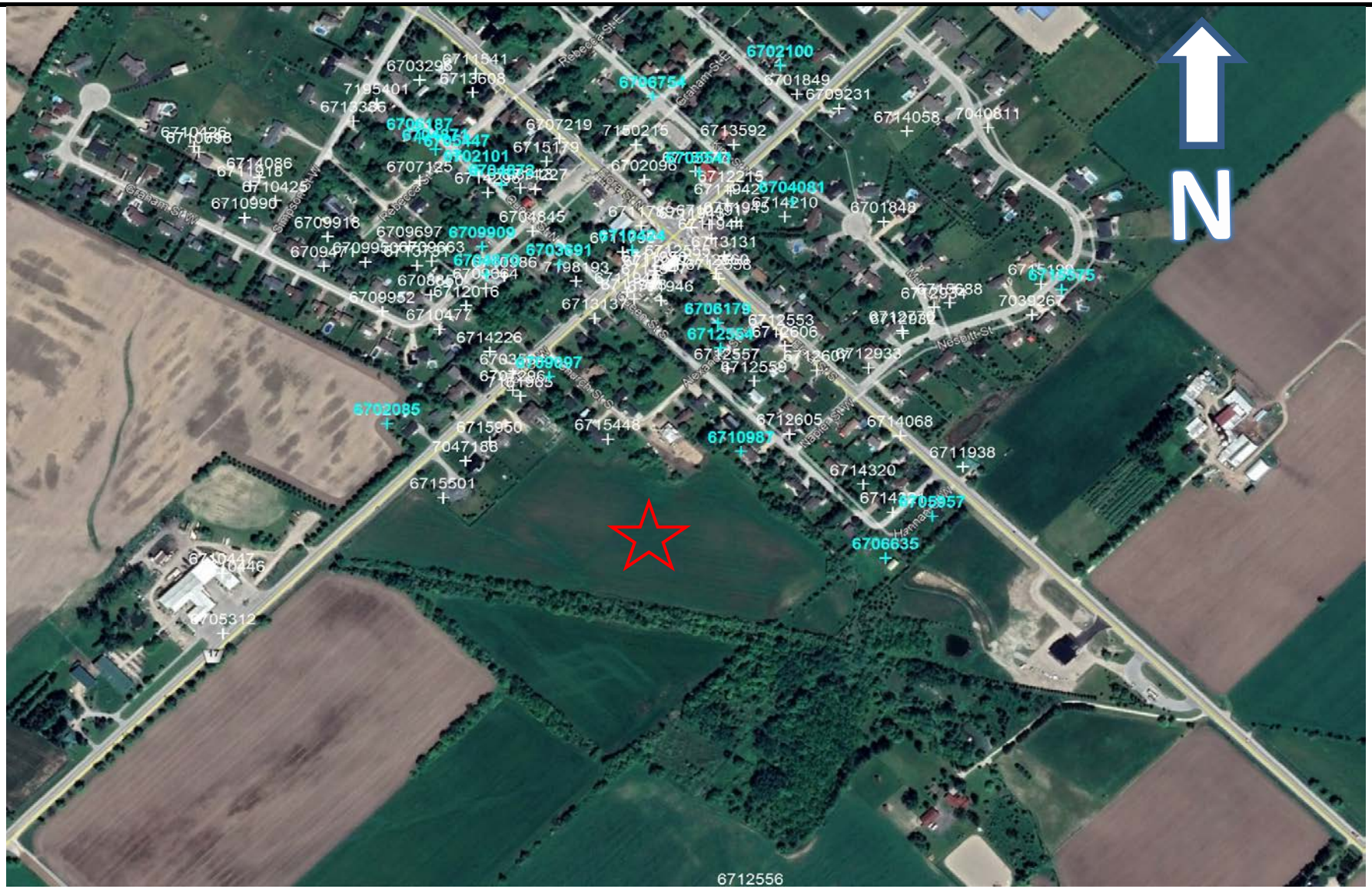
- Observation Well
- Supply Well

NOTE-plotted locations are approximate

Drawing 2 - Site Plan
31 Church Street, Alma

HCS HYDROGEOLOGY CONSULTING SERVICES INC

Drawn:	CFH
Date:	04-Apr-23



LEGEND

- Subject Property
- Supply Well (<31 m deep)
- Supply Well (>47 m deep)

imagery from Google Earth © 2021

Drawing 3 - MECP WWRs
31 Church Street, Alma

HCS HYDROGEOLOGY CONSULTING SERVICES

Drawn:	CFH
Date:	02-Jan-21

APPENDIX B: MECP WATER WELL RECORDS

Water Well Records

January 26, 2023

7:39:53 PM

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
NICHOL TOWNSHIP 003	17 540383 4841927 W	2006-01 2663	6.21	FR 0157	26/26/25/1:	DO		6715688 (Z41577) A039863	BRWN CLAY STNS 0155 GRVL 0157
NICHOL TOWNSHIP 003	17 540503 4841943 W	2005-10 2663	15.7	FR 0049	9/10/30/1:0	DO		6715575 (Z29024) A017819	BRWN CLAY STNS 0024 BRWN CLAY GRVL 0037 BRWN CLAY STNS 0047 GRVL 0049
NICHOL TOWNSHIP 11 001	17 540471 4841913 W	2006-10 6865	5.11	FR 0164	10/11/12/1:0	DO	0162 3	7039267 (Z56267) A039863	BRWN SILT SAND 0162 GRVL SAND 0169
NICHOL TOWNSHIP CON 11 001	17 540148 4842061 W	1997-03 6865	6	FR 0194	5/7/15/1:0	DO		6712215 (176918)	LOAM 0001 BRWN CLAY SNDY 0003 GREY CLAY GRVL 0040 GREY CLAY 0048 GREY CLAY GRVL 0101 GREY HPAN 0124 GREY CLAY GRVL 0142 GREY HPAN 0168 GREY CLAY GRVL 0183 BRWN SAND GRVL 0194
NICHOL TOWNSHIP CON 11 001	17 540125 4842021 W	1990-10 4552	6	FR 0170	0/40/10/18:0	CO		6710491 (70360)	BRWN LOAM 0002 BRWN SAND CLAY 0011 GREY CLAY STNS 0118 BRWN CLAY 0166 BRWN GRVL 0170
NICHOL TOWNSHIP CON 11 001	17 540144 4842046 W	1996-04 2336	2		4///:	CO	0001 5	6711942 (167000)	BRWN GRVL CLAY FILL 0003 GREY GRVL CLAY 0006
NICHOL TOWNSHIP CON 11 001	17 540106 4842017 W	1996-04 2336	2		4///:	CO	0001 5	6711943 (168001)	BRWN GRVL CLAY 0002 GREY GRVL SAND CLAY 0006
NICHOL TOWNSHIP CON 11 001	17 540127 4842004 W	1996-04 2336	2		4///:	CO	0001 5	6711944 (168002)	BRWN GRVL SAND 0003 GREY GRVL SAND CLAY 0006
NICHOL TOWNSHIP CON 11 001	17 540154 4842024 W	1996-04 2336	2		4///:	CO	0001 5	6711945 (168003)	BRWN GRVL SAND 0003 GREY GRVL SAND CLAY 0006
NICHOL TOWNSHIP CON 11 001	17 540312 4842024 W	1954-04 1723	4 4	FR 0257	0///:	ST DO		6701848 ()	BRWN CLAY BLDR 0182 GRVL 0235 MSND 0248 LMSN 0257
NICHOL TOWNSHIP CON 11 001	17 540332 4841894 W	1998-12 2663	6	FR 0160	8/20/30/1:0	DO		6712770 (198833)	BRWN CLAY STNS GRVL 0035 BRWN CLAY GRVL 0075 BRWN GRVL SAND 0115 BRWN CLAY GRVL 0135 BRWN CLAY SAND GRVL 0154 GRVL 0160
NICHOL TOWNSHIP CON 11 001	17 540214 4842048 W	1971-11 2519	30	FR 0027	25///:	DO		6704081 ()	GREY CLAY 0027 GREY SAND 0028 GREY CLAY MUCK 0035
NICHOL TOWNSHIP CON 11 001	17 540141 4841983 W	1999-09 6865	6	UK 0167	9/12/10/1:0	DO		6713131 (203987)	LOAM 0001 BRWN CLAY STNS 0012 GREY CLAY 0021 GREY SAND CLAY 0025 GREY HPAN CLAY 0042 GREY CLAY GRVL 0116 GREY HPAN CLAY 0143 GREY CLAY STNS 0162 BRWN GRVL SAND 0167
NICHOL TOWNSHIP CON 11 001	17 540481 4841950 W	2004-09 2663	6.25	FR 0155 FR 0160	16/20/30/1:0	DO		6715199 (Z17931) A007148	BRWN CLAY STNS 0155 GRVL 0160
NICHOL TOWNSHIP CON 11 002	17 540296 4841850 W	1999-04 2663	6	FR 0167	5/8/30/1:	DO		6712933 (198858)	BRWN CLAY STNS 0025 BRWN CLAY SAND GRVL 0085 BRWN SAND GRVL 0105 BRWN CLAY SAND GRVL 0162 GRVL 0167

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
NICHOL TOWNSHIP CON 11 002	17 540397 4841732 W	1996-02 6865	6	FR 0165	/15/30/1:30	DO		6711938 (168201)	BRWN LOAM 0002 BRWN CLAY SNDY STNS 0011 BRWN SAND GRVL 0017 GREY CLAY GRVL 0123 BRWN HPAN 0152 BRWN GRVL SAND 0165
NICHOL TOWNSHIP CON 11 003	17 540366 4841922 W	1999-04 2663	6	FR 0166	8/10/30/1:	DO		6712934 (198855)	BRWN CLAY STNS 0025 BRWN CLAY SAND GRVL 0075 BRWN SAND GRVL 0085 BRWN CLAY SAND GRVL 0120 BRWN SAND GRVL 0125 BRWN CLAY SAND GRVL 0160 GRVL 0166
NICHOL TOWNSHIP CON 11 012	17 540333 4841891 W	1999-04 2663	6	FR 0167	11/13/30/1:	DO		6712932 (198854)	BRWN CLAY STNS GRVL 0025 BRWN CLAY GRVL 0095 BRWN CLAY SAND GRVL 0165 GRVL 0167
NICHOL TOWNSHIP CON 11 019	17 540337 4842132 W	2002-05 2663	6	FR 0163	11/11/25/1:0	DO		6714058 (235155)	BRWN CLAY STNS GRVL 0102 BRWN CLAY HARD 0143 BRWN CLAY HARD 0160 GRVL 0163
PEEL TOWNSHIP	17 540063 4841984 W	2009-10 7238	1.78			MO	0005 10	7133280 (Z104442) A091557	BRWN SILT CLAY SAND 0008 BRWN TILL 0015
PEEL TOWNSHIP	17 539736 4841932 W	2015-08 7557			21/35/10/1:	DO		7248261 (Z218781) A193144	
PEEL TOWNSHIP 006	17 539811 4841972 W	2001-07 2663	6	FR 0184	21/25/30/1:	DO		6713731 (225435)	BRWN CLAY 0080 BRWN CLAY GRVL 0085 BRWN CLAY 0120 BRWN GRVL CLAY 0126 BRWN CLAY 0131 GRVL 0144 BRWN CLAY 0178 GRVL 0184
PEEL TOWNSHIP 061	17 539887 4842059 W	2002-10 2663	6	FR 0160	/1/25/1:0	DO		6714296 (247504)	BRWN CLAY STNS GRVL 0155 BRWN SAND CLAY 0160 GRVL 0166
PEEL TOWNSHIP 061	17 539873 4842064 W	2002-10 2663				NU		6714297 (247505) A	
PEEL TOWNSHIP CON 11 001	17 540206 4842030 W	2002-08 2663	6 5	FR 0165	7/20/25/1:0	DO		6714210 (247563)	BRWN CLAY STNS BLDR 0113 BLDR 0115 BRWN CLAY STNS BLDR 0162 GRVL 0165
PEEL TOWNSHIP CON 13 021	17 539626 4842029 W	1991-08 1660	6	FR 0232	27/35/10/2:0	DO		6710990 (43769)	BRWN CLAY 0004 BRWN CLAY SAND 0039 GREY CLAY FGVL 0098 GREY CLAY BLDR 0101 GREY CLAY SILT 0147 GREY CLAY 0189 GREY SAND MGVL 0226 GREY CGVL 0232
PEEL TOWNSHIP CON 13 021	17 539642 4842077 W	2002-05 6865	6	UK 0188	20/21/10/1:0	DO		6714086 (242335)	BRWN CLAY 0013 GREY CLAY 0032 GREY GRVL CLAY 0049 GREY CLAY STNS ROCK 0083 GREY CLAY HARD 0152 GREY CLAY GRVL 0186 BRWN GRVL SAND 0188
PEEL TOWNSHIP CON 13 021	17 539964 4841973 W	1970-06 2519	30	FR 0022	14/25//:	DO		6703691 ()	BRWN CLAY 0009 GREY CLAY STNS 0022 GREY MSND GRVL 0025
PEEL TOWNSHIP CON 13 021	17 539603 4841533 W	1974-09 1804	5	FR 0218	10/10/40/2:0	ST		6705312 ()	BLCK LOAM 0003 RED CLAY GRVL STNS 0214 GRVL 0218
PEEL TOWNSHIP CON 13 022	17 539743 4842144 W	2000-05 6865	6	UK 0168	50/75/8/1:	DO		6713386 (211312)	LOAM 0002 BRWN CLAY SNDY GRVL 0013 GREY CLAY GRVL 0101 GREY CLAY STNS 0114 GREY HPAN CLAY 0140 BRWN SAND CLAY 0158 BRWN GRVL SAND 0168
PEEL TOWNSHIP CON 13 022	17 539914 4841843 W	1969-11 1657	5 5	FR 0185	5/25/20/1:0	DO		6703564 ()	BRWN CLAY 0005 BRWN MSND GRVL 0070 GREY CLAY BLDR 0185 GRVL 0193
PEEL TOWNSHIP CON 13 022	17 539779 4841783 W	1966-05 1906	5	FR 0090	8/50/10/3:0	DO		6702085 ()	LOAM 0001 CLAY STNS 0028 STNS 0032 CLAY GRVL 0088 GRVL 0090

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PEEL TOWNSHIP CON 13 022	17 539715 4842006 W	1989-09 2665	5	FR 0192	20/20/15/72:0	DO		6709918 (69751)	BRWN CLAY STNS 0097 GRVL SAND 0101 BRWN CLAY STNS 0187 CGVL 0192
PEEL TOWNSHIP CON 13 022	17 539914 4841823 W	1980-07 4716	5	FR 0179	17/18/8/10:0	DO		6707296 ()	BLCK LOAM 0002 BRWN CLAY STNS 0018 GREY CLAY STNS 0032 GREY CLAY GRVL STNS 0078 BRWN CLAY SILT GRVL 0100 BRWN CLAY SAND GRVL 0148 GREY SAND SILT 0154 BRWN CLAY 0179 GREY GRVL CSND 0181
PEEL TOWNSHIP CON 13 022	17 539756 4841976 W	1989-06 4643	6	FR 0210	15/60//1:0	DO		6709950 (15746)	BRWN FILL 0004 YLLW CLAY 0171 BLUE CLAY STNS 0209 BRWN GRVL 0214
PEEL TOWNSHIP CON 13 022	17 539711 4841971 W	1988-11 1906	5	FR 0215	24/45/20/2:0	DO		6709471 (19524)	BRWN CLAY STNS 0210 CGVL 0215
PEEL TOWNSHIP CON 13 022	17 539853 4841839 W	1987-11 4854	30	FR 0012 FR 0019	10///:	DO		6709097 (24404)	BRWN CLAY 0014 GREY CLAY 0024 GREY CLAY BLDR 0035
PEEL TOWNSHIP CON 13 022	17 539841 4841850 W	2017-09 6231						7298013 (Z250077) A	
PEEL TOWNSHIP CON 13 022	17 540042 4841990 W	1990-06 2663	6	FR 0085	15//5/1:0	DO		6710424 (83518)	LOAM 0002 CLAY 0025 CLAY GRVL 0045 SAND CGVL 0075 SAND 0085
PEEL TOWNSHIP CON 13 022	17 539889 4841869 W	2002-09 6865	6	UK 0193	22/22/12/1:0	DO		6714226 (242365)	BRWN CLAY SNDY 0013 GREY CLAY STNS 0080 GREY CLAY GRVL 0093 GREY CLAY HARD 0119 GREY CLAY STNS 0132 GREY CLAY HARD 0166 GREY CLAY GRVL 0189 BRWN GRVL SAND 0193
PEEL TOWNSHIP CON 13 022	17 539613 4841596 W	1990-09 4552	6	FR 0230	20/80/30/1:30	IN		6710446 (61227)	BRWN FILL SOFT 0007 BRWN CLAY PCKD 0020 BRWN CLAY DNSE 0030 BRWN CLAY HARD 0080 GREY CLAY DNSE 0105 GREY GRVL SOFT 0112 GREY CLAY DNSE 0220 BRWN GRVL PCKD 0230
PEEL TOWNSHIP CON 13 022	17 539602 4841605 W	1990-10 4552	6	FR 0212	20/80/30/1:20	IN		6710447 (61228)	BRWN FILL SOFT 0006 BRWN CLAY STNS SOFT 0080 GREY CLAY SOFT 0105 GREY GRVL SOFT 0112 GREY CLAY STNS HARD 0190 GREY CLAY GRVL PCKD 0200 GREY CLAY DNSE 0208 BRWN GRVL PCKD 0212
PEEL TOWNSHIP CON 14 021	17 539530 4842147 W	2663	6 6	FR 0235	36//15/1:0	DO		6710831 (109424)	BRWN CLAY STNS 0045 BRWN CLAY SAND GRVL 0145 BRWN CLAY HPAN GRVL 0234 GRVL 0236
PEEL TOWNSHIP CON 14 021	17 539577 4842107 W	1991-08 2663	6	FR 0190 FR 0200	32//15/1:0	DO		6710718 (109364)	BRWN CLAY 0040 SAND 0050 CLAY SLTY GRVL 0100 CLAY GRVL 0140 CLAY GRVL HPAN 0170 CLAY GRVL SLTY 0200
PEEL TOWNSHIP CON 14 021	17 539659 4842049 W	1990-06 2663	6 6	FR 0190 FR 0195	50//20/1:0	DO		6710425 (83519)	CLAY 0015 CLAY GRVL 0040 SAND GRVL 0060 CLAY GRVL 0100 CLAY HPAN 0140 CLAY GRVL 0146 CLAY HPAN 0190 GRVL 0195
PEEL TOWNSHIP CON 14 021	17 539572 4842114 W	1990-07 2663	6 6	FR 0190 FR 0200	25//15/1:0	DO		6710426 (83516)	BRWN CLAY 0040 SAND 0050 CLAY SLTY GRVL 0100 GRVL CLAY 0140 HPAN CLAY GRVL 0170 CLAY SLTY GRVL 0200
PEEL TOWNSHIP CON 14 021	17 539632 4842067 W	1996-01 2663	6	FR 0190 FR 0202	25//15/1:0	DO		6711918 (169058)	BRWN CLAY 0040 SAND 0050 CLAY SLTY GRVL 0100 GRVL CLAY 0140 HPAN CLAY GRVL 0170 CLAY SLTY GRVL 0202
PEEL TOWNSHIP CON 14 021	17 539577 4842107 W	1991-07 2663	6	FR 0190 FR 0200	32//15/1:0	DO		6710696 (83487)	BRWN CLAY 0040 SAND 0050 CLAY SLTY GRVL 0100 CLAY GRVL 0140 CLAY GRVL HPAN 0170 CLAY GRVL SLTY 0200
PEEL TOWNSHIP CON 14 021	17 539548 4842128 W	1990-02 2336	6	FR 0211	20/60/25/1:0	DO		6710207 (73606)	BRWN CLAY SAND STNS 0015 BRWN CLAY 0115 BRWN CLAY SAND 0208 BRWN GRVL 0211

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PEEL TOWNSHIP CON 14 022	17 539805 4842059 W	2018-08 7557			15/40/15/1:0	DO		7325734 (Z284215) A256238	
PEEL TOWNSHIP CON 14 022	17 539922 4842064 W	1987-08 4643	5	FR 0200	/50/30/1:0	DO		6708913 (01294)	RED CLAY BLDR 0198 BRWN GRVL 0203
PEEL TOWNSHIP CON 14 022	17 539827 4841977 W	1988-11 3518	6	FR 0219	18/50/20/1:0	DO		6709663 (55180)	BRWN FILL STNS 0002 GREY CLAY STNS BLDR 0208 BRWN GRVL SAND LOOS 0219
PEEL TOWNSHIP CON 14 022	17 539885 4841945 W	1988-11 3518	6	FR 0190	15/56/20/1:0	DO		6709664 (55158)	RED CLAY SOFT 0004 BRWN SAND CLAY STNS 0021 GREY CLAY STNS BLDR 0176 BRWN GRVL LOOS 0201
PEEL TOWNSHIP CON 14 022	17 539835 4841896 W	1990-09 1737	6	FR 0229	30/55/10/2:0	DO	0234 3	6710477 (85493)	BRWN FILL SOFT 0014 BRWN CLAY STNS GRVL 0085 GREY CLAY STNS HARD 0135 GREY CLAY HARD 0229 GREY GRVL SOFT 0237
PEEL TOWNSHIP CON 14 022	17 539814 4842073 W	1979-08 2564	4	FR 0195	20/40/20/4:0	DO		6707125 ()	CLAY SNDY 0005 SILT SAND 0060 GRVL CMTD 0100 CLAY 0195 GRVL 0198
PEEL TOWNSHIP CON 14 022	17 540032 4841988 W	1995-05 6865	6 6	FR 0201	10//15/1:0	DO		6711790 (146657)	BRWN LOAM 0001 BRWN CLAY SNDY 0007 GREY CLAY STNS 0020 GREY GRVL 0023 BRWN CLAY GRVL 0029 GREY CLAY GRVL 0075 GREY GRVL CLAY 0133 BRWN HPAN 0161 GREY GRVL CLAY 0197 GREY FGVL MSND 0201
PEEL TOWNSHIP CON 14 022	17 540052 4842019 W	1995-05 6865	6 6	FR 0201	3/3/15/1:0	DO		6711789 (146655)	BRWN LOAM 0003 BRWN FILL WDFR LOOS 0007 BRWN CLAY GRVL 0012 GREY GRVL CLAY 0021 GREY CLAY 0033 GREY GRVL CLAY STNS 0130 BRWN HPAN 0166 GREY GRVL CLAY 0199 GREY CGVL 0204
PEEL TOWNSHIP CON 14 022	17 540005 4841950 W	2013-02 7221						7198194 (Z159296) A	
PEEL TOWNSHIP CON 14 022	17 539905 4841959 W	1992-09 2576	6	FR 0191	7//200/1:0	DO		6710986 (114454)	PRDR 0167 BRWN GRVL CLAY 0170 BRWN CLAY STNS GRVL 0191 GRVL 0201
PEEL TOWNSHIP CON 14 022	17 540055 4842074 W	1958-07 3524	6	FR 0164	/164//:	CO DO		6702096 ()	PRDG 0012 CLAY FSND 0032 BLUE CLAY 0068 HPAN 0078 GRVL CLAY 0086 HPAN 0140 GRVL HPAN 0160 0164
PEEL TOWNSHIP CON 14 022	17 540046 4842116 W	2010-06 7154	6.25	FR 0185	10/31/10/2:0	DO		7150215 (Z107344) A084724	BRWN CLAY STNS 0067 GREY CLAY 0174 GREY GRVL HARD 0185
PEEL TOWNSHIP CON 14 022	17 539935 4842013 W	1973-08 3518	5	FR 0180	-2/15/15/2:0	DO		6704845 ()	BLCK LOAM 0002 GREY CLAY GRVL 0048 GREY STNS 0050 BRWN SAND GRVL 0060 GREY GRVL 0075 BRWN CLAY GRVL 0175 GREY GRVL 0183
PEEL TOWNSHIP CON 14 022	17 539950 4842096 W	2004-09 2663	6.25	FR 0179	39/43/30/1:0	DO		6715179 (Z17934) A007203	BLCK LOAM 0002 BRWN CLAY GRVL 0175 GRVL 0180
PEEL TOWNSHIP CON 14 022	17 540110 4842084 W	2004-08 6865	6.30	0166	8/10/7/1:0	DO		6715077 (Z05738) A005678	BRWN CLAY STNS 0018 GREY CLAY STNS 0089 GREY CLAY 0094 GREY CLAY GRVL 0105 GREY CLAY STNS STNS 0148 BRWN GRVL SAND SILT 0159 BRWN SAND GRVL 0165 BRWN GRVL SAND 0166
PEEL TOWNSHIP CON 14 022	17 539886 4841961 W	1973-11 2519	30	FR 0023	20/35/0/:	DO		6704870 ()	BRWN CLAY 0012 GREY CLAY 0023 GREY GRVL SAND 0025 GREY CLAY STNS 0035

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PEEL TOWNSHIP CON 14 022	17 539831 4842110 W	1973-11 2519	30	FR 0015	10/30/0/:	DO		6704871 ()	BRWN CLAY 0010 GREY GRVL 0015 GREY SAND 0017 GREY CLAY STNS 0030
PEEL TOWNSHIP CON 14 022	17 539938 4842063 W	2002-09 6865	6	UK 0182	8/12/12/1:0	DO		6714227 (242367)	LOAM 0001 BRWN CLAY 0010 GREY CLAY STNS 0081 GREY CLAY STNS HARD 0139 GREY CLAY STNS 0173 GREY CLAY GRVL 0180 BRWN GRVL SAND 0182
PEEL TOWNSHIP CON 14 022	17 539902 4842068 W	1973-11 2519	30	FR 0017	4/30/0/:	DO		6704872 ()	BRWN CLAY 0010 GREY CLAY 0017 GREY SAND GRVL 0020 GREY CLAY ROCK 0030
PEEL TOWNSHIP CON 14 022	17 540061 4842120 W	2010-06 7154						7150214 (Z107345) A	
PEEL TOWNSHIP CON 14 022	17 539826 4841937 W	1987-06 5469	5	FR 0182	1//30/2:	DO		6708850 (09408)	BRWN CLAY LOOS 0050 BRWN GRVL CLAY PORS 0054 BLUE CLAY BLDR DNSE 0182
PEEL TOWNSHIP CON 14 022	17 539864 4841924 W	1996-06 2576	6	FR 0190 UK 0196	5//80/1:30	DO		6712016 (157438)	BRWN CLAY GRVL 0009 GREY CLAY SLTY GRVL 0075 BRWN CLAY SLTY GRVL 0190 BRWN GRVL 0196
PEEL TOWNSHIP CON 14 022	17 539964 4842123 W	1979-10 4544	5	FR 0180	3//25/1:0	CO		6707219 ()	BLCK LOAM 0001 RED CLAY 0047 BRWN GRVL 0052 RED CLAY 0180 BRWN GRVL 0185
PEEL TOWNSHIP CON 14 022	17 539982 4841953 W	2013-02 7221	6.26	UT 0201	10/13/3/1:0	DO		7198193 (Z159297) A118971	BRWN CLAY 0012 GREY CLAY 0043 GREY FSND 0052 GREY CLAY 0109 GREY CLAY 0194 GREY SAND 0204
PEEL TOWNSHIP CON 14 022	17 540151 4842116 W	2000-09 1737	6	FR 0205	25/45/10/3:30	DO	0202 3	6713592 (217912)	LOAM 0001 BRWN CLAY SAND SOFT 0025 GREY CLAY STNS HARD 0097 GREY CLAY HARD 0193 BRWN CGVL 0205
PEEL TOWNSHIP CON 14 022	17 539854 4842103 W	1975-02 2519	30	FR 0020	8//5/:	DO		6705447 ()	FILL 0003 LOAM 0004 BRWN CLAY 0012 BRWN CLAY SNDY 0020 SAND GRVL 0026 GREY CLAY STNS 0028
PEEL TOWNSHIP CON 14 022	17 539875 4842085 W	1967-07 2519	30	FR 0015		DO		6702101 ()	BRWN CLAY 0012 BLUE CLAY MSND 0022 CLAY STNS 0025 HPAN 0030
PEEL TOWNSHIP CON 14 022	17 539814 4842123 W	1976-07 2519	30	FR 0027	20///:	DO		6706187 ()	BLCK LOAM 0001 GREY CLAY 0027 BRWN GRVL BLDR 0028
PEEL TOWNSHIP CON 14 022	17 539881 4841994 W	1989-07 4854	30	FR 0022 FR 0038	18///:	DO		6709909 (39128)	BRWN CLAY 0004 GREY CLAY 0021 GREY CLAY BLDR 0023 BLUE CLAY 0038 GREY SAND 0039 GREY CLAY 0042
PEEL TOWNSHIP CON 14 022	17 540114 4842083 W	1975-06 2519	30	FR 0020	19//3/:	DO		6705541 ()	BRWN CLAY 0012 GREY CLAY 0020 BRWN SAND 0021 GREY CLAY 0032
PEEL TOWNSHIP CON 14 022	17 539803 4841995 W	1988-12 3518	6	FR 0201	48/130/20/1:0	DO		6709697 (55159)	GREY CLAY STNS BLDR 0170 BRWN STNS SAND CLAY 0198 BRWN CGVL LOOS 0201
PEEL TOWNSHIP CON 14 022	17 539774 4841917 W	1989-04 4643	6	FR 0215	27/60/40/2:15	DO		6709952 (15748)	BRWN CLAY 0040 YLLW CLAY 0186 BLUE CLAY 0213 BRWN GRVL 0218
PEEL TOWNSHIP CON 61 012	17 540424 4842136 W	2007-01 2663	6.25	FR 0166	33/39/8/1:0	DO		7040811 (Z41615) A039545	BRWN CLAY STNS 0162 GRVL 0166
PILKINGTON TOWNSHIP	17 540012 4841854 W	2018-11 7556				PS		7323683 (Z291454) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PILKINGTON TOWNSHIP	17 540501 4841536 W	2019-02 7221	6 6		///:	CO		7331187 (Z306172) A090010 A	
PILKINGTON TOWNSHIP 01 001	17 540016 4841765 W	2005-08 7154	6.25	FR 0184 0187	12/21/12/1:0	DO	0184 3	6715448 (Z32403) A020155	BRWN CLAY SLTY 0011 BRWN CLAY STNS 0052 BRWN CLAY 0074 GREY GRVL 0084 GREY CLAY STNS 0124 GREY CLAY 0177 GREY GRVL SAND SOFT 0187
PILKINGTON TOWNSHIP 01 001	17 539839 4841695 W	2005-09 7154	6.25	FR 0204 FR 0204	22/72/10/2:0	DO	0201 3	6715501 (Z35593) A030082	BRWN CLAY SLTY STNS 0027 GREY CLAY STNS 0118 GREY CLAY 0197 GREY GRVL SAND SOFT 0204
PILKINGTON TOWNSHIP 01 001	17 539889 4841762 W	2006-08 2644	6.25	FR 0198	23/50/75/1:	DO		6715950 (Z41928) A037661	BRWN CLAY FILL 0004 GREY CLAY STNS 0018 GREY HPAN STNS 0096 GREY GRVL SLTY 0109 GREY HPAN STNS 0198 BRWN CGVL 0201
PILKINGTON TOWNSHIP 01 001	17 539863 4841739 W	2007-06 6865	6.30	0198	24/25/13/1:	DO		7047188 (Z56280) A034702	BRWN CLAY 0016 GREY CLAY STNS 0089 GREY CLAY SAND SILT 0118 BRWN CLAY STNS HARD 0159 GREY CLAY STNS STNS 0183 BRWN SAND GRVL CLAY 0195 BRWN GRVL SAND 0198
PILKINGTON TOWNSHIP P 099	17 540137 4841873 W	1998-06 2663	6	FR 0080	34/60/30/1:0	DO		6712554 (192804)	LOAM 0001 BRWN CLAY SAND 0040 BRWN CLAY SAND GRVL 0065 BRWN SAND GRVL 0075 GRVL 0080
PILKINGTON TOWNSHIP P 131	17 540202 4841890 W	1998-06 2663	6	FR 0161	6/6/30/1:0	DO		6712553 (192805)	LOAM 0001 BRWN CLAY SAND STNS 0020 BRWN CLAY GRVL 0040 GRVL 0045 BRWN CLAY SAND GRVL 0080 BRWN SAND GRVL 0104 BRWN CLAY GRVL HARD 0157 GRVL 0161
PILKINGTON TOWNSHIP P 132	17 540091 4841973 W	1998-06 2663	6	FR 0160	7/78/30/1:0	DO		6712555 (192803)	LOAM 0002 BRWN CLAY STNS 0030 BRWN CLAY SAND GRVL 0045 BRWN SAND GRVL 0055 BRWN CLAY GRVL HPAN 0158 GRVL CGRD 0160
PILKINGTON TOWNSHIP GR W 01 001	17 540314 4841623 W	1977-12 5469	30	FR 0013	12//4/1:0	DO		6706635 ()	BLCK LOAM 0003 BRWN CLAY 0011 GREY CLAY 0013 SAND GRVL 0014 GREY CLAY 0026 GRVL SAND 0027
PILKINGTON TOWNSHIP GR W 01 001	17 540134 4841903 W	1976-08 2519	30	FR 0028	20///:	DO		6706179 ()	BRWN LOAM 0001 BRWN CLAY 0008 GREY CLAY 0028 BRWN GRVL 0028
PILKINGTON TOWNSHIP GR W 01 001	17 540211 4841771 W	1998-06 2663	6	FR 0159	/2/30/1:0	DO		6712605 (192829)	LOAM 0001 BRWN CLAY 0010 BRWN SAND GRVL 0025 BRWN CLAY SAND GRVL 0080 BRWN BLDR LTCL 0082 BRWN SAND GRVL 0095 BRWN CLAY SAND GRVL 0120 BRWN CLAY GRVL 0130 GRVL 0154 UNKN 0159
PILKINGTON TOWNSHIP GR W 01 001	17 540083 4841996 W	2009-10 7238	1.76			MO	0005 10	7133281 (Z104443) A091556	BRWN SILT CLAY SAND 0008 BRWN TILL 0015
PILKINGTON TOWNSHIP GR W 01 001	17 540063 4841984 W	2009-10 7238	1.76			MO	0005 10	7133279 (Z104444) A090730	BRWN CLAY SILT SAND 0008 BRWN TILL 0015
PILKINGTON TOWNSHIP GR W 01 001	17 540123 4841887 W	2009-07 7221						7129535 (Z102430) A	
PILKINGTON TOWNSHIP GR W 01 001	17 540045 4841816 W	2009-07 7146						7127595 (Z099228) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PILKINGTON TOWNSHIP GR W 01 001	17 540322 4841678 W	2002-09 6865	6	UK 0155	-5/-2/10/1:0	DO		6714321 (242375)	BRWN CLAY GRVL SNDY 0013 GREY CLAY HARD 0028 GREY CLAY STNS STNS 0083 GREY CLAY GRVL 0110 GREY CLAY STNS 0149 GREY CLAY HARD 0153 BRWN GRVL SAND 0155
PILKINGTON TOWNSHIP GR W 01 001	17 540290 4841711 W	2002-09 6865	6	UK 0156	-4/-2//:	DO		6714320 (242376)	BRWN GRVL CLAY SNDY 0014 GREY CLAY HARD 0026 GREY CLAY STNS 0096 GREY CLAY HARD 0146 GREY CLAY STNS 0155 BRWN SAND GRVL 0156
PILKINGTON TOWNSHIP GR W 01 001	17 540330 4841769 W	2002-03 6865	6	UK 0158	-4/2/6/:	DO		6714068 (225340)	BRWN CLAY SAND GRVL 0010 GREY CLAY STNS 0089 GREY CLAY HARD 0110 GREY CLAY GRVL 0151 GREY CLAY HARD 0157 BRWN GRVL SAND 0158
PILKINGTON TOWNSHIP GR W 01 001	17 540002 4841909 W	1999-10 6865	6	FR 0171	6/9/10/1:0	DO		6713137 (203999)	LOAM 0002 BRWN CLAY 0017 BRWN GRVL SAND 0021 GREY CLAY STNS 0083 GREY HPAN 0115 GREY CLAY STNS 0167 BRWN GRVL SAND 0171
PILKINGTON TOWNSHIP GR W 01 001	17 540066 4841965 W	1996-04 2336	2		4///:	CO	0016 5	6711950 (168008)	GRVL 0001 GREY CLAY 0017 GREY SAND 0018 GREY CLAY 0021
PILKINGTON TOWNSHIP GR W 01 001	17 539922 4841816 W	2010-07 7221	6.26	UT 0189	23/25/12/1:0	DO		7161965 (Z118761) A090016	BRWN CLAY HARD 0010 GREY CLAY STNS 0100 GREY CLAY HARD 0172 GREY CLAY STNS 0184 BRWN GRVL SAND 0189
PILKINGTON TOWNSHIP GR W 01 001	17 540159 4841750 W	1992-09 6624	5	FR 0100	17/40/12/4:0	DO		6710987 (093827)	BRWN LOAM 0001 BRWN CLAY GRVL SAND 0019 BRWN CLAY HPAN GRVL 0022 BRWN CLAY FGVL 0062 GREY CLAY GRVL STNS 0095 GRVL SAND 0102
PILKINGTON TOWNSHIP GR W 01 001	17 540206 4841876 W	1998-07 2663	6	FR 0161	0/2/30/1:0	DO		6712606 (192828)	LOAM 0001 BRWN CLAY STNS 0035 BRWN CLAY SAND GRVL 0080 BRWN SAND GRVL 0090 BRWN CLAY GRVL 0157 GRVL 0161
PILKINGTON TOWNSHIP GR W 01 001	17 540132 4841962 W	1998-06 2663	6	FR 0160	5/14/30/1:0	DO		6712560 (192811)	LOAM 0001 FILL 0015 BRWN CLAY SAND STNS 0025 BRWN CLAY SAND GRVL 0085 BRWN SAND GRVL 0095 BRWN CLAY GRVL HPAN 0157 GRVL 0160
PILKINGTON TOWNSHIP GR W 01 001	17 540173 4841834 W	1998-06 2663	6	FR 0164	/1/30/1:0	DO		6712559 (192813)	LOAM 0001 BRWN CLAY SAND STNS 0035 BRWN CLAY SAND GRVL 0075 BRWN SAND GRVL 0090 BRWN CLAY GRVL 0155 GRVL 0164
PILKINGTON TOWNSHIP GR W 01 001	17 540135 4841956 W	1998-06 2663	6	FR 0163	6/12/30/1:0	DO		6712558 (192810)	LOAM 0001 BRWN CLAY SAND STNS 0025 BRWN CLAY SAND GRVL 0090 BRWN CLAY GRVL HARD 0158 GRVL 0163
PILKINGTON TOWNSHIP GR W 01 001	17 540144 4841849 W	1998-06 2663	6	FR 0160	/6/30/1:0	DO		6712557 (192812)	LOAM 0001 BRWN CLAY SAND STNS 0040 BRWN CLAY SAND GRVL 0065 BRWN SAND GRVL 0070 BRWN CLAY SAND GRVL 0090 BRWN SAND GRVL 0100 BRWN CLAY GRVL HARD 0155 GRVL 0160
PILKINGTON TOWNSHIP GR W 01 001	17 540231 4841698 W	2016-03 7556				DO		7262913 (Z226395) A199518	
PILKINGTON TOWNSHIP GR W 01 001	17 540068 4841960 W	1996-08 6865	6	FR 0194	0/6/15/1:0	DO		6712097 (169678)	LOAM 0002 BRWN CLAY 0009 GREY CLAY GRVL STNS 0095 BRWN HPAN 0156 GREY CLAY GRVL 0186 GRVL 0194
PILKINGTON TOWNSHIP GR W 01 001	17 540037 4841940 W	1996-04 2336	2		4///:	CO	0016 5	6711949 (168007)	GRVL 0001 GREY CLAY 0017 GREY SAND 0018 GREY CLAY 0021

