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Hydrogeological Investigation
St. Jacobs Lands
St. Jacobs, ON

Dear Mr. Bender

1. Introduction

GHD Limited (GHD) was retained by Schlegel Urban Developments Corp. (Schlegel) to complete a Hydrogeological Investigation to support the proposed residential development of the St. Jacobs Lands located at 52 Hawkesville Road (Site) in the Village of St. Jacobs within the Township of Woolwich. The location of the Site is shown of **Figure 1.1**. GHD prepared this letter report to present the findings of the Hydrogeological Investigation.

1.1 Site Development Concept

It is currently proposed that the Site will be developed for a mixture of low density, townhouse, and multi-unit residential housing along with open space, parkland, and stormwater management areas. The proposed development concept is shown on **Figure 1.2**¹. The development is focused on the southern portion of the Site. The northern portion of the Site consists of woodlot/wetland area that will remain as open space.

1.2 Purpose and Scope

This letter report has been prepared to summarize the results of the Hydrogeological Assessment completed for the Site. The Hydrogeological Assessment is focused on characterizing geology and groundwater elevation/flow conditions within the uppermost (i.e., shallow) groundwater zone encountered beneath the Site. Shallow groundwater conditions will have the most significant bearing on the proposed Site development with respect to basement depths, subsurface servicing, earthworks and grading, etc.

The following scope of work was undertaken to support the Hydrogeological Assessment:

- Background information review including publicly available reference materials, such as the Ontario Water Well Database, Site zoning, Quaternary geology maps/reports. This included reviewing data from previous

¹ The development concept shown on Figure 1.2 corresponds to the version provided to GHD by GSP Group on April 1, 2025. GHD understands minor adjustments to the development concept have occurred since this time; however, these adjustments have no bearing on the Hydrogeological Assessment presented herein.

investigations completed at the Site by others, as provided by Schlegel. The data reviewed from previous investigations are provided in **Appendix A**.

- A focused subsurface investigation including:
 - Advancement of 10 boreholes to characterize subsurface conditions and facilitate installation of groundwater monitoring wells within the boreholes.
 - Completion of the 10 boreholes as monitoring wells.
 - Development of newly installed monitoring wells to ensure groundwater elevations and aquifer test results are representative of natural conditions.
 - Completion of hydraulic testing at seven wells to estimate the hydraulic conductivity of the shallow groundwater zone observed beneath the Site.
 - Installation of long-term electronic pressure transducers to continuously monitor groundwater elevations at ten wells.
 - Collection of manual static groundwater elevation measurements across the monitoring well network.
 - Collection of groundwater samples from 3 monitoring wells (MW1-24, MW4-24, and MW7-24).
- Analyses have included:
 - Analysing the hydraulic testing data to estimate hydraulic conductivity for the shallow groundwater zone.
 - Characterization of depth to groundwater (and seasonal variability), groundwater flow directions, and horizontal hydraulic gradients for the shallow groundwater zone.
 - Comparison of laboratory analytical analysis of groundwater samples to applicable regulatory standards.

1.3 Limitations

This letter report has been prepared by GHD for Schlegel and may only be used and relied on by Schlegel for the purpose agreed between GHD and Schlegel as set out in **Section 1.2**. GHD otherwise disclaims responsibility to any person other than Schlegel arising in connection with this letter report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this letter report were limited to those specifically detailed in this letter report and are subject to the scope limitations set out herein.

1.4 Assumptions

GHD made the following assumptions during the development of this letter report:

- The stratigraphic observations made during the advancement of boreholes are representative of geologic conditions throughout the Site
- Samples were handled and managed such that the results are representative of Site conditions
- Laboratory analytical data was analysed according to the lab's internal standard operating procedures (SOPs)

2. Background

Background information for the Site is presented in the following sections including the Site location, surrounding land use, topography and drainage, physiography, regional geology, private water well survey, and surface water features. Information was obtained from publicly available sources.

2.1 Site Location and Description

The Site is located at 52 Hawkesville Rd in the Town of St. Jacobs within the Township of Woolwich north of Hawesville Road, as shown on **Figure 1.1**. The Site consists of agricultural land. The Site is bordered by the Waterloo Central Railway spur line to west. A woodlot/wetland area is located in the approximate northern half of the Site. Residential and commercial properties are present to the south and east of the Site, as described further in **Section 2.2**.

2.2 Surrounding Land Use

Figure 2.1 illustrates the land use surrounding the Site. The Site is surrounded by agricultural land located to the west (beyond the spur line) and south of the Site. To the east of the Site the properties are mixture of residential and industrial with a hatchery and a church located opposite the southeast portion of the Site. The residences and hatchery front onto Northside Drive. The church fronts onto Hawkesville Road. The northern half of the Site is a woodlot/wetland, which is then bounded by residential and agricultural land further to the north.

2.3 Topography and Drainage

The existing topography of the Site and regional area is shown on **Figure 2.2**. The Site is at an elevation ranging from approximately 345 to 348 metres above mean sea level (mAMSL). Sloping at the Site starts along the northwest to southeast oriented topographic ridge in the southern portion of the Site, which is at an elevation of approximately 348 mAMSL. From this ridge, topography slopes to north and northeast towards the woodlot/wetland area in the northern portion of the Site, and slopes to the south and southwest towards Conestogo River to the south of the Site. Topographic relief between the Site and the Conestogo River is over 20 metres (m).

The topographic ridge represents a surface water flow divide on the Site. Drainage from the approximate northern two-thirds of the Site occurs from the ridge to the north and northeast towards the woodlot/wetland area. Besides the woodlot/wetland area, there are no other surface water features on the Site. The woodlot/wetland area outlets to Municipal Drain No. 11 that extends from the northeast corner of the Site and flows to the east beneath Arthur Street. Drainage from the approximate southern one-third of the site occurs from the ridge to the south and southwest towards Conestogo River.

2.4 Physiography and Regional Geology

The regional overburden (surficial) geology is illustrated on **Figure 2.3**. As shown on **Figure 2.3**, the surficial soil at the Site primarily consists of a clay to silt textured till derived from glaciolacustrine deposits or shale with smaller portions of the site to the north and east consisting of sandy glaciofluvial deposits derived from river deposits and delta topset facies.

The Site is located within the Till Plains (Drumlinized) physiographic region, as illustrated on **Figure 2.4**. The Till Plains physiographic region surrounds the entirety of the Site and covers the area to the north of the Site. To the south of the Site, the Spillways physiographic region surround the area to the north and south of the Conestogo River.

2.5 Well Survey and Source Water Protection

Figure 2.5 shows the locations of private water wells recorded by the Ministry of the Environment, Conservation and Parks (MECP) Water Well database within 500 m of the southern half of the Site (where the development is focused). The MECP Water Well database includes records of existing and historic water wells which include general descriptions of the geology encountered during drilling as well as identification of any significant water bearing zones.

MECP well records for private water supply wells within 500 m of the Site are included in **Appendix B**. The private wells range in depth from 47.7 to 63.1 mBGS and are screened in bedrock. Two exceptions to this are well 6502667 approximately 450 m southeast of the proposed Site development and well 6503087 approximately 300 m east of the proposed Site development that have shallow depths of 7.3 and 6.1 mBGS, respectively, and are screened in sand.

Figure 2.6 shows the location of municipal water supply wells that are located approximately 1.5 kilometres (km) to the north of the Site and approximately 2 km east of the Site. **Figure 2.6** shows the Wellhead Protection Areas (WHPAs) developed for these municipal wells under Ontario's Source Water Protection (SWP) program, as well as vulnerable aquifers defined under the SWP program. The Site is located beyond both WHPAs and the Site does not contain any vulnerable aquifers.

2.6 Surface Water Features

Besides the woodlot/wetland area in the northern portion of the Site, which will remain intact as open space post-development, there are no other surface water features on the Site as shown on **Figure 2.7**. The woodlot/wetland area outlets to Municipal Drain No. 11 that extends from the northeast corner of the Site and flows to the east beneath Arthur Street. Beyond the southwest corner of the Site, there is an unnamed tributary that connects to Conestogo River. The northwest to southeast oriented topographic ridge in the southern portion of the Site that is apparent on **Figure 2.2** corresponds to the watershed boundary between the Conestogo River and Municipal Drain No. 11 watersheds, as shown on Drawing 1 of 2 presented in Headway Engineering (2023)² and included in **Appendix A**.

3. Field Investigation Methodology

The Site-specific geology and hydrogeology presented in the following sections are based on the results of the subsurface investigation undertaken at the Site, which is described in **Sections 3.1 to 3.4**.

3.1 Borehole Advancement and Monitoring Well Installation

Between April 9 to 12, 2024, 10 boreholes were advanced on Site and were completed as monitoring wells. The locations of the monitoring wells installed on Site are shown in **Figure 3.1**. **Figure 3.1** also includes locations of pre-existing monitoring wells installed in December 2021 on the northeastern portion of the Site by Chung & Vander Doelen Engineering LTD. (CVD) as a separate scope of work. The stratigraphic and instrumentation records for the CVD monitoring wells are included in **Appendix A**. Stratigraphic and groundwater elevation data from the CVD monitoring wells have been incorporated into this Hydrogeological Assessment, where applicable.