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PILKINGTON TOWNSHIP GR W 01 001	17 540044 4841932 W	1996-04 2336	2		4///:	CO	0016 5	6711948 (168006)	BRWN GRVL FILL 0001 GREY CLAY 0017 GREY SAND 0018 GREY CLAY 0021
PILKINGTON TOWNSHIP GR W 01 001	17 540066 4841951 W	1996-04 2336	2		5///:	CO	0016 5	6711947 (168005)	BRWN GRVL FILL 0001 GREY CLAY 0017 GREY SAND 0018 GREY CLAY 0021
PILKINGTON TOWNSHIP GR W 01 001	17 540073 4841930 W	1996-04 2336	2		4///:	CO	0016 5	6711946 (168004)	BRWN GRVL FILL 0002 GREY CLAY 0017 BRWN SAND 0018 GREY CLAY 0021
PILKINGTON TOWNSHIP GR W 01 001	17 540094 4841959 W	2014-05 7154						7221972 (Z181427) A	
PILKINGTON TOWNSHIP GR W 01 002	17 540364 4841673 W	1976-03 2519	30	FR 0020	9//4/1:0	DO		6705957 ()	BRWN FILL 0004 BRWN CLAY 0009 BRWN SAND GRVL 0021 GREY CLAY 0030
PILKINGTON TOWNSHIP GR W 01 002	17 540169 4841223 L	1998-06 2663	6 5	FR 0155	45/45/30/1:0	DO		6712556 (192802)	LOAM 0002 BRWN CLAY STNS 0020 BRWN SAND GRVL 0030 GREY CLAY GRVL 0085 BRWN CLAY SAND GRVL 0100 BRWN CLAY GRVL HPAN 0140 BRWN CLAY BLDR HPAN 0153 GRVL CGRD 0155
PILKINGTON TOWNSHIP GR W 07 001	17 540240 4841847 W	1998-06 2663	6	FR 0161	6/2/30/1:0	DO		6712607 (192827)	LOAM 0001 BRWN CLAY STNS 0020 BRWN SAND GRVL 0025 BRWN CLAY GRVL 0130 BRWN CLAY SAND GRVL 0140 BRWN CLAY GRVL 0157 GRVL CGRD 0161

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: Oct 3, 2022

PROPERTY INFORMATION

Current Owner: JENN & CHRIS BONTHRON Previous Owner (If Known): _____

Address: 10 church st S Alma

Contact Number: 519-831-3593

WELL INFORMATION

MECP Well Tag # _____

Well Depth: _____ Well Diameter: _____ Well Use: (Residential) Agricultural Commercial

Construction Date: _____ Depth of Pump: _____

Aquifer Type: Bedrock Overburden Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) Has gone dry before

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: Clear Taste: we filter it

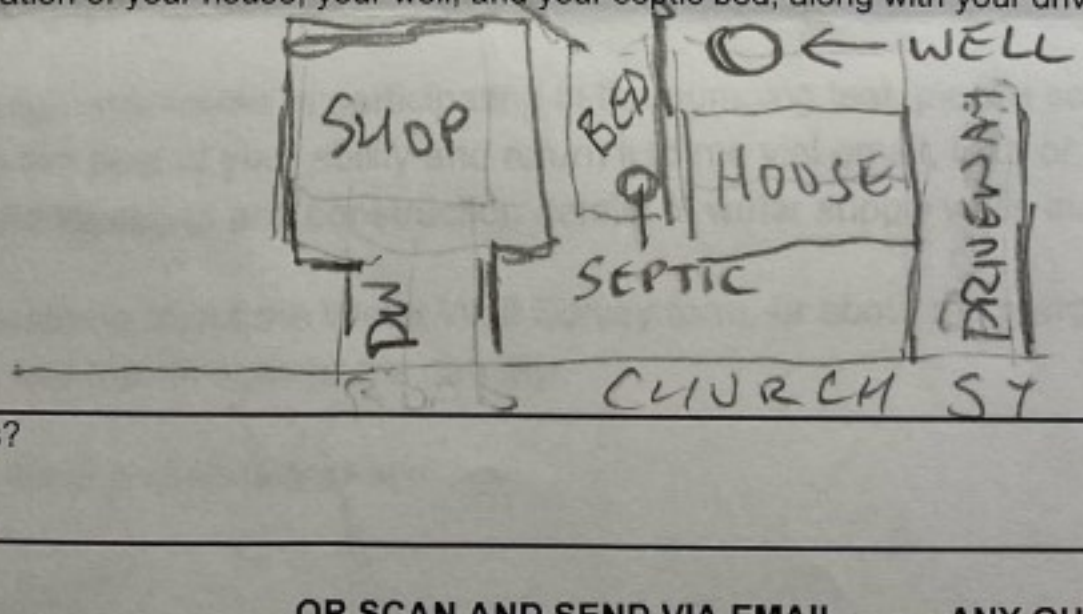
Water treatment system? (Describe) — Odour: No

Rusty / black stains on sinks/toilets? No

Have you had water chemistry tests done on your well water? (Describe) No

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.



Any Additional Comments?

PLEASE RETURN TO:
Hydrogeology Consulting Services Inc.
28 Upper Mercer Street
Kitchener, Ontario
N2A 4M9

OR SCAN AND SEND VIA EMAIL OR TEXT TO:
905-550-0969
chrishelmer@hydrog.ca

HCS HYDROGEOLOGY CONSULTING SERVICES

ANY QUESTIONS? Please Contact:

Chris Helmer, Senior Hydrogeologist
Phone: 905-550-0969
Email: chrishelmer@hydrog.ca

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: Oct 3/12

PROPERTY INFORMATION

Current Owner: E.L Arbuckle Previous Owner (If Known): see 1959

Address: 15 Queen St South

Contact Number: above address

WELL INFORMATION

Hanlon Well drilling

MECP Well Tag #: _____

Well Depth: _____ Well Diameter: _____ Well Use: Residential Agricultural Commercial

Construction Date: _____ Depth of Pump: _____

Aquifer Type: (Bedrock) Overburden Is the well accessible for inspection? YES (NO)

Any issues with water supply i.e. your well going dry? (Describe) _____

Would you be willing to participate in a water well monitoring program? YES (NO)

WATER CHEMISTRY

Appearance: _____ Taste: good

Water treatment system? (Describe) softener Odour: clear

(Rusty) black stains on sinks/toilets? _____

Have you had water chemistry tests done on your well water? (Describe) No

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.

Any Additional Comments?

I would be more conserend re sewage

PLEASE RETURN TO:

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2A 4M9

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WATER WELL SURVEY

Project: 31 Church Street, Alma Date: _____

PROPERTY INFORMATION

Current Owner: JOHNSTON Previous Owner (If Known): _____

Address: 52 ALMA QUEEN ST SOUTH

Contact Number: 519-993-3398

WELL INFORMATION

MECP Well Tag # _____

Well Depth: _____ Well Diameter: _____ Well Use: (Residential) Agricultural Commercial

Construction Date: _____ Depth of Pump: _____

Aquifer Type: Bedrock Overburden Is the well accessible for inspection? YES NO

Any issues with water supply i.e. your well going dry? (Describe) NO

Would you be willing to participate in a water well monitoring program? YES NO

WATER CHEMISTRY

Appearance: _____ Taste: _____

Water treatment system? (Describe) _____ Odour: _____

Rusty / black stains on sinks/toilets? _____

Have you had water chemistry tests done on your well water? (Describe) _____

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.

SHARED WELL.
WELL IS AT HOUSE CORNER HANNA AND COUNTRY RD. #7.

Any Additional Comments?

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WATER WELL SURVEY

Project: 31 Church Street, Alma Date: 4 OCT '22

PROPERTY INFORMATION

Current Owner: Vic DeVries Previous Owner (If Known): Annie Sullivan

Address: 24 Alexander St. (NoBiAo) Alma Ont.

Contact Number: 519.846.1985

WELL INFORMATION

MECP Well Tag # _____

Well Depth: _____ Well Diameter: _____ Well Use: (Residential) Agricultural Commercial

Construction Date: _____ Depth of Pump: _____

Aquifer Type: Bedrock Overburden Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) _____

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: CLEAR Taste: No unusual taste

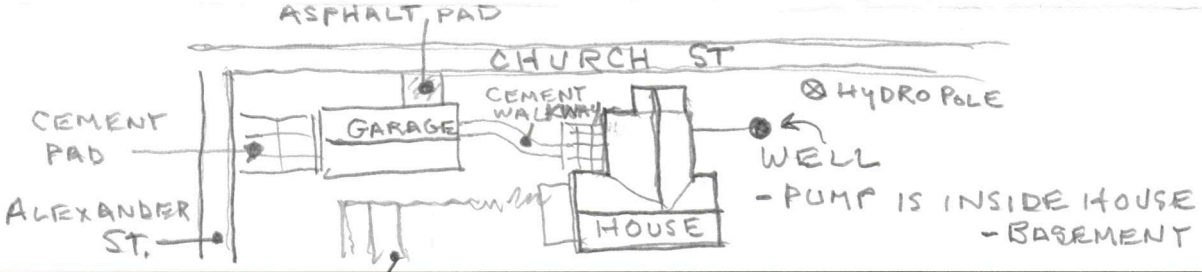
Water treatment system? (Describe) "RAINFRESH" WHOLE-HOUSE FILTER Odour: No odour

Rusty / black stains on sinks/toilets? No (Any stains are due to poor housekeeping)

Have you had water chemistry tests done on your well water? (Describe) - Not for several years

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.



Any Additional Comments?

Address is 24 Alexander St - House looks like it's on Church St.

PLEASE RETURN TO:
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N2A 4M9

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Email: chrishelmer@hydrog.ca

HCS HYDROGEOLOGY CONSULTING SERVICES

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: _____

PROPERTY INFORMATION

Current Owner: HELEN TRASK Previous Owner (If Known): SELF FOR 71yrs.

Address: 19 PEEL ST W., ALMA, ON. N0B 1S0

Contact Number: 1-519-846-5731 (SON) OF HELEN

WELL INFORMATION

MECP Well Tag # _____

Well Depth: 30 FT. Well Diameter: 4 FT Well Use: (Residential) Agricultural Commercial

Construction Date: OVER 70 YRS Depth of Pump: 4 FT. APPROXIMATELY

Aquifer Type: Bedrock Overburden Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) NONE

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: CLEAR Taste: ORDINARY

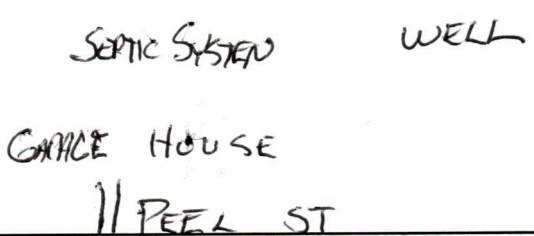
Water treatment system? (Describe) ULTRAVIOLET LIGHT Odour: NONE

Rusty / black stains on sinks/toilets? NO

Have you had water chemistry tests done on your well water? (Describe) YES

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.



Any Additional Comments? MY MOTHER IS 93 YRS OLD - VERY POOR EYESIGHT
PLEASE BE ADVISED - CONTACT SON MILTON TRASK AT ABOVE #

PLEASE RETURN TO:
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28 Upper Mercer Street
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N2A 4M9

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chrishelmer@hydrog.ca

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Email: chrishelmer@hydrog.ca

HCS HYDROGEOLOGY CONSULTING SERVICES

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: Sept 30/22

PROPERTY INFORMATION

Current Owner: John & Sharon Vanderwelle Previous Owner (If Known): n/a.

Address: 32 Alma Queen St. S., Alma, ON. N0B1A0

Contact Number: 519-846-0868.

WELL INFORMATION

MECP Well Tag # Not known

Well Depth: 102' ?? Well Diameter: 5½" O.D. casing. Well Use: (Residential) Agricultural Commercial

Construction Date: 1992. Depth of Pump: Not known

Aquifer Type: Bedrock ? Overburden ? Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) Nothing apparent.

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: clear Taste: Iron

Water treatment system? (Describe) Iron Filter Odour: Sulpher (if iron filter not present)

Rusty / black stains on sinks/toilets? Rust, Red Stains (if iron filter not present.)

Have you had water chemistry tests done on your well water? (Describe) No.

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.

Any Additional Comments?

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page 1 of 5

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: Oct 26, 2022

PROPERTY INFORMATION

Current Owner: Phyllis Wilson Previous Owner (If Known): Trevor Kathleen Hill

Address: ALMA 27 Queen St South BOX 68 N0B 1A0

Contact Number: 519-846-0462

WELL INFORMATION

MECP Well Tag # well ID # 6712559 (see attached)

Well Depth: 164 ft Well Diameter: _____ Well Use: (Residential) Agricultural Commercial

Construction Date: June 17 1998 Depth of Pump: in house

Aquifer Type: Bedrock Overburden Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) water level was above the ground now gone down below ground level

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: _____ Taste: good

Water treatment system? (Describe) Aquamax Odour: none

Rusty / black stains on sinks/toilets? yes - septens helped with the colour

Have you had water chemistry tests done on your well water? (Describe) _____

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.

see attached

Phyllis Wilson
Oct 26/22

Any Additional Comments? with the water level gone down - will more wells effect our supply

PLEASE RETURN TO:
Hydrogeology Consulting Services Inc.
28 Upper Mercer Street
Kitchener, Ontario
N2A 4M9

OR SCAN AND SEND VIA EMAIL OR TEXT TO:
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chrishelmer@hydrog.ca

ANY QUESTIONS? Please Contact:
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Phone: 905-550-0969
Email: chrishelmer@hydrog.ca

HCS HYDROGEOLOGY CONSULTING SERVICES

plus

I have asked my neighbor Heather Smith to send this in for me.
I have no access to the internet
could you send her (Heather) any information that I need to have or know

Phyllis Wilson

Note - old well de-commissioned in 2021

page 2085

P Phyllis Wilson

Page 5085

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: Oct 28, 2022

PROPERTY INFORMATION

Current Owner: Heather & William (Bill) Smith Previous Owner (If Known): /

Address: 31 Alma Queen Street South, Box 148, Alma ON N0B 1A0

Contact Number: 519-804-8439 cell 519-504-3912

We have lived at this address since 1978.

WELL INFORMATION

MECP Well Tag # well ID # 6712605 (copy attached)

Well Depth: 159 feet Well Diameter: inside 6 inches Well Use: (Residential) Agricultural Commercial

Construction Date: June 26, 1998 Depth of Pump: pump is in the basement of the house

Aquifer Type: Bedrock Overburden see well record Is the well accessible for inspection? YES NO see letter

Any issues with water supply i.e. your well going dry? (Describe) see letter

Would you be willing to participate in a water well monitoring program? see letter YES NO

WATER CHEMISTRY

Appearance: Taste: see letter

Water treatment system? (Describe) Odour:

Rusty / black stains on sinks/toilets? see letter

Have you had water chemistry tests done on your well water? (Describe)

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.

see photo attached

Any Additional Comments?

PLEASE RETURN TO:
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Kitchener, Ontario
N2A 4M9

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chrishelmer@hydrog.ca

ANY QUESTIONS? Please Contact:
Chris Helmer, Senior Hydrogeologist
Phone: 905-550-0969
Email: chrishelmer@hydrog.ca

HCS HYDROGEOLOGY CONSULTING SERVICES

DATE: Oct 30, 2022
TO: Chris Helmer, Hydrogeology Consulting Services Inc, Elora ON
FROM: Heather and William 'Bill' Smith|
31 Alma Queen Street South, Box 148, Alma ON N0B 1A0
Home Phone 519-804-8439; Cell Phone 519-504-3912
RE: **Water Well Survey for residents near 31 Church Street, Alma ON**

Our submission to the water well survey consists of this letter plus 3 attachments including the completed survey, our Water Well Record, and a photo showing the house and locations of the decommissioned well, the active drilled well, and the septic system. Assume that the photo of the property rather than a site diagram will be sufficient for your purposes.

STREET ADDRESS:

- **31 Alma Queen Street South** *(formerly was 31 Queen Street South)* in Alma.
- We have lived at this address since 1978.
- The property was formerly in Pilkington Township, but is now in Mapleton Township.

DRILLED WELL - CONSTRUCTED IN 1998

- Summer 1998, us and 6 neighbours *(houses north from Napier Street – between Alma Queen Street South and Elora Street South)* had new water wells drilled by Hanlon Well Drilling at the expense of the land developer for the then proposed Nesbitt Street subdivision. These 7 houses had shallow wells.
- Those in the block South of Napier Street towards Elora/Salem (*Elora St and Queen St on the 2 sides)* did not get new wells under that 1998 agreement because at the time, Norma and Ralph Deagle (since deceased) supplied water to several neighbouring houses. I checked the Well Water Map records this week for that block of 6 houses and it looks like there are only 3 wells for those 6 houses. True?

DRILLED WELL – GENERAL CHARACTERISTICS: See the Well Record (well ID #6712605).

DRILLED WELL – WATER LEVEL/QUANTITY CURRENTLY:

- We'd like to know what the water level is in our water well for a baseline measure before the proposed Church Street Development begins (*i.e., if development is approved)*. However, **we assume that you won't be able to use our well for any proposed monitoring/testing because of the 'pitless adapter' (spelling ?)** that was put in the well the day it was drilled. Hopefully other home owners in our neighbourhood will agree to participate in the water survey and water monitoring.
- We have never run out of water, but there has only ever been 2 people living in our house and we tend to be conservative with water usage e.g., limit the number of laundry/dishwasher loads and/or showers per day. We water vegetables in the garden but not the lawn.
- Our neighbour whose water well is the closest to ours reported that the **water level dropped** in her well in recent years. We assume therefore, that our well water level has likely also dropped

since 1998 given the proximity of the two wells and the similarity of the 'Log of Overburden and Bedrock Materials' on the 2 Well Records.

DRILLED WELL – WATER QUALITY:

- **We don't recall having a water chemistry test** done. If your company will be offering this service free of charge, please include us if it is possible to do so without disturbing the 'pitless adapter'.
- Beginning immediately upon hookup of the drilled well to the house (1998), there was a **very strong sulfur smell, the water was very orange, and immediately stained the toilets etc. terribly.**
- Very soon after hookup we **installed an iron filter for all well water coming into the house, as well as a reverse osmosis drinking water system.**
- **All water samples tested by the Health Unit have been negative for bacteria**. We submitted a water sample to the Health Unit again Oct 28, 2022.
- Currently:
    - The water is clear and tastes good.
    - We have never had a water softener.
    - There is minimal calcium build up on the water faucets, and is cleaned off easily a couple of time per year with vinegar or CLR.
    - Our dishwasher is 16 years old. Clean it routinely and easily with an environmentally friendly product 'Lemi Shine'.

UNUSED SHALLOW WELL - DECOMMISSIONED IN 2021:

- That Well ID Number: 7389413, and Well Audit Number: Z362395.
- Us and 2 neighbours (*3 new drilled wells in 1998)* had our shallow wells decommissioned in 2021 under the Grand River Conservation 'Rural Water Quality' program.
- Our decommissioned well still shows on the Ontario Water Records Map, but not the decommissioned wells of those 2 neighbours.

DISTRIBUTION OF THE LETTER/SURVEY ABOUT WATER WELLS

Who received the letter/survey? We know that 2 neighbours on Alma Queen Street South received the letter/survey. However, the home owners directly behind us on Elora Street South did not. Why not? We gave that household a copy of the letter/survey and suggested that they contact you.

Additional comments and questions from Heather will follow under separate cover by Monday.

End of letter

PROPERTY INFORMATION

Current Owner: Kevin Loic + Annette Morrison Previous Owner (If Known): _____

Address: 32 Elora St. S. Alma ON. N0B 1A0

Contact Number: 519-846 0823

WELL INFORMATION

MECP Well Tag # 6712607

Well Depth: 157' Well Diameter: 6" Well Use: (Residential) Agricultural Commercial

Construction Date: June 29/1998 Depth of Pump: Pump in house

Aquifer Type: Bedrock Overburden ? Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) NO

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: clear Taste: slight rust/iron taste

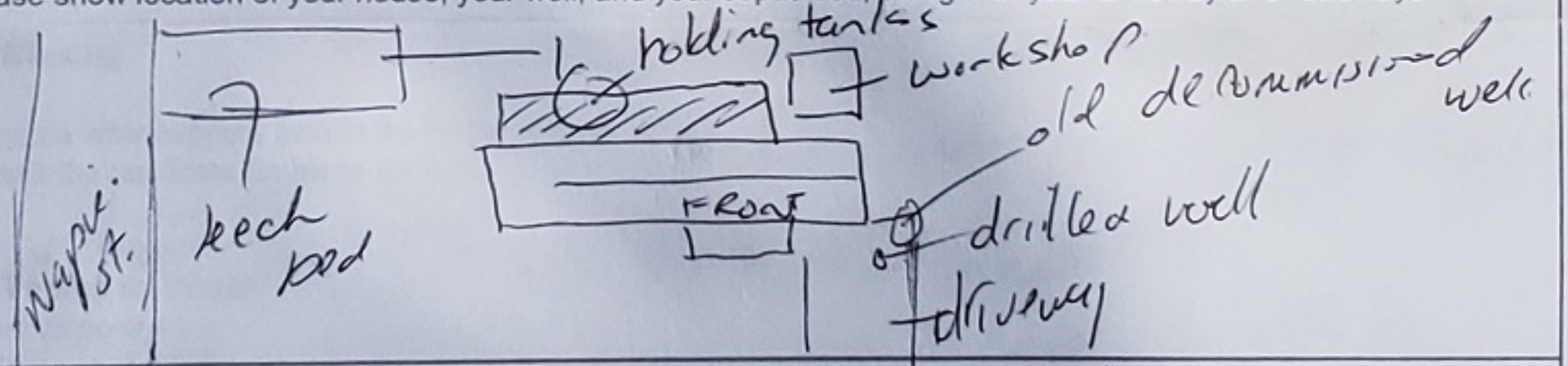
Water treatment system? (Describe) water soft. / + iron remover w/ filter Odour: slight - / less since installing iron remover / water softener

Rusty / black stains on sinks/toilets? not since installing

Have you had water chemistry tests done on your well water? (Describe) they tested water flow-rate about 6 yrs ago.

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.



Any Additional Comments? Property is 132' x 132'. - drilled has a connection where the old dug well well located.

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N2A 4M9

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chrishelmer@hydrog.ca

ANY QUESTIONS? Please Contact:
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Email: chrishelmer@hydrog.ca

WATER WELL SURVEY

Project: 31 Church Street, Alma Date: Oct. 01/22

PROPERTY INFORMATION

Current Owner: JEAN BENDER Previous Owner (If Known): n/a.

Address: 12 CHURCH STREET, ALMA, ON N0B1A0

Contact Number: 519-846-0382

WELL INFORMATION

MECP Well Tag # A020155

Well Depth: ? Well Diameter: ? Well Use: (Residential) Agricultural Commercial

Construction Date: approx. 2005. Depth of Pump: ?

Aquifer Type: Bedrock ? Overburden ? Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) Not apparent.

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: clear Taste: IRON

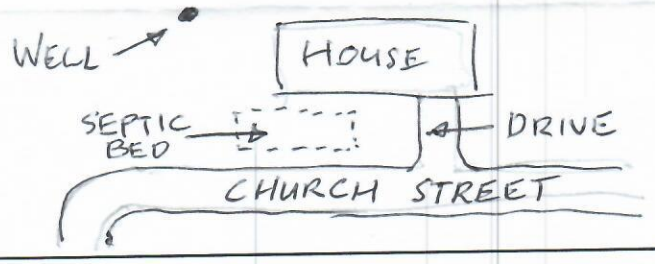
Water treatment system? (Describe) IRON FILTER Odour: Sulphur

Rusty / black stains on sinks/toilets? Rusty, red stains (if Iron Filter not used)

Have you had water chemistry tests done on your well water? (Describe) No.

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.



Any Additional Comments?

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WATER WELL SURVEY

Project: 31 Church Street, Alma Date: _____

PROPERTY INFORMATION

Current Owner: JERRE + TERRY DAVIDSON Previous Owner (If Known): N/A.

Address: 47 PEEL ST WEST, ALMA

Contact Number: 519 362 1880

WELL INFORMATION

MECP Well Tag # _____

Well Depth: ~ 230 feet Well Diameter: _____ Well Use: (Residential) Agricultural Commercial

Construction Date: 2005 Depth of Pump: _____

Aquifer Type: Bedrock Overburden Is the well accessible for inspection? (YES) NO

Any issues with water supply i.e. your well going dry? (Describe) No

Would you be willing to participate in a water well monitoring program? (YES) NO

WATER CHEMISTRY

Appearance: CLEAR Taste: _____

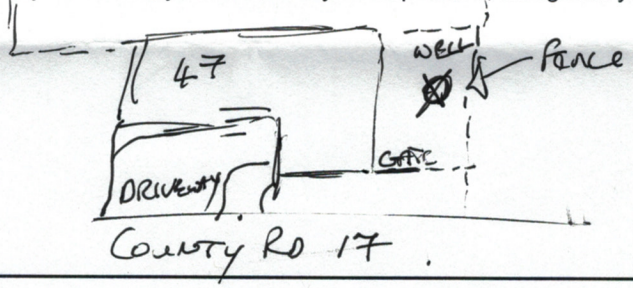
Water treatment system? (Describe) IRON FILTER SOFTENER Odour: NONE.
for REVERSE OSMOSIS FOR DRINKING WATER.

Rusty / black stains on sinks/toilets? NO

Have you had water chemistry tests done on your well water? (Describe) NO

SKETCH OF PROPERTY

Please show location of your house, your well, and your septic bed, along with your driveway and roadways.



Any Additional Comments?

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HCS HYDROGEOLOGY CONSULTING SERVICES

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. Tag#:A357595 — A357595

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☑ Imperial

Page 1 of 1

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by the Owner
	EXACT CONSTRUCTION LTD.	exact.construction@hotmail.com	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
8262 WELLINGTON RD. 19	FERGUS	ONTARIO	N1M2W4	5197877071

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
31 CHURCH ST. S.	PEEL		

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON	ALMA	Ontario	N0B1A0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	539938	4841705		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BLK	TOPSOIL			0	1
BRN	CLAY	STONES		1	4
GRY	CLAY	GRAVEL		4	37
GRY	HARDPAN			37	190
GRY	GRAVEL			190	202

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	190	BENTONITE-BENSEAL/EZMUD	0.9m³
190	202	SILICA SAND #0	0.48m³

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4	STEEL	.188	+2.5	195
6 1/4	STEEL	.188	199	202

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6 5/8	STAINLESS STEEL	14	195	199

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
200'	☐	☑ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	202	9

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 40'

Pumping rate (l/min / GPM): 30

Duration of pumping: 6 hrs + 0 min

Final water level end of pumping (m/ft): 26.6'

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min/GPM): 30

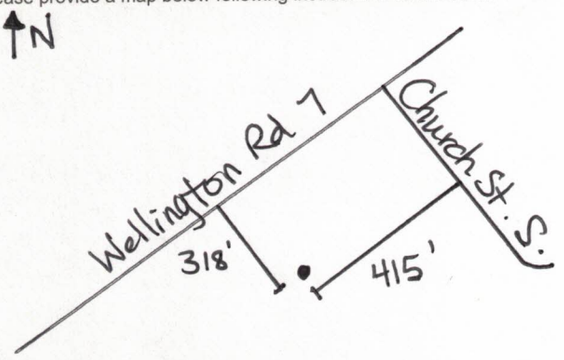
Well production (l/min/GPM): 20+

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		22		
1		25.2	1	23.2
2		25.3	2	23.2
3		25.3	3	23.2
4		25.4	4	23.1
5		25.4	5	23.1
10		25.4	10	23.0
15		25.6	15	22.9
20		25.7	20	22.9
25		25.7	25	22.8
30		25.8	30	22.8
40		25.9	40	22.7
50		26	50	22.7
60		26	60	22.6

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MCLEOD WATER WELLS LTD.	7343

Business Address (Street Number/Name)	Municipality
3389 EGREMONT DR.	STRATHROY

Province	Postal Code	Business E-mail Address
ONTARIO	N7G3H6	info@mcleodwaterwells.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5192459355	MCLEOD, JASON

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3021		2022/11/19

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2022/10/03	2022/10/05

Ministry Use Only

Audit No. Z399245

Received

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Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. Tag#:A357596 — A357596

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☑ Imperial

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed for Well Owner
	EXACT CONSTRUCTION LTD.	exact.construction@hotmail.com	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
8262 WELLINGTON RD. 19	FERGUS	ONTARIO	N1M2W4	5197877071

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
31 CHURCH ST. S.	PEEL		

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON	ALMA	Ontario	N0B1A0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	539970	4841694		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BLK	TOPSOIL			0	1
BRN	CLAY	STONES		1	4
GRY	CLAY			4	36
GRY	GRAVEL			36	75
GRY	HARDPAN			75	130
GRY	CLAY		STICKY	130	172
GRY	GRAVEL	SAND		172	201

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	193	BENTONITE-BENSEAL/E2MUD	0.9m³
193	201	GRAVEL	

Method of Construction

☐ Cable Tool ☑ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, specify
☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☑ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify
☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning
☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4	STEEL	.188	+2	196
6 1/4	STEEL	.188	200	201

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
6 5/8	STAINLESS STEEL	10	196	200

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
200'	☐	☑ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	201	9

Results of Well Yield Testing

After test of well yield, water was: ☑ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 40'

Pumping rate (l/min/GPM): 30

Duration of pumping: 6 hrs + 0 min

Final water level end of pumping (m/ft): 21.7'

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min/GPM): 30

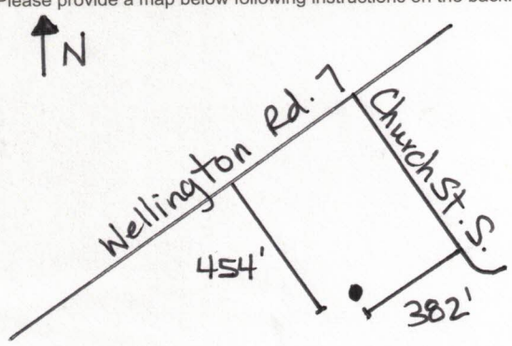
Well production (l/min/GPM): 20+

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	20.1		
1	20.3	1	21.4
2	20.4	2	21.4
3	20.4	3	21.4
4	20.5	4	21.3
5	20.5	5	21.3
10	20.6	10	21.2
15	20.6	15	21.1
20	20.8	20	21.1
25	20.8	25	21.0
30	20.9	30	21.0
40	21.0	40	20.8
50	21.0	50	20.8
60	21.1	60	20.8

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MCLEOD WATER WELLS LTD.	7343

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
3389 EGREMONT DR.	STRATHROY	ONTARIO	N7G3H6	info@mcleodwaterwells.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
5192459355	MCLEOD, JASON	3021		2022/11/09

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2022/11/03	2022/11/05

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Received

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Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
Tag#:A299778 A299778

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
31 Church St	Mapleton	1	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Alma	Ontario	N0B1A0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	539910	4841613	West of Grand River	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth From (m/ft)	Depth To (m/ft)
Black	Topsoil			0	.2
Brown	Clay	sand, gravel		.2	2.74
Brown	Gravel	clay		2.74	17.37
Brown	Sand	gravel, clay		17.37	21.64
Brown	Clay	silt, stones		21.64	51.51
Brown	Gravel	sand		51.51	54.25

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.09	Bentonite	.19

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☒ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth From (m/ft)	Depth To (m/ft)
15.24	Steel	.477	+.55	53.03

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth From (m/ft)	Depth To (m/ft)
10.16	Stainless	20	53.03	54.25

Status of Well

☐ Water Supply
☐ Replacement Well
☒ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	
53.64 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	

Hole Diameter

Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
0	6.09	25.4
6.09	54.25	19.68

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at (m/ft): 23

Pumping rate (l/min / GPM): 68.19

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 5.74

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft): 23

Recommended pump rate (l/min / GPM): 68.19

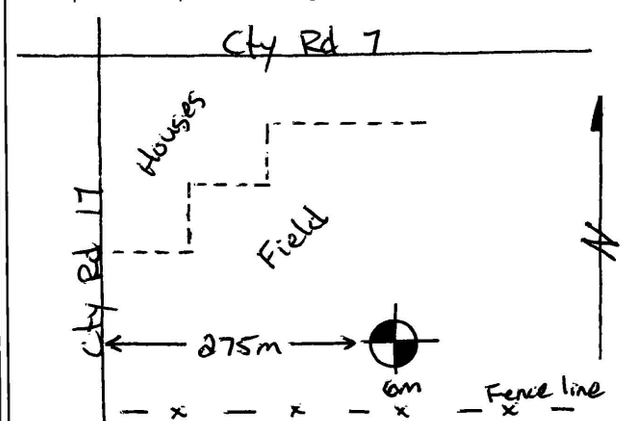
Well production (l/min / GPM): unknown

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	5.74		
1	5.74	1	5.74
2	5.74	2	
3	5.74	3	
4	5.74	4	
5	5.74	5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Franklin Drilling Services Inc	7119

Business Address (Street Number/Name)	Municipality
6891 Sdrd 7 West Mt. Forest	

Province	Postal Code	Business E-mail Address
ON	N0G2L0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5195014750	Franklin Liam

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
3594		

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	20200804	20200728

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Audit No. Z340201

Received NOV 02 2020

0506E (2018/12)

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Ontario Ministry of the Environment

Well Tag Numb (sticker and print number below) A 030082 Ao 300 82

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
WELLINGTON	PILKINGTON	1 1

GPS Reading: NAD 83 | Zone 17 | Easting 539839 | Northing 4841695 | Unit Make/Model MAGELEN | Mode of Operation: UTM | ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
BROWN	SILTY CLAY & STONES			0	27ft
GRAY	CLAY & STONES			27ft	118ft
GRAY	CLAY			118ft	197ft
GRAY	GRAVEL & SAND SOFT			197ft	204ft

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	[redacted]	
0	204ft	8.5ft

Water Record

Water found at ___ Metres	Kind of Water
201ft	☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
204ft	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
___ m	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
___ m	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:

After test of well yield, water was ☒ Clear and sediment free ☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
6¼	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	0	201ft
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
6¼	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized S.S	30	201ft	204ft
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method: pump-air

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		22ft		
1	1	25ft	1	
2	2	28ft	2	
3	3	30ft	3	
4	4	32ft	4	
5	5	34ft	5	
10	10	42ft	10	
15	15	47ft	15	
20	20	50ft	20	
25	25	52ft	25	
30	30	54ft	30	
40	40	57ft	40	
50	50	59ft	50	
60	60	62ft	60	

Pump intake set at - (metres) 100ft

Pumping rate - (litres/min) 10ft

Duration of pumping 2 hrs + 0 min

Final water level end of pumping 72ft metres

Recommended pump type. ☐ Shallow ☐ Deep

Recommended pump depth 100ft metres

Recommended pump rate. 10gpm (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	195ft	BENTONITE SLURRY	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☒ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☒ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

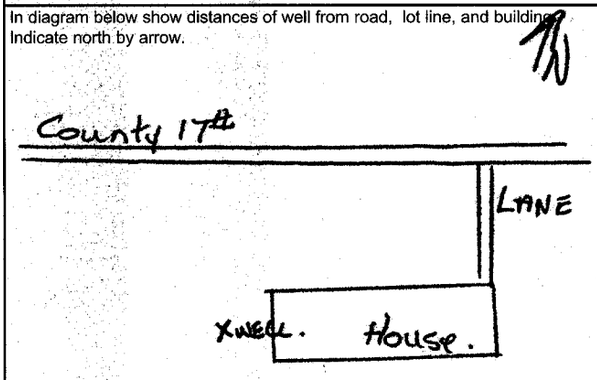
☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154
Business Address (street name, number, city etc.)	
251 ELDON ST GODERICH ONT	
Name of Well Technician (last name, first name)	Well Technician's Licence No.
KEITH LANG	T446
Signature of Technician/Contractor	Date Submitted YYYY MM DD
X Keith Lang	

Audit No. Z 35593

Date Well Completed YYYY MM DD: 2005 9 9

Was the well owner's information package delivered? ☒ Yes ☐ No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source	Contractor 7154
Date Received YYYY MM DD: OCT 05 2005	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. *(Place Sticker and/or Print Below)* Tag#:A299778 A299778

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name): 31 Church St

Township: Mapleton

Lot: 1

Concession: 1

County/District/Municipality: Wellington

City/Town/Village: Alma

Province: Ontario

Postal Code: N0B1A0

UTM Coordinates: NAD 83 Zone 17 Easting 539910 Northing 4841613

Municipal Plan and Sublot Number: West of Grand River

Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Topsoil			0	.2
Brown	Clay	sand, gravel		.2	2.74
Brown	Gravel	clay		2.74	17.37
Brown	Sand	gravel, clay		17.37	21.64
Brown	Clay	silt, stones		21.64	51.51
Brown	Gravel	sand		51.51	54.25

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.09	Bentonite	.19

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [X] Test Hole [ ] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.24	Steel	.477	+.55	53.03

Status of Well

[ ] Water Supply
[ ] Replacement Well
[X] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[ ] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
10.16	Stainless	20	53.03	54.25

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
53.64	[ ] Fresh [X] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.09	25.4
6.09	54.25	19.68

Results of Well Yield Testing

After test of well yield, water was:
[X] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 23