Prior to beginning subsurface work, the Site was cleared for public underground utilities using Ontario One Call. MultiVIEW Locates Inc. (MultiVIEW) from Mississauga, Ontario was retained to complete private utility locates for each individual borehole location.

Aardvark Drilling Contractor Services (Aardvark) from Guelph, Ontario was retained to advance 10 boreholes for completion as groundwater monitoring wells using a CME 75M (N) track mounted drill rig. Boreholes were advanced using 8-inch outer diameter hollow stem auger methods. Soil samples were collected continuously every 1.5 – 2.0 feet to termination depths of the borehole using a 2-foot-long split spoon sampler, in general accordance with the specifications of the Standard Penetration Test (SPT).

Drilling was completed under GHD supervision and soil was logged by GHD staff according to the modified Unified Soil Classification System (USCS). Additionally, at each borehole location, the relative density or consistency of the soil layers were measured by counting the number of SPT blows ('N' values) required to

² Headway Engineering, 2023. Municipal Drain No. 11, Prepared for: Woolwich Township, April 28.

drive a conventional split-barrel soil sampler a vertical distance of 1 foot. If more than 25 blows were required to advance the split barrel 6 inches, SPT was stopped, and 'N' values were noted as refusal. Drilling extended to a maximum depth of approximately 6.7 mBGS.

Monitoring wells were constructed with 2-inch diameter, schedule 40 polyvinyl chloride (PVC) screen, and completed with 50 mm diameter PVC riser pipe and J-plug. Well screens ranged from 5 to 10 feet in length, based on the total depth of the borehole and the inferred saturated layers. A lockable protective casing with a concrete collar was placed around each of the monitoring wells upon completion.

The monitoring well locations were chosen to provide representation of hydrogeologic conditions across the Site. The monitoring wells were developed until the purged groundwater was visibly clear of sediment to ensure groundwater elevations and samples collected from the wells were representative of the surrounding groundwater flow system. Well development for monitoring wells MW8-24, MW9-24, and MW10-24 extended to December 2024 due to the lower permeability silt to silty clay till screened by these wells.

The stratigraphic and instrumentation records for each GHD monitoring well are presented in **Appendix C**. **Table 1** provides a summary of the monitoring well completion details (including the CVD monitoring wells).

In addition to the CVD monitoring wells, MTE Consultants Inc. (MTE) advanced six boreholes at the Site in September 2023 as a part of a separate scope of work. The locations and stratigraphic logs for these boreholes are included in **Appendix A**. The stratigraphic data from the MTE boreholes have not been incorporated into this Hydrogeological Assessment since several of the GHD monitoring wells were installed at similar locations as the MTE boreholes and the GHD monitoring wells have more comprehensive Site stratigraphy data due to the increased frequency of soil sampling completed during borehole drilling.

3.2 Groundwater Elevation Monitoring

GHD obtained manual depth to groundwater measurements (providing manual groundwater elevations at the time of measurement) across the monitoring network on eight separate occasions, as follows:

- April 16, 2024 immediately after well installation
- May 1, July 18, October 11, and November 28, 2024 after development of monitoring wells MW1-24 to MW7-24
- December 13, 2024, and January 16 and April 8, 2025 after completing development of monitoring wells MW8-24 to MW10-24.

Prior to December 13, 2024 event, groundwater elevations were measured at all GHD monitoring wells even though well development had not been completed at monitoring wells MW8-24 to MW10-24³.

Prior to the April 18, 2025 monitoring event, GHD obtained to access the CVD monitoring wells installed in the eastern portion of the property. The April 18, 2025 monitoring event included the CVD monitoring wells.

Table 2 presents the manual groundwater elevation measurements collected during the Hydrogeological Assessment.

A VanEssen TD-Diver (Diver) pressure transducer was installed in seven of the monitoring wells (MW1-24 to MW7-24) on May 2, 2024, and in three of the monitoring wells (MW8-24 to MW10-24) on December 13, 2024 (once development of these wells was completed). The pressure transducers were set to record groundwater elevations hourly. The pressure transducers provide continuous groundwater elevation monitoring and allow for evaluation of seasonal groundwater elevation fluctuations. The manual groundwater elevation measurements allow for validation of the transducer measured groundwater elevations.

CVD also installed Diver pressure transducers monitoring wells BH1, BH3, BH5, and BH10. CVD set these transducers to record groundwater elevations every six hours. These pressure transducers had been recording groundwater elevations beginning in December 2021 to April 2022. CVD provided both their manual and

³ Note that only groundwater elevations measured after well development are considered representative of actual groundwater elevation conditions.

transducer measured groundwater elevations. CVD's table of manual groundwater elevations and hydrographs of pressure transducer measured groundwater elevations are provided in **Appendix A**. CVD provided their groundwater elevation data electronically to GHD, and these data have been incorporated into the Hydrogeological Assessment.

The groundwater elevation data are evaluated in **Section 4.2**.

3.3 Single Well Response Testing

In-situ hydraulic response testing, referred to as single well response tests (SWRT), are typically completed to estimate the horizontal hydraulic conductivity of groundwater bearing deposits. SWRTs involve the injection or removal of a known volume of water into/from the well and measuring the water level response in the well until it returns to static conditions (i.e., falling/rising head test).

GHD completed SWRTs on monitoring wells chosen to be representative of the shallow groundwater zone beneath the Site. SWRTs were undertaken at seven of the monitoring wells (MW1-24 to MW7-24) to estimate the hydraulic conductivity of the geologic material screened by each monitoring well. If the screens covered more than one geologic unit, hydraulic testing results are representative of the most conductive (i.e., most permeable) material. There were between 4 to 8 SWRTs conducted on each monitoring well that was tested. Each test included inducing a sudden change in static groundwater elevation and observing the recovery of groundwater back to static levels. The sudden change in groundwater elevations were induced by introducing and subsequently removing a solid slug of PVC, displaces a known volume of groundwater within the well casing. Changes in groundwater levels were observed continuously using the Diver transducers throughout each test.

The results of the hydraulic testing were analyzed using the Bouwer and Ricer (1976)⁴ solution for unconfined conditions using the software AQTESOLV™. These solutions were used to estimate the horizontal hydraulic conductivity of the geologic material intersected the screened interval of each monitoring well. Individual SWRT results with geometric mean hydraulic conductivity values for each of the tested summarized in **Table 3**. The AQTESOLV™ output for the analysis of each test is included in **Appendix D**.

The hydraulic conductivity data are used to estimate groundwater flow rates within the shallow groundwater zone beneath the Site in **Section 4.2**.

3.4 Groundwater Quality

Groundwater quality samples were collected from select monitoring wells (MW1-24, MW4-24, and MW7-24) on October 11, 2024. Samples were collected for the laboratory analysis of metals (dissolved) and general chemistry parameters. A duplicate sample and a trip blank were submitted for quality assurance/quality control.

The groundwater samples were submitted under chain of custody procedures to ALS Environmental Laboratories (ALS) of Waterloo, Ontario a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory. The laboratory certificate of analysis is provided in **Appendix E**.

The laboratory analytical results for the groundwater samples are summarized in **Table 4** and are compared to the MECP Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition (MEPC, 2011)⁵ (MECP Table 2 Standards).

The evaluation of the groundwater sampling results is presented in **Section 4.2**.

⁴ Bouwer, H. and Rice, R.C., 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, *Water Resources Research*, vol 12, no. 3, pp. 423 – 428.

⁵ MECP, 2011. "Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act", April 15, referenced in Ontario Regulation 153/04 (Records of Site Condition).

4. Summary of Site-Specific Geologic, and Hydrogeologic Conditions

The following sections provide a description of the geologic and hydrogeologic conditions beneath the Site, based on the available previous Site assessments and the GHD investigations and groundwater monitoring. Geologic Cross-Sections A-A' and B-B' were prepared based on the data collected. The cross-section locations are shown on **Figure 3.1**, and Cross-Sections A-A' and B-B' are presented on **Figures 4.1** and **4.2**, respectively.

As described in **Section 1.2**, the Hydrogeologic Assessment is focused on characterizing geology and groundwater elevation/flow conditions within the uppermost (i.e., shallow) groundwater zone encountered beneath the Site. As a result, the summary of Site-specific geologic and hydrogeologic conditions is limited to overburden to depth of approximately 6.7 mBGS, which is the maximum depth of investigations completed to support this Hydrogeological Assessment.

4.1 Overburden Site Geology

The overburden stratigraphy at the Site is primarily described using data from the GHD investigations. Additional data from CVD investigations is used to supplement the GHD observations. Stratigraphy can be generally characterized as a heterogeneous layering of:

- Surficial Soil (0 to less than 0.5 mBGS) – Topsoil
- Medium to fine Grained Glaciofluvial Deposits – Sand
- Fine Grained Glaciolacustrine Deposits – Silty sand, sandy silt, clayey sand
- Till – Clayey silt till to silt till

The overburden stratigraphy described above appears generally consistent across the northern half of the proposed Site development (north of MW7-24). In the southern half of the proposed Site development (south of MW7-24), the sand stratigraphy thins as the top surface of the silt and till rises to be closer ground surface, as shown on **Figure 4.1**.

Surficial Soil

A thin layer of topsoil was noted at all monitoring locations ranging from 0.15 to 0.76 m in thickness. The topsoil was characterized as being a sandy dark brown to black soil, with trace gravel and organics.

Coarse- to Medium-Grained Glaciofluvial Deposits

Beneath the surficial soil a layer of coarse- to fine-grained sand was encountered. The sand layer was characterized as being poorly to well graded as the layer increased with depth. The well graded sand contained coarser grained materials while the poorly graded sand typically had a higher fine-grained content. The sand layer extended to depths up to 3.96 mBGS at MW4-24. The sand layer was encountered below a shallow fine-grained layer (consisting of a clay, to silty sand, to sandy silt) at the monitoring wells located in northwest of the property (MW1-24, MW2-24, MW3-24). At BH10 at the southeast corner of the woodlot/wetland area, a sand layer was also encountered below a shallow fine-grained layer (consisting of a silty sand). It is likely the sand and gravel layer continues beneath the woodlot/wetland area in the northern portion of the Site.

Fine-Grained Glaciolacustrine Deposits

A discontinuous layer of fine-grained glaciolacustrine deposits was encountered below the sand layer. The fine-grained layer was observed to consist of a clay, to silty sand, to sandy silt. The fine-grained material was typically characterized by having higher SPT 'N' values than the coarse-grained material. As described above, the coarse-grained materials were observed below the fine-grained deposits at boreholes in the northern

portion of the proposed Site development. Additionally, thin seams of coarse-grained materials were noted in the fine-grained deposits at boreholes MW5-24 and MW6-24.

Till

Beneath both the coarse- and fine-grained materials, a layer of till (or clay) was encountered and extended to the depth of completion of the boreholes. The till layer primarily consisted of silt and clay with trace sand, gravel and cobbles. The till layer was characterized by having SPT 'N' values greater than 25, indicating a very high degree of stiffness. The shallowest the till layer was encountered occurred at MW10-24 where the till layer started at 1.83 mBGS and continued to borehole completion at 6.10 mBGS. As shown on **Figure 4.1**, the top of the till layer increases in depth towards the north end of the proposed Site development.

4.2 Site Hydrogeology

The Site is underlain by a coarse-grained glaciofluvial deposit, a fine-grained glaciofluvial deposit, and a till unit. The shallow groundwater zone is located within the glaciofluvial units, and the till unit forms a base to the shallow groundwater zone. The following sections describe the Site hydrogeology relative to the shallow groundwater zone.

4.2.1 Groundwater Elevation Monitoring Results

Table 2 presents the manual groundwater elevation measurements collected during the Hydrogeological Assessment. **Table 2** also shows the depth to groundwater below ground surface for each monitoring event. **Table 2** shows that groundwater is most shallow during winter and spring months (January to May) ranging from approximately 0.3 to 2.9 mBGS with an average of approximately 0.8 mBGS. The depth to groundwater increases during summer and fall months (June to December) with an average of approximately 1.7 mBGS.

The groundwater elevations from the pressure transducers and the manually measured groundwater elevations were plotted on a series of hydrographs for each monitoring well. The hydrographs include the ground surface elevation at each monitoring well. The hydrographs also include daily precipitation obtained from the Environment Canada weather station in Elora, Ontario⁶. The hydrographs are presented on **Figures F.1 to F.10 of Appendix F** for the GHD monitoring wells and on **Figures F.11 to F.17 of Appendix F** for the CVD monitoring wells. The hydrographs for the GHD monitoring wells extend from May 2024 to April 2025. The hydrographs for the CVD monitoring wells extend from December 2021 to April 2025 (and includes the previous monitoring data collected by CVD presented in **Appendix A**, which CVD provided electronically to GHD).

Similar to the depth to groundwater measurements shown in **Table 2**, the hydrographs show seasonally high groundwater elevations during winter and spring, and lowered groundwater elevations during summer and fall. The hydrographs for the CVD monitoring wells span approximately 3.25 years and consistently show this pattern of seasonal groundwater elevation variations.

Figures F.2 (MW2-24), F.5 (MW5-24), F.6 (MW6-24), and F.7 (MW7-24) show groundwater elevations periodically above ground surface in January to April 2025. MW2-24, MW5-24, MW6-24, and MW7-24 (in the northern, central, and west-central portions of the proposed Site development) have well screens within the sand unit and the sand unit extends to ground surface. Thus, at MW2-24, MW5-24, MW6-24, and MW7-24, the groundwater elevations above ground surface indicate potential flooded conditions for brief time periods (i.e., days) at the location of these monitoring wells during wet conditions in winter and spring.

⁶ https://climate.weather.gc.ca/climate_data/daily_data_e.html?hlyRange=2003-09-09%7C2025-04-24&dlyRange=2003-10-01%7C2025-04-24&mlyRange=2003-10-01%7C2006-12-01&StationID=41983&Prov=ON&urlExtension=_e.html&searchType=stnName&optLimit=yearRange&StartYear=1840&EndYear=2025&selRowPerPage=25&Line=5&searchMethod=contains&Month=4&Day=24&txtStationName=elora&timeframe=2&Year=2025&time=LST

Figures F.3 (MW3-24), **F.4** (MW4-24), **F.9** (MW9-24), **F.11** (BH1), and **F.15** (BH5) show groundwater elevations within less than approximately 0.2 mBGS in March and April 2025.

The hydrographs show rapid groundwater elevation increases in response to larger rainfall events. This is consistent with the shallow depth to groundwater across the Site.

The hydrographs show an influence of groundwater pumping, where groundwater elevations decrease, or are drawn down, rapidly during the summer months while pumping occurs. Then groundwater elevations increase, or recover, rapidly when pumping ceases in December. The influence of groundwater pumping is most prominent at BH5 (**Figure F.15**) where the greatest amount of drawdown (approximately 4 m) occurs in the fall of 2022, 2023, and 2024. Groundwater elevation drawdown due to pumping is apparent in all hydrographs across the Site, with the possible exception of MW8-24, MW9-24, and MW10-24. These monitoring wells are screened within lower permeability fine-grained silt and till in the southwestern portion of the Site that likely limits the lateral propagation of drawdown due to pumping.

Figure 2.5 shows the two water wells 6502672 and 6503543 in close proximity to BH5. The MECP well records for these wells show they are 46.6 and 58.2 mBGS, respectively, and screened in bedrock. Despite this, based on their close proximity to BH5 (within approximately 150 m), it would appear that groundwater pumping from one, or both, of these water wells creates the drawdown observed across the Site in the shallow groundwater zone. These two water wells were installed in the 1960s and it is possible that there is no seal between the well casing and overburden. In this case, a hydraulic connection between the shallow groundwater zone and bedrock could exist along the well casing exterior such that bedrock pumping draws some groundwater from the shallow groundwater zone. Pumping information for the two water wells is not publicly available.

The hydrograph for monitoring well BH10 (**Figure F.17**) in the southeast corner of the woodlot/wetland area shows that peak groundwater elevations, during wet conditions in winter and spring, remain at least approximately 1.5 mBGS at this location. This supports that groundwater discharge from the shallow groundwater zone to the woodlot/wetland area does not occur. Thus, the woodlot/wetland area appears to be sustained by surface water runoff from surrounding areas.

4.2.2 Groundwater Flow Direction and Hydraulic Gradient

Figure 4.3, **Figure 4.4**, and **Figure 4.5** present interpreted groundwater elevation contours at the Site for the monitoring events on November 28, 2024, January 16, 2025, and April 8, 2025. As presented on **Figure 4.3** to **Figure 4.5**, groundwater flow at the Site is split into two major components with an apparent northwest to southeast oriented groundwater flow divide in the southern portion of the Site, approximately corresponding to the locations of MW5-24, MW6-24 and MW9-24. The groundwater flow divide coincides with the northwest to southeast oriented topographic ridge in the southern portion of the Site that is apparent on **Figure 2.2**. North of the divide, groundwater flow is directed to the north and northeast towards the woodlot/wetland area. South of the divide, groundwater flow is directed to the southwest towards the unnamed tributary described in **Section 2.6** that connects to Conestogo River. This general groundwater flow pattern appears to persist at the Site regardless of seasonal variations and pumping influences.

Groundwater flow to the north-northeast occurs at an average horizontal hydraulic gradient of approximately 0.01 metres per metre (m/m). Groundwater flow to the southwest occurs at an average horizontal hydraulic gradient of approximately 0.018 m/m. The steeper horizontal hydraulic gradient to southwest is consistent with groundwater flowing through the lower permeability fine-grained silt and till in the southwestern portion of the Site.