Pumping rate (l/min / GPM): 68.19

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 5.74

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 23

Recommended pump rate (l/min / GPM): 68.19

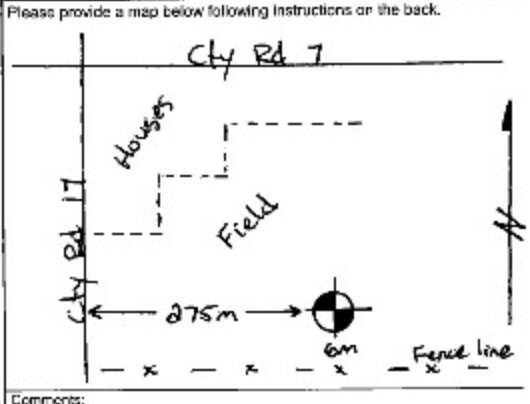
Well production (l/min / GPM): unknown

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	5.74		
1	5.74	1	5.74
2	5.74	2	
3	5.74	3	
4	5.74	4	
5	5.74	5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Franklin Drilling Services Inc

Well Contractor's Licence No.: 7719

Business Address (Street Number/Name): 6891 Sdrd 7 West

Municipality: Mt. Forest

Province: ON

Postal Code: N0G2L0

Business E-mail Address:

Bus. Telephone No. (inc. area code): 5199014750

Name of Well Technician (Last Name, First Name): Franklin, Liam

Well Technician's Licence No.: 3594

Signature of Technician and/or Contractor:

Date Submitted: [redacted]

Well owner's information package delivered: [X] Yes [ ] No

Date Package Delivered: 2020/08/04

Date Work Completed: 2020/07/28

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Audit No.: Z340201

Received: NOV 02 2020

0506E (2015/12)

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Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#:A299778 A299778

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
31 Church St	Mapleton	1	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Alma	Ontario	N0B1A0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	539910	4841613	West of Grand River	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Topsoil			0	.2
Brown	Clay	sand, gravel		.2	2.74
Brown	Gravel	clay		2.74	17.37
Brown	Sand	gravel, clay		17.37	21.64
Brown	Clay	silt, stones		21.64	51.51
Brown	Gravel	sand		51.51	54.25

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
0	6.09	Bentonite	.19

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☒ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.24	Steel	.477	+1.55	53.03

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
10.16	Stainless	20	53.03	54.25

Status of Well

☐ Water Supply
☐ Replacement Well
☒ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* _____
☐ Other, *specify* _____

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at (m/ft): 23

Pumping rate (l/min / GPM): 68.19

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 5.74

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 23

Recommended pump rate (l/min / GPM): 68.19

Well production (l/min / GPM): unknown

Disinfected? ☒ Yes ☐ No

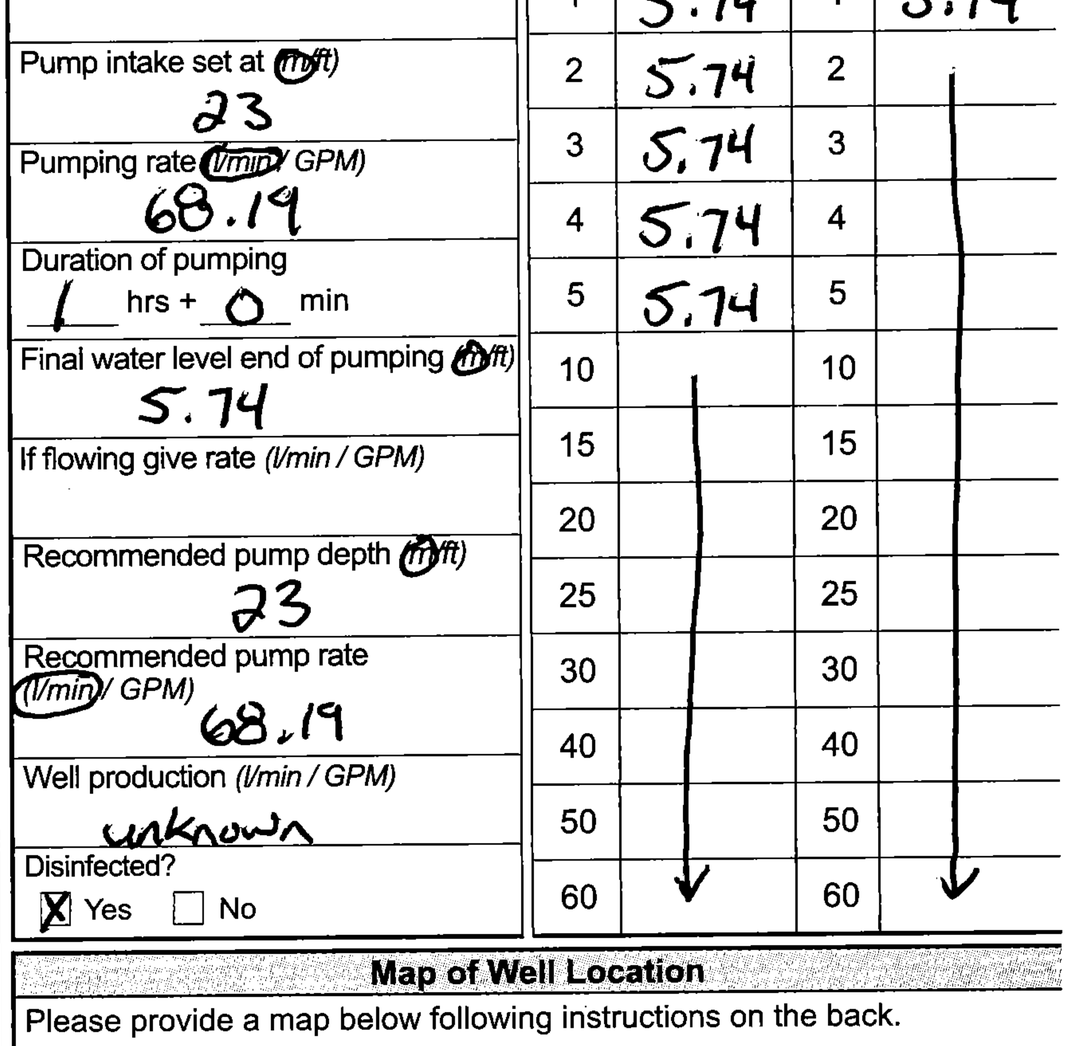
Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	5.74		
1	5.74	1	5.74
2	5.74	2	
3	5.74	3	
4	5.74	4	
5	5.74	5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
536.4 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☒ Untested ☐ Other, *specify* _____	0	6.09	25.4
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify* _____	6.09	54.25	19.68
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify* _____			

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Franklin Drilling Services Inc	7119

Business Address (Street Number/Name)	Municipality
6891 Sdrd 7 West Mt. Forest	

Province	Postal Code	Business E-mail Address
ON	N0G2L0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
5195014750	Franklin Liam

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3594		YYYY MM DD

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	20200804	20200728

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Audit No. Z340201

Received NOV 02 2020

0506E (2018/12)

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Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. Tag#:A357595 — A357595

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☑ Imperial

Page 1 of 1

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by the Owner
	EXACT CONSTRUCTION LTD.	exact.construction@hotmail.com	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
8262 WELLINGTON RD. 19	FERGUS	ONTARIO	N1M2W4	5197877071

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
31 CHURCH ST. S.	PEEL		

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON	ALMA	Ontario	N0B1A0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	539938	4841705		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BLK	TOPSOIL			0	1
BRN	CLAY	STONES		1	4
GRY	CLAY	GRAVEL		4	37
GRY	HARDPAN			37	190
GRY	GRAVEL			190	202

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	190	BENTONITE-BENSEAL/EZMUD	0.9m³
190	202	SILICA SAND #0	0.48m³

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4	STEEL	.188	+2.5	195
6 1/4	STEEL	.188	199	202

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6 5/8	STAINLESS STEEL	14	195	199

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
200'	☐	☑ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	202	9

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 40'

Pumping rate (l/min / GPM): 30

Duration of pumping: 6 hrs + 0 min

Final water level end of pumping (m/ft): 26.6'

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min/GPM): 30

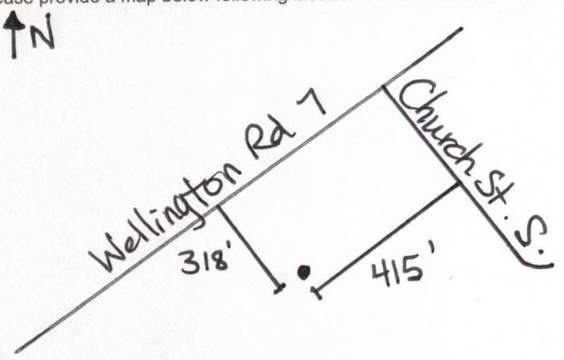
Well production (l/min/GPM): 20+

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		22		
1		25.2	1	23.2
2		25.3	2	23.2
3		25.3	3	23.2
4		25.4	4	23.1
5		25.4	5	23.1
10		25.4	10	23.0
15		25.6	15	22.9
20		25.7	20	22.9
25		25.7	25	22.8
30		25.8	30	22.8
40		25.9	40	22.7
50		26	50	22.7
60		26	60	22.6

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MCLEOD WATER WELLS LTD.	7343

Business Address (Street Number/Name)	Municipality
3389 EGREMONT DR.	STRATHROY

Province	Postal Code	Business E-mail Address
ONTARIO	N7G3H6	info@mcleodwaterwells.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5192459355	MCLEOD, JASON

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3021		2022/11/19

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2022/10/03	2022/10/05

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Well Tag No. Tag#:A357596 — A357596

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☑ Imperial

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed for Well Owner
	EXACT CONSTRUCTION LTD.	exact.construction@hotmail.com	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
8262 WELLINGTON RD. 19	FERGUS	ONTARIO	N1M2W4	5197877071

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
31 CHURCH ST. S.	PEEL		

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON	ALMA	Ontario	N0B1A0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	539970	4841694		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BLK	TOPSOIL			0	1
BRN	CLAY	STONES		1	4
GRY	CLAY			4	36
GRY	GRAVEL			36	75
GRY	HARDPAN			75	130
GRY	CLAY		STICKY	130	172
GRY	GRAVEL	SAND		172	201

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	193	BENTONITE-BENSEAL/E2MUD	0.9m³
193	201	GRAVEL	

Method of Construction

☐ Cable Tool ☑ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, specify
☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☑ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify
☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning
☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4	STEEL	.188	+2	196
6 1/4	STEEL	.188	200	201

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
6 5/8	STAINLESS STEEL	10	196	200

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
200'	☐	☑ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	201	9

Results of Well Yield Testing

After test of well yield, water was: ☑ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 40'

Pumping rate (l/min/GPM): 30

Duration of pumping: 6 hrs + 0 min

Final water level end of pumping (m/ft): 21.7'

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min/GPM): 30

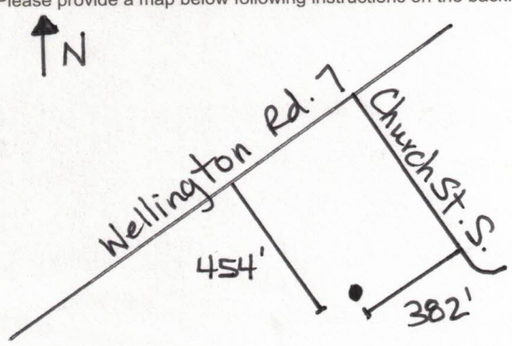
Well production (l/min/GPM): 20+

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	20.1		
1	20.3	1	21.4
2	20.4	2	21.4
3	20.4	3	21.4
4	20.5	4	21.3
5	20.5	5	21.3
10	20.6	10	21.2
15	20.6	15	21.1
20	20.8	20	21.1
25	20.8	25	21.0
30	20.9	30	21.0
40	21.0	40	20.8
50	21.0	50	20.8
60	21.1	60	20.8

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MCLEOD WATER WELLS LTD.	7343

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
3389 EGREMONT DR.	STRATHROY	ONTARIO	N7G3H6	info@mcleodwaterwells.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
5192459355	MCLEOD, JASON	3021		2022/11/09

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2022/11/03	2022/11/05

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Audit No. Z399244

Received

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MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

40P/9E

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11 | 6705957 | MUNICIP. 67011 | CON. GRW | 01

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Pilkington	1 GRW	002

[redacted] a

DATE COMPLETED: DAY 03 MO. 03 YR. 76

...ING 4145 0 | RC. 5 | ELEVATION 1445 | RC 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Fill			0	4
Brown	Clay			4	9
Brown	Sand and Gravel			9	21
Grey	Clay			21	30

31 | 0004601 | 0009605 | 0021 62811 | 0030 2105

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0020	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
30"	☐ STEEL ☒ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	.064	0	0030
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☐ PUMP ☒ BAILER
PUMPING RATE: 0004 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
009 FEET	FEET	FEET	FEET	FEET	FEET

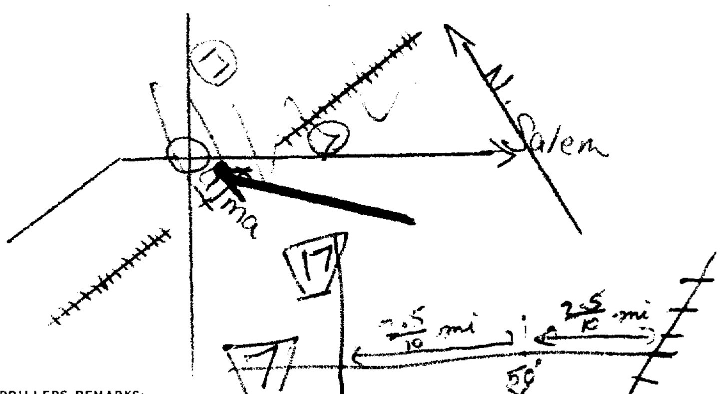
WATER LEVELS DURING: ☐ PUMPING ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: 20 FEET
WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 020 FEET
RECOMMENDED PUMPING RATE: 0004 GPM
GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 4041

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.

Last house on the right side coming out of Alma, south towards Salem. New house before railroads tracks.



DRILLERS REMARKS

FINAL STATUS OF WELL 1
☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED

WATER USE 01
☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING 6
☐ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☒ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Hadco Well Drilling & Digging Ltd.
LICENCE NUMBER: 2519
ADDRESS: Box 188, Elmira, Ontario
NAME OF DRILLER OR BORER: Mr. Roy Franklin
LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: [signature]
SUBMISSION DATE: DAY 4 MO. Mar. YR. 76

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 2519 | DATE RECEIVED: 150376
DATE OF INSPECTION: Jun 23/77 | INSPECTOR: [illegible]
REMARKS: CSS.S8
P
WI

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 MOE 07-091

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

6710987

1. PRINT ONLY IN SPACES PROVIDED
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11

MUNICIP 6701 | CON. CON | 92/3

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC	LOT
WELLINGTON	PILKINGTON TWP	1	1

[redacted] BOX 170 ALMA ONT

DATE COMPLETED: DAY 1 MO 9 YR 92

ING | RC | ELEVATION | RC | BASIN CODE | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	TOP SOIL			0	1
"	CLAY	GRAVEL SAND		1	19
"	CLAY	HARD PAN - GRAVEL		19	22
"	CLAY	FINE GRAVEL		22	62.
GREY	CLAY	GRAVEL STONES		62	95
	GRAVEL	SAND	OVER DEVELORING MAY CAUSE SAND SURGE	95	102
			total depth		102 ft.

31

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
100	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0'	102'
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER (INCHES)	LENGTH (FEET)

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN (FEET)

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	12 GPM	4 HOURS ___ MINS

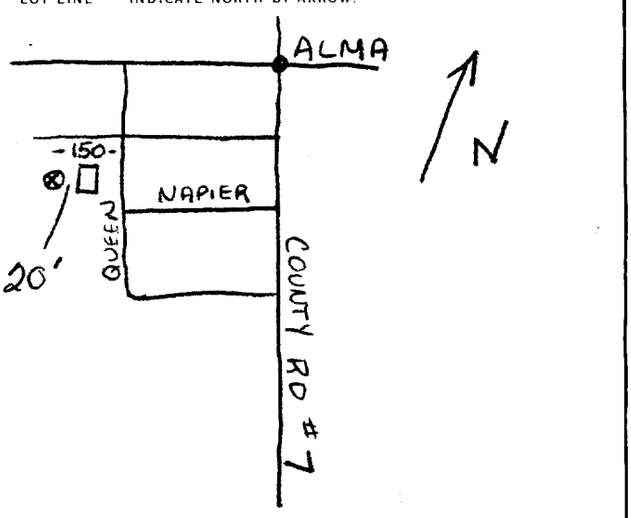
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
17 FEET	40 FEET	FEET	FEET	FEET	40 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	83 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	70 FEET	10 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

093827

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: ADVANCED WATER SYSTEMS | WELL CONTRACTOR'S LICENCE NUMBER: 6624

ADDRESS: 33 HAYES AVE GUELPH

NAME OF WELL TECHNICIAN: JEFF ANDERSON | WELL TECHNICIAN'S LICENCE NUMBER: T-0453

SIGNATURE OF TECHNICIAN/CONTRACTOR: [signature] | SUBMISSION DATE: DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR: 6624 | DATE RECEIVED: SEP 15 1992

DATE OF INSPECTION | INSPECTOR

REMARKS: CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Page 385

Ministry of Environment and Energy — Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 — 6712559 — Municipality 6701 — Con. GR W — Lot 91 96

County or District: WELLINGTON — Township/Borough/City/Town/Village: PUSLINCH — Con block tract survey, etc.: PLAN 134 — Lot: 91 96

[redacted] Address: 27 QUEEN ST. ARA — Date completed: 17 06 98 (day month year)

Northing — RC — Elevation — RC — Basin Code — ii — iii — iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	Depth – feet To
	TOP SOIL			0	1
BROWN	CLAY	SAND, STONES		1	35
BROWN	CLAY	SAND, GRAVEL		35	75
BROWN	SAND	GRAVEL		75	90
BROWN	CLAY	GRAVEL		90	155
	GRAVEL			155	164
			TOTAL = 164 FT.		
		6" CASING DRIVE SHOE			

31

32

41 WATER RECORD

Water found at – feet	Kind of water	
164	1 ☑ Fresh 2 ☐ Salty	3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty	3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty	3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty	3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty	3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
6"	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+3	164
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.) — Diameter — Length (inches / feet)

Material and type — Depth at top of screen (feet)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
0	20	BENSEAL

71 PUMPING TEST

Pumping test method: 1 ☑ Pump 2 ☐ Bailer — Pumping rate: 30 GPM — Duration of pumping: ..... Hours ..... Mins

Static level	Water level end of pumping	Water levels during: 1 ☑ Pumping 2 ☐ Recovery			
Flowing	1 feet	15 minutes: 1 feet	30 minutes: 1 feet	45 minutes: 1 feet	60 minutes: 1 feet

If flowing give rate: ..... GPM — Pump intake set at: ..... feet — Water at end of test: ☑ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep — Recommended pump setting: 20/40 feet — Recommended pump rate: 30 GPM

FINAL STATUS OF WELL

1 ☑ Water supply; 2 ☐ Observation well; 3 ☐ Test hole; 4 ☐ Recharge well; 5 ☐ Abandoned, insufficient supply; 6 ☐ Abandoned, poor quality; 7 ☐ Abandoned (Other); 8 ☐ Dewatering; 9 ☐ Unfinished; 10 ☐ Replacement well

WATER USE

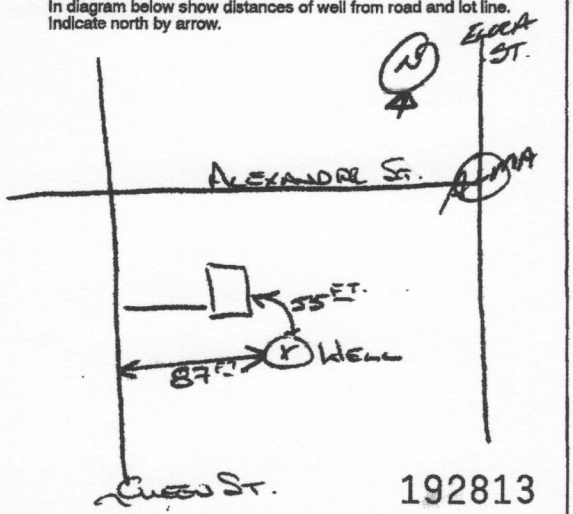
1 ☑ Domestic; 2 ☐ Stock; 3 ☐ Irrigation; 4 ☐ Industrial; 5 ☐ Commercial; 6 ☐ Municipal; 7 ☐ Public supply; 8 ☐ Cooling & air conditioning; 9 ☐ Not used; 10 ☐ Other .....

METHOD OF CONSTRUCTION

1 ☐ Cable tool; 2 ☐ Rotary (conventional); 3 ☐ Rotary (reverse); 4 ☐ Rotary (air); 5 ☐ Air percussion; 6 ☐ Boring; 7 ☐ Diamond; 8 ☐ Jetting; 9 ☐ Driving; 10 ☐ Digging; 11 ☐ Other .....

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



192813

Name of Well Contractor: HARRISON WATER DRILLING LTD — Well Contractor's Licence No.: 2663

Address: RR#5 GUELPH ONT N1H 6J2

Name of Well Technician: HENRY R. HARRISON — Well Technician's Licence No.: T-059C

Signature of Technician/Contractor: [signature] — Submission date: 98 06 29 (day mo yr)

MINISTRY USE ONLY — Data source: 58 — Contractor: 2663 (55-62) — Date received: JUN 29 1998 (63-68)

Date of inspection — Inspector

Remarks: CSS. S9

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0506 (07/94) Front Form 9

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 6712605 Municipality 6701 Con. GR W 01

County or District: WELLINGTON
Township/Borough/City/Town/Village: PUSLINGTON
Con block tract survey, etc.: 134
Lot: 98
[redacted]
Address: 31 QUEEN ST.
Date completed: 26 06 98 (day month year)

Northing RC Elevation RC Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see Instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	Depth – feet To
	TOP SOIL			0	1
BROWN	CLAY			1	10
BROWN	SAND	GRAVEL		10	25
BROWN	CLAY	SAND, GRAVEL		25	80
LIGHT BROWN	BOULDER			80	82
BROWN	SAND	GRAVEL		82	95
BROWN	CLAY	SAND, GRAVEL		95	120
BROWN	CLAY	GRAVEL		120	130
	GRAVEL			130	154
				154	159
		6" DRIVE SHOE	TOTAL = 159 FT		

41 WATER RECORD

Water found at – feet	Kind of water
159	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
6"	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+2	158
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type	Depth at top of screen feet	

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
0	20	BENDEAL

71 PUMPING TEST

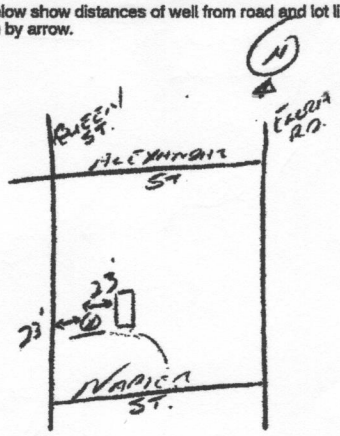
Pumping test method: 1 ☑ Pump 2 ☐ Bailer
Pumping rate: 30 GPM
Duration of pumping: 1 Hours ... Mins
Static level: FREE WATER feet
Water level end of pumping: 2' feet
Water levels during: 1 ☑ Pumping 2 ☐ Recovery

15 minutes	30 minutes	45 minutes	60 minutes
2' feet	2' feet	2' feet	2' feet

If flowing give rate: 5 GPM
Pump intake set at: feet
Water at end of test: ☐ Clear ☐ Cloudy
Recommended pump type: ☑ Shallow ☐ Deep
Recommended pump setting: 20/40 feet
Recommended pump rate: 30 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



192829

FINAL STATUS OF WELL

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not used 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☑ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
HARCOURT WATER DRILLING LTD	2663
Address: RR #5 GUELPH N1H 6J2	
Name of Well Technician: HENRY R HARCOURT	Well Technician's Licence No.: T-0590
Signature of Technician/Contractor	Submission date: 01 07 98 (day mo yr)

MINISTRY USE ONLY

Data source	Contractor	Date received
	2663	AUG 05 1998
Date of Inspection	Inspector	
Remarks: CSS. S9		

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Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 | 6712607 | Municipality 6701 | Con. GR W | 07

County or District: WELLINGTON
Township/Borough/City/Town/Village: PILKINGTON
Con | block | tract | survey, etc.: 7
Lot: 128
Address: 30 ELORA RD. S. ALMA
Date completed: 29 06 98 (day month year)

21 | T M | Northing | RC | Elevation | RC | Basin Code: ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	Depth – feet To
	TOP SOIL			0	1
BROWN	CLAY	STONES		1	20
BROWN	SAND	GRAVEL		20	25
BROWN	CLAY	GRAVEL		25	130
BROWN	CLAY	SAND, GRAVEL		130	140
BROWN	CLAY	GRAVEL		140	157
	GRAVEL		COARSE	157	
		TOTAL = 157	6" DIA CASING DRIVE SHOE		

31
32

41 WATER RECORD

Water found at – feet	Kind of water
161	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
6"	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+1	160
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type	Depth at top of screen feet	

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
0	20	BENSEAL

71 PUMPING TEST

Pumping test method: 1 ☑ Pump 2 ☐ Bailer
Pumping rate: 30 GPM
Duration of pumping: ..... Hours ..... Mins

Static level	Water level end of pumping	Water levels during: 1 ☑ Pumping 2 ☐ Recovery 15 minutes	30 minutes	45 minutes	60 minutes
6' feet	2' feet	2' feet	2' feet	2' feet	2' feet

If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☑ Clear ☐ Cloudy
Recommended pump type: ☐ Shallow ☐ Deep
Recommended pump setting: 20/40 feet
Recommended pump rate: 30 GPM

FINAL STATUS OF WELL

1 ☐ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE

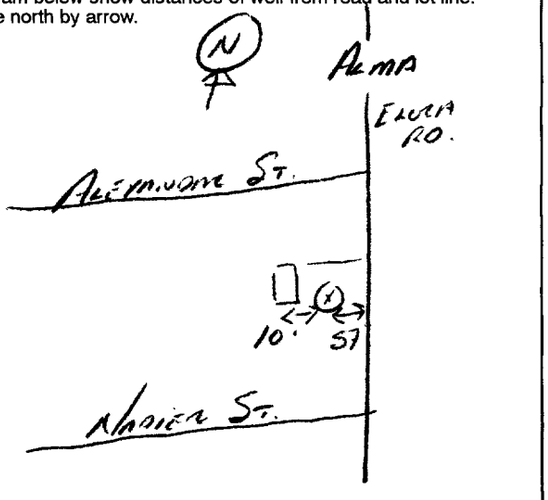
1 ☐ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not used
10 ☐ Other .....

METHOD OF CONSTRUCTION

1 ☐ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☑ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other .....

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



192827

Name of Well Contractor: [redacted] WELL DRILLING LTD
Well Contractor's Licence No.: 2663
Address: R.R. # 5 GUELPH ONT. N1H 6J2
Name of Well Technician: HENRY R. [redacted]
Well Technician's Licence No.: T-0590
Signature of Technician/Contractor:
Submission date: 29 JUL 98 (day mo yr)

MINISTRY USE ONLY
Data source
Contractor: 2663
Date received: AUG 05 1998
Date of inspection
Inspector
Remarks: CSS. S9

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Ontario Ministry of the Environment

Well Tag Number (Plea... nber below): A020155 #A0_0155

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
WELLINGTON	PILKINGTON	1 1

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation	
	83	17	540016	4841765	MAGELEN	UTM	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
BROWN	CLAY SILTY			0	11ft
BROWN	CLAY & STONES			11ft	52ft
BROWN	CLAY			52ft	74ft
GRAY	GRAVEL			74ft	84ft
GRAY	CLAY & STONE			84ft	124ft
GRAY	CLAY			124ft	177ft
GRAY	GRAVEL & SAND SOFT			177ft	187ft

Hole Diameter

Depth From	Metres To	Diameter Centimetres
0	184	8.5
184ft	187ft	6in

Water Record

Water found at ___ Metres	Kind of Water
184ft	☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Other:
187ft	
___ m	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
___ m	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:

After test of well yield, water was ☒ Clear and sediment free ☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
6¼	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	0	184ft
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.	Depth From	Depth To
5¼	☐ Steel ☐ Fibreglass ☐ Plastic ☒ Concrete ☐ Galvanized S.S	30	184ft	187ft

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method: PUMP_AIR

Pump intake set at - (metres) 50ft

Pumping rate - (litres/min) 12gpm

Duration of pumping 1 hrs + 0 min

Final water level end of pumping 21ft metres

Recommended pump type. ☐ Shallow ☒ Deep

Recommended pump depth 50ft metres

Recommended pump rate. 12gpm (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		13"FT		
1		14ft	1	15ft
2	15ft		2	13ft
3	16ft		3	12ft
4	17ft		4	
5	18ft		5	
10	21ft		10	
15			15	
20	21ft		20	
25			25	
30			30	
40			40	
50			50	
60	21ft		60	12ft

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	180ft	BENTONITE SLURRY	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☒ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154

Business Address (street name, number, city etc.): 251 ELDON ST GODERICH ONT

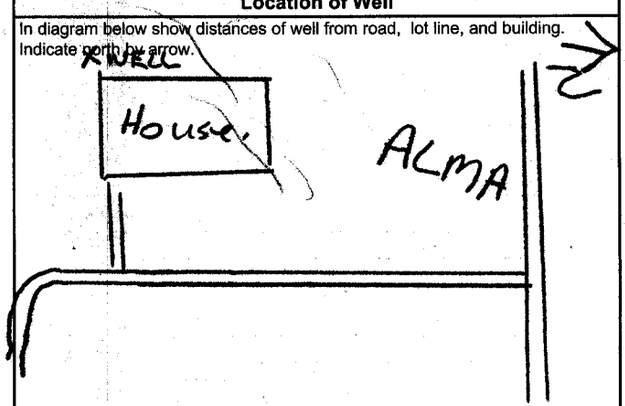
Name of Well Technician (last name, first name)	Well Technician's Licence No.
KEITH LANG	T446

Signature of Technician/Contractor: X [signature]

Date Submitted YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 32403

Date Well Completed YYYY MM DD: 2005 8 8

Was the well owner's information package delivered? ☒ Yes ☐ No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source

Contractor 7154

Date Received AUG 26 2005 YYYY MM DD

Date of Inspection YYYY MM DD

Remarks

Well Record Number 15ft 15ft 13ft

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Numb (sticker and print number below) A 030082 Ao 300 82

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
WELLINGTON	PILKINGTON	1 1

GPS Reading: NAD 83 | Zone 17 | Easting 539839 | Northing 4841695 | Unit Make/Model MAGELEN | Mode of Operation: UTM | ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
BROWN	SILTY CLAY & STONES			0	27ft
GRAY	CLAY & STONES			27ft	118ft
GRAY	CLAY			118ft	197ft
GRAY	GRAVEL & SAND SOFT			197ft	204ft

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	[redacted]	
0	204ft	8.5ft

Water Record

Water found at ___ Metres	Kind of Water
201ft	☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
204ft	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
___ m	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:
___ m	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:

After test of well yield, water was ☒ Clear and sediment free ☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
6¼	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	0	201ft
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
6¼	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized S.S	30	201ft	204ft
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method: pump-air

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		22ft		
1	1	25ft	1	
2	2	28ft	2	
3	3	30ft	3	
4	4	32ft	4	
5	5	34ft	5	
10	10	42ft	10	
15	15	47ft	15	
20	20	50ft	20	
25	25	52ft	25	
30	30	54ft	30	
40	40	57ft	40	
50	50	59ft	50	
60	60	62ft	60	

Pump intake set at - (metres) 100ft

Pumping rate - (litres/min) 10ft

Duration of pumping 2 hrs + 0 min

Final water level end of pumping 72ft metres

Recommended pump type. ☐ Shallow ☐ Deep

Recommended pump depth 100ft metres

Recommended pump rate. 10gpm (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	195ft	BENTONITE SLURRY	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☒ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☒ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

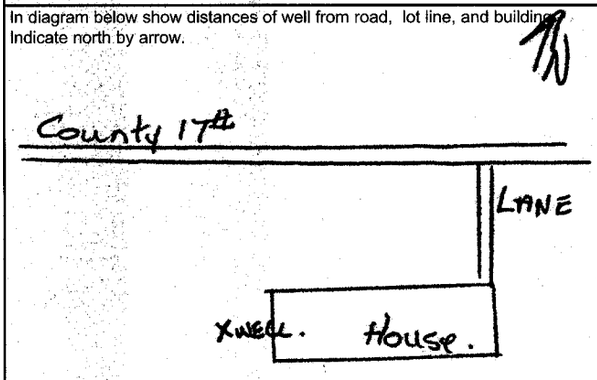
☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154
Business Address (street name, number, city etc.)	
251 ELDON ST GODERICH ONT	
Name of Well Technician (last name, first name)	Well Technician's Licence No.
KEITH LANG	T446
Signature of Technician/Contractor	Date Submitted YYYY MM DD
X Keith Lang	

Audit No. Z 35593

Date Well Completed YYYY MM DD: 2005 9 9

Was the well owner's information package delivered? ☒ Yes ☐ No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source	Contractor 7154
Date Received YYYY MM DD: OCT 05 2005	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

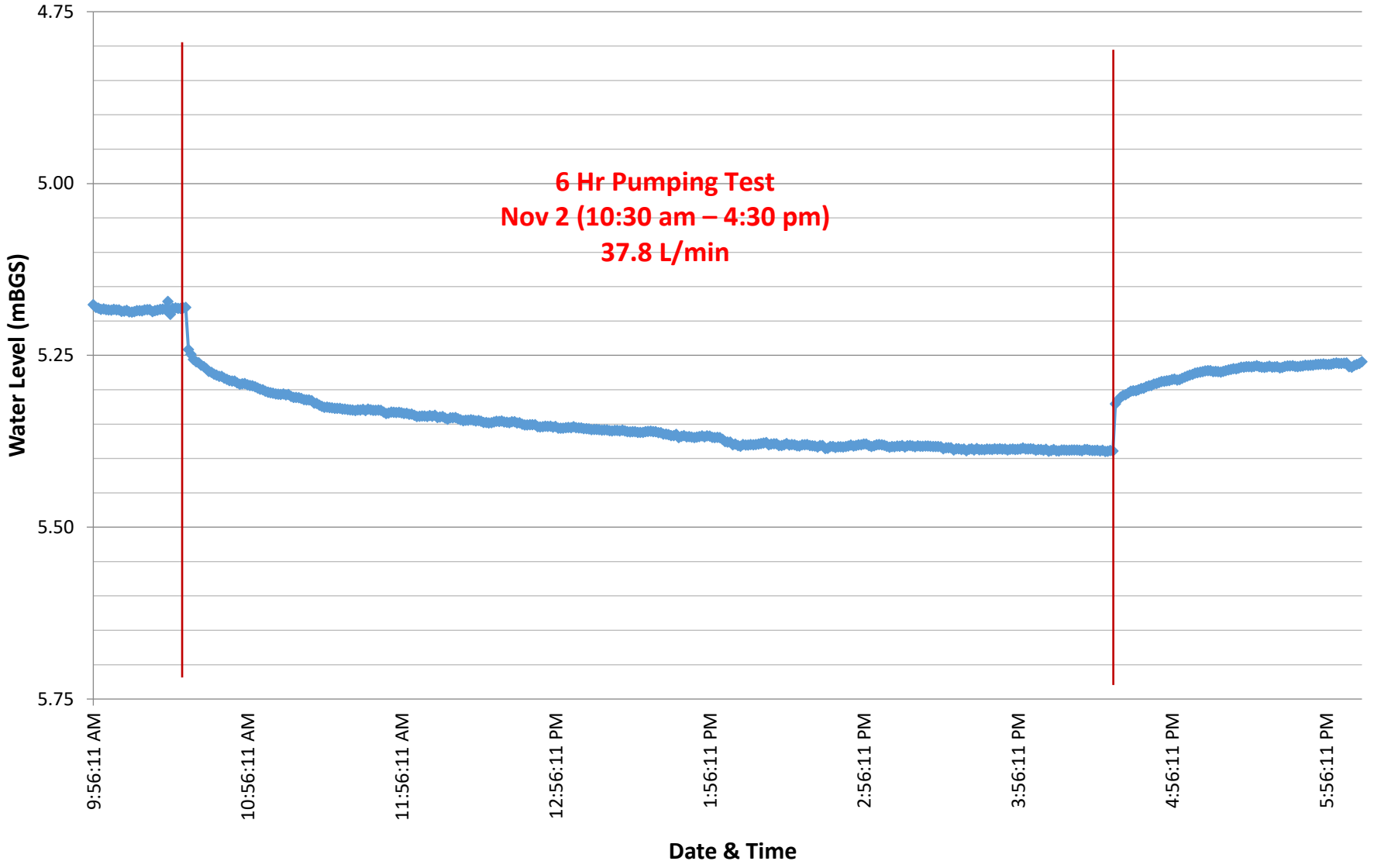
Cette formule est disponible en français