Figure 4.6 shows the interpolated depth to groundwater below ground surface throughout the proposed Site development based on the groundwater elevation contours for April 8, 2025 presented on **Figure 4.5**. The April 8, 2025 groundwater elevations approximately reflect seasonally high groundwater elevations (i.e., wet conditions), although the hydrographs show that higher groundwater elevations occurred for short durations prior to April 8, 2025 (e.g., see **Figure F.7** for the hydrograph for MW7-24). Similar to the hydrographs,

Figure 4.6 shows that the depth to groundwater is shallow across the Site ranging from approximately 0.2 to 1.8 mBGS.

4.2.3 Hydraulic Testing Results and Groundwater Flow Velocity

A summary of the SWRT results is provided in **Table 3**. Copies of the SWRT analysis are included in **Appendix D**.

Based on the results of the SWRTs, the hydraulic conductivity of the shallow soils ranges between 1.55×10^{-4} centimetres per second (cm/s) to 4.46×10^{-2} cm/s with a geometric mean value of 1.08×10^{-3} cm/s. The maximum hydraulic conductivity (4.46×10^{-2} cm/s) occurring at MW1-24 is consistent with that of a sand and gravel screened by MW1-24 and the geometric mean (1.08×10^{-3} cm/s) is consistent with that of a sand to silty sand.

Hydraulic testing was not completed at monitoring wells MW8-24, MW9-24, and MW10-24. These three wells are screened in the fine-grained silt and till in the southwestern portion of the. The hydraulic conductivity at these wells is anticipated to be at least one order-of-magnitude lower than the hydraulic conductivity determined at the other monitoring wells.

For groundwater flow to the north-northeast within the shallow groundwater zone, applying Darcy's Law with the geometric mean hydraulic conductivity (K) of 1.08×10^{-3} cm/s, horizontal hydraulic gradient (i) of 0.01 m/d, and an effective soil porosity (n_e) of 0.25 for sand (Fetter, 2001)⁷, the average linear groundwater flow velocity ($q = [K \times i] \div n_e$) is estimated to be approximately 13.6 metres per year (m/yr).

For groundwater flow to the southwest within the shallow groundwater zone, applying Darcy's Law with the minimum hydraulic conductivity of 1.55×10^{-4} cm/s, horizontal hydraulic gradient of 0.018 m/d, and an effective soil porosity (n_e) of 0.3 for silt and till (Fetter, 2001), the average linear groundwater flow velocity is estimated to be approximately 2.9 m/yr.

4.2.4 Groundwater Quality

Table 4 summarizes the laboratory analytical results for the groundwater samples collected at the Site. The groundwater samples were analysed for general chemistry, nutrients, and metals (dissolved). The groundwater quality results were evaluated with respect to the MECP Table 2 Standards in **Table 4**. No parameters were detected above the MECP Table 2 Standards, which is consistent with the agricultural use of the Site.

5. Impact Assessment

As shown on **Figure 2.5**, several private water wells exist in the Site vicinity. The bulk of these water wells are completed in bedrock at 47.7 to 63.1 mBGS, with two shallow water wells (6502672 and 6503543) located southeast and east of the Site completed in sand at 6.1 to 7.3 mBGS. The proposed Site development will not involve any significant dewatering of the shallow groundwater zone, either during construction or post-development. Given this, and that the majority of the water wells are completed in bedrock, the proposed Site development is not expected to result in any impacts to the water wells through lowering of groundwater elevations in the shallow groundwater zone.

As shown on Figure 2.6, municipal water supply wells are located approximately 1.5 km to the north of the Site and approximately 2 km east of the Site. The Site is located beyond the WHPAs for these municipal wells developed under Ontario's SWP program. Additionally, the Site does not contain any vulnerable aquifers, as identified under the SWP program

⁷ Fetter, C.W., 2001. Applied Hydrogeology, 4th ed., Upper Saddle River, New Jersey: Prentice-Hall Inc.

GHD (2025)⁸ completed a feature-based water balance analysis for the woodlot/wetland area in the northern portion of the Site to assess the potential impacts of the proposed Site development on the hydrological function of the woodlot/wetland area and Municipal Drain No. 11 that is the outlet for the woodlot/wetland area. The results of the analysis show only minor changes to the surface water flow contributions to the woodlot/wetland area and show no changes to the hydrological function of Municipal Drain No. 11 due to the proposed Site development.

Relative to pre-development conditions, the water balance analysis presented in GHD (2025) shows a reduction in infiltration due to the proposed Site development (i.e., post-development). This may result in some limited lowering of shallow groundwater elevations beneath the Site. However, any lowering of shallow groundwater elevations beneath the Site will not have an impact on the woodlot/wetland area. As described in **Section 4.2.1**, groundwater elevations at BH10 in the southeast corner of the woodlot/wetland area under wet conditions in winter and spring remain at least approximately 1.5 mBGS at this location. This supports that groundwater discharge from the shallow groundwater zone to the woodlot/wetland area does not occur and that the woodlot/wetland area is sustained by surface water runoff.

The Woolwich Township Engineering Development and Infrastructure Manual (Woolwich Township, 2022)⁹ states that:

- Footings for foundations of residential and non-residential buildings require a 0.6 m minimum separation from fluctuations in the groundwater table (i.e., 0.6 m minimum separation from the seasonally high groundwater table)
- The underside of basement floors for walk-out residential and non-residential buildings require a 0.8 m minimum separation from fluctuations in the groundwater table (i.e., 0.8 m minimum separation from the seasonally high groundwater table)

The groundwater elevation data collected to date show that, under seasonally wet conditions during winter and spring, the groundwater table depth is shallow across the Site ranging from approximately 0.2 to 1.8 mBGS. The shallow depth to groundwater will need to be accounted for in developing the grading design for the proposed Site redevelopment to meet the separation requirements between building footings and the seasonally high groundwater table.

6. Summary of Findings

Based on the findings of this Hydrogeological Assessment, the following summary of results is provided:

1. There are no surface water features on the Site, with the exception of a woodlot/wetland area in the northern portion of the Site that will remain intact as open space post-development. The woodlot/wetland area outlets to Municipal Drain No. 11 northeast of the Site. The feature-based water balance analysis for the woodlot/wetland area presented in GHD (2025) shows only minor changes to the surface water flow contributions to the woodlot/wetland area and shows no changes to the hydrological function of Municipal Drain No. 11 due to the proposed Site development.
2. MECP well records show that several private wells exist within a 500 m radius of the proposed Site development. The private wells range in depth from 47.7 to 63.1 mBGS and are screened in bedrock. Two exceptions to this are well 6502667 approximately 450 m southeast of the proposed Site development and well 6503087 approximately 300 m east of the proposed Site development that have shallow depths of 7.3 and 6.1 mBGS, respectively, and are screened in sand. The proposed Site development will not involve any significant dewatering, either during construction or post-development. Given this, and that the majority of the water wells are completed in bedrock, the proposed Site development is not expected to

⁸ GHD, 2025. Preliminary Feature-Based Water Balance Assessment, Technical Memorandum, St. Jacobs Lands, April.

⁹ Woolwich Township, 2022. Engineering Development and Infrastructure Manual, March 28.

result in any impacts to the water wells through any lowering of groundwater elevations in the shallow groundwater zone beneath the Site.

3. Municipal water supply wells are located approximately 1.5 km to the north of the Site and approximately 2 km east of the Site. The Site is located beyond the WHPAs for these municipal wells developed under Ontario's SWP program. Additionally, the Site does not contain any vulnerable aquifers, as identified under the SWP program.
4. The Site is underlain by a coarse-grained glaciofluvial deposit, a fine-grained glaciofluvial deposit, and a till unit. The groundwater table, referred to as the shallow groundwater zone, is located within the glaciofluvial units, and the till unit forms a base to the shallow groundwater zone. The till was encountered to the maximum depth investigated at the Site of approximately 6.5 mBGS.
5. The groundwater elevation data collected to date show that, under seasonally wet conditions during winter and spring, the depth to groundwater is shallow across the Site ranging from approximately 0.2 to 1.8 mBGS.
6. There is an apparent northwest to southeast oriented groundwater flow divide in the southern portion of the Site that coincides with the northwest to southeast oriented topographic ridge in this area. North of the divide, groundwater flow is directed to the north and northeast towards the woodlot/wetland area. South of the divide, groundwater flow is directed to the southwest towards an unnamed tributary southwest of the Site. The unnamed tributary connects to Conestogo River located approximately 0.5 km south of the Site.
7. Continuous groundwater elevation monitoring shows the influence of groundwater pumping on the shallow groundwater zone during the summer and fall. Likely, this is due to pumping of one of two, or both, private water wells east of the Site, which are screened in bedrock at approximately 50 mBGS. These wells were installed in the 1960s and it is possible there is no seal between the well casing and overburden resulting in a hydraulic connection between the shallow groundwater zone and bedrock along the well casing exterior such that bedrock pumping draws some groundwater from the shallow groundwater zone.
8. Groundwater samples were collected from the shallow groundwater zone for the laboratory analysis of general chemistry, nutrients, and metals (dissolved). The laboratory analytical results meet the MECP Table 2 Standards.
9. The groundwater elevation monitoring completed to date show that groundwater discharge to the woodlot/wetland area from the shallow groundwater zone does not occur and that the woodlot/wetland area is sustained by surface water runoff. Thus, while the water balance analysis presented in GHD (2025) shows a reduction in infiltration due to the proposed Site development, any lowering of shallow groundwater elevations beneath the Site due to reduced infiltration will not have an impact on the woodlot/wetland area.
10. The groundwater elevation data collected to date show that, under seasonally wet conditions during winter and spring, the groundwater table depth is shallow across the Site ranging from approximately 0.2 to 1.8 mBGS. The shallow depth to groundwater will need to be accounted for in developing the grading design for the proposed Site redevelopment to meet the separation requirements between building footings and the seasonally high groundwater table. Woolwich Township requires a 0.6 m minimum separation for footings of foundations for residential and non-residential buildings, and a 0.8 m minimum separation for the underside of basement floors for walk-out residential and non-residential buildings.