APPENDIX C: PUMPING TEST ANALYSIS GRAPHS

Single Well Pumping Test of Well A357596, November 2, 2022

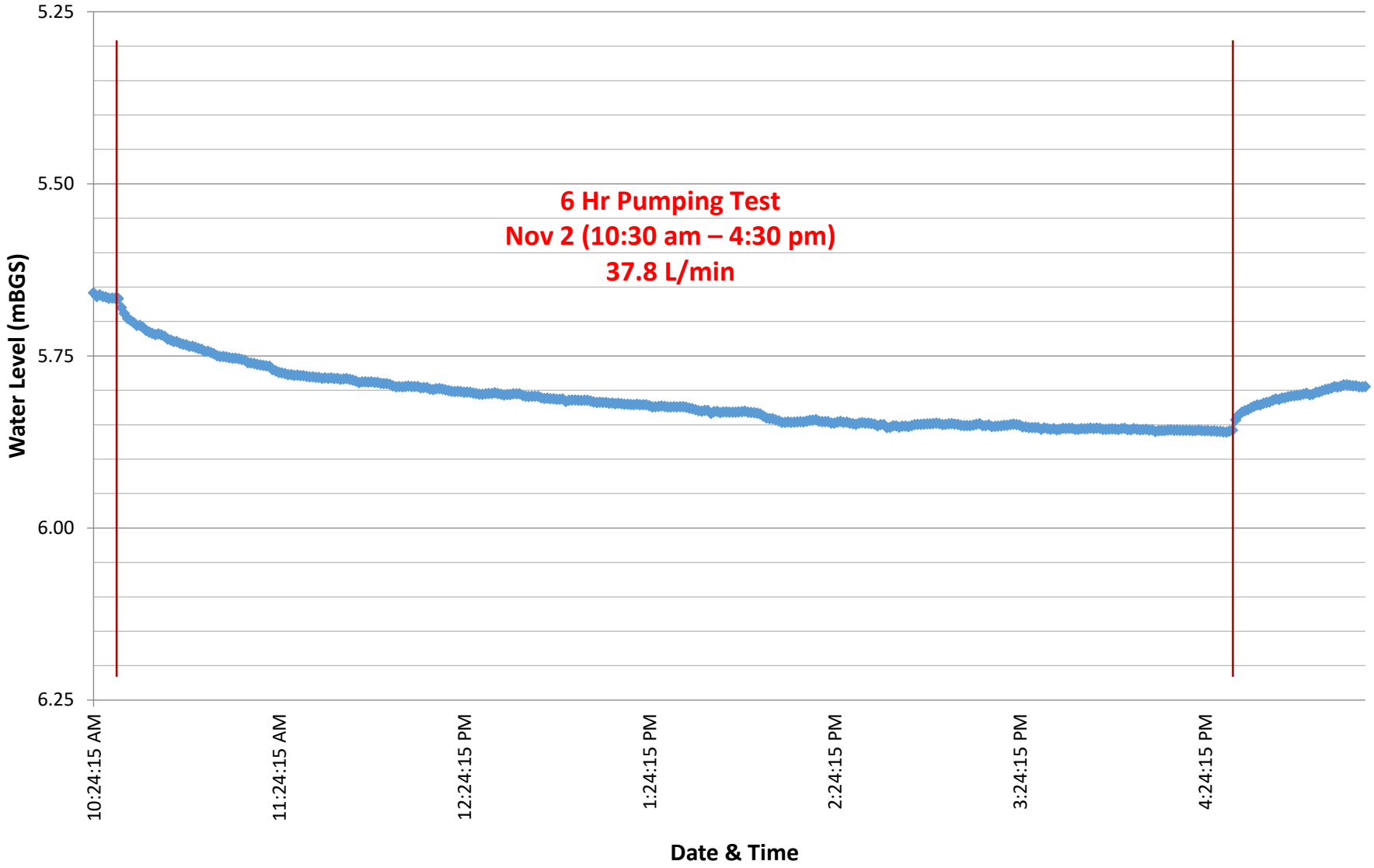
Double Well Pumping Test of Wells A357595 & A357596, November 4, 2022

Figure 1
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Pumping Well A357596 Time vs. Water Level



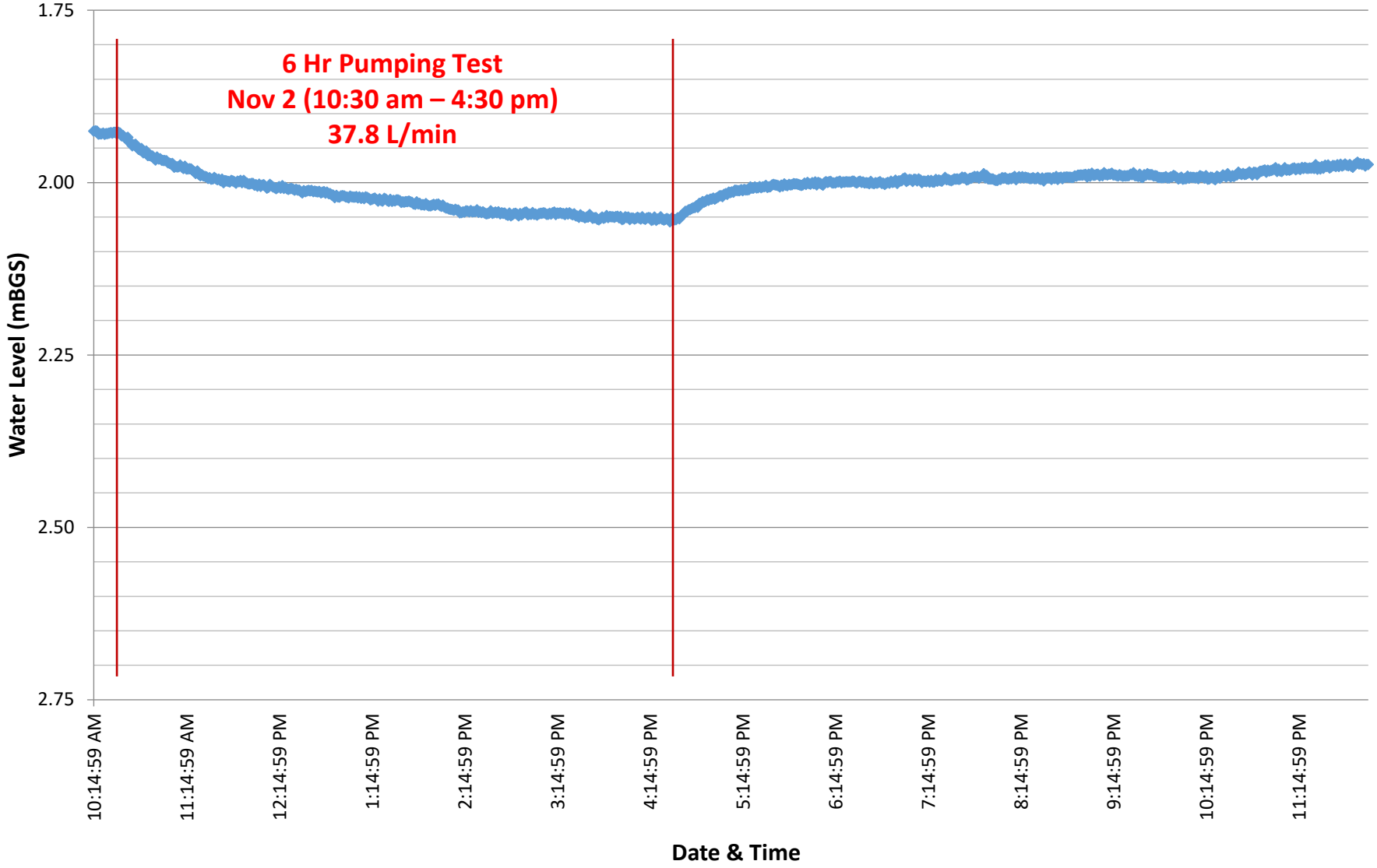
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 2
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well A357595 Time vs. Water Level



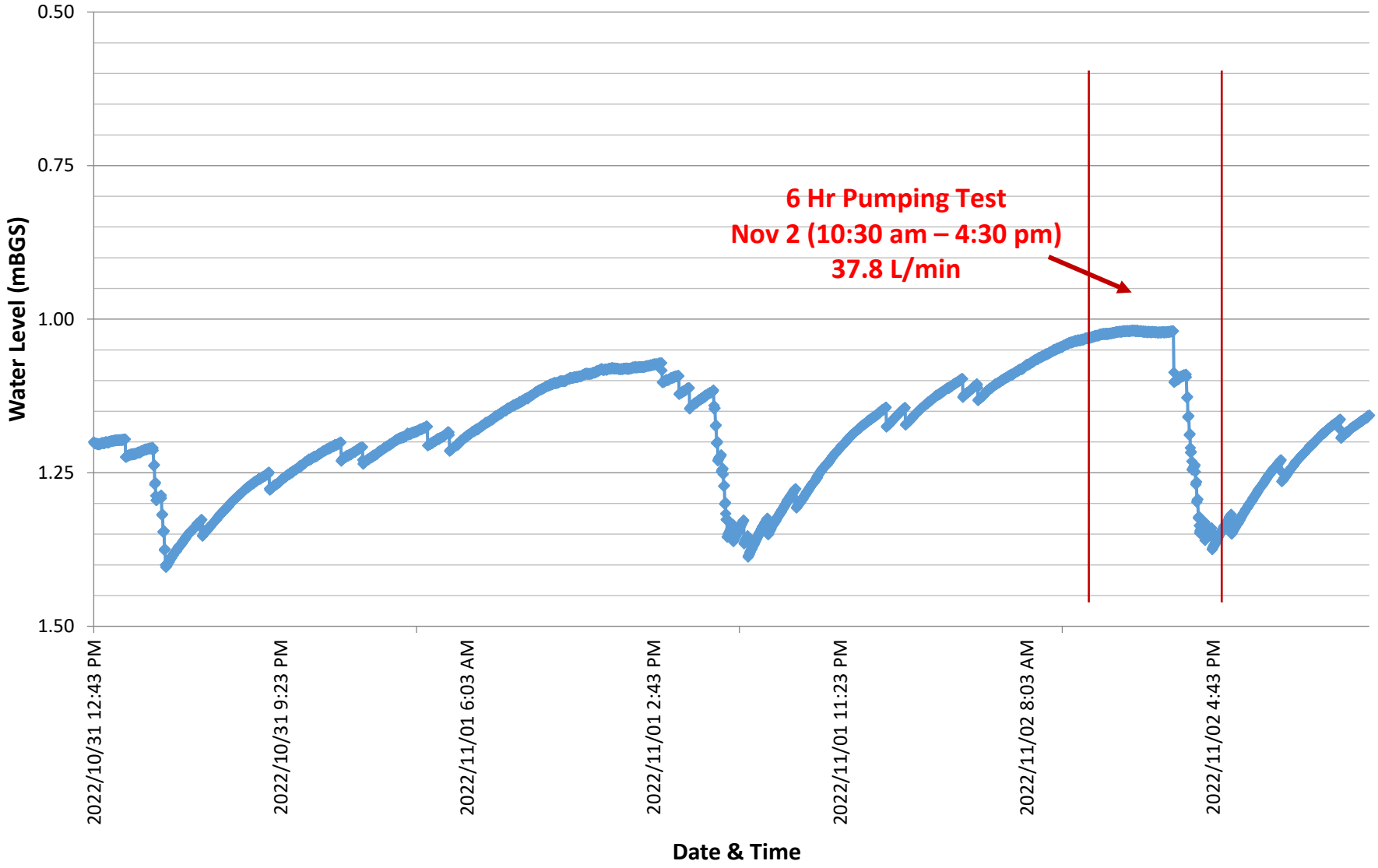
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 3
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well A299778 Time vs. Water Level



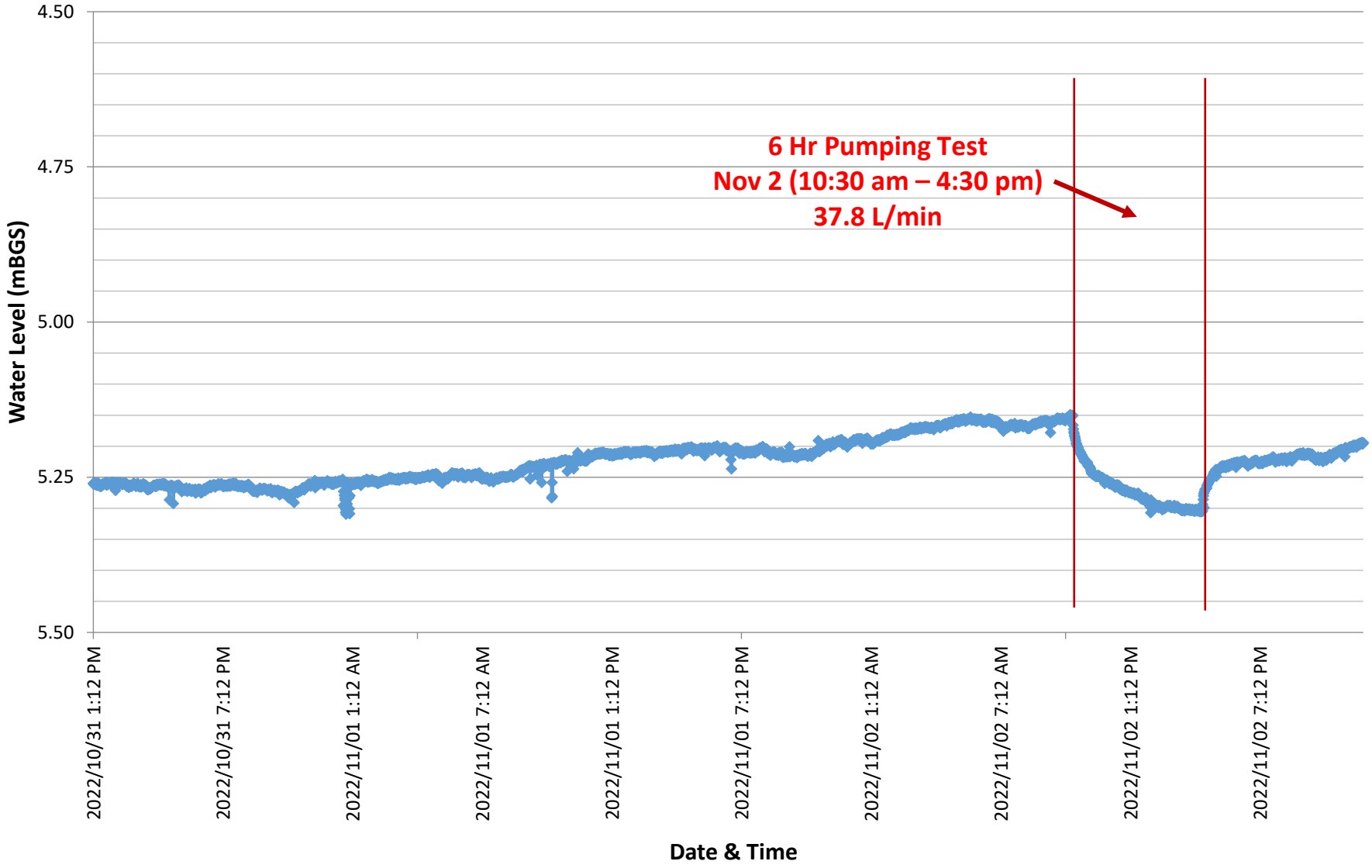
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 4
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well 10 Church Street Time vs. Water Level



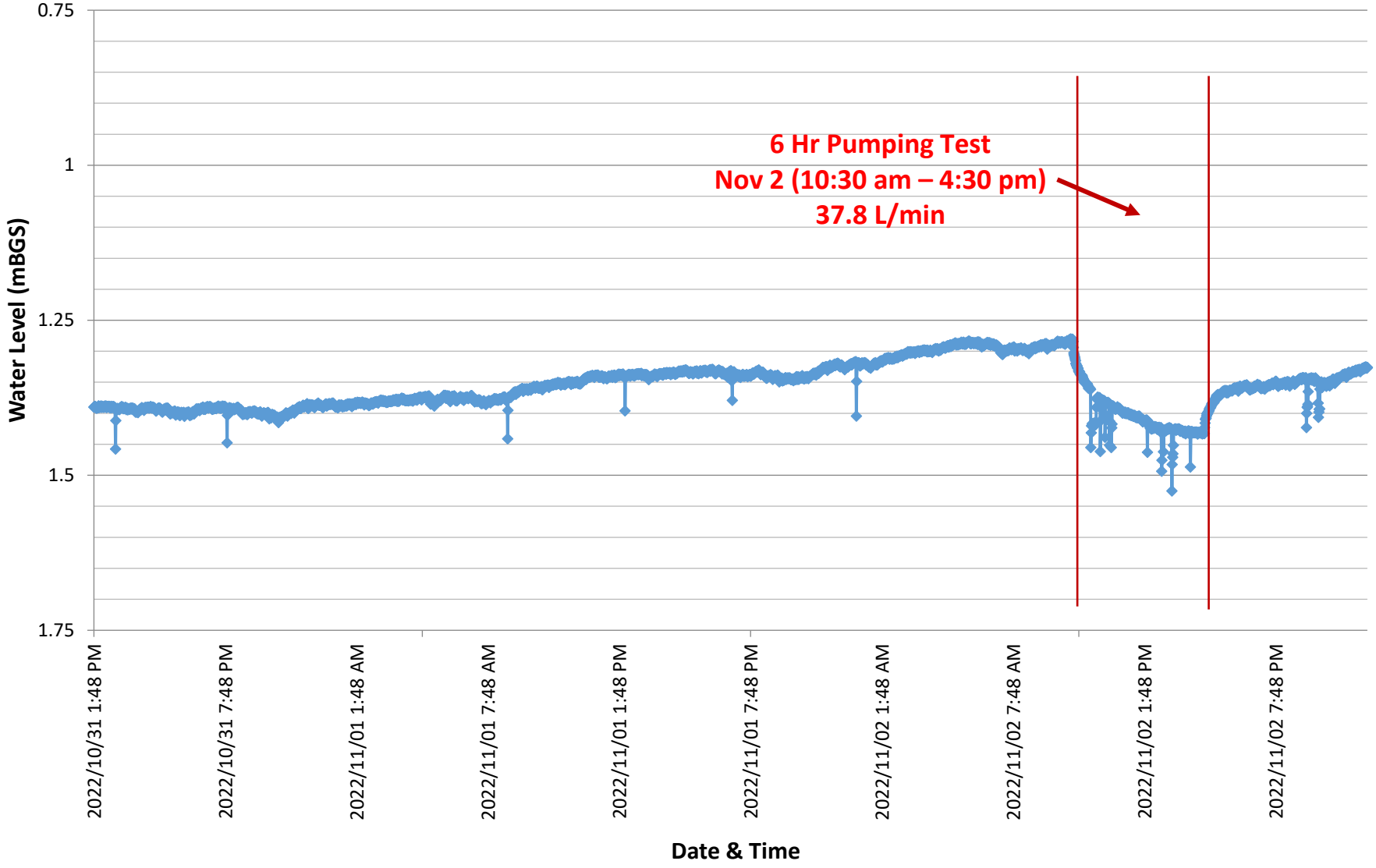
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 5
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well 12 Church Street Time vs. Water Level



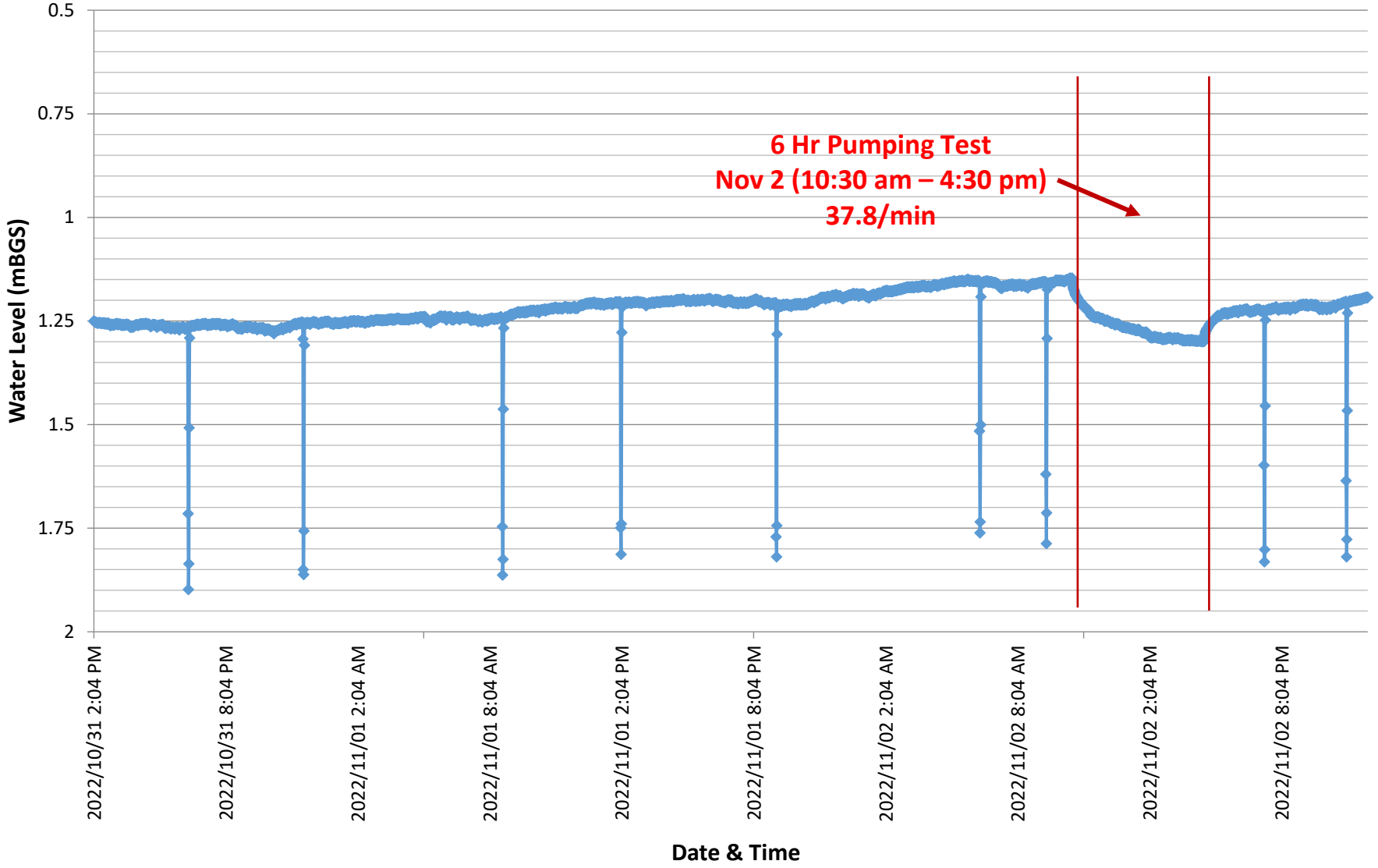
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 6
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well 27 Queen Street Time vs. Water Level



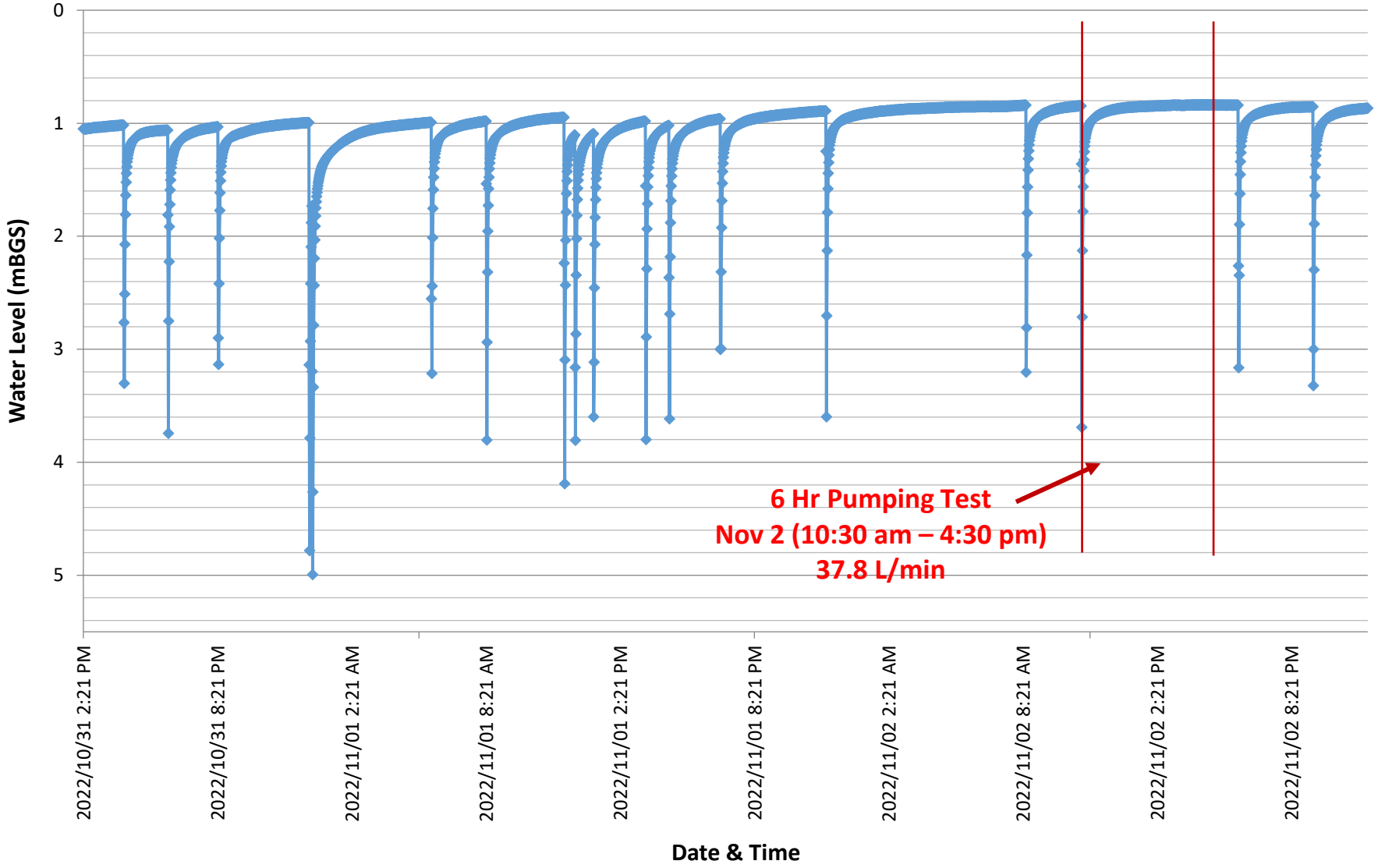
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 7
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well 31 Queen Street Time vs. Water Level



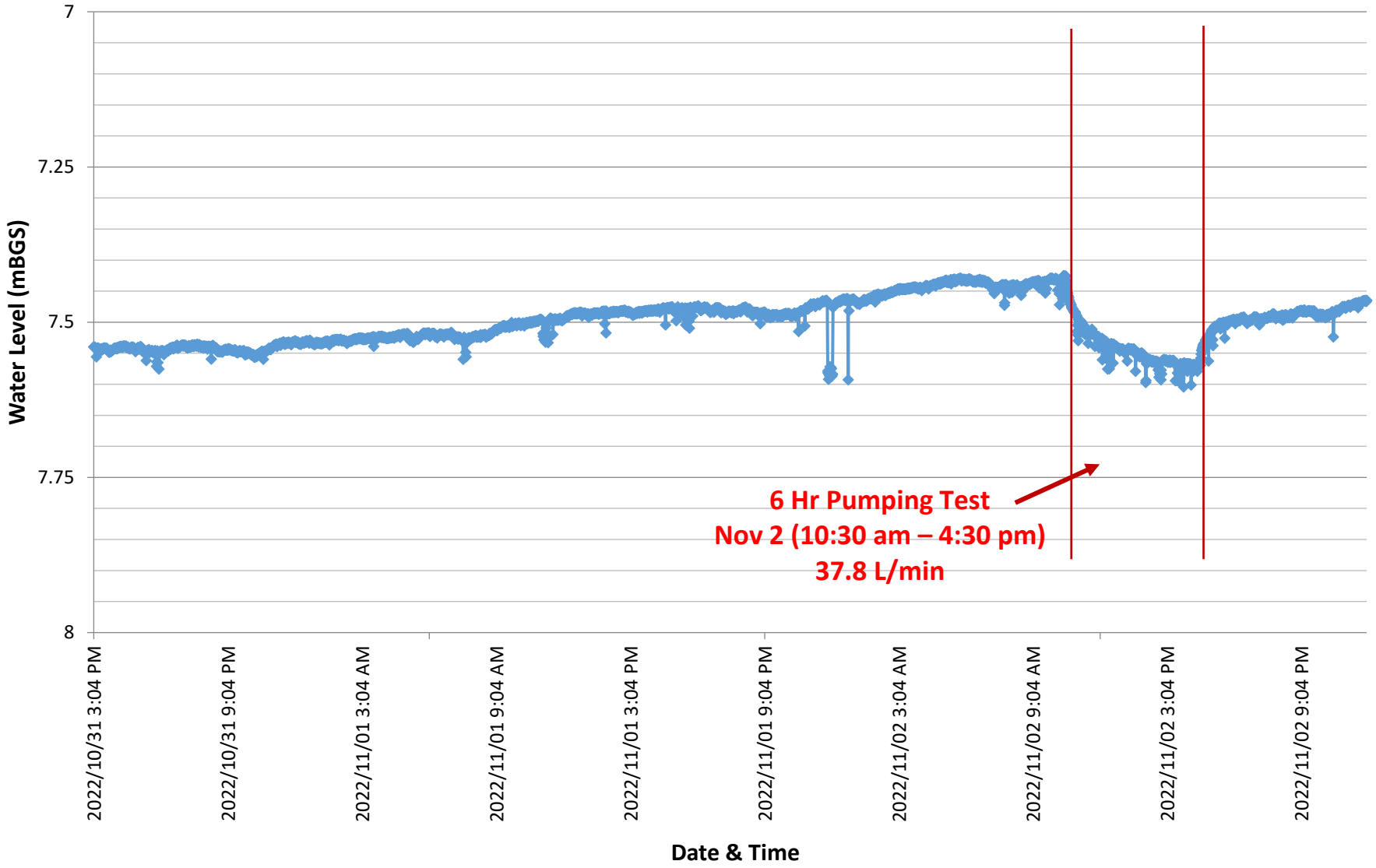
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 8
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well 32 Queen Street Time vs. Water Level



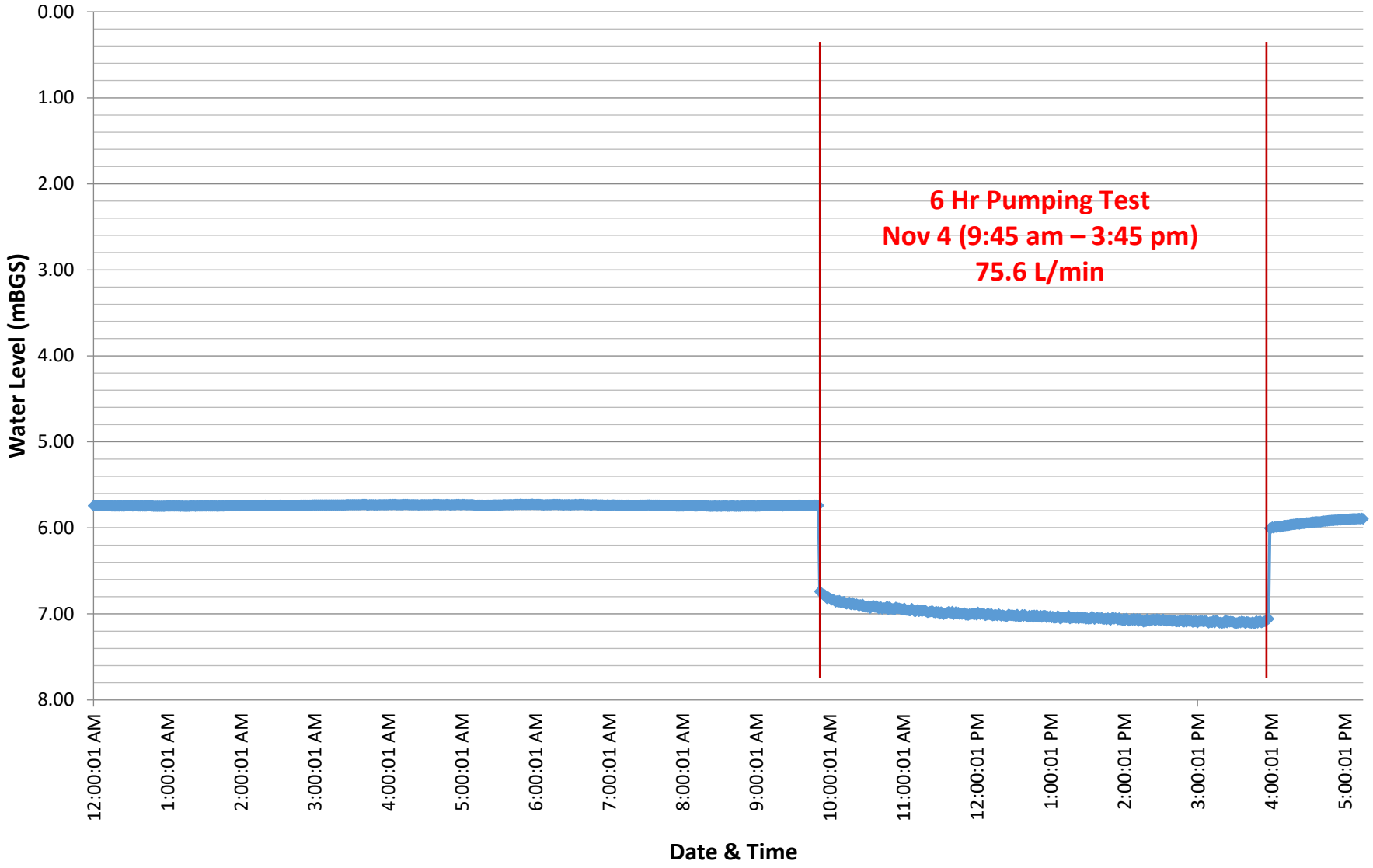
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 9
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Observation Well 47 Peel Street Time vs. Water Level



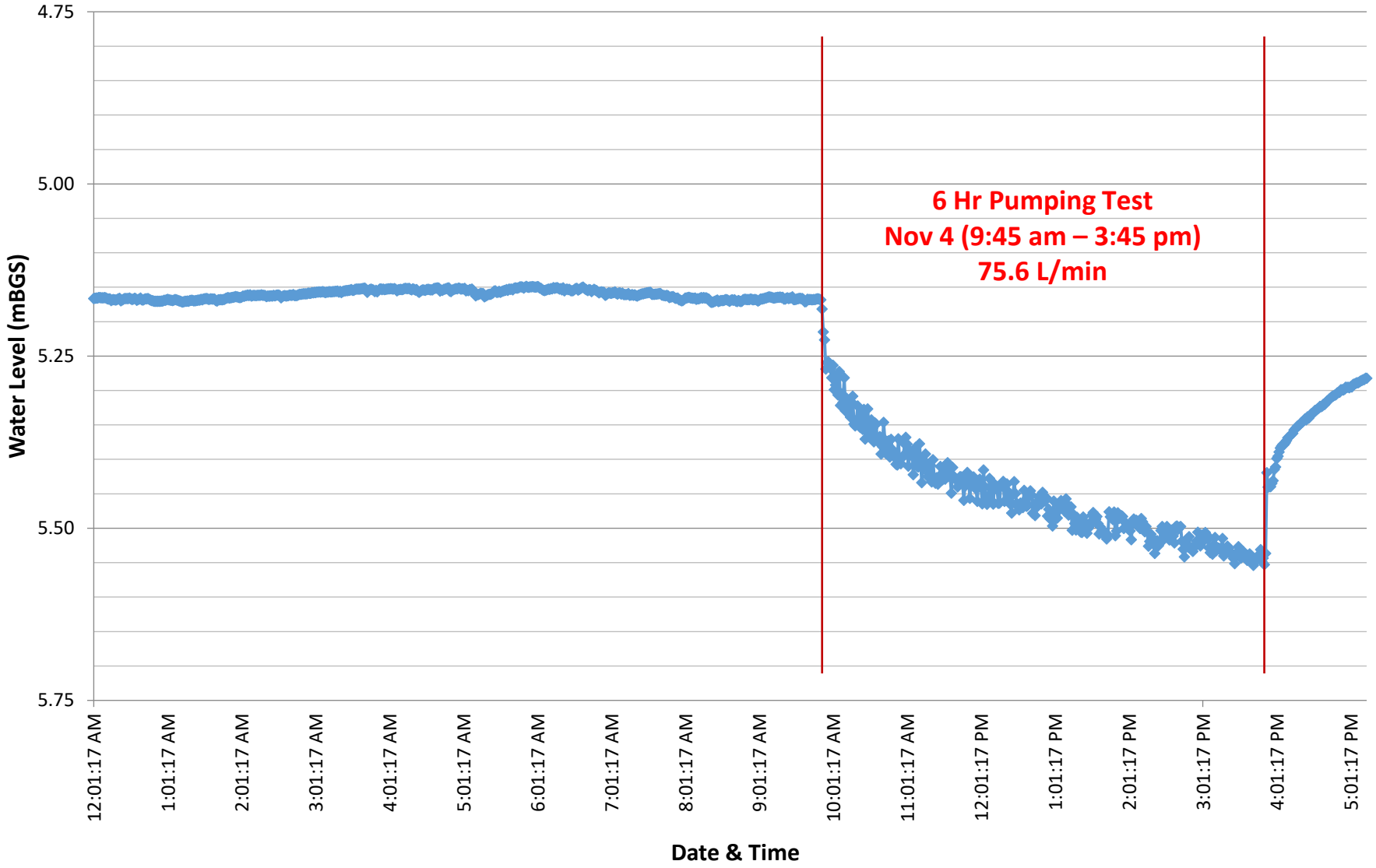
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 10
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Pumping Well A357595 Time vs. Water Level



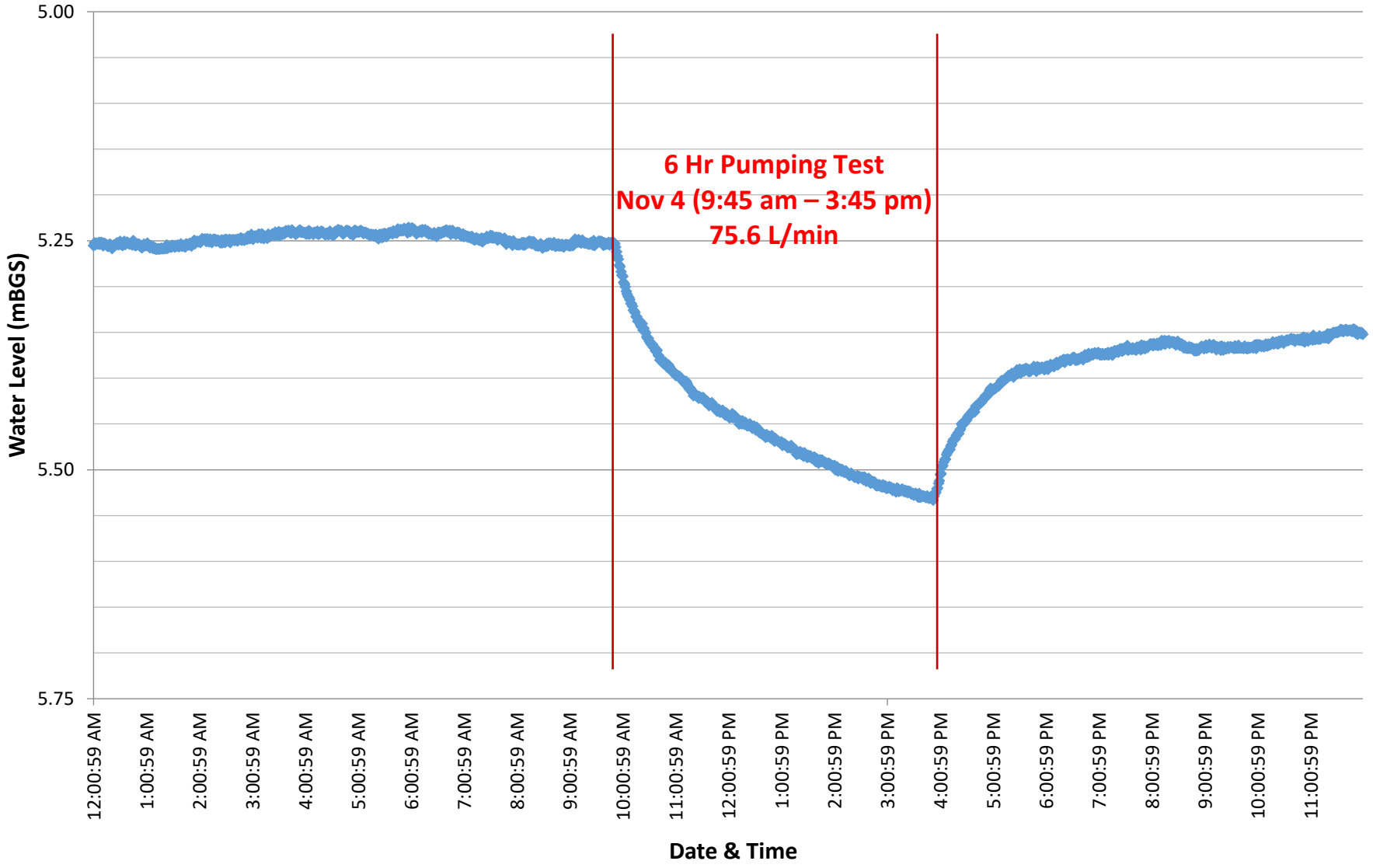
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 11
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Pumping Well A357596 Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 12
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well A299778 Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 13
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well 10 Church Street Time vs. Water Level