Regards



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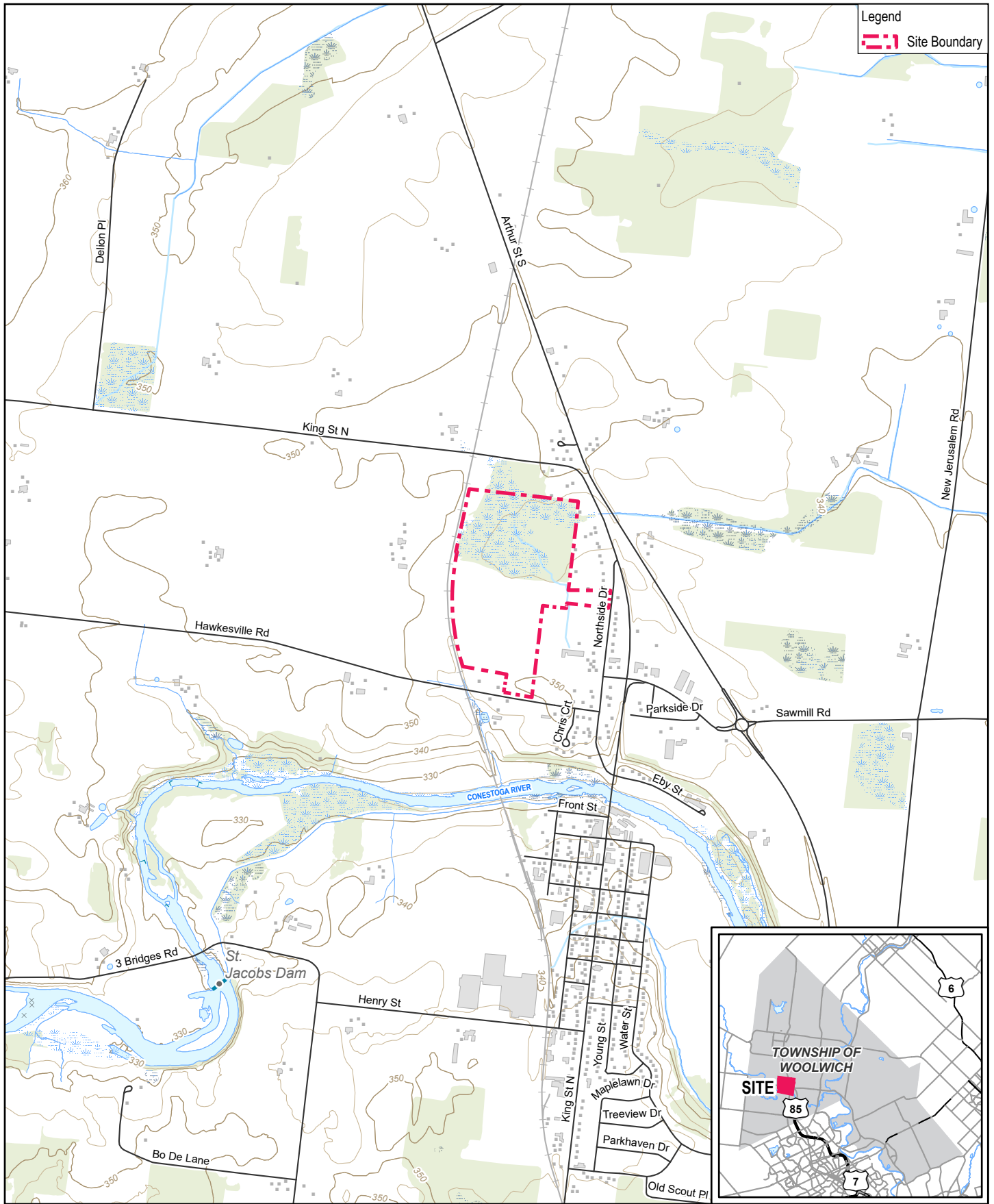
Steven M. Harris, M.A.Sc., P.Eng. (ON), PE (MI)
Principal/Technical Director
(519) 504-7027
steve.harris@ghd.com

Copy to: Matt Ninomiya/Erika Woods, Walterfeddy

Encl.

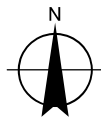
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Figure 1.2 – Development Concept
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Figure 2.2 – Topography
Figure 2.3 – Surficial Geology
Figure 2.4 – Physiography
Figure 2.5 – MECP Water Well Records
Figure 2.6 – Well Head Protection Area
Figure 2.7 – Surface Water Features
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Figures



Paper Size ANSI A
 0 200 400 600
 Metres

Map Projection: Transverse Mercator
 Horizontal Datum: North American 1983
 Grid: NAD 1983 UTM Zone 17N



SCHLEGEL URBAN DEVELOPMENTS CORP.
ST. JACOBS LANDS
ST. JACOBS, ON

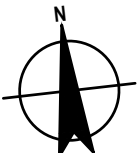
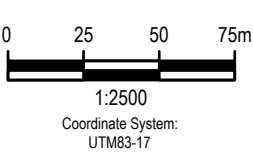
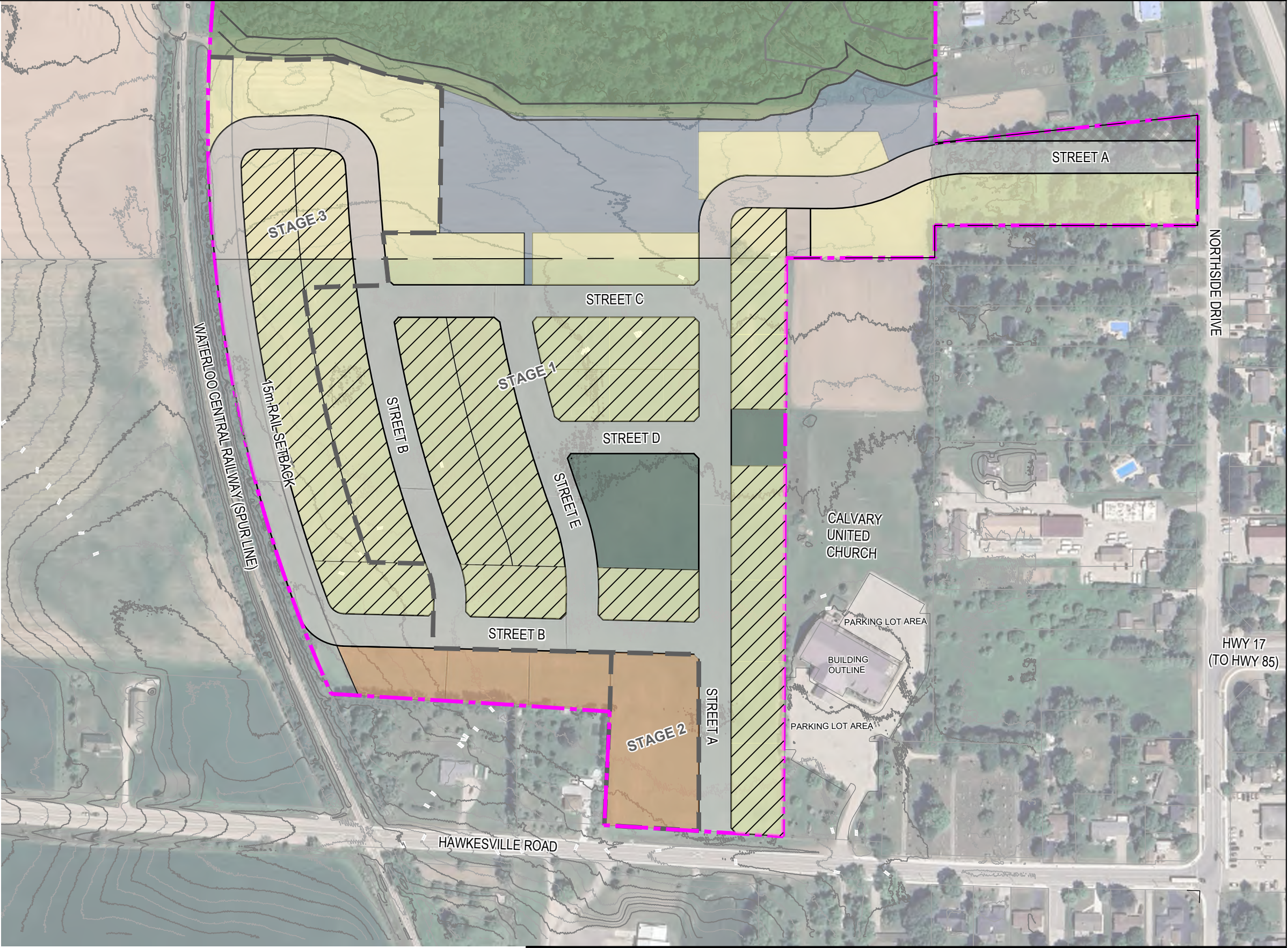
Project No. 12637434
 Revision No. -
 Date Apr 22, 2025

SITE LOCATION MAP

FIGURE 1.1

LEGEND

- SITE BOUNDARY
- PROPOSED PHASE LIMIT
- LOW DENSITY RESIDENTIAL
- LOW DENSITY/SEMIS/TOWNS RESIDENTIAL
- STREET TOWNS
- MULTI-RESIDENTIAL
- PARK
- STORMWATER MANAGEMENT



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ST. JACOBS, ON

Project No. 12637434
Date May 2025

DEVELOPMENT CONCEPT

FIGURE 1.2

/HJHQG
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 \$VVHVVPHQW 3D
 :DWHUFRXUVH
 :DWHUERG
 6KRUHOLQH



0HWUHV

0DS 3URMHFWLRQ 7UDQVYHUVH OHUF
 +RULJRWDO 'DWXP 1RUWK PHULFDC
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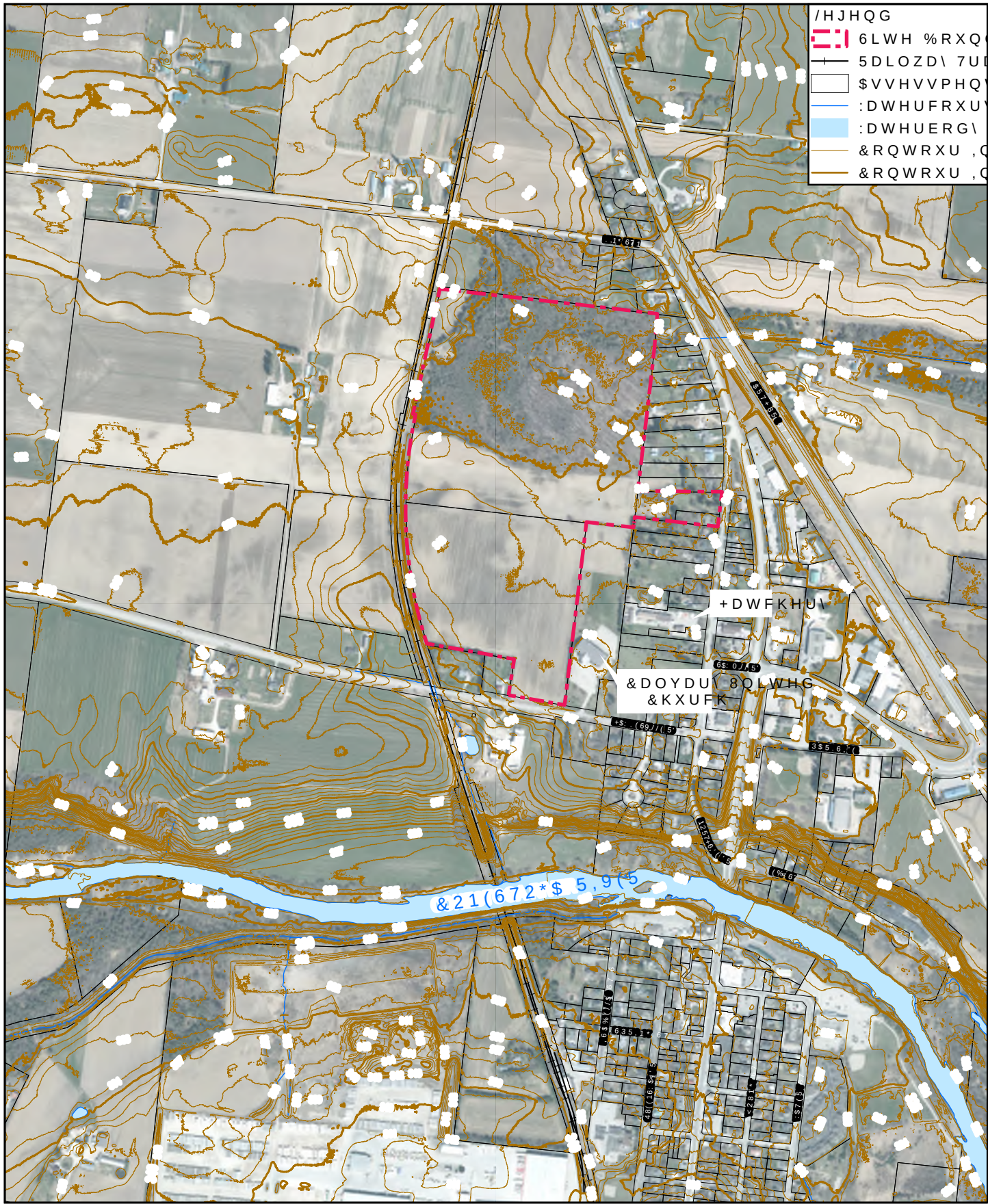