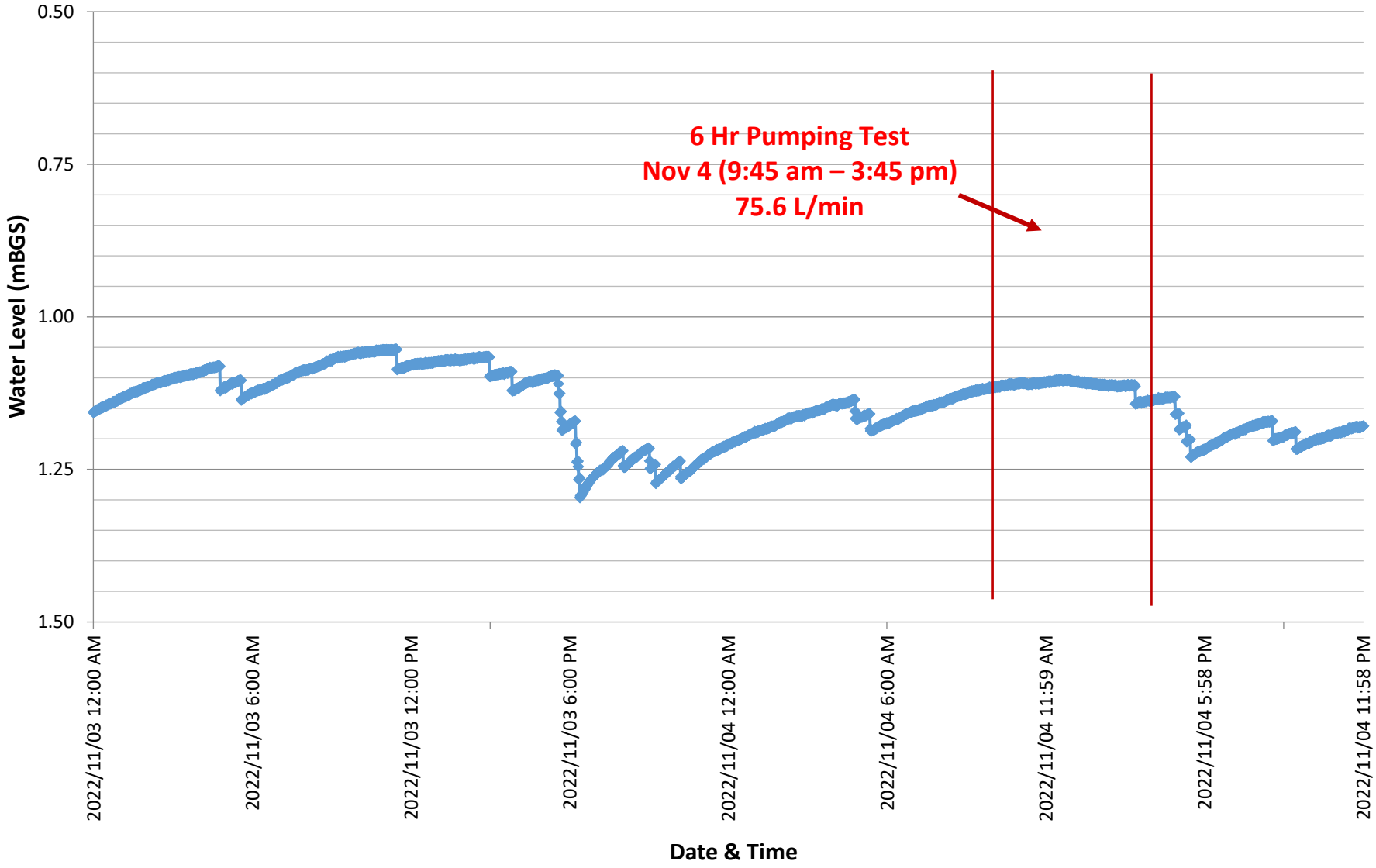


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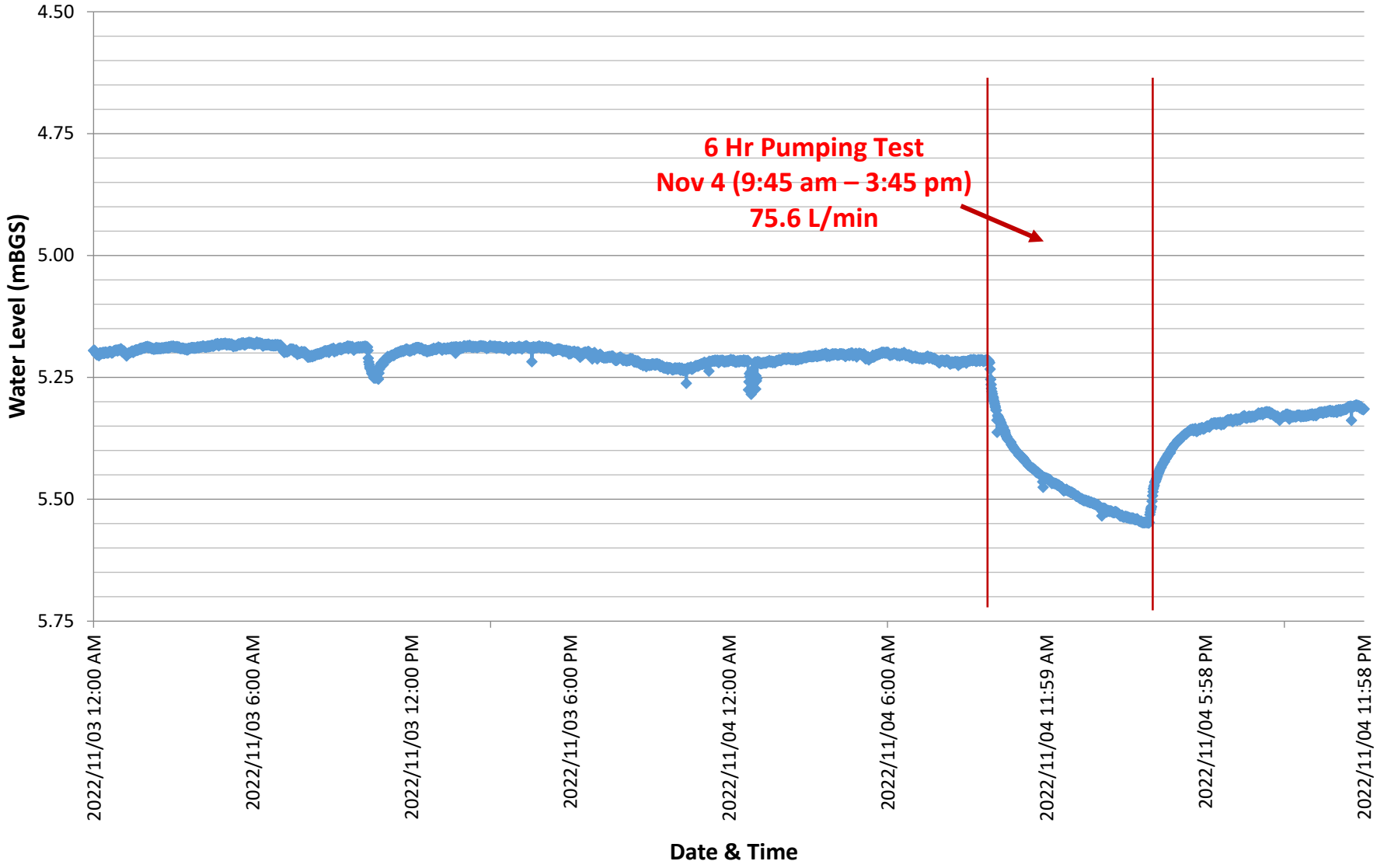
Figure 14
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well 12 Church Street Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 15
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well 27 Queen Street Time vs. Water Level

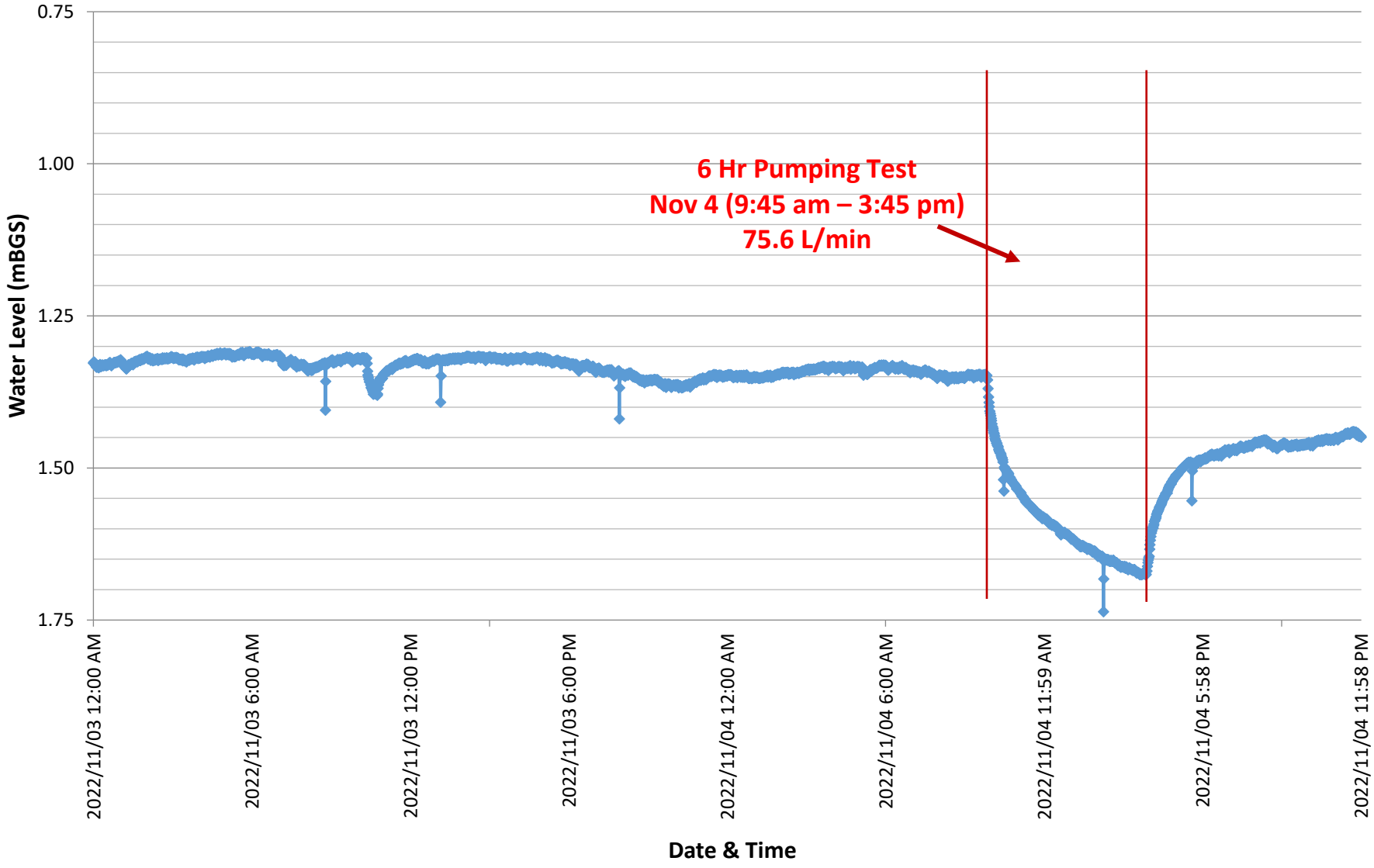


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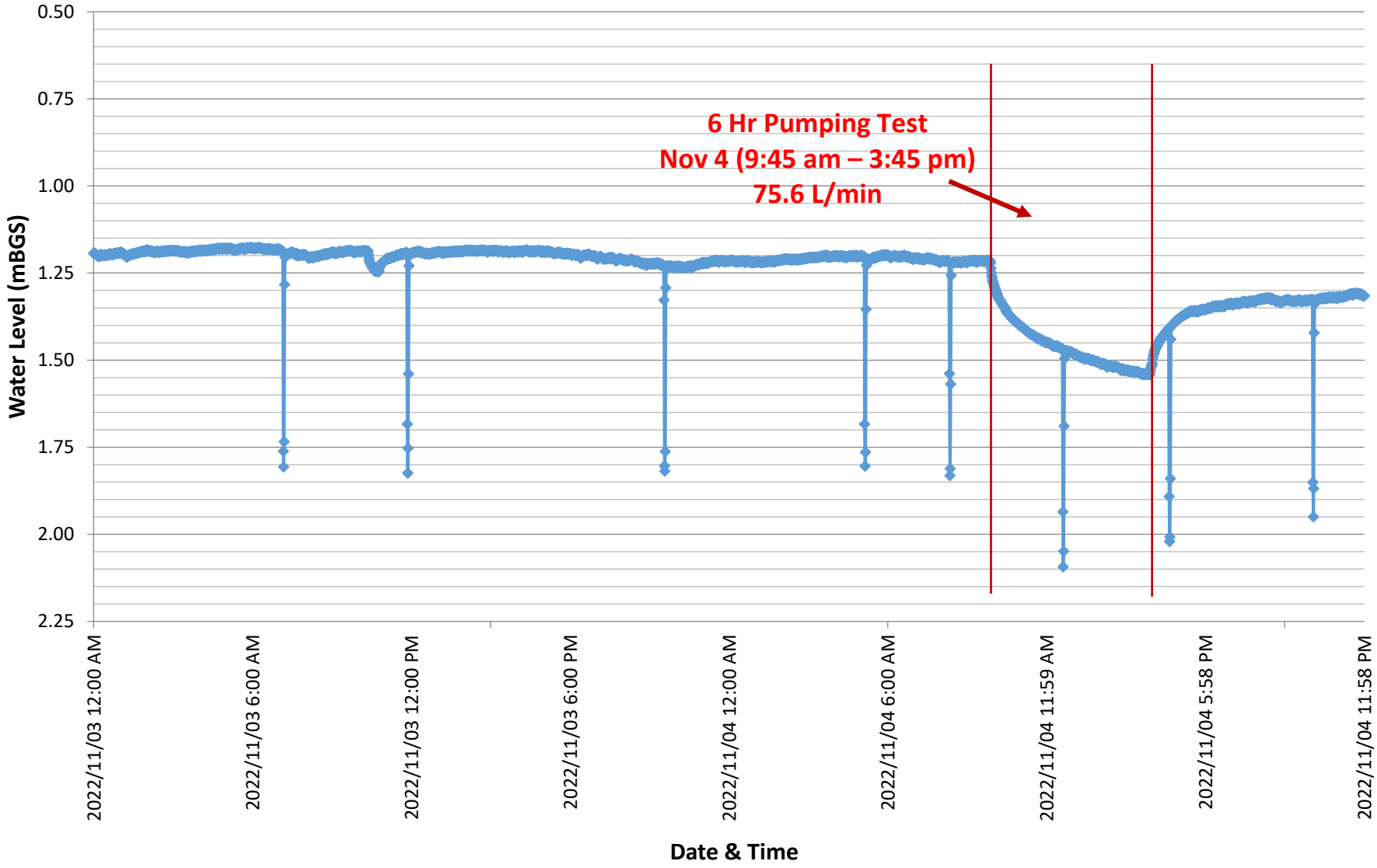
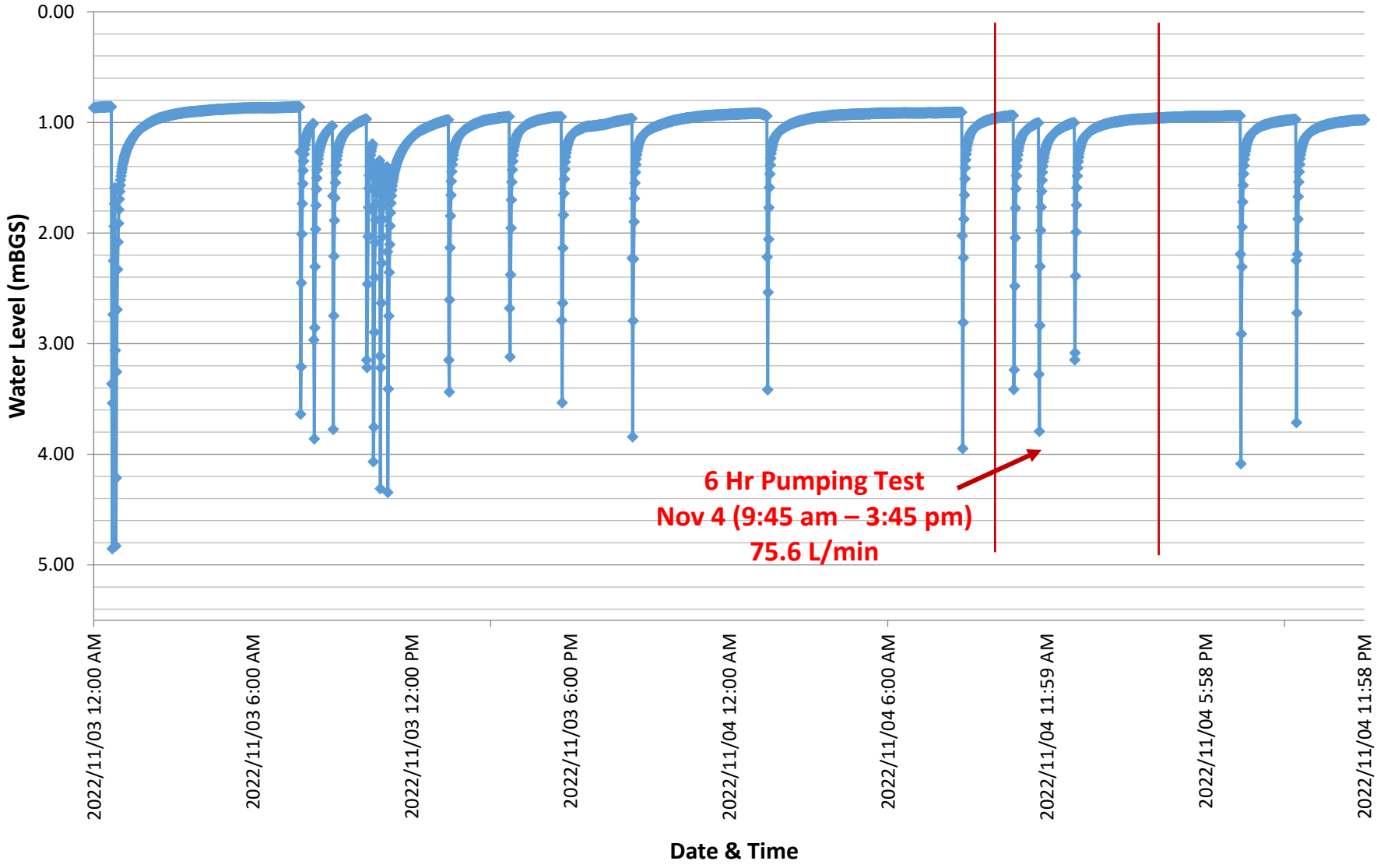
Figure 16
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well 31 Queen Street Time vs. Water Level



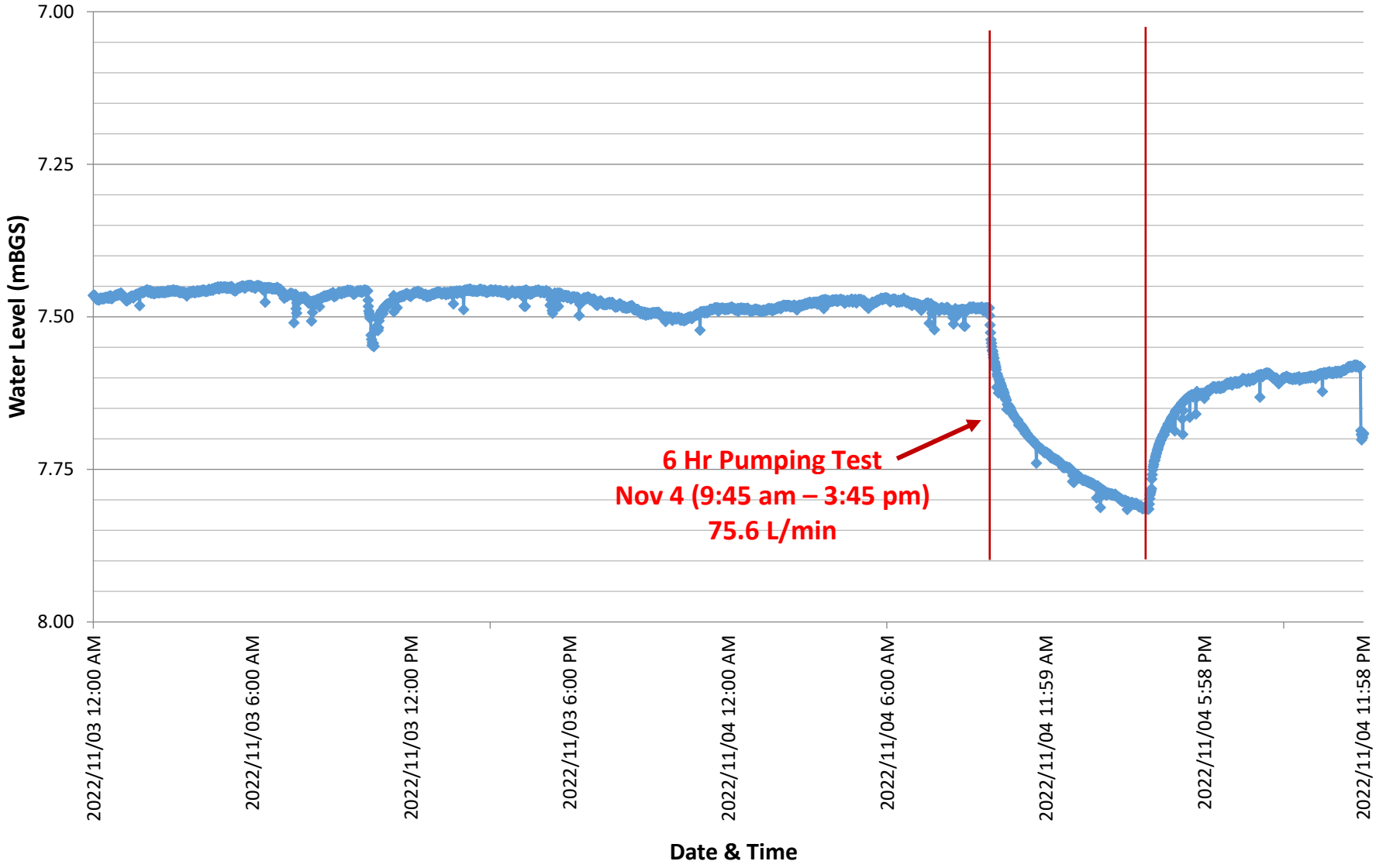
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 17
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well 32 Queen Street Time vs. Water Level



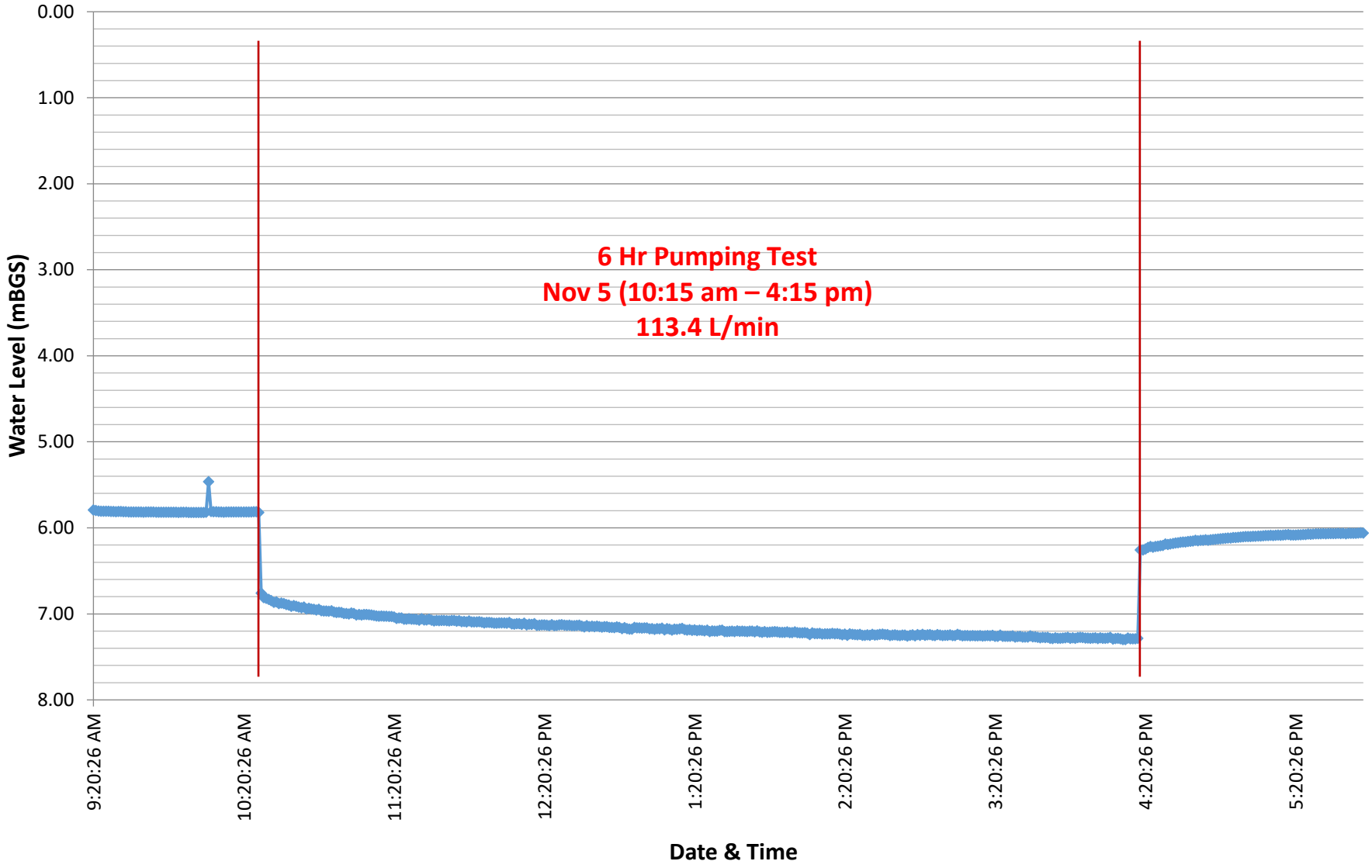
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 18
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Observation Well 47 Peel Street Time vs. Water Level



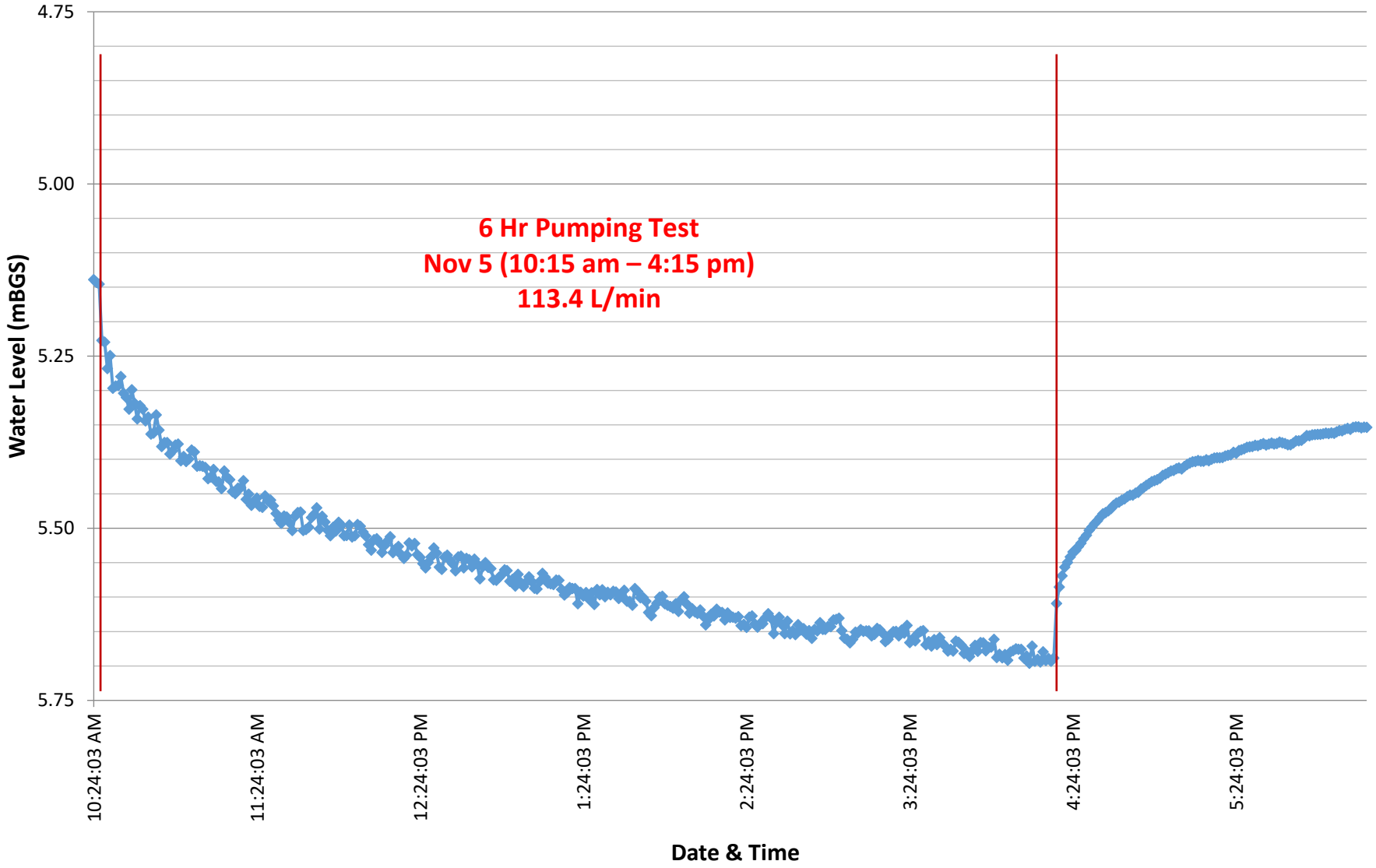
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 19
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Pumping Well A357595 Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 20
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Pumping Well A357596 Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 21
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Pumping Well A299778 Time vs. Water Level

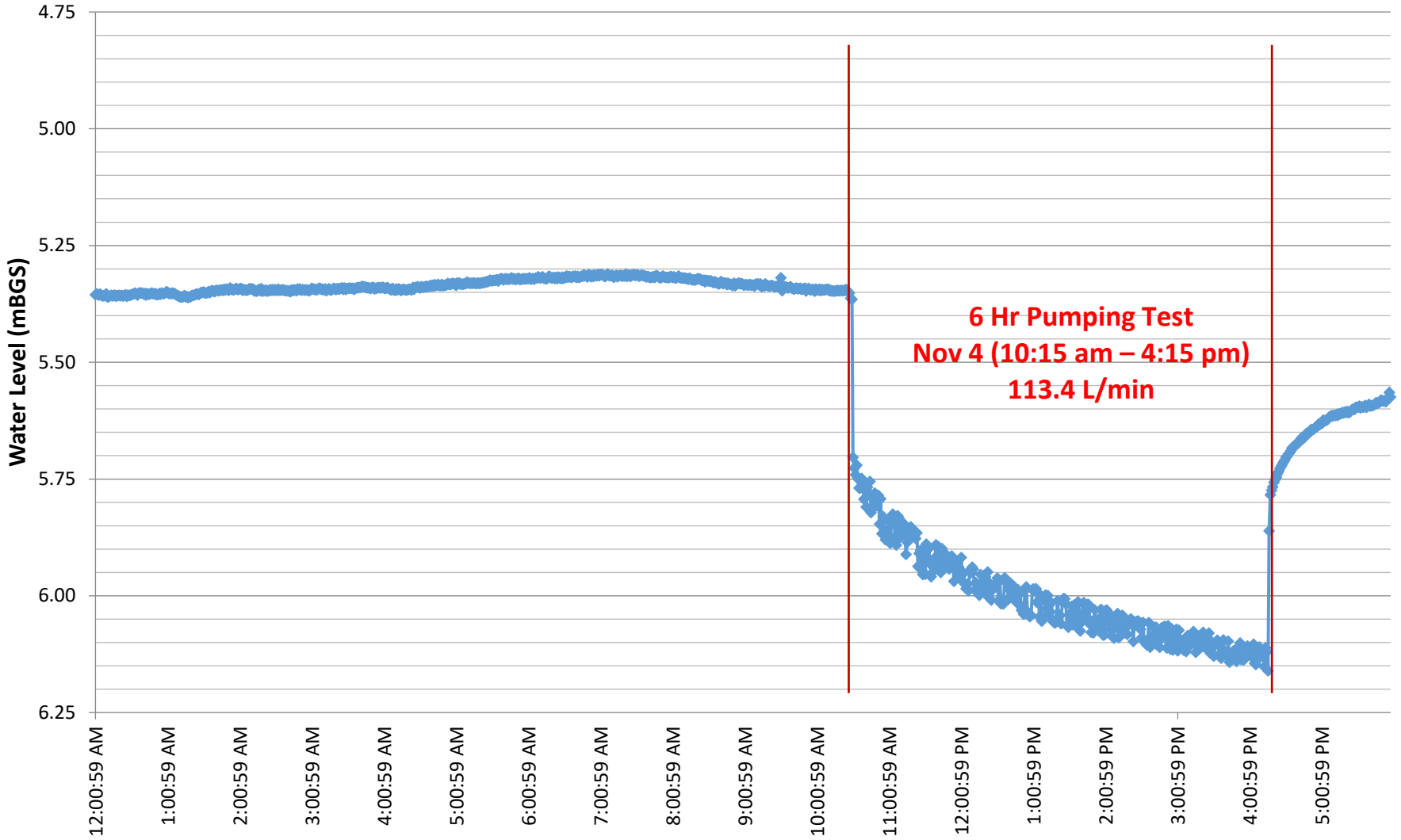


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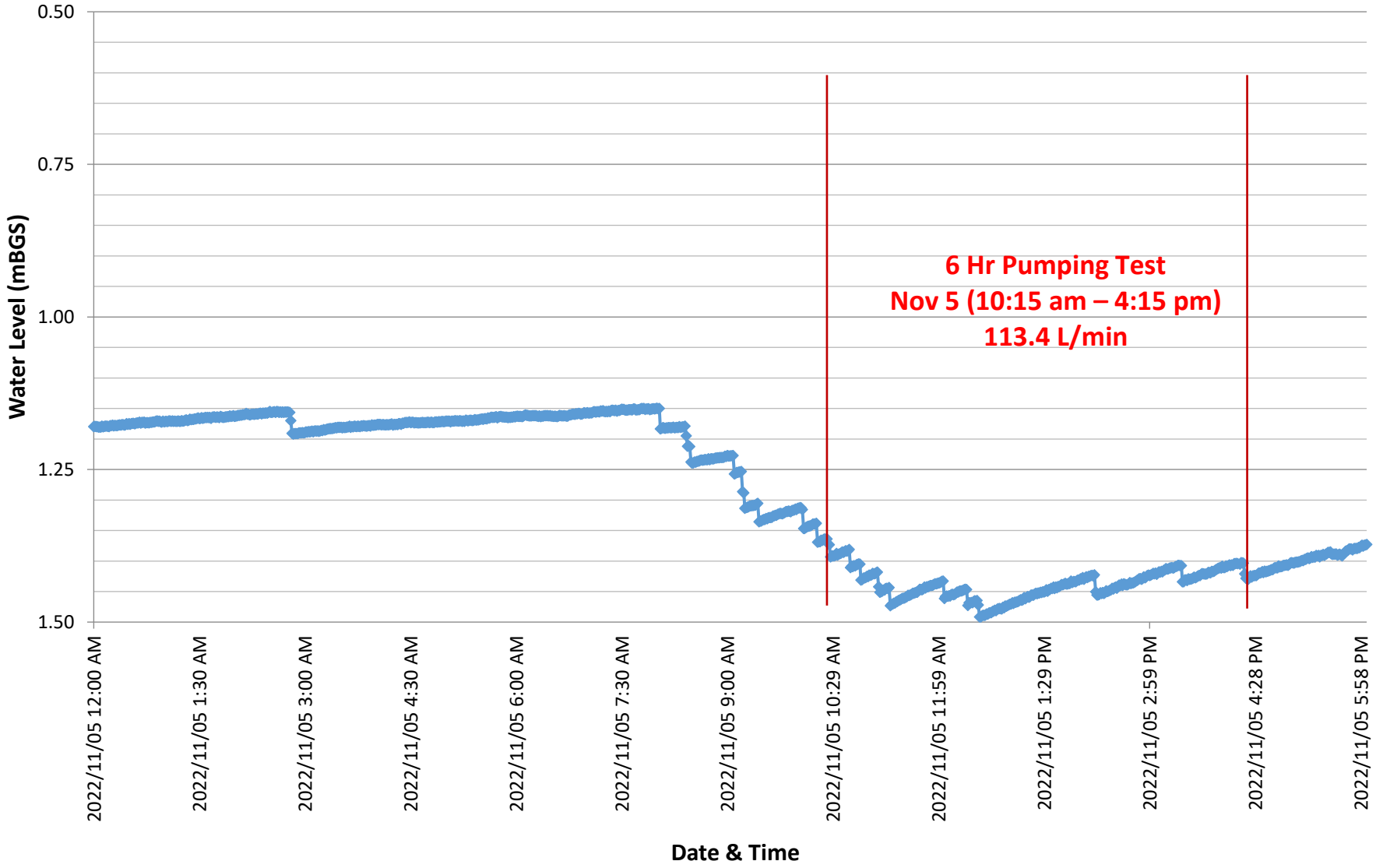
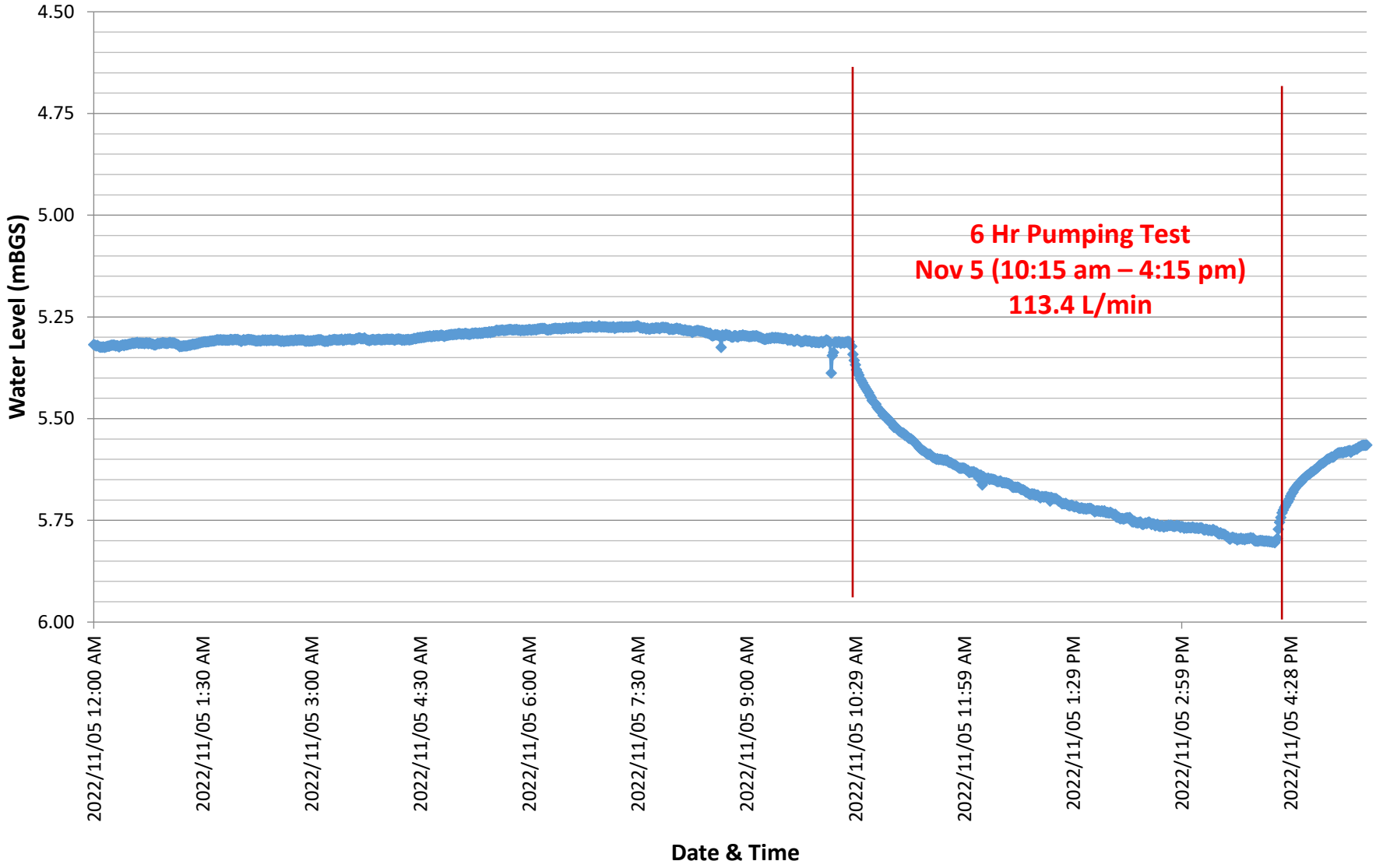
Figure 22
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Observation Well 10 Church Street Time vs. Water Level