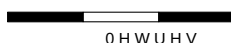
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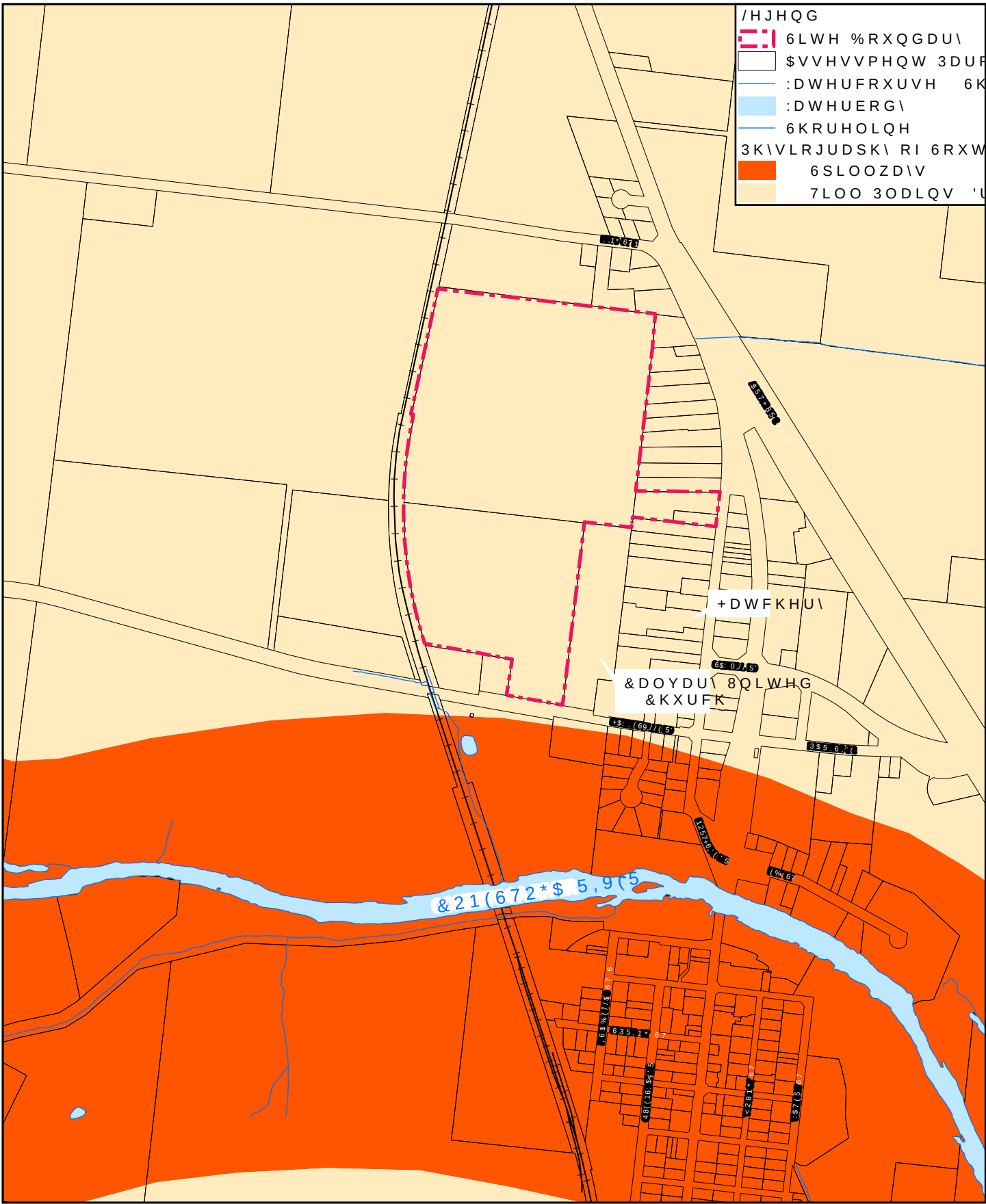
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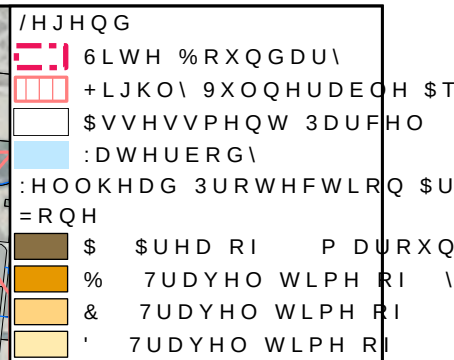
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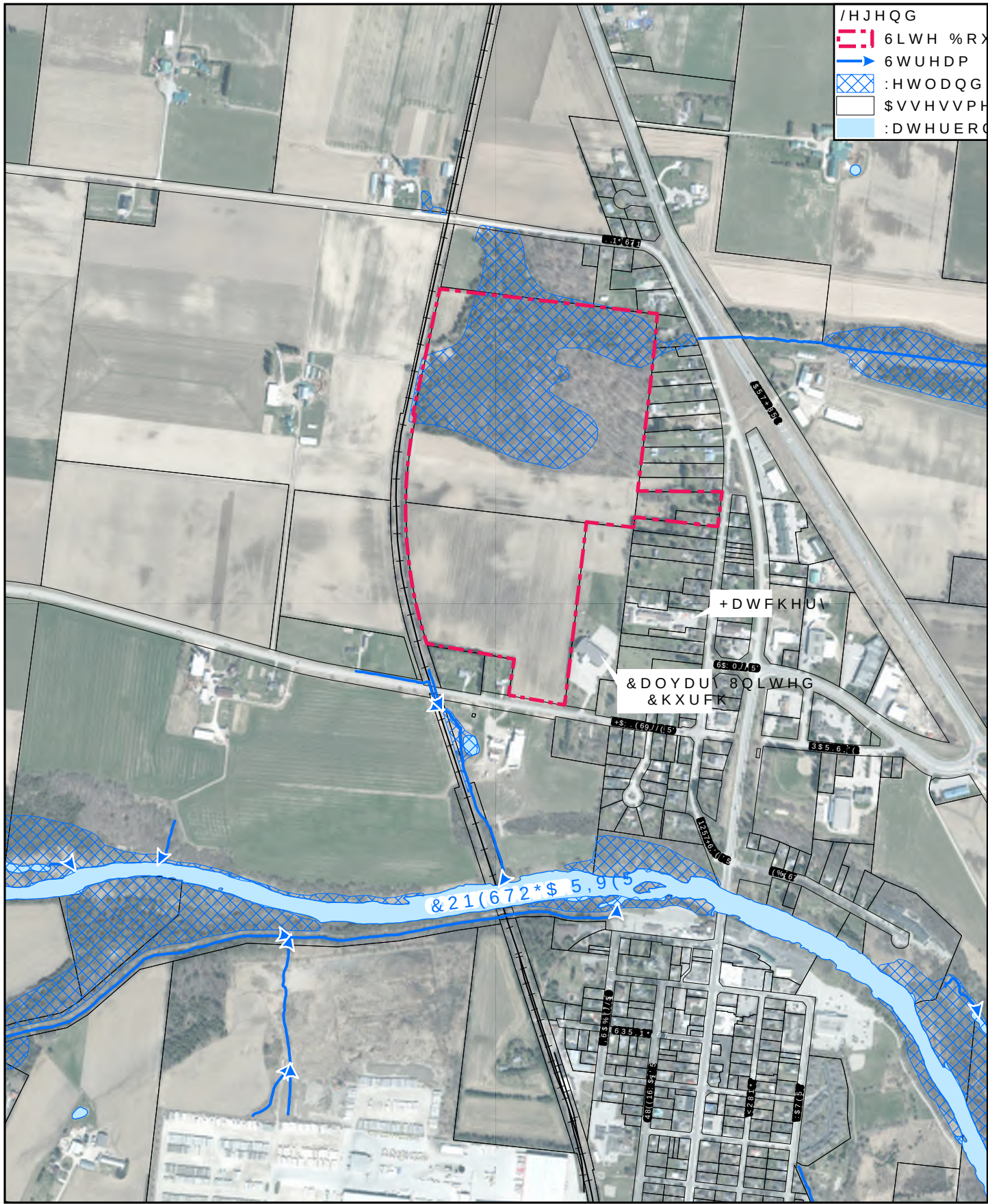




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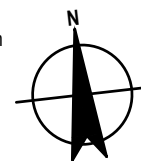
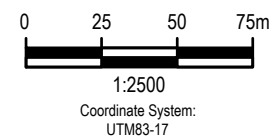
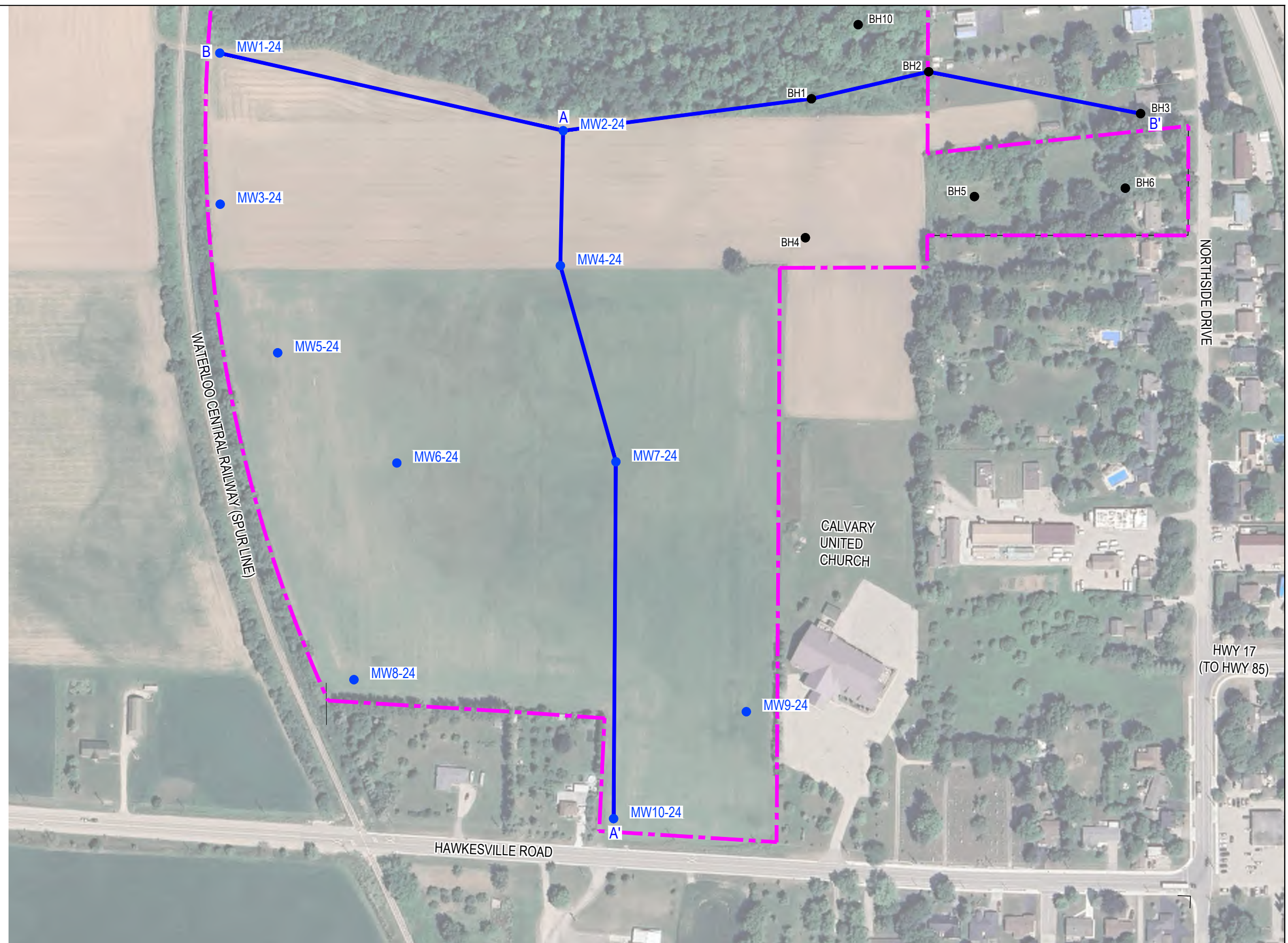


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3ULQW GDWH \$SU RQ \$SU

- LEGEND**
- SITE BOUNDARY
 - MONITORING WELL LOCATION (GHD)
 - MONITORING WELL LOCATION (CVD)
 - A — A' CROSS-SECTION LOCATION