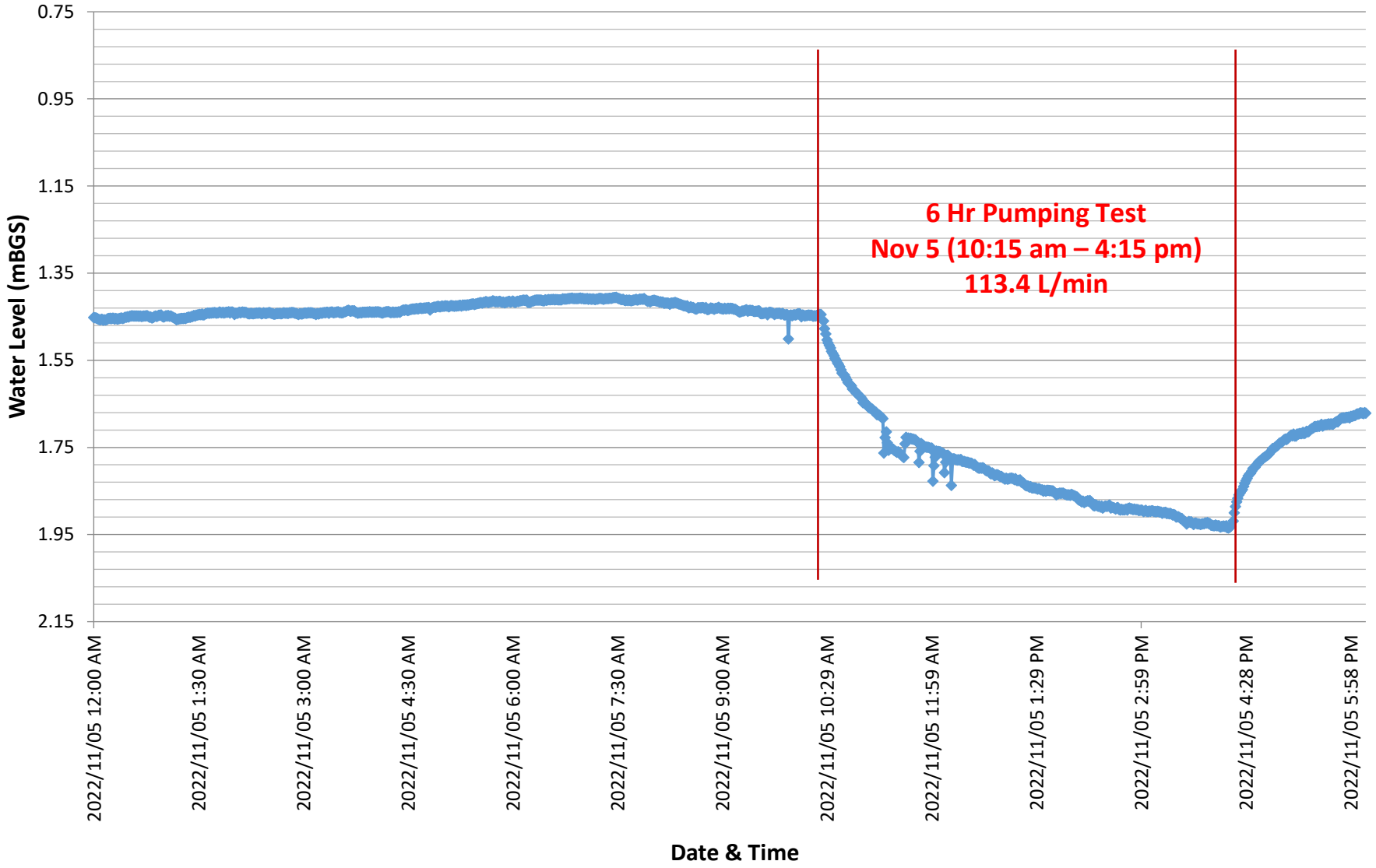
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 23
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Observation Well 12 Church Street Time vs. Water Level



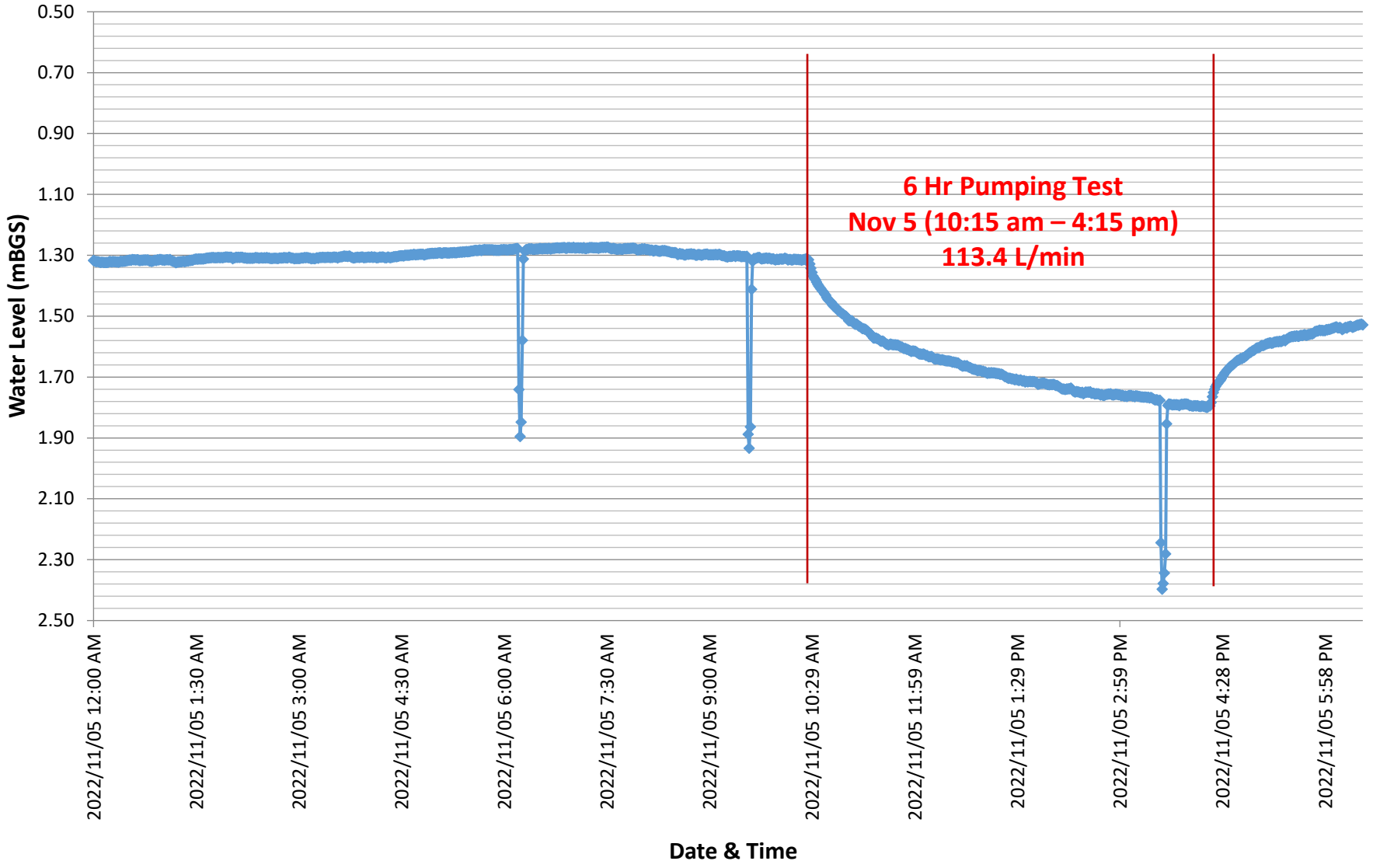
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 24
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Observation Well 27 Queen Street Time vs. Water Level



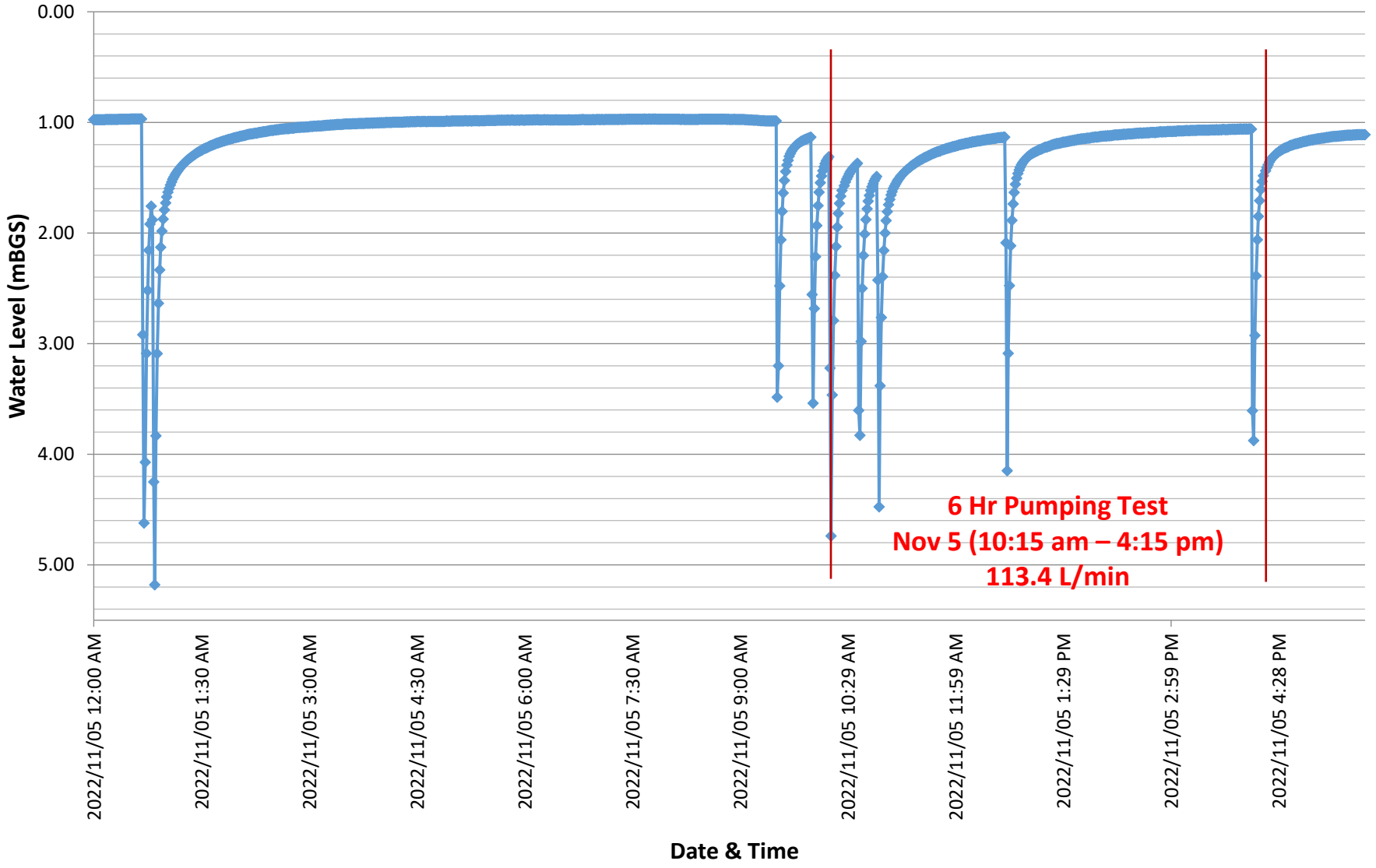
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 25
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Observation Well 31 Queen Street Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 26
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Observation Well 32 Queen Street Time vs. Water Level



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 27
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Observation Well 47 Peel Street Time vs. Water Level

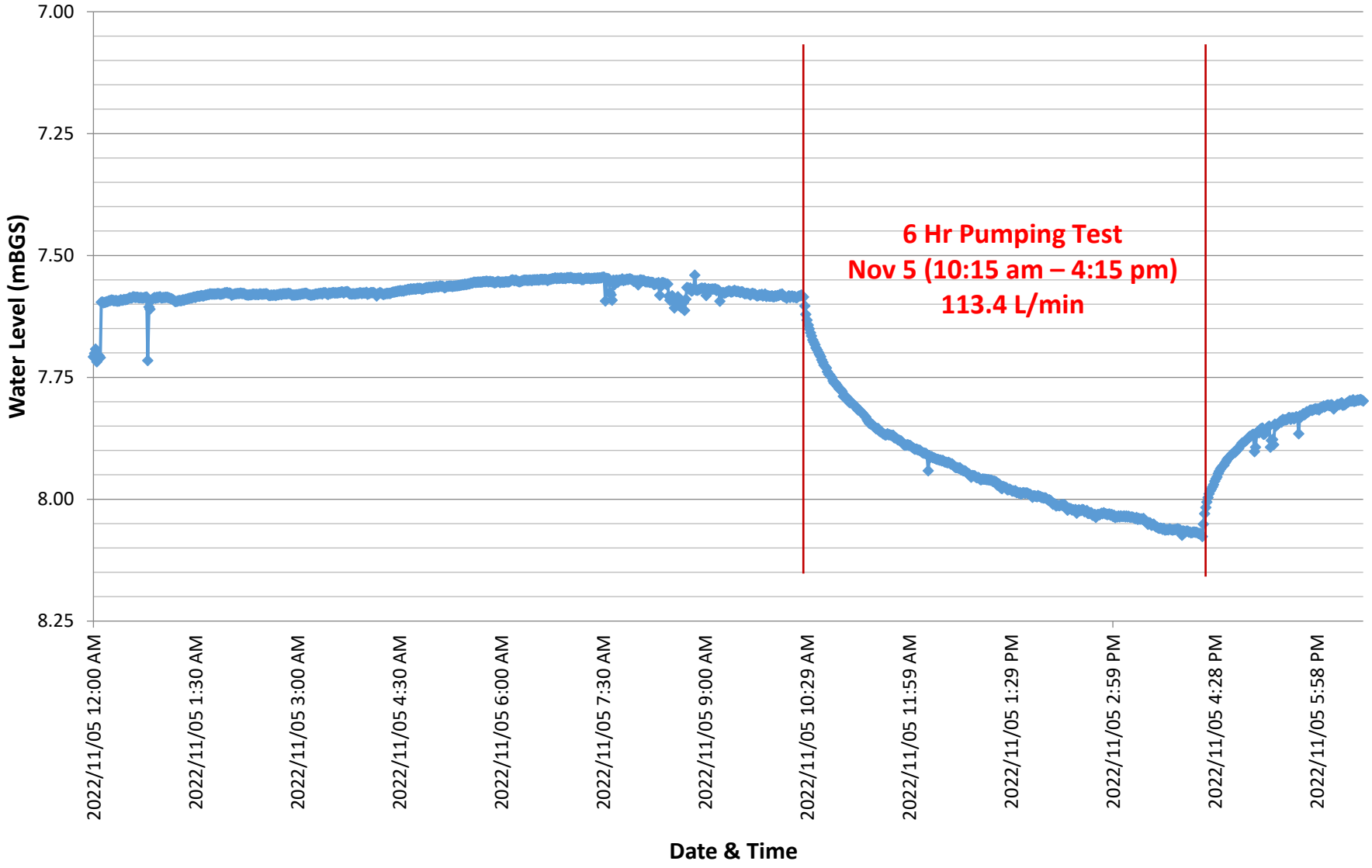


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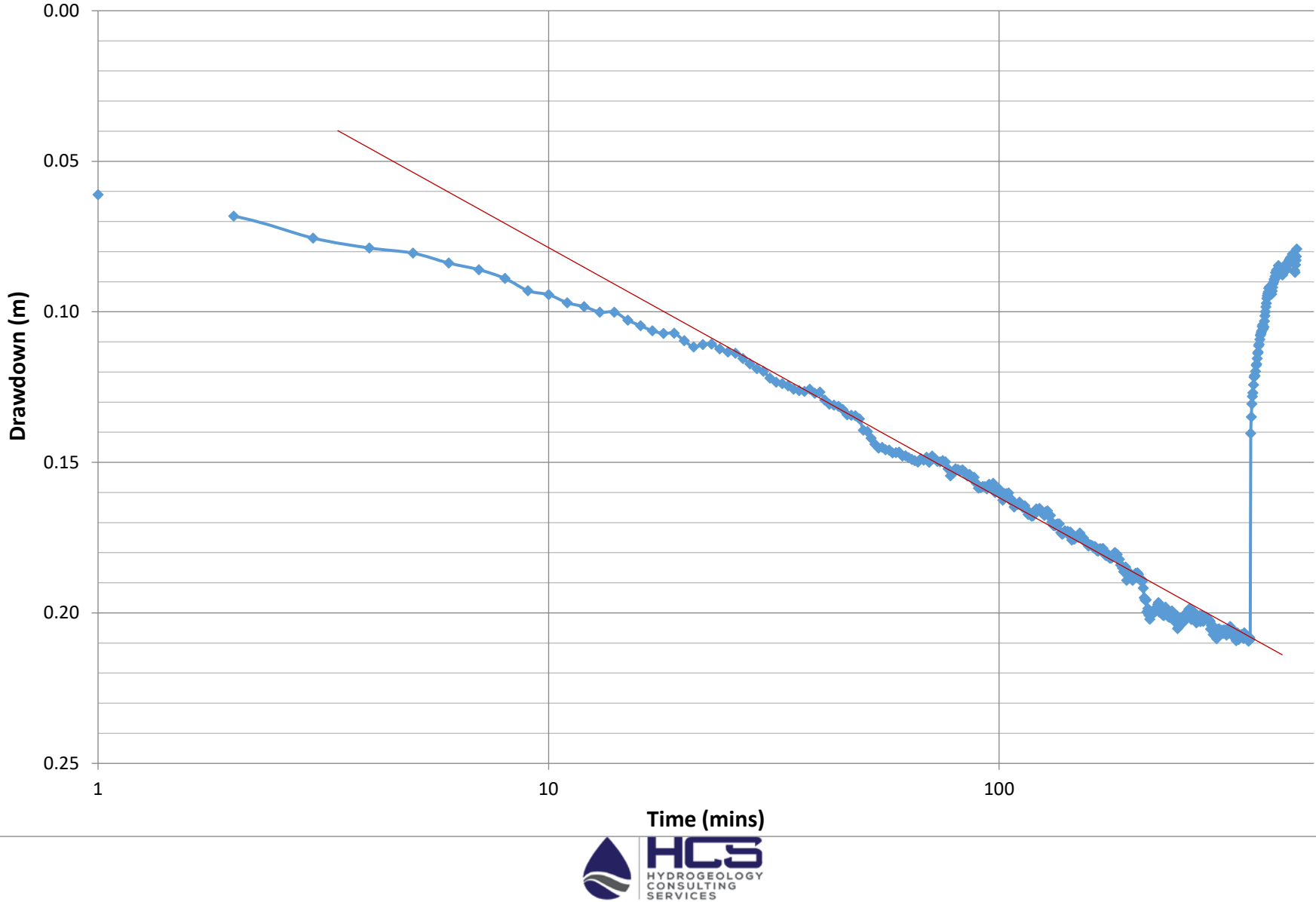
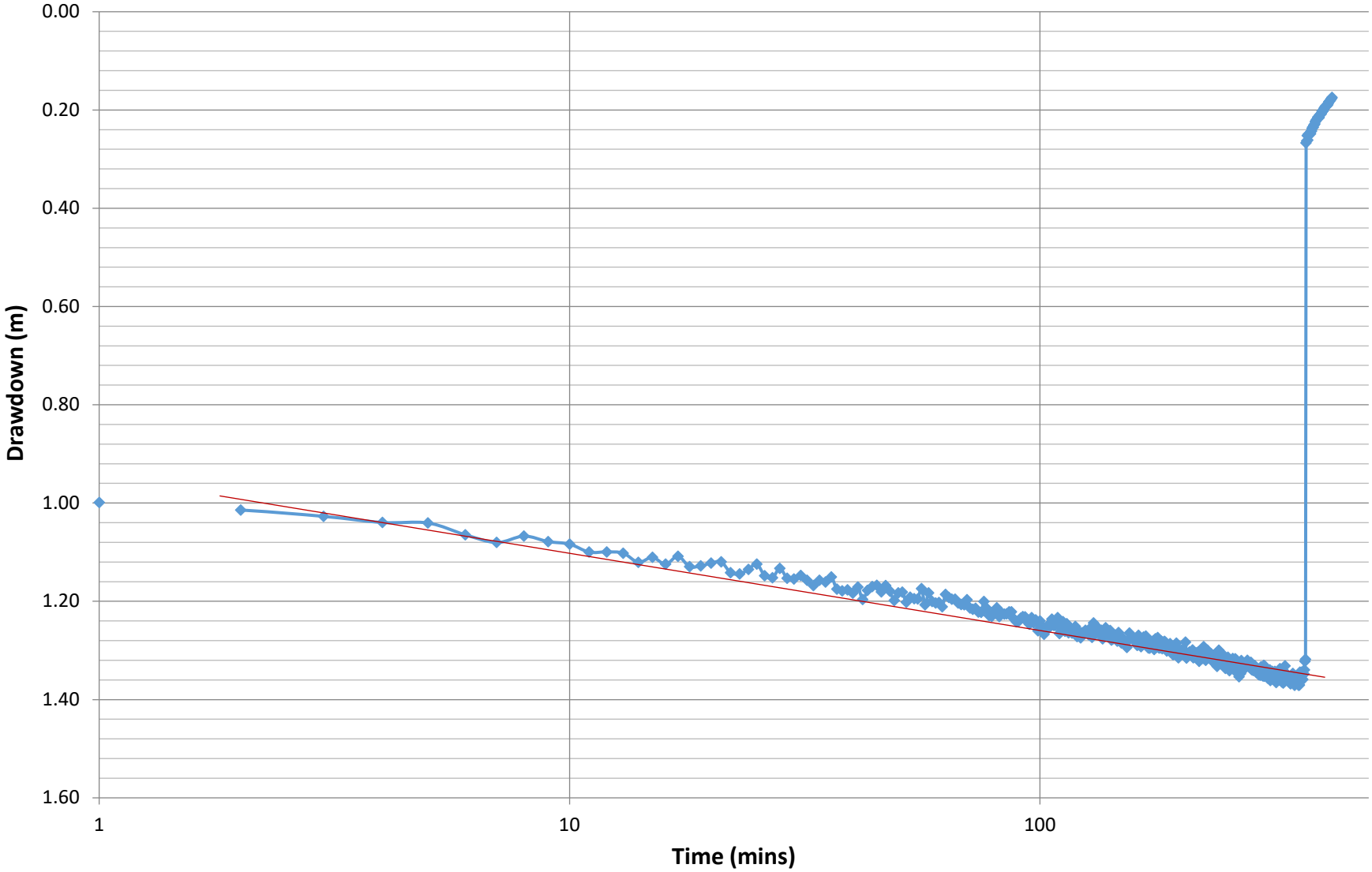
Figure 28
31 Church Street Development
Single Well Pumping Test of Well A357596, Nov. 2, 2022
Pumping Well A357596 Time vs. Drawdown



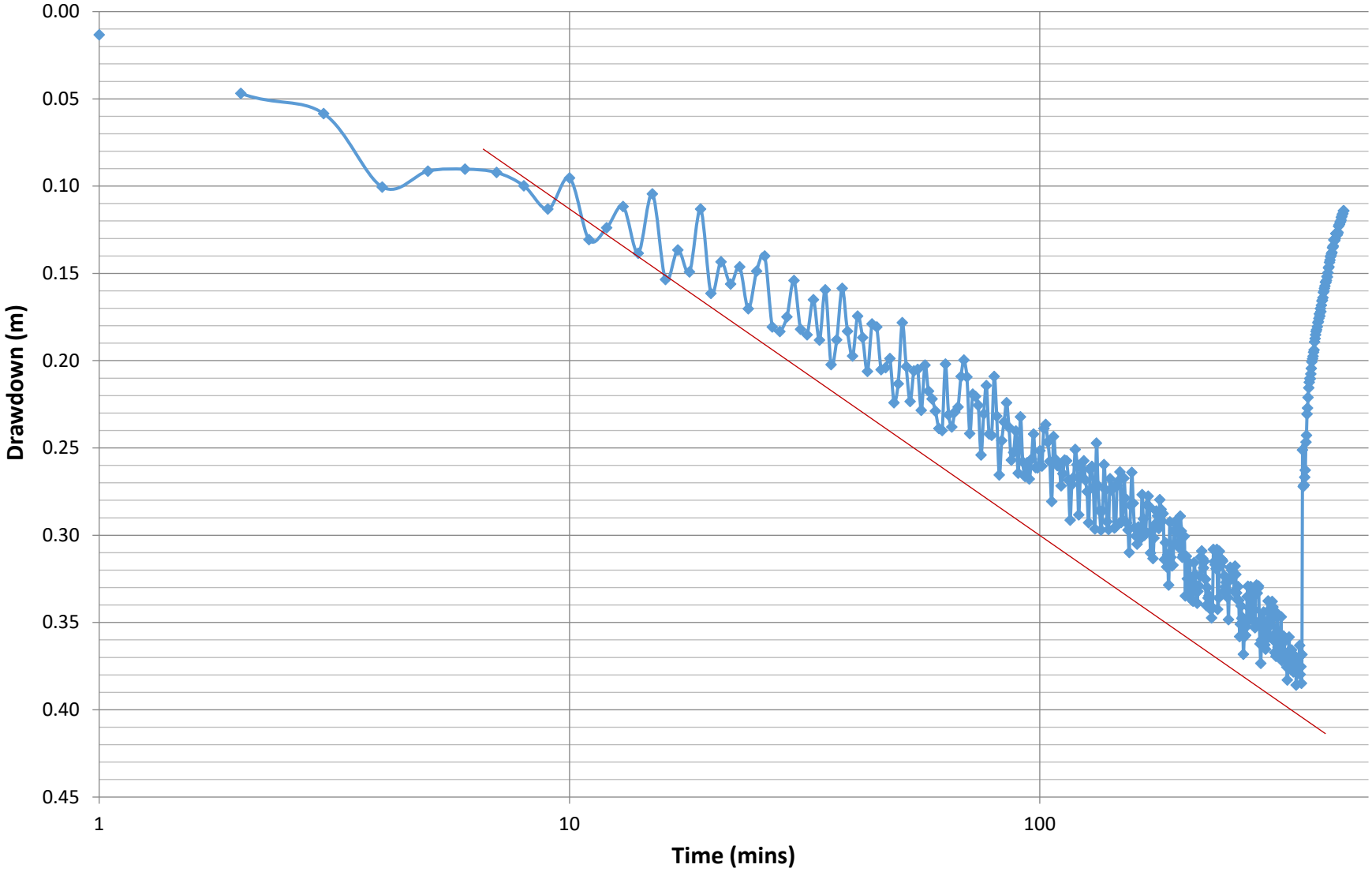
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 29
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Pumping Well A357595 Time vs. Drawdown



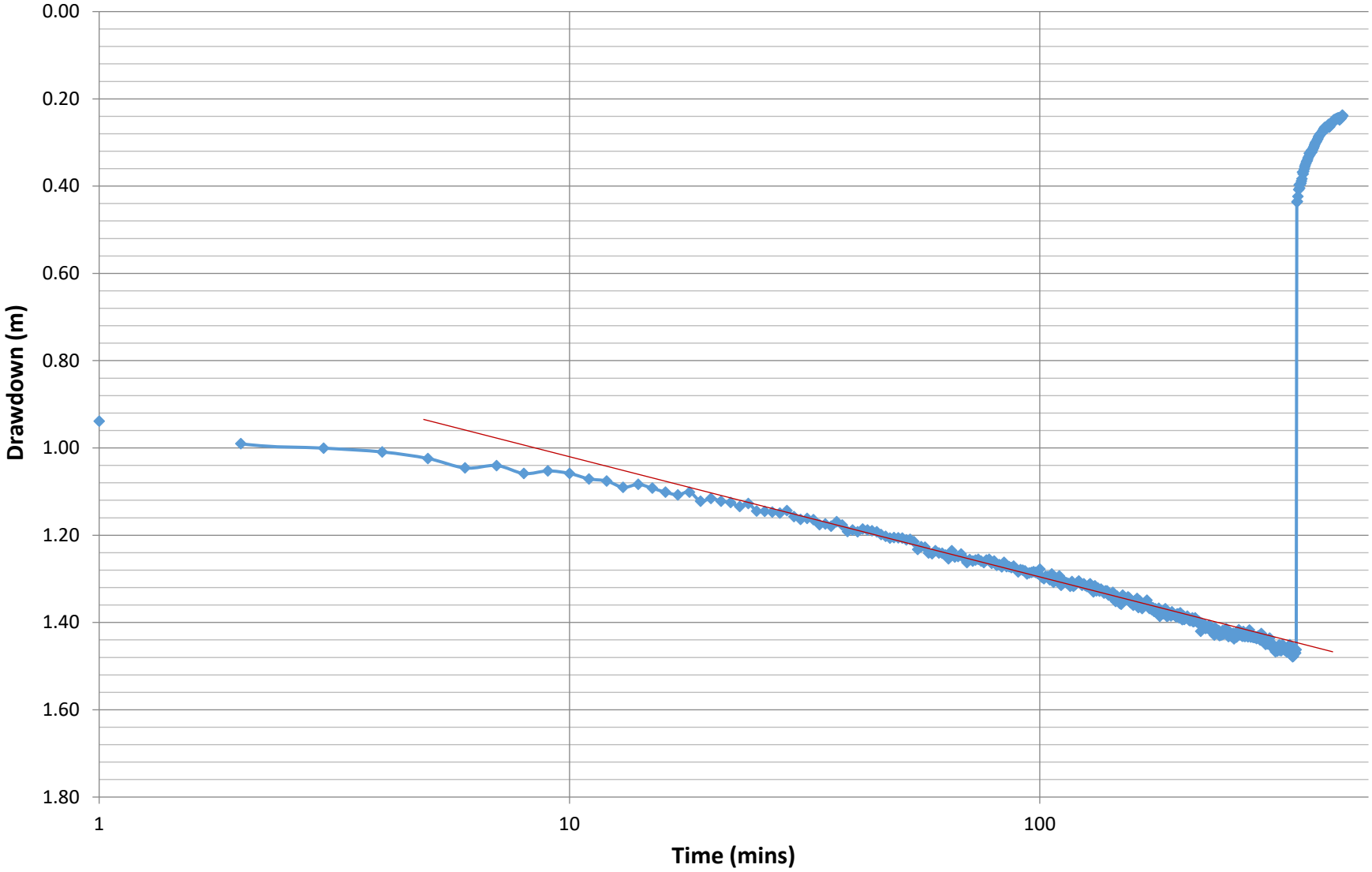
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 30
31 Church Street Development
Double Well Pumping Test of Wells A357595 & A357596, Nov. 4, 2022
Pumping Well A357596 Time vs. Drawdown



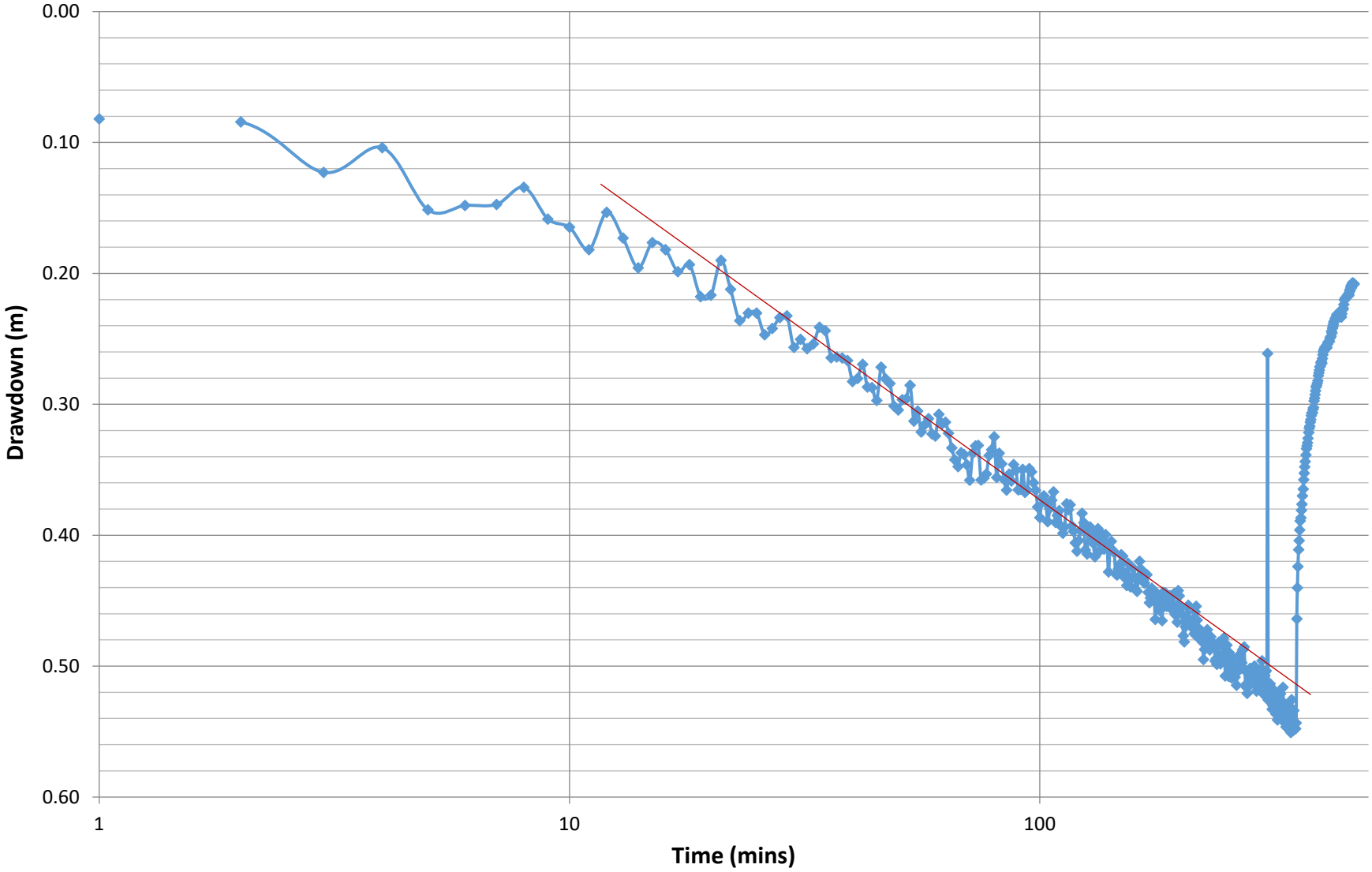
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 31
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Pumping Well A357595 Time vs. Drawdown