SCHLEGEL URBAN DEVELOPMENTS CORP.
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INVESTIGATIVE LOCATIONS

Project No. 12637434
Date April 2025

FIGURE 3.1

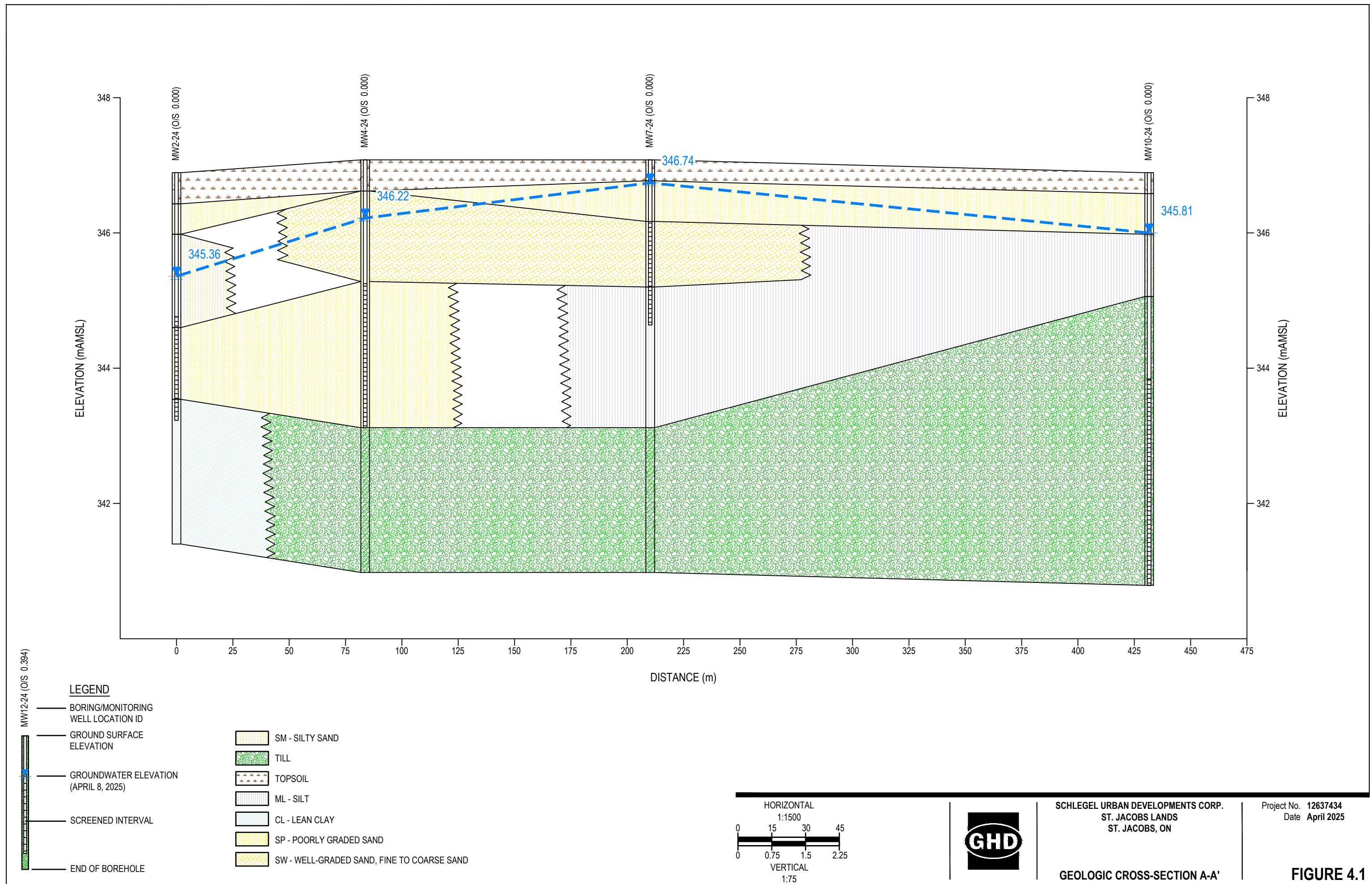
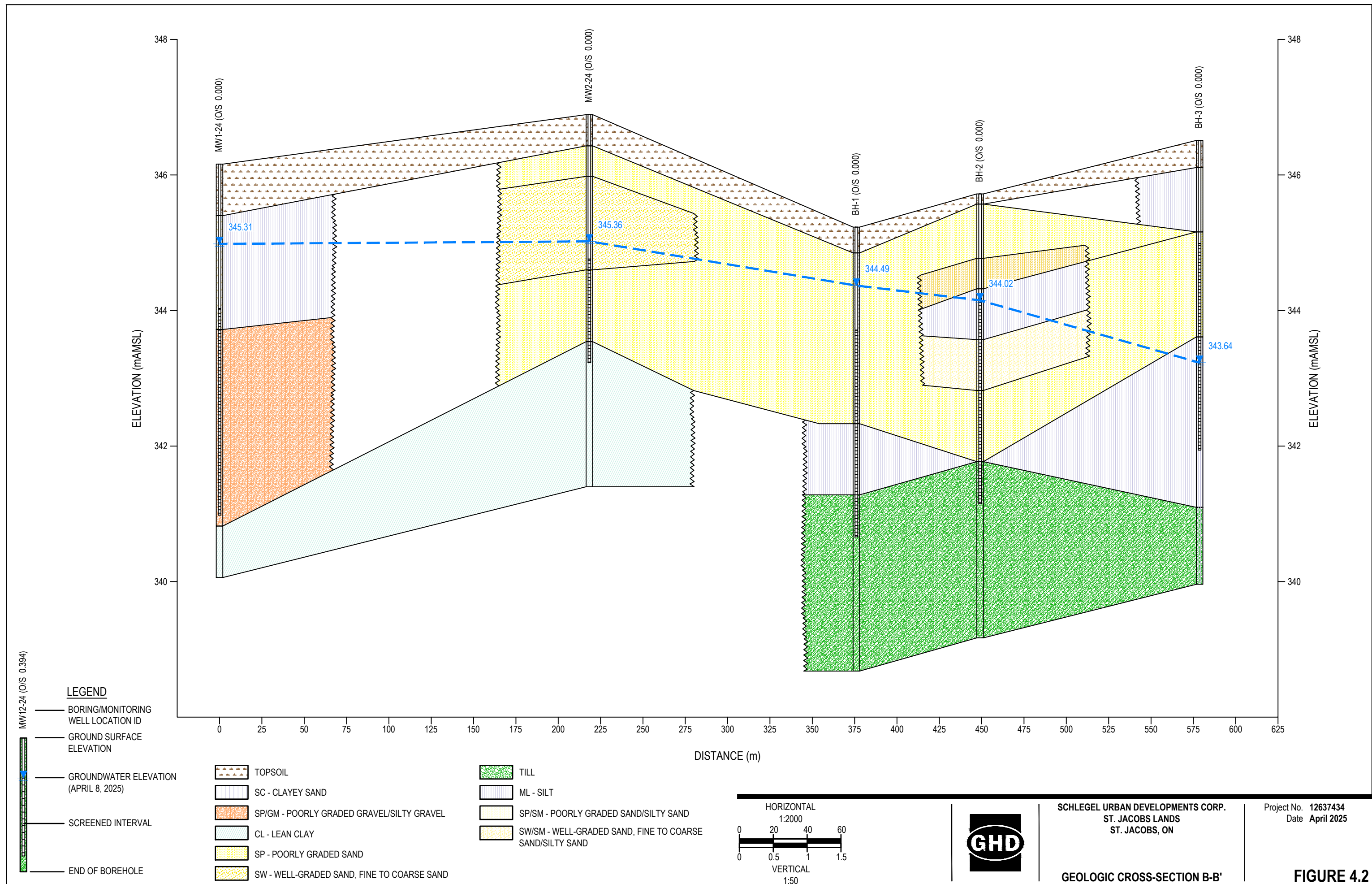
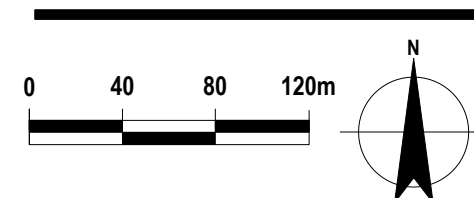
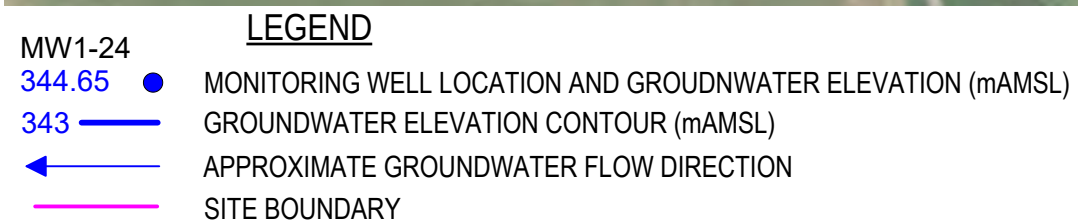