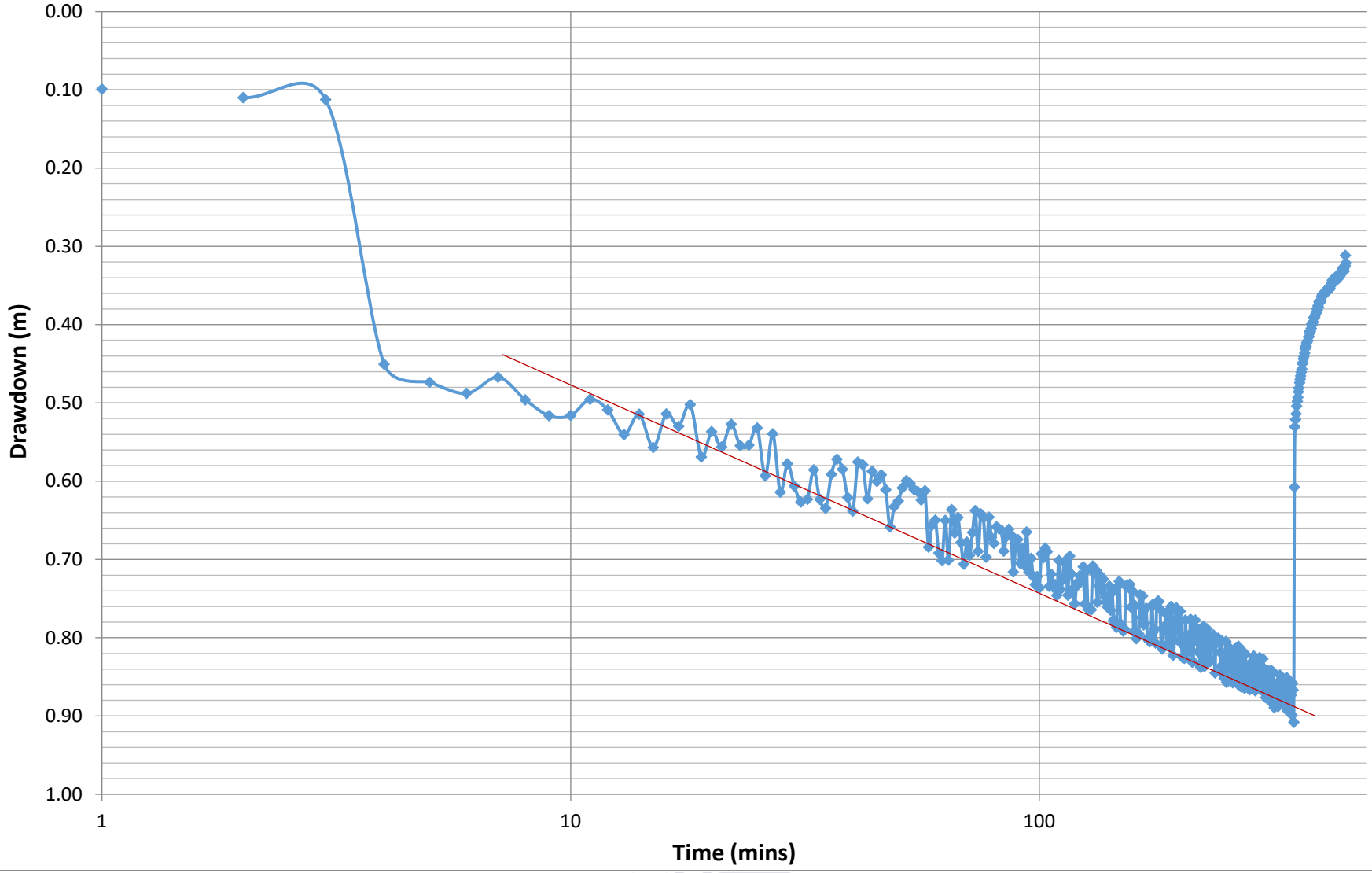
HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 32
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Pumping Well A357596 Time vs. Drawdown



HCS HYDROGEOLOGY CONSULTING SERVICES

Figure 33
31 Church Street Development
Triple Well Pumping Test of Wells A357595, A357596 & A299778, Nov. 5, 2022
Pumping Well A299778 Time vs. Drawdown



HCS HYDROGEOLOGY CONSULTING SERVICES

APPENDIX D: LABORATORY CERTIFICATES OF ANALYSIS

WT2220838
WT2220859

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2220838**	Page	: 1 of 8
Client	: **Hydrogeology Consulting Services**	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 905 550 0969	Telephone	: +1 519 886 6910
Project	: ALMA CHURCH STREET	Date Samples Received	: 04-Nov-2022 18:30
PO	: ----	Date Analysis Commenced	: 05-Nov-2022
C-O-C number	: ----	Issue Date	: 14-Nov-2022 16:00
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario
Ruby Sujeepan		Microbiology, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no unit
%	percent
µS/cm	microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
CU	colour units (1 CU = 1 mg/L Pt)
meq/L	milliequivalents per litre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: A357596 Sampling date/time: 04-Nov-2022 10:45 WT2220838-001	ONDWS AO/OG	ONDWS MAC				
Physical Tests										
alkalinity, bicarbonate (as HCO3)	E290	1.0	mg/L	253	--	--	--	--	--	--
alkalinity, carbonate (as CO3)	E290	1.0	mg/L	2.5	--	--	--	--	--	--
alkalinity, hydroxide (as OH)	E290	1.0	mg/L	<1.0	--	--	--	--	--	--
alkalinity, total (as CaCO3)	E290	1.0	mg/L	212	30 - 500 mg/L	--	--	--	--	--
colour, apparent	E330	2.0	CU	14.9	5 CU	--	--	--	--	--
conductivity	E100	1.0	µS/cm	415	--	--	--	--	--	--
hardness (as CaCO3), from total Ca/Mg	EC100A	0.50	mg/L	200	--	--	--	--	--	--
pH	E108	0.10	pH units	8.34	6.5 - 8.5 pH units	--	--	--	--	--
solids, total dissolved [TDS], calculated	EC103A	1.0	mg/L	270	--	--	--	--	--	--
solids, total dissolved [TDS]	E162	10	mg/L	242 DLDS	500 mg/L	--	--	--	--	--
turbidity	E121	0.10	NTU	1.91	5 NTU	--	--	--	--	--
Langelier index (@ 20°C)	EC105A	0.010	-	0.893	--	--	--	--	--	--
Anions and Nutrients										
ammonia, total (as N)	E298	0.0050	mg/L	0.0384	--	--	--	--	--	--
bromide	E235.Br	0.10	mg/L	<0.10	--	--	--	--	--	--
chloride	E235.Cl	0.50	mg/L	3.09	250 mg/L	--	--	--	--	--
fluoride	E235.F	0.020	mg/L	0.228	--	1.5 mg/L	--	--	--	--
nitrate (as N)	E235.NO3	0.020	mg/L	<0.020	--	10 mg/L	--	--	--	--
nitrate + nitrite (as N)	EC235.N+N	0.0032	mg/L	<0.0224	--	10 mg/L	--	--	--	--
nitrite (as N)	E235.NO2	0.010	mg/L	<0.010	--	1 mg/L	--	--	--	--
phosphate, ortho-, dissolved (as P)	E378-T	0.0030	mg/L	<0.0030	--	--	--	--	--	--
sulfate (as SO4)	E235.SO4	0.30	mg/L	10.2	--	--	--	--	--	--
Microbiological Tests										
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	Not Detected	--	1 CFU/100mL	--	--	--	--
coliforms, total background	E012.BG.TC	1	CFU/100mL	101	--	--	--	--	--	--
coliforms, total	E012.TC	1	CFU/100mL	1	--	1 CFU/100mL	--	--	--	--
Metals										

Analyte	Method	LOR	Unit	WT2220838-001 (Continued)	ONDWS AO/OG	ONDWS MAC				
Metals - Continued										
sodium adsorption ratio [SAR]	EC102	0.10	-	0.41	--	--	--	--	--	--
Ion Balance										
anion sum	EC101A	0.10	meq/L	4.55	--	--	--	--	--	--
cation sum (total)	EC101A	0.10	meq/L	4.62	--	--	--	--	--	--
ion balance (APHA)	EC101A	0.010	%	0.763	--	--	--	--	--	--
ion balance (cations/anions)	EC101A	0.01	%	102	--	--	--	--	--	--
Total Metals										
aluminum, total	E420	0.0030	mg/L	0.0047	0.1 mg/L	--	--	--	--	--
antimony, total	E420	0.00010	mg/L	<0.00010	--	0.006 mg/L	--	--	--	--
arsenic, total	E420	0.00010	mg/L	0.00157	--	0.01 mg/L	--	--	--	--
barium, total	E420	0.00010	mg/L	0.0361	--	1 mg/L	--	--	--	--
beryllium, total	E420	0.000020	mg/L	<0.000020	--	--	--	--	--	--
bismuth, total	E420	0.000050	mg/L	<0.000050	--	--	--	--	--	--
boron, total	E420	0.010	mg/L	0.036	--	5 mg/L	--	--	--	--
cadmium, total	E420	0.0000050	mg/L	<0.0000050	--	0.005 mg/L	--	--	--	--
calcium, total	E420	0.050	mg/L	43.5	--	--	--	--	--	--
cesium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
chromium, total	E420	0.00050	mg/L	<0.00050	--	0.05 mg/L	--	--	--	--
cobalt, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
copper, total	E420	0.00050	mg/L	<0.00050	1 mg/L	--	--	--	--	--
iron, total	E420	0.010	mg/L	0.315	0.3 mg/L	--	--	--	--	--
lead, total	E420	0.000050	mg/L	<0.000050	--	0.01 mg/L	--	--	--	--
lithium, total	E420	0.0010	mg/L	0.0020	--	--	--	--	--	--
magnesium, total	E420	0.0050	mg/L	22.3	--	--	--	--	--	--
manganese, total	E420	0.00010	mg/L	0.0455	0.05 mg/L	--	--	--	--	--
molybdenum, total	E420	0.000050	mg/L	0.00222	--	--	--	--	--	--
nickel, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
phosphorus, total	E420	0.050	mg/L	<0.050	--	--	--	--	--	--
potassium, total	E420	0.050	mg/L	0.880	--	--	--	--	--	--
rubidium, total	E420	0.00020	mg/L	0.00027	--	--	--	--	--	--
selenium, total	E420	0.000050	mg/L	<0.000050	--	0.05 mg/L	--	--	--	--
silicon (as SiO2), total	EC420.SiO2	0.25	mg/L	11.4	--	--	--	--	--	--
silicon, total	E420	0.10	mg/L	5.31	--	--	--	--	--	--
silver, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
sodium, total	E420	0.050	mg/L	13.3	200 mg/L	20 mg/L	--	--	--	--
strontium, total	E420	0.00020	mg/L	0.469	--	--	--	--	--	--

Analyte	Method	LOR	Unit	WT2220838-001 (Continued)	ONDWS AO/OG	ONDWS MAC				
Total Metals - Continued										
sulfur, total	E420	0.50	mg/L	3.34	--	--	--	--	--	--
tellurium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--
thallium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
thorium, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
tin, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
titanium, total	E420	0.00030	mg/L	<0.00030	--	--	--	--	--	--
tungsten, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
uranium, total	E420	0.000010	mg/L	0.000498	--	0.02 mg/L	--	--	--	--
vanadium, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
zinc, total	E420	0.0030	mg/L	<0.0030	5 mg/L	--	--	--	--	--
zirconium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
A357596	Water	colour, apparent	May interfere with disinfection; removal is important to ensure effective treatment.	ONDWS	AO/OG	14.9 CU	5 CU
	Water	iron, total	Based on taste and staining of laundry and plumbing fixtures; no evidence exists of dietary iron toxicity in the general population.	ONDWS	AO/OG	0.315 mg/L	0.3 mg/L
	Water	coliforms, total	Total coliforms are not used as indicators of potential health effects from pathogenic microorganisms; they are used as a tool to determine how well the drinking water treatment system is operating and to indicate water quality changes in the distribution system. Detection of total coliforms from consecutive samples from the same site or from more than 10% of the samples collected in a given sampling period should be investigated.	ONDWS	MAC	1 CFU/100mL	1 CFU/100mL

Key:

ONDWS	Ontario Drinking Water Regulation (JAN, 2020)
AO/OG	Aesthetic Objective/Operational Guideline
MAC	Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2020)

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: A357596 Sampling date/time: 04-Nov-2022 14:45 WT2220838-002	ONDWS AO/OG	ONDWS MAC				
Physical Tests										
alkalinity, bicarbonate (as HCO3)	E290	1.0	mg/L	256	--	--	--	--	--	--
alkalinity, carbonate (as CO3)	E290	1.0	mg/L	1.6	--	--	--	--	--	--
alkalinity, hydroxide (as OH)	E290	1.0	mg/L	<1.0	--	--	--	--	--	--
alkalinity, total (as CaCO3)	E290	1.0	mg/L	212	30 - 500 mg/L	--	--	--	--	--
colour, apparent	E330	2.0	CU	17.3	5 CU	--	--	--	--	--
conductivity	E100	1.0	µS/cm	414	--	--	--	--	--	--
hardness (as CaCO3), from total Ca/Mg	EC100A	0.50	mg/L	194	--	--	--	--	--	--
pH	E108	0.10	pH units	8.31	6.5 - 8.5 pH units	--	--	--	--	--
solids, total dissolved [TDS], calculated	EC103A	1.0	mg/L	269	--	--	--	--	--	--
solids, total dissolved [TDS]	E162	10	mg/L	235 DLDS	500 mg/L	--	--	--	--	--
turbidity	E121	0.10	NTU	1.96	5 NTU	--	--	--	--	--
Langelier index (@ 20°C)	EC105A	0.010	-	0.844	--	--	--	--	--	--
Anions and Nutrients										
ammonia, total (as N)	E298	0.0050	mg/L	0.0368	--	--	--	--	--	--
bromide	E235.Br	0.10	mg/L	<0.10	--	--	--	--	--	--
chloride	E235.Cl	0.50	mg/L	2.83	250 mg/L	--	--	--	--	--
fluoride	E235.F	0.020	mg/L	0.214	--	1.5 mg/L	--	--	--	--
nitrate (as N)	E235.NO3	0.020	mg/L	<0.020	--	10 mg/L	--	--	--	--
nitrate + nitrite (as N)	EC235.N+N	0.0032	mg/L	<0.0224	--	10 mg/L	--	--	--	--
nitrite (as N)	E235.NO2	0.010	mg/L	<0.010	--	1 mg/L	--	--	--	--
phosphate, ortho-, dissolved (as P)	E378-T	0.0030	mg/L	<0.0030	--	--	--	--	--	--
sulfate (as SO4)	E235.SO4	0.30	mg/L	9.68	--	--	--	--	--	--
Microbiological Tests										
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	Not Detected	--	1 CFU/100mL	--	--	--	--
coliforms, total background	E012.BG.TC	1	CFU/100mL	26	--	--	--	--	--	--
coliforms, total	E012.TC	1	CFU/100mL	Not Detected	--	1 CFU/100mL	--	--	--	--
Metals										

Analyte	Method	LOR	Unit	WT2220838-002 (Continued)	ONDWS AO/OG	ONDWS MAC				
Metals - Continued										
sodium adsorption ratio [SAR]	EC102	0.10	-	0.40	--	--	--	--	--	--
Ion Balance										
anion sum	EC101A	0.10	meq/L	4.53	--	--	--	--	--	--
cation sum (total)	EC101A	0.10	meq/L	4.49	--	--	--	--	--	--
ion balance (APHA)	EC101A	0.010	%	<0.010	--	--	--	--	--	--
ion balance (cations/anions)	EC101A	0.01	%	99.1	--	--	--	--	--	--
Total Metals										
aluminum, total	E420	0.0030	mg/L	0.0041	0.1 mg/L	--	--	--	--	--
antimony, total	E420	0.00010	mg/L	<0.00010	--	0.006 mg/L	--	--	--	--
arsenic, total	E420	0.00010	mg/L	0.00161	--	0.01 mg/L	--	--	--	--
barium, total	E420	0.00010	mg/L	0.0358	--	1 mg/L	--	--	--	--
beryllium, total	E420	0.000020	mg/L	<0.000020	--	--	--	--	--	--
bismuth, total	E420	0.000050	mg/L	<0.000050	--	--	--	--	--	--
boron, total	E420	0.010	mg/L	0.035	--	5 mg/L	--	--	--	--
cadmium, total	E420	0.0000050	mg/L	<0.0000050	--	0.005 mg/L	--	--	--	--
calcium, total	E420	0.050	mg/L	41.4	--	--	--	--	--	--
cesium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
chromium, total	E420	0.00050	mg/L	<0.00050	--	0.05 mg/L	--	--	--	--
cobalt, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
copper, total	E420	0.00050	mg/L	<0.00050	1 mg/L	--	--	--	--	--
iron, total	E420	0.010	mg/L	0.315	0.3 mg/L	--	--	--	--	--
lead, total	E420	0.000050	mg/L	<0.000050	--	0.01 mg/L	--	--	--	--
lithium, total	E420	0.0010	mg/L	0.0018	--	--	--	--	--	--
magnesium, total	E420	0.0050	mg/L	22.1	--	--	--	--	--	--
manganese, total	E420	0.00010	mg/L	0.0449	0.05 mg/L	--	--	--	--	--
molybdenum, total	E420	0.000050	mg/L	0.00218	--	--	--	--	--	--
nickel, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
phosphorus, total	E420	0.050	mg/L	<0.050	--	--	--	--	--	--
potassium, total	E420	0.050	mg/L	0.860	--	--	--	--	--	--
rubidium, total	E420	0.00020	mg/L	0.00028	--	--	--	--	--	--
selenium, total	E420	0.000050	mg/L	<0.000050	--	0.05 mg/L	--	--	--	--
silicon (as SiO2), total	EC420.SiO2	0.25	mg/L	11.5	--	--	--	--	--	--
silicon, total	E420	0.10	mg/L	5.36	--	--	--	--	--	--
silver, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
sodium, total	E420	0.050	mg/L	13.0	200 mg/L	20 mg/L	--	--	--	--
strontium, total	E420	0.00020	mg/L	0.471	--	--	--	--	--	--

Analyte	Method	LOR	Unit	WT2220838-002 (Continued)	ONDWS AO/OG	ONDWS MAC				
Total Metals - Continued										
sulfur, total	E420	0.50	mg/L	3.24	--	--	--	--	--	--
tellurium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--
thallium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
thorium, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
tin, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
titanium, total	E420	0.00030	mg/L	<0.00030	--	--	--	--	--	--
tungsten, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
uranium, total	E420	0.000010	mg/L	0.000482	--	0.02 mg/L	--	--	--	--
vanadium, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
zinc, total	E420	0.0030	mg/L	<0.0030	5 mg/L	--	--	--	--	--
zirconium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
A357596	Water	colour, apparent	May interfere with disinfection; removal is important to ensure effective treatment.	ONDWS	AO/OG	14.9 CU	5 CU
	Water	iron, total	Based on taste and staining of laundry and plumbing fixtures; no evidence exists of dietary iron toxicity in the general population.	ONDWS	AO/OG	0.315 mg/L	0.3 mg/L
	Water	coliforms, total	Total coliforms are not used as indicators of potential health effects from pathogenic microorganisms; they are used as a tool to determine how well the drinking water treatment system is operating and to indicate water quality changes in the distribution system. Detection of total coliforms from consecutive samples from the same site or from more than 10% of the samples collected in a given sampling period should be investigated.	ONDWS	MAC	1 CFU/100mL	1 CFU/100mL

Key:

ONDWS	Ontario Drinking Water Regulation (JAN, 2020)
AO/OG	Aesthetic Objective/Operational Guideline
MAC	Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2020)

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2220838**	Page	: 1 of 11
Client	: **Hydrogeology Consulting Services**	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 905 550 0969	Telephone	: +1 519 886 6910
Project	: ALMA CHURCH STREET	Date Samples Received	: 04-Nov-2022 18:30
PO	: ----	Issue Date	: 14-Nov-2022 15:58
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) A357596, A357596	E298	04-Nov-2022	05-Nov-2022	----	----		07-Nov-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC										
HDPE [ON MECP] A357596	E235.Br	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Bromide in Water by IC										
HDPE [ON MECP] A357596	E235.Br	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] A357596	E235.Cl	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] A357596	E235.Cl	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	7 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (0.003 mg/L)										
HDPE [ON MECP] A357596, A357596	E378-T	04-Nov-2022	----	----	----		07-Nov-2022	7 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] A357596	E235.F	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] A357596	E235.F	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	7 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] A357596	E235.NO3	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	7 days	6 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] A357596	E235.NO3	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	7 days	7 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] A357596	E235.NO2	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	7 days	6 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] A357596	E235.NO2	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	7 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] A357596	E235.SO4	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] A357596	E235.SO4	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	7 days	✓
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] A357596	E012A.EC	04-Nov-2022	----	----	----		05-Nov-2022	48 hrs	20 hrs	✓
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] A357596	E012A.EC	04-Nov-2022	----	----	----		05-Nov-2022	48 hrs	24 hrs	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Microbiological Tests : Total Coliforms (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
A357596	E012.TC	04-Nov-2022	----	----	----		05-Nov-2022	48 hrs	20 hrs	✓
Microbiological Tests : Total Coliforms (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
A357596	E012.TC	04-Nov-2022	----	----	----		05-Nov-2022	48 hrs	24 hrs	✓
Microbiological Tests : Total Coliforms Background (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
A357596	E012.BG.TC	04-Nov-2022	----	----	----		05-Nov-2022	48 hrs	20 hrs	✓
Microbiological Tests : Total Coliforms Background (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
A357596	E012.BG.TC	04-Nov-2022	----	----	----		05-Nov-2022	48 hrs	24 hrs	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP]										
A357596	E290	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP]										
A357596	E290	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	14 days	7 days	✓
Physical Tests : Colour (Apparent) by Spectrometer										
HDPE [ON MECP]										
A357596	E330	04-Nov-2022	----	----	----		07-Nov-2022	48 hrs	76 hrs	× EHT
Physical Tests : Colour (Apparent) by Spectrometer										
HDPE [ON MECP]										
A357596	E330	04-Nov-2022	----	----	----		07-Nov-2022	48 hrs	80 hrs	× EHT
Physical Tests : Conductivity in Water										
HDPE [ON MECP]										
A357596	E100	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE [ON MECP] A357596	E100	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	7 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] A357596	E108	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	14 days	6 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] A357596	E108	04-Nov-2022	09-Nov-2022	----	----		10-Nov-2022	14 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] A357596, A357596	E162	04-Nov-2022	----	----	----		09-Nov-2022	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] A357596, A357596	E121	04-Nov-2022	----	----	----		08-Nov-2022	3 days	4 days	× EHT
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) A357596	E420	04-Nov-2022	07-Nov-2022	----	----		07-Nov-2022	180 days	2 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) A357596	E420	04-Nov-2022	07-Nov-2022	----	----		07-Nov-2022	180 days	3 days	✓

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	737916	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	731712	0	20	0.0	5.0	✗
Bromide in Water by IC	E235.Br	737910	1	5	20.0	5.0	✓
Chloride in Water by IC	E235.Cl	737911	1	20	5.0	5.0	✓
Colour (Apparent) by Spectrometer	E330	734071	1	13	7.6	5.0	✓
Conductivity in Water	E100	737917	1	5	20.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	733221	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	731863	1	10	10.0	5.0	✓
Fluoride in Water by IC	E235.F	737912	1	5	20.0	5.0	✓
Nitrate in Water by IC	E235.NO3	737914	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	737913	1	20	5.0	5.0	✓
pH by Meter	E108	737918	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	737915	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	737253	1	19	5.2	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	731861	0	2	0.0	5.0	✗
Total Coliforms Background (MF-mEndo)	E012.BG.TC	731862	0	2	0.0	5.0	✗
Total metals in Water by CRC ICPMS	E420	732985	1	12	8.3	5.0	✓
Turbidity by Nephelometry	E121	734591	1	17	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	737916	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	731712	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	737910	1	5	20.0	5.0	✓
Chloride in Water by IC	E235.Cl	737911	1	20	5.0	5.0	✓
Colour (Apparent) by Spectrometer	E330	734071	1	13	7.6	5.0	✓
Conductivity in Water	E100	737917	1	5	20.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	733221	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	737912	1	5	20.0	5.0	✓
Nitrate in Water by IC	E235.NO3	737914	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	737913	1	20	5.0	5.0	✓
pH by Meter	E108	737918	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	737915	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	737253	1	19	5.2	5.0	✓
Total metals in Water by CRC ICPMS	E420	732985	1	12	8.3	5.0	✓
Turbidity by Nephelometry	E121	734591	1	17	5.8	5.0	✓
Method Blanks (MB)							

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Alkalinity Species by Titration	E290	737916	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	731712	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	737910	1	5	20.0	5.0	✓
Chloride in Water by IC	E235.Cl	737911	1	20	5.0	5.0	✓
Colour (Apparent) by Spectrometer	E330	734071	1	13	7.6	5.0	✓
Conductivity in Water	E100	737917	1	5	20.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	733221	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	731863	1	10	10.0	5.0	✓
Fluoride in Water by IC	E235.F	737912	1	5	20.0	5.0	✓
Nitrate in Water by IC	E235.NO3	737914	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	737913	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	737915	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	737253	1	19	5.2	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	731861	1	2	50.0	5.0	✓
Total Coliforms Background (MF-mEndo)	E012.BG.TC	731862	1	2	50.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	732985	1	12	8.3	5.0	✓
Turbidity by Nephelometry	E121	734591	1	17	5.8	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	731712	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	737910	1	5	20.0	5.0	✓
Chloride in Water by IC	E235.Cl	737911	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	733221	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	737912	1	5	20.0	5.0	✓
Nitrate in Water by IC	E235.NO3	737914	1	20	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	737913	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	737915	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	732985	1	12	8.3	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Coliforms Background (MF-mEndo)	E012.BG.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Noncoliform bacteria observed on Total Coliform plates are enumerated.
Total Coliforms (MF-mEndo)	E012.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Following filtration (0.45 µm), and incubation at 35.0 ±0.5°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
E. coli (MF-mFC-BCIG)	E012A.EC Waterloo - Environmental	Water	ON E3433 (mod)	Following filtration (0.45 µm), and incubation at 44.5±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated.
Conductivity in Water	E100 Waterloo - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Waterloo - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TDS by Gravimetry	E162 Waterloo - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC	E235.Br Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrite in Water by IC	E235.NO2 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Waterloo - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Colour (Apparent) by Spectrometer	E330 Waterloo - Environmental	Water	APHA 2120 C (mod)	Colour (Apparent) is measured in an unfiltered sample spectrophotometrically using the single wavelength method. The colour contribution of settleable solids are not included in the result. This method is intended for potable waters. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T Waterloo - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Hardness (Calculated) from Total Ca/Mg	EC100A Waterloo - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ion Balance using Total Metals	EC101A Waterloo - Environmental	Water	APHA 1030E	Cation Sum (using total metals), Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Sodium Adsorption Ratio [SAR] from Total Metals	EC102 Waterloo - Environmental	Water	CCME Sodium Adsorption Ratio (SAR)	The Sodium Adsorption Ratio (SAR) for a water sample is calculated from the Sodium, Calcium, and Magnesium concentrations of the water, using the same calculations as would be used for a sediment paste extract.
TDS calculated from conductivity	EC103A Waterloo - Environmental	Water	APHA 1030 E	Total dissolved solids (as mg/L) can be estimated by multiplying electrical conductance (in umhos/cm) by 0.65.
Langelier Index using Laboratory pH (Ca-T)	EC105A Waterloo - Environmental	Water	APHA 2330B	Langelier Index provides an indication of scale formation potential at a given pH and temperature, and is calculated as per APHA 2330B Saturation Index. Positive values indicate oversaturation with respect to CaCO3. Negative values indicate undersaturation of CaCO3. This calculation uses laboratory pH measurements and provides estimates of Langelier Index at temperatures of 4, 15, 20, 25, 66, and 77°C.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Waterloo - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).
Total Silicon as Silica (Calculation)	EC420.SiO2 Waterloo - Environmental	Water	N/A	Total Silicon (as SiO2) is a calculated parameter. Total Silicon (as SiO2 mg/L) = 2.139 x Total Silicon (mg/L).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.

QUALITY CONTROL REPORT

Work Order	: **WT2220838**	Page	: 1 of 14
Client	: Hydrogeology Consulting Services	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: ALMA CHURCH STREET	Date Samples Received	: 04-Nov-2022 18:30
PO	: ----	Date Analysis Commenced	: 05-Nov-2022
C-O-C number	: ----	Issue Date	: 14-Nov-2022 15:59
Sampler	: ---- 905 550 0969		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Ruby Sujeepan		Waterloo Microbiology, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 734071)											
WT2220730-014	Anonymous	colour, apparent	----	E330	2.0	CU	83.9	85.0	1.34%	20%	----
Physical Tests (QC Lot: 734591)											
WT2220809-004	Anonymous	turbidity	----	E121	0.10	NTU	380	378	0.528%	15%	----
Physical Tests (QC Lot: 737253)											
HA2200031-004	Anonymous	solids, total dissolved [TDS]	----	E162	13	mg/L	234	247	5.40%	20%	----
Physical Tests (QC Lot: 737916)											
WT2220802-017	Anonymous	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	334	318	4.96%	20%	----
Physical Tests (QC Lot: 737917)											
WT2220802-017	Anonymous	conductivity	----	E100	2.0	µS/cm	592	588	0.678%	10%	----
Physical Tests (QC Lot: 737918)											
WT2220802-017	Anonymous	pH	----	E108	0.10	pH units	7.85	7.95	1.26%	4%	----
Anions and Nutrients (QC Lot: 733221)											
WT2220467-020	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0060	mg/L	0.0758	0.0742	2.04%	20%	----
Anions and Nutrients (QC Lot: 737910)											
WT2220802-017	Anonymous	bromide	24959-67-9	E235.Br	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 737911)											
WT2220802-017	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	0.96	0.80	0.15	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 737912)											
WT2220802-017	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.058	0.054	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 737913)											
WT2220802-017	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 737914)											
WT2220802-017	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.384	0.377	1.81%	20%	----
Anions and Nutrients (QC Lot: 737915)											
WT2220802-017	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	0.58	0.51	0.07	Diff <2x LOR	----
Microbiological Tests (QC Lot: 731863)											
WT2220779-001	Anonymous	coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
Total Metals (QC Lot: 732985)											
WT2220738-001	Anonymous	aluminum, total	7429-90-5	E420	0.0300	mg/L	0.425	0.402	5.57%	20%	----
		antimony, total	7440-36-0	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 732985) - continued											
WT2220738-001	Anonymous	arsenic, total	7440-38-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00100	mg/L	0.224	0.221	1.22%	20%	----
		beryllium, total	7440-41-7	E420	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000500	mg/L	0.0000655	0.0000508	0.0000147	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.500	mg/L	254	270	6.39%	20%	----
		cesium, total	7440-46-2	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.100	mg/L	0.444	0.466	0.022	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000500	mg/L	<0.000500	0.000532	0.000032	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0100	mg/L	0.0339	0.0381	0.0041	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0500	mg/L	54.0	53.6	0.764%	20%	----
		manganese, total	7439-96-5	E420	0.00100	mg/L	0.186	0.183	1.73%	20%	----
		molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.000694	0.000648	0.000046	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.500	mg/L	10.0	10.0	0.0141%	20%	----
		rubidium, total	7440-17-7	E420	0.00200	mg/L	0.00559	0.00529	0.00030	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000500	mg/L	0.000829	0.000856	0.000027	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	1.00	mg/L	7.84	7.98	0.15	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.500	mg/L	366	367	0.330%	20%	----
		strontium, total	7440-24-6	E420	0.00200	mg/L	0.800	0.794	0.759%	20%	----
		sulfur, total	7704-34-9	E420	5.00	mg/L	18.7	18.4	0.31	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00300	mg/L	0.00583	0.00585	0.00002	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000100	mg/L	0.00323	0.00322	0.0713%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 732985) - continued											
WT2220738-001	Anonymous	vanadium, total	7440-62-2	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 734071)						
colour, apparent	----	E330	2	CU	<2.0	----
Physical Tests (QCLot: 734591)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 737253)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 737916)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 737917)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 731712)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 733221)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	<0.0030	----
Anions and Nutrients (QCLot: 737910)						
bromide	24959-67-9	E235.Br	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 737911)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 737912)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 737913)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 737914)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 737915)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Microbiological Tests (QCLot: 731861)						
coliforms, total	----	E012.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 731862)						
coliforms, total background	----	E012.BG.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 731863)						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
Total Metals (QCLot: 732985)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 732985) - continued						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 732985) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 734071)									
colour, apparent	----	E330	2	CU	25 CU	94.1	70.0	130	----
Physical Tests (QCLot: 734591)									
turbidity	----	E121	0.1	NTU	200 NTU	90.9	85.0	115	----
Physical Tests (QCLot: 737253)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	107	85.0	115	----
Physical Tests (QCLot: 737916)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	107	85.0	115	----
Physical Tests (QCLot: 737917)									
conductivity	----	E100	1	µS/cm	1409 µS/cm	98.9	90.0	110	----
Physical Tests (QCLot: 737918)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Anions and Nutrients (QCLot: 731712)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.2	85.0	115	----
Anions and Nutrients (QCLot: 733221)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	0.0212 mg/L	100	80.0	120	----
Anions and Nutrients (QCLot: 737910)									
bromide	24959-67-9	E235.Br	0.1	mg/L	0.5 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 737911)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 737912)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 737913)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 737914)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	99.5	90.0	110	----
Anions and Nutrients (QCLot: 737915)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Total Metals (QCLot: 732985)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	98.9	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 732985) - continued									
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	109	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	95.9	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	95.4	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	93.0	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	95.6	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	97.1	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	101	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	97.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	94.5	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	95.3	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	107	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	100	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	94.2	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	107	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	99.6	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	98.6	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	96.0	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	98.3	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	99.1	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	104	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	96.9	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	102	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	91.8	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	104	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	93.6	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	96.1	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	101	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	99.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	95.9	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	95.4	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	96.1	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	98.7	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 732985) - continued									
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	98.7	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 731712)										
WT2220612-013	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 733221)										
WT2220467-020	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	ND mg/L	0.0196 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 737910)										
WT2220802-017	Anonymous	bromide	24959-67-9	E235.Br	0.51 mg/L	0.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 737911)										
WT2220802-017	Anonymous	chloride	16887-00-6	E235.Cl	98.7 mg/L	100 mg/L	98.7	75.0	125	----
Anions and Nutrients (QCLot: 737912)										
WT2220802-017	Anonymous	fluoride	16984-48-8	E235.F	0.921 mg/L	1 mg/L	92.1	75.0	125	----
Anions and Nutrients (QCLot: 737913)										
WT2220802-017	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.496 mg/L	0.5 mg/L	99.3	75.0	125	----
Anions and Nutrients (QCLot: 737914)										
WT2220802-017	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	2.39 mg/L	2.5 mg/L	95.5	75.0	125	----
Anions and Nutrients (QCLot: 737915)										
WT2220802-017	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	100 mg/L	100 mg/L	100	75.0	125	----
Total Metals (QCLot: 732985)										
WT2220817-001	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0481 mg/L	0.05 mg/L	96.3	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0506 mg/L	0.05 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.00479 mg/L	0.005 mg/L	95.8	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0500 mg/L	0.05 mg/L	100.0	70.0	130	----
		boron, total	7440-42-8	E420	0.043 mg/L	0.05 mg/L	86.6	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00489 mg/L	0.005 mg/L	97.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00255 mg/L	0.0025 mg/L	102	70.0	130	----
		chromium, total	7440-47-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0120 mg/L	0.0125 mg/L	95.9	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 732985) - continued										
WT2220817-001	Anonymous	iron, total	7439-89-6	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0249 mg/L	0.025 mg/L	99.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.0126 mg/L	0.0125 mg/L	100	70.0	130	----
		magnesium, total	7439-95-4	E420	2.28 mg/L	2.5 mg/L	91.4	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
		phosphorus, total	7723-14-0	E420	0.586 mg/L	0.5 mg/L	117	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.00544 mg/L	0.005 mg/L	109	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00459 mg/L	0.005 mg/L	91.8	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.00373 mg/L	0.005 mg/L	74.5	70.0	130	----
		thallium, total	7440-28-0	E420	0.0490 mg/L	0.05 mg/L	98.0	70.0	130	----
		thorium, total	7440-29-1	E420	0.00450 mg/L	0.005 mg/L	90.1	70.0	130	----
		tin, total	7440-31-5	E420	0.0225 mg/L	0.025 mg/L	90.1	70.0	130	----
		titanium, total	7440-32-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		tungsten, total	7440-33-7	E420	0.00433 mg/L	0.005 mg/L	86.7	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.00025 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0245 mg/L	0.025 mg/L	98.0	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
		zirconium, total	7440-67-7	E420	ND mg/L	0.005 mg/L	ND	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

Environmental Division Waterloo

Work Order Reference WT2220838

COC Nu. 17 -

Page of

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	Hydrogeology Consulting Services (Kitchener)
Contact:	Chris Helmer
Phone:	905-550-0969
	Company address below will appear on the final report
Street:	25 Water Street West
City/Province:	Elora, ON
Postal Code:	N0B 1S0
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format

Select Report Format: ☑ PDF ☐

Quality Control (QC) Report with Re

☒ Compare Results to Criteria on Report -

Select Distribution: ☑ EMAIL

Email 1 or Fax chrishelmer@hydr

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax chrishelmer@hydrog.ca

Email 2

Project Information

ALS Account # / Quote #: Standing Offer 2022

Job #: ALMA CHURCH STREET

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Contact: Emily Smith Sampler:

ALS Lab Work Order # (lab use only): WT2220838 FH

Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may a

[R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

4-20%] ☐ 3-25%] ☐ 2-50%] ☐

EMERGENCY

1 Business day [E - 100%]

Same Day, Weekend or Statutory holiday [E2 -20

(Laboratory opening fees may apply)]

e Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Potability Package
	A357596	4/11/22	10:45	Water	4	X
	A357596	4/11/22	14:45	Water	4	X
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☒ NO

Are samples for human consumption/ use?

☒ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

ODWQS

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES		
				10.0		

SHIPMENT RELEASE (client use)

Date: 4/11/2022 Time: 18:15

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: MA Date: 2022-11-04 Tim

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

K PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

les are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

MA MH-390, GC-024,

CERTIFICATE OF ANALYSIS

Work Order	: **WT2220859**	Page	: 1 of 5
Client	: **Hydrogeology Consulting Services**	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 905 550 0969	Telephone	: +1 519 886 6910
Project	: ALMA	Date Samples Received	: 07-Nov-2022 09:00
PO	: ----	Date Analysis Commenced	: 07-Nov-2022
C-O-C number	: ----	Issue Date	: 14-Nov-2022 15:59
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no unit
%	percent
µS/cm	microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
CU	colour units (1 CU = 1 mg/L Pt)
meq/L	milliequivalents per litre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
TNTC	*Too numerous to count (microbiology test). Overcrowded, confluent &/or non-identifiable microbial growth prevented identification & measurement of target bacterial colonies.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: 31 QUEEN ALMA STREET	10 CHURCH STREET	----	----	----
					Client sampling date / time: 05-Nov-2022 18:35	05-Nov-2022 15:30	----	----	----
					WT2220859-001	WT2220859-002	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	240	432	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	7.1	<1.0	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	208	354	----	----	----
colour, apparent	----	E330	2.0	CU	<2.0	<2.0	----	----	----
conductivity	----	E100	1.0	µS/cm	394	1270	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.50	mg/L	191	425	----	----	----
pH	----	E108	0.10	pH units	8.49	8.19	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	214 DLDS	693 DLDS	----	----	----
solids, total dissolved [TDS], calculated	----	EC103A	1.0	mg/L	256	826	----	----	----
turbidity	----	E121	0.10	NTU	<0.10	<0.10	----	----	----
Langelier index (@ 20°C)	----	EC105A	0.010	-	0.992	1.27	----	----	----
pH, saturation (@ 20°C)	----	EC105A	0.010	pH units	7.50	6.92	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	----	----	----
bromide	24959-67-9	E235.Br	0.10	mg/L	<0.10	<0.50 DLDS	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	3.05	201 DLDS	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.224	<0.100 DLDS	----	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.064	2.08 DLDS	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0032	mg/L	0.0640	2.08	----	----	----
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.050 DLDS	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	<0.0030	<0.0030	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	7.25	16.8 DLDS	----	----	----
Microbiological Tests									
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	Not Detected	Not Detected	----	----	----
coliforms, total	----	E012.TC	1	CFU/100mL	Not Detected	>200 TNTC	----	----	----
coliforms, total background	----	E012.BG.TC	1	CFU/100mL	Not Detected	>200 TNTC	----	----	----
Metals									
sodium adsorption ratio [SAR]	----	EC102	0.10	-	0.41	2.24	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: 31 QUEEN ALMA STREET	Client sample ID: 10 CHURCH STREET	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
					Client sampling date / time: 05-Nov-2022 18:35	Client sampling date / time: 05-Nov-2022 15:30	----	----	----
					WT2220859-001	WT2220859-002	--------	--------	--------
					Result	Result	----	----	----
Ion Balance									
anion sum	----	EC101A	0.10	meq/L	4.41	13.2	----	----	----
cation sum (total)	----	EC101A	0.10	meq/L	4.40	13.1	----	----	----
ion balance (APHA)	----	EC101A	0.010	%	<0.010	<0.010	----	----	----
ion balance (cations/anions)	----	EC101A	0.01	%	99.8	99.2	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00056	0.00012	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0284	0.0815	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.033	0.017	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	39.0	111	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.00328	0.0247	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	0.000614	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0017	0.0088	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	22.7	35.9	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00011	0.00122	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00223	0.000100	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	0.00070	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	0.796	1.35	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00021	0.00081	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
silicon (as SiO2), total	7631-86-9	EC420.SiO2	0.25	mg/L	10.7	17.2	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: 31 QUEEN ALMA STREET	Client sample ID: 10 CHURCH STREET	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
					Client sampling date / time: 05-Nov-2022 18:35	Client sampling date / time: 05-Nov-2022 15:30	----	----	----
					WT2220859-001	WT2220859-002	--------	--------	--------
					Result	Result	----	----	----
Total Metals									
silicon, total	7440-21-3	E420	0.10	mg/L	5.00	8.02	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	13.0	106	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.405	0.217	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	2.66	6.31	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000302	0.000471	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	0.0059	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	0.00201	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2220859**	Page	: 1 of 8
Client	: **Hydrogeology Consulting Services**	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 905 550 0969	Telephone	: +1 519 886 6910
Project	: ALMA	Date Samples Received	: 07-Nov-2022 09:00
PO	: ----	Date Analysis Commenced	: 07-Nov-2022
C-O-C number	: ----	Issue Date	: 14-Nov-2022 15:59
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no unit
%	percent
µS/cm	microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
CU	colour units (1 CU = 1 mg/L Pt)
meq/L	milliequivalents per litre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
TNTC	*Too numerous to count (microbiology test). Overcrowded, confluent &/or non-identifiable microbial growth prevented identification & measurement of target bacterial colonies.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: 31 QUEEN ALMA STREET Sampling date/time: 05-Nov-2022 18:35 WT2220859-001	ONDWS AO/OG	ONDWS MAC				
Physical Tests										
alkalinity, bicarbonate (as HCO3)	E290	1.0	mg/L	240	--	--	--	--	--	--
alkalinity, carbonate (as CO3)	E290	1.0	mg/L	7.1	--	--	--	--	--	--
alkalinity, hydroxide (as OH)	E290	1.0	mg/L	<1.0	--	--	--	--	--	--
alkalinity, total (as CaCO3)	E290	1.0	mg/L	208	30 - 500 mg/L	--	--	--	--	--
colour, apparent	E330	2.0	CU	<2.0	5 CU	--	--	--	--	--
conductivity	E100	1.0	µS/cm	394	--	--	--	--	--	--
hardness (as CaCO3), from total Ca/Mg	EC100A	0.50	mg/L	191	--	--	--	--	--	--
pH	E108	0.10	pH units	8.49	6.5 - 8.5 pH units	--	--	--	--	--
solids, total dissolved [TDS], calculated	EC103A	1.0	mg/L	256	--	--	--	--	--	--
solids, total dissolved [TDS]	E162	10	mg/L	214 DLDS	500 mg/L	--	--	--	--	--
turbidity	E121	0.10	NTU	<0.10	5 NTU	--	--	--	--	--
Langelier index (@ 20°C)	EC105A	0.010	-	0.992	--	--	--	--	--	--
pH, saturation (@ 20°C)	EC105A	0.010	pH units	7.50	--	--	--	--	--	--
Anions and Nutrients										
ammonia, total (as N)	E298	0.0050	mg/L	<0.0050	--	--	--	--	--	--
bromide	E235.Br	0.10	mg/L	<0.10	--	--	--	--	--	--
chloride	E235.Cl	0.50	mg/L	3.05	250 mg/L	--	--	--	--	--
fluoride	E235.F	0.020	mg/L	0.224	--	1.5 mg/L	--	--	--	--
nitrate (as N)	E235.NO3	0.020	mg/L	0.064	--	10 mg/L	--	--	--	--
nitrate + nitrite (as N)	EC235.N+N	0.0032	mg/L	0.0640	--	10 mg/L	--	--	--	--
nitrite (as N)	E235.NO2	0.010	mg/L	<0.010	--	1 mg/L	--	--	--	--
phosphate, ortho-, dissolved (as P)	E378-T	0.0030	mg/L	<0.0030	--	--	--	--	--	--
sulfate (as SO4)	E235.SO4	0.30	mg/L	7.25	--	--	--	--	--	--
Microbiological Tests										
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	Not Detected	--	1 CFU/100mL	--	--	--	--
coliforms, total background	E012.BG.TC	1	CFU/100mL	Not Detected	--	--	--	--	--	--
coliforms, total	E012.TC	1	CFU/100mL	Not Detected	--	1 CFU/100mL	--	--	--	--

Analyte	Method	LOR	Unit	WT2220859-001 (Continued)	ONDWS AO/OG	ONDWS MAC				
Metals										
sodium adsorption ratio [SAR]	EC102	0.10	-	0.41	--	--	--	--	--	--
Ion Balance										
anion sum	EC101A	0.10	meq/L	4.41	--	--	--	--	--	--
cation sum (total)	EC101A	0.10	meq/L	4.40	--	--	--	--	--	--
ion balance (APHA)	EC101A	0.010	%	<0.010	--	--	--	--	--	--
ion balance (cations/anions)	EC101A	0.01	%	99.8	--	--	--	--	--	--
Total Metals										
aluminum, total	E420	0.0030	mg/L	<0.0030	0.1 mg/L	--	--	--	--	--
antimony, total	E420	0.00010	mg/L	<0.00010	--	0.006 mg/L	--	--	--	--
arsenic, total	E420	0.00010	mg/L	0.00056	--	0.01 mg/L	--	--	--	--
barium, total	E420	0.00010	mg/L	0.0284	--	1 mg/L	--	--	--	--
beryllium, total	E420	0.000020	mg/L	<0.000020	--	--	--	--	--	--
bismuth, total	E420	0.000050	mg/L	<0.000050	--	--	--	--	--	--
boron, total	E420	0.010	mg/L	0.033	--	5 mg/L	--	--	--	--
cadmium, total	E420	0.0000050	mg/L	<0.0000050	--	0.005 mg/L	--	--	--	--
calcium, total	E420	0.050	mg/L	39.0	--	--	--	--	--	--
cesium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
chromium, total	E420	0.00050	mg/L	<0.00050	--	0.05 mg/L	--	--	--	--
cobalt, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
copper, total	E420	0.00050	mg/L	0.00328	1 mg/L	--	--	--	--	--
iron, total	E420	0.010	mg/L	<0.010	0.3 mg/L	--	--	--	--	--
lead, total	E420	0.000050	mg/L	<0.000050	--	0.01 mg/L	--	--	--	--
lithium, total	E420	0.0010	mg/L	0.0017	--	--	--	--	--	--
magnesium, total	E420	0.0050	mg/L	22.7	--	--	--	--	--	--
manganese, total	E420	0.00010	mg/L	0.00011	0.05 mg/L	--	--	--	--	--
molybdenum, total	E420	0.000050	mg/L	0.00223	--	--	--	--	--	--
nickel, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
phosphorus, total	E420	0.050	mg/L	<0.050	--	--	--	--	--	--
potassium, total	E420	0.050	mg/L	0.796	--	--	--	--	--	--
rubidium, total	E420	0.00020	mg/L	0.00021	--	--	--	--	--	--
selenium, total	E420	0.000050	mg/L	<0.000050	--	0.05 mg/L	--	--	--	--
silicon (as SiO2), total	EC420.SiO2	0.25	mg/L	10.7	--	--	--	--	--	--
silicon, total	E420	0.10	mg/L	5.00	--	--	--	--	--	--
silver, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
sodium, total	E420	0.050	mg/L	13.0	200 mg/L	20 mg/L	--	--	--	--
strontium, total	E420	0.00020	mg/L	0.405	--	--	--	--	--	--

Analyte	Method	LOR	Unit	WT2220859-001 (Continued)	ONDWS AO/OG	ONDWS MAC				
Total Metals - Continued										
sulfur, total	E420	0.50	mg/L	2.66	--	--	--	--	--	--
tellurium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--
thallium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
thorium, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
tin, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
titanium, total	E420	0.00030	mg/L	<0.00030	--	--	--	--	--	--
tungsten, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
uranium, total	E420	0.000010	mg/L	0.000302	--	0.02 mg/L	--	--	--	--
vanadium, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
zinc, total	E420	0.0030	mg/L	<0.0030	5 mg/L	--	--	--	--	--
zirconium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any qualifiers detected.

No Breaches Found

Key:

ONDWS Ontario Drinking Water Regulation (JAN, 2020)

AO/OG Aesthetic Objective/Operational Guideline

MAC Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2020)

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: 10 CHURCH STREET Sampling date/time: 05-Nov-2022 15:30 WT2220859-002	ONDWS AO/OG	ONDWS MAC				
Physical Tests										
alkalinity, bicarbonate (as HCO3)	E290	1.0	mg/L	432	--	--	--	--	--	--
alkalinity, carbonate (as CO3)	E290	1.0	mg/L	<1.0	--	--	--	--	--	--
alkalinity, hydroxide (as OH)	E290	1.0	mg/L	<1.0	--	--	--	--	--	--
alkalinity, total (as CaCO3)	E290	1.0	mg/L	354	30 - 500 mg/L	--	--	--	--	--
colour, apparent	E330	2.0	CU	<2.0	5 CU	--	--	--	--	--
conductivity	E100	1.0	µS/cm	1270	--	--	--	--	--	--
hardness (as CaCO3), from total Ca/Mg	EC100A	0.50	mg/L	425	--	--	--	--	--	--
pH	E108	0.10	pH units	8.19	6.5 - 8.5 pH units	--	--	--	--	--
solids, total dissolved [TDS], calculated	EC103A	1.0	mg/L	826	--	--	--	--	--	--
solids, total dissolved [TDS]	E162	10	mg/L	693 DLDS	500 mg/L	--	--	--	--	--
turbidity	E121	0.10	NTU	<0.10	5 NTU	--	--	--	--	--
Langelier index (@ 20°C)	EC105A	0.010	-	1.27	--	--	--	--	--	--
pH, saturation (@ 20°C)	EC105A	0.010	pH units	6.92	--	--	--	--	--	--
Anions and Nutrients										
ammonia, total (as N)	E298	0.0050	mg/L	<0.0050	--	--	--	--	--	--
bromide	E235.Br	0.10	mg/L	<0.50 DLDS	--	--	--	--	--	--
chloride	E235.Cl	0.50	mg/L	201 DLDS	250 mg/L	--	--	--	--	--
fluoride	E235.F	0.020	mg/L	<0.100 DLDS	--	1.5 mg/L	--	--	--	--
nitrate (as N)	E235.NO3	0.020	mg/L	2.08 DLDS	--	10 mg/L	--	--	--	--
nitrate + nitrite (as N)	EC235.N+N	0.0032	mg/L	2.08	--	10 mg/L	--	--	--	--
nitrite (as N)	E235.NO2	0.010	mg/L	<0.050 DLDS	--	1 mg/L	--	--	--	--
phosphate, ortho-, dissolved (as P)	E378-T	0.0030	mg/L	<0.0030	--	--	--	--	--	--
sulfate (as SO4)	E235.SO4	0.30	mg/L	16.8 DLDS	--	--	--	--	--	--
Microbiological Tests										
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	Not Detected	--	1 CFU/100mL	--	--	--	--
coliforms, total background	E012.BG.TC	1	CFU/100mL	>200 TNTC	--	--	--	--	--	--
coliforms, total	E012.TC	1	CFU/100mL	>200 TNTC	--	1 CFU/100mL	--	--	--	--

Analyte	Method	LOR	Unit	WT2220859-002 (Continued)	ONDWS AO/OG	ONDWS MAC				
Metals										
sodium adsorption ratio [SAR]	EC102	0.10	-	2.24	--	--	--	--	--	--
Ion Balance										
anion sum	EC101A	0.10	meq/L	13.2	--	--	--	--	--	--
cation sum (total)	EC101A	0.10	meq/L	13.1	--	--	--	--	--	--
ion balance (APHA)	EC101A	0.010	%	<0.010	--	--	--	--	--	--
ion balance (cations/anions)	EC101A	0.01	%	99.2	--	--	--	--	--	--
Total Metals										
aluminum, total	E420	0.0030	mg/L	<0.0030	0.1 mg/L	--	--	--	--	--
antimony, total	E420	0.00010	mg/L	<0.00010	--	0.006 mg/L	--	--	--	--
arsenic, total	E420	0.00010	mg/L	0.00012	--	0.01 mg/L	--	--	--	--
barium, total	E420	0.00010	mg/L	0.0815	--	1 mg/L	--	--	--	--
beryllium, total	E420	0.000020	mg/L	<0.000020	--	--	--	--	--	--
bismuth, total	E420	0.000050	mg/L	<0.000050	--	--	--	--	--	--
boron, total	E420	0.010	mg/L	0.017	--	5 mg/L	--	--	--	--
cadmium, total	E420	0.0000050	mg/L	<0.0000050	--	0.005 mg/L	--	--	--	--
calcium, total	E420	0.050	mg/L	111	--	--	--	--	--	--
cesium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
chromium, total	E420	0.00050	mg/L	<0.00050	--	0.05 mg/L	--	--	--	--
cobalt, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
copper, total	E420	0.00050	mg/L	0.0247	1 mg/L	--	--	--	--	--
iron, total	E420	0.010	mg/L	<0.010	0.3 mg/L	--	--	--	--	--
lead, total	E420	0.000050	mg/L	0.000614	--	0.01 mg/L	--	--	--	--
lithium, total	E420	0.0010	mg/L	0.0088	--	--	--	--	--	--
magnesium, total	E420	0.0050	mg/L	35.9	--	--	--	--	--	--
manganese, total	E420	0.00010	mg/L	0.00122	0.05 mg/L	--	--	--	--	--
molybdenum, total	E420	0.000050	mg/L	0.000100	--	--	--	--	--	--
nickel, total	E420	0.00050	mg/L	0.00070	--	--	--	--	--	--
phosphorus, total	E420	0.050	mg/L	<0.050	--	--	--	--	--	--
potassium, total	E420	0.050	mg/L	1.35	--	--	--	--	--	--
rubidium, total	E420	0.00020	mg/L	0.00081	--	--	--	--	--	--
selenium, total	E420	0.000050	mg/L	<0.000050	--	0.05 mg/L	--	--	--	--
silicon (as SiO2), total	EC420.SiO2	0.25	mg/L	17.2	--	--	--	--	--	--
silicon, total	E420	0.10	mg/L	8.02	--	--	--	--	--	--
silver, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
sodium, total	E420	0.050	mg/L	106	200 mg/L	20 mg/L	--	--	--	--
strontium, total	E420	0.00020	mg/L	0.217	--	--	--	--	--	--

Analyte	Method	LOR	Unit	WT2220859-002 (Continued)	ONDWS AO/OG	ONDWS MAC				
Total Metals - Continued										
sulfur, total	E420	0.50	mg/L	6.31	--	--	--	--	--	--
tellurium, total	E420	0.00020	mg/L	<0.00020	--	--	--	--	--	--
thallium, total	E420	0.000010	mg/L	<0.000010	--	--	--	--	--	--
thorium, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
tin, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
titanium, total	E420	0.00030	mg/L	<0.00030	--	--	--	--	--	--
tungsten, total	E420	0.00010	mg/L	<0.00010	--	--	--	--	--	--
uranium, total	E420	0.000010	mg/L	0.000471	--	0.02 mg/L	--	--	--	--
vanadium, total	E420	0.00050	mg/L	<0.00050	--	--	--	--	--	--
zinc, total	E420	0.0030	mg/L	0.0059	5 mg/L	--	--	--	--	--
zirconium, total	E420	0.00020	mg/L	0.00201	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
10 CHURCH STREET	Water	solids, total dissolved [TDS]	Based on taste; TDS above 500 mg/L results in excessive scaling in water pipes, water heaters, boilers and appliances; TDS is composed of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulphate and nitrate.	ONDWS	AO/OG	693 mg/L	500 mg/L
	Water	coliforms, total	Total coliforms are not used as indicators of potential health effects from pathogenic microorganisms; they are used as a tool to determine how well the drinking water treatment system is operating and to indicate water quality changes in the distribution system. Detection of total coliforms from consecutive samples from the same site or from more than 10% of the samples collected in a given sampling period should be investigated.	ONDWS	MAC	>200	1 CFU/100mL
	Water	sodium, total	Based on taste; where a sodium-based water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended.	ONDWS	MAC	106 mg/L	20 mg/L

Key:

ONDWS	Ontario Drinking Water Regulation (JAN, 2020)
AO/OG	Aesthetic Objective/Operational Guideline
MAC	Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2020)

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2220859**	Page	: 1 of 13
Client	: **Hydrogeology Consulting Services**	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 905 550 0969	Telephone	: +1 519 886 6910
Project	: ALMA	Date Samples Received	: 07-Nov-2022 09:00
PO	: ----	Issue Date	: 14-Nov-2022 15:59
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Total Metals	QC-737130-001	----	silver, total	7440-22-4	E420	0.000018 [B] mg/L	0.00001 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
10 CHURCH STREET	E298	05-Nov-2022	10-Nov-2022	----	----		11-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
31 QUEEN ALMA STREET	E298	05-Nov-2022	10-Nov-2022	----	----		11-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Bromide in Water by IC										
HDPE [ON MECP]										
10 CHURCH STREET	E235.Br	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Bromide in Water by IC										
HDPE [ON MECP]										
31 QUEEN ALMA STREET	E235.Br	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP]										
10 CHURCH STREET	E235.Cl	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP]										
31 QUEEN ALMA STREET	E235.Cl	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (0.003 mg/L)										
HDPE [ON MECP]										
10 CHURCH STREET	E378-T	05-Nov-2022	----	----	----		09-Nov-2022	7 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (0.003 mg/L)										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E378-T	05-Nov-2022	----	----	----		09-Nov-2022	7 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] 10 CHURCH STREET	E235.F	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E235.F	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] 10 CHURCH STREET	E235.NO3	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	7 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E235.NO3	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	7 days	5 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] 10 CHURCH STREET	E235.NO2	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	7 days	5 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E235.NO2	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	7 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] 10 CHURCH STREET	E235.SO4	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E235.SO4	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] 31 QUEEN ALMA STREET	E012A.EC	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	43 hrs	✓
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] 10 CHURCH STREET	E012A.EC	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	46 hrs	✓
Microbiological Tests : Total Coliforms (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] 31 QUEEN ALMA STREET	E012.TC	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	43 hrs	✓
Microbiological Tests : Total Coliforms (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] 10 CHURCH STREET	E012.TC	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	46 hrs	✓
Microbiological Tests : Total Coliforms Background (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] 31 QUEEN ALMA STREET	E012.BG.TC	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	43 hrs	✓
Microbiological Tests : Total Coliforms Background (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] 10 CHURCH STREET	E012.BG.TC	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	46 hrs	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] 10 CHURCH STREET	E290	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E290	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	14 days	5 days	✓
Physical Tests : Colour (Apparent) by Spectrometer										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E330	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	48 hrs	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Colour (Apparent) by Spectrometer										
HDPE [ON MECP] 10 CHURCH STREET	E330	05-Nov-2022	----	----	----		07-Nov-2022	48 hrs	51 hrs	× EHTL
Physical Tests : Conductivity in Water										
HDPE [ON MECP] 10 CHURCH STREET	E100	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E100	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] 10 CHURCH STREET	E108	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	14 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E108	05-Nov-2022	10-Nov-2022	----	----		10-Nov-2022	14 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] 10 CHURCH STREET	E162	05-Nov-2022	----	----	----		10-Nov-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E162	05-Nov-2022	----	----	----		10-Nov-2022	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] 10 CHURCH STREET	E121	05-Nov-2022	----	----	----		08-Nov-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] 31 QUEEN ALMA STREET	E121	05-Nov-2022	----	----	----		08-Nov-2022	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
10 CHURCH STREET	E420	05-Nov-2022	08-Nov-2022	----	----		09-Nov-2022	180 days	3 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
31 QUEEN ALMA STREET	E420	05-Nov-2022	08-Nov-2022	----	----		09-Nov-2022	180 days	3 days	✓

Legend & Qualifier Definitions

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: ✗ = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	738289	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	738727	1	19	5.2	5.0	✓
Bromide in Water by IC	E235.Br	738296	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	738295	1	16	6.2	5.0	✓
Colour (Apparent) by Spectrometer	E330	734071	1	13	7.6	5.0	✓
Conductivity in Water	E100	738290	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	736616	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	733573	0	3	0.0	5.0	✗
Fluoride in Water by IC	E235.F	738293	1	10	10.0	5.0	✓
Nitrate in Water by IC	E235.NO3	738291	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	738292	1	15	6.6	5.0	✓
pH by Meter	E108	738288	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	738294	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	738691	1	20	5.0	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	733574	0	3	0.0	5.0	✗
Total Coliforms Background (MF-mEndo)	E012.BG.TC	733575	0	3	0.0	5.0	✗
Total metals in Water by CRC ICPMS	E420	736126	1	15	6.6	5.0	✓
Turbidity by Nephelometry	E121	734591	1	17	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	738289	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	738727	1	19	5.2	5.0	✓
Bromide in Water by IC	E235.Br	738296	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	738295	1	16	6.2	5.0	✓
Colour (Apparent) by Spectrometer	E330	734071	1	13	7.6	5.0	✓
Conductivity in Water	E100	738290	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	736616	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	738293	1	10	10.0	5.0	✓
Nitrate in Water by IC	E235.NO3	738291	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	738292	1	15	6.6	5.0	✓
pH by Meter	E108	738288	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	738294	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	738691	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	736126	2	15	13.3	5.0	✓
Turbidity by Nephelometry	E121	734591	1	17	5.8	5.0	✓
Method Blanks (MB)							

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Alkalinity Species by Titration	E290	738289	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	738727	1	19	5.2	5.0	✓
Bromide in Water by IC	E235.Br	738296	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	738295	1	16	6.2	5.0	✓
Colour (Apparent) by Spectrometer	E330	734071	1	13	7.6	5.0	✓
Conductivity in Water	E100	738290	1	4	25.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	736616	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	733573	1	3	33.3	5.0	✓
Fluoride in Water by IC	E235.F	738293	1	10	10.0	5.0	✓
Nitrate in Water by IC	E235.NO3	738291	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	738292	1	15	6.6	5.0	✓
Sulfate in Water by IC	E235.SO4	738294	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	738691	1	20	5.0	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	733574	1	3	33.3	5.0	✓
Total Coliforms Background (MF-mEndo)	E012.BG.TC	733575	1	3	33.3	5.0	✓
Total metals in Water by CRC ICPMS	E420	736126	2	15	13.3	5.0	✓
Turbidity by Nephelometry	E121	734591	1	17	5.8	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	738727	1	19	5.2	5.0	✓
Bromide in Water by IC	E235.Br	738296	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	738295	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	736616	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	738293	1	10	10.0	5.0	✓
Nitrate in Water by IC	E235.NO3	738291	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	738292	1	15	6.6	5.0	✓
Sulfate in Water by IC	E235.SO4	738294	1	17	5.8	5.0	✓
Total metals in Water by CRC ICPMS	E420	736126	1	15	6.6	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Coliforms Background (MF-mEndo)	E012.BG.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Noncoliform bacteria observed on Total Coliform plates are enumerated.
Total Coliforms (MF-mEndo)	E012.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Following filtration (0.45 µm), and incubation at 35.0 ±0.5°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
E. coli (MF-mFC-BCIG)	E012A.EC Waterloo - Environmental	Water	ON E3433 (mod)	Following filtration (0.45 µm), and incubation at 44.5±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated.
Conductivity in Water	E100 Waterloo - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Waterloo - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TDS by Gravimetry	E162 Waterloo - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC	E235.Br Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrite in Water by IC	E235.NO2 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Waterloo - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Colour (Apparent) by Spectrometer	E330 Waterloo - Environmental	Water	APHA 2120 C (mod)	Colour (Apparent) is measured in an unfiltered sample spectrophotometrically using the single wavelength method. The colour contribution of settleable solids are not included in the result. This method is intended for potable waters. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T Waterloo - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Hardness (Calculated) from Total Ca/Mg	EC100A Waterloo - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ion Balance using Total Metals	EC101A Waterloo - Environmental	Water	APHA 1030E	Cation Sum (using total metals), Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Sodium Adsorption Ratio [SAR] from Total Metals	EC102 Waterloo - Environmental	Water	CCME Sodium Adsorption Ratio (SAR)	The Sodium Adsorption Ratio (SAR) for a water sample is calculated from the Sodium, Calcium, and Magnesium concentrations of the water, using the same calculations as would be used for a sediment paste extract.
TDS calculated from conductivity	EC103A Waterloo - Environmental	Water	APHA 1030 E	Total dissolved solids (as mg/L) can be estimated by multiplying electrical conductance (in umhos/cm) by 0.65.
Langelier Index using Laboratory pH (Ca-T)	EC105A Waterloo - Environmental	Water	APHA 2330B	Langelier Index provides an indication of scale formation potential at a given pH and temperature, and is calculated as per APHA 2330B Saturation Index. Positive values indicate oversaturation with respect to CaCO3. Negative values indicate undersaturation of CaCO3. This calculation uses laboratory pH measurements and provides estimates of Langelier Index at temperatures of 4, 15, 20, 25, 66, and 77°C.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Waterloo - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).
Total Silicon as Silica (Calculation)	EC420.SiO2 Waterloo - Environmental	Water	N/A	Total Silicon (as SiO2) is a calculated parameter. Total Silicon (as SiO2 mg/L) = 2.139 x Total Silicon (mg/L).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.

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QUALITY CONTROL REPORT

Work Order	: **WT2220859**	Page	: 1 of 15
Client	: Hydrogeology Consulting Services	Laboratory	: Waterloo - Environmental
Contact	: Chris Helmer	Account Manager	: Emily Smith
Address	: 25 Water Street West Elora ON Canada N0B 1S0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: ALMA	Date Samples Received	: 07-Nov-2022 09:00
PO	: ----	Date Analysis Commenced	: 07-Nov-2022
C-O-C number	: ----	Issue Date	: 14-Nov-2022 15:57
Sampler	: ---- 905 550 0969		
Site	: ----		
Quote number	: Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 734071)											
WT2220730-014	Anonymous	colour, apparent	----	E330	2.0	CU	83.9	85.0	1.34%	20%	----
Physical Tests (QC Lot: 734591)											
WT2220809-004	Anonymous	turbidity	----	E121	0.10	NTU	380	378	0.528%	15%	----
Physical Tests (QC Lot: 738288)											
WT2220703-001	Anonymous	pH	----	E108	0.10	pH units	8.29	8.29	0.00%	4%	----
Physical Tests (QC Lot: 738289)											
WT2220703-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	227	228	0.729%	20%	----
Physical Tests (QC Lot: 738290)											
WT2220703-001	Anonymous	conductivity	----	E100	2.0	µS/cm	831	833	0.240%	10%	----
Physical Tests (QC Lot: 738691)											
WT2221020-003	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	277	275	0.543%	20%	----
Anions and Nutrients (QC Lot: 736616)											
WT2220730-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 738291)											
WT2220858-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 738292)											
WT2220858-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 738293)											
WT2220858-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.038	0.038	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 738294)											
WT2220858-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	23.9	24.0	0.493%	20%	----
Anions and Nutrients (QC Lot: 738295)											
WT2220858-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	0.87	0.85	0.02	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 738296)											
WT2220858-001	Anonymous	bromide	24959-67-9	E235.Br	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 738727)											
WT2220749-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.260	0.259	0.385%	20%	----
Total Metals (QC Lot: 736126)											
WT2220859-001	31 QUEEN ALMA STREET	aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 736126) - continued											
WT2220859-001	31 QUEEN ALMA STREET	arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00056	0.00058	0.00002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0284	0.0284	0.186%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.033	0.034	0.0008	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	39.0	39.6	1.48%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00328	0.00328	0.000001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0017	0.0017	0.00001	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	22.7	23.0	1.34%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00011	0.00015	0.00004	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00223	0.00221	1.13%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.796	0.796	0.00396%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00021	0.00021	0.000005	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	5.00	4.89	2.25%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	13.0	13.2	0.990%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.405	0.409	0.997%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	2.66	2.52	0.14	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000302	0.000310	2.52%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 736126) - continued											
WT2220859-001	31 QUEEN ALMA STREET	vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 734071)						
colour, apparent	----	E330	2	CU	<2.0	----
Physical Tests (QCLot: 734591)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 738289)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 738290)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 738691)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 736616)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	<0.0030	----
Anions and Nutrients (QCLot: 738291)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 738292)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 738293)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 738294)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 738295)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 738296)						
bromide	24959-67-9	E235.Br	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 738727)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Microbiological Tests (QCLot: 733573)						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 733574)						
coliforms, total	----	E012.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 733575)						
coliforms, total background	----	E012.BG.TC	1	CFU/100mL	<1	----
Total Metals (QCLot: 736126)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 736126) - continued						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 736126) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 737130)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	# 0.000018	B
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 737130) - continued						
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 734071)									
colour, apparent	----	E330	2	CU	25 CU	94.1	70.0	130	----
Physical Tests (QCLot: 734591)									
turbidity	----	E121	0.1	NTU	200 NTU	90.9	85.0	115	----
Physical Tests (QCLot: 738288)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 738289)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	107	85.0	115	----
Physical Tests (QCLot: 738290)									
conductivity	----	E100	1	µS/cm	1409 µS/cm	100	90.0	110	----
Physical Tests (QCLot: 738691)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	97.0	85.0	115	----
Anions and Nutrients (QCLot: 736616)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	0.0212 mg/L	102	80.0	120	----
Anions and Nutrients (QCLot: 738291)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 738292)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 738293)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 738294)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 738295)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 738296)									
bromide	24959-67-9	E235.Br	0.1	mg/L	0.5 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 738727)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.8	85.0	115	----
Total Metals (QCLot: 736126)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	99.2	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	100	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 736126) - continued									
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	99.2	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	101	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	94.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	103	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	101	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	99.0	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.0	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	99.8	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	98.5	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	98.7	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	96.6	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	107	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	100	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	96.3	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	99.9	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	100	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	97.2	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	101	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	103	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	89.7	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	96.2	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	100	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	92.5	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	99.9	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	98.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	97.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	98.9	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	97.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	98.0	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	101	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 736126) - continued									
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	93.6	80.0	120	----
Total Metals (QCLot: 737130)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	100	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	103	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	105	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	97.7	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	104	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	99.1	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	105	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	101	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	97.9	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	96.2	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	99.1	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	97.7	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	99.8	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	105	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	97.0	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	97.4	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	102	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	93.1	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	106	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	100	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	105	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	87.4	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	102	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	100	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	104	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	97.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	99.4	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	98.0	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	99.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	97.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 737130) - continued									
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	98.0	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	102	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	99.0	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	99.6	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	92.7	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 736616)										
WT2220730-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0180 mg/L	0.0196 mg/L	92.1	70.0	130	----
Anions and Nutrients (QCLot: 738291)										
WT2220858-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	2.33 mg/L	2.5 mg/L	93.1	75.0	125	----
Anions and Nutrients (QCLot: 738292)										
WT2220858-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.505 mg/L	0.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 738293)										
WT2220858-001	Anonymous	fluoride	16984-48-8	E235.F	0.944 mg/L	1 mg/L	94.4	75.0	125	----
Anions and Nutrients (QCLot: 738294)										
WT2220858-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	98.0 mg/L	100 mg/L	98.0	75.0	125	----
Anions and Nutrients (QCLot: 738295)										
WT2220858-001	Anonymous	chloride	16887-00-6	E235.Cl	97.7 mg/L	100 mg/L	97.7	75.0	125	----
Anions and Nutrients (QCLot: 738296)										
WT2220858-001	Anonymous	bromide	24959-67-9	E235.Br	0.52 mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 738727)										
WT2220749-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Total Metals (QCLot: 736126)										
WT2220859-002	10 CHURCH STREET	aluminum, total	7429-90-5	E420	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		antimony, total	7440-36-0	E420	0.0520 mg/L	0.05 mg/L	104	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0529 mg/L	0.05 mg/L	106	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.00474 mg/L	0.005 mg/L	94.7	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0461 mg/L	0.05 mg/L	92.3	70.0	130	----
		boron, total	7440-42-8	E420	0.044 mg/L	0.05 mg/L	87.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00502 mg/L	0.005 mg/L	100	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00249 mg/L	0.0025 mg/L	99.8	70.0	130	----
		chromium, total	7440-47-3	E420	0.0127 mg/L	0.0125 mg/L	101	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0123 mg/L	0.0125 mg/L	98.3	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 736126) - continued										
WT2220859-002	10 CHURCH STREET	iron, total	7439-89-6	E420	0.049 mg/L	0.05 mg/L	98.4	70.0	130	----
		lead, total	7439-92-1	E420	0.0234 mg/L	0.025 mg/L	93.6	70.0	130	----
		lithium, total	7439-93-2	E420	0.0116 mg/L	0.0125 mg/L	93.0	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0122 mg/L	0.0125 mg/L	97.5	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0125 mg/L	0.0125 mg/L	100	70.0	130	----
		nickel, total	7440-02-0	E420	0.0240 mg/L	0.025 mg/L	96.1	70.0	130	----
		phosphorus, total	7723-14-0	E420	0.513 mg/L	0.5 mg/L	103	70.0	130	----
		potassium, total	7440-09-7	E420	2.52 mg/L	2.5 mg/L	101	70.0	130	----
		rubidium, total	7440-17-7	E420	0.00533 mg/L	0.005 mg/L	106	70.0	130	----
		selenium, total	7782-49-2	E420	0.0510 mg/L	0.05 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00430 mg/L	0.005 mg/L	86.1	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.00460 mg/L	0.005 mg/L	91.9	70.0	130	----
		thallium, total	7440-28-0	E420	0.0467 mg/L	0.05 mg/L	93.4	70.0	130	----
		thorium, total	7440-29-1	E420	0.00485 mg/L	0.005 mg/L	97.0	70.0	130	----
		tin, total	7440-31-5	E420	0.0246 mg/L	0.025 mg/L	98.4	70.0	130	----
		titanium, total	7440-32-6	E420	0.0129 mg/L	0.0125 mg/L	103	70.0	130	----
		tungsten, total	7440-33-7	E420	0.00485 mg/L	0.005 mg/L	97.1	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.00025 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0262 mg/L	0.025 mg/L	105	70.0	130	----
		zinc, total	7440-66-6	E420	0.0238 mg/L	0.025 mg/L	95.2	70.0	130	----
		zirconium, total	7440-67-7	E420	0.00499 mg/L	0.005 mg/L	99.7	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 -

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Hydrogeology Consulting Services (Kitchener)	Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Chris Helmer	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	905-550-0969	☒ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Street:	25 Water Street West	Email 1 or Fax chrishelmer@hydrog.ca	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Elora, ON	Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	N0B 1S0	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax chrishelmer@hydrog.ca	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Standing Offer 2022	AFE/Cost Center:	PO#
Job #:	~~Bergey Court~~ ALMA	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	WT2220859	ALS Contact: Emily Smith	Sampler:

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Potability Package
	31 QUEEN ALMA STREET	5/11/2022	13:35	Water	4	X
	10 CHURCH STREET	5/11/2022	15:30	Water	4	X
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		
				Water		

Environmental Division Waterloo

Work Order Reference

WT2220859

Telephone : +1 519 886 6910

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	ODWQS
Are samples for human consumption/ use? ☒ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	3.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Gillian Valentini	Date: 5/11/22	Time: 17:00	Received by:	Date:	Time:	Received by:	Date: 11/7/22	Time: 9:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

MM391, N388, GC029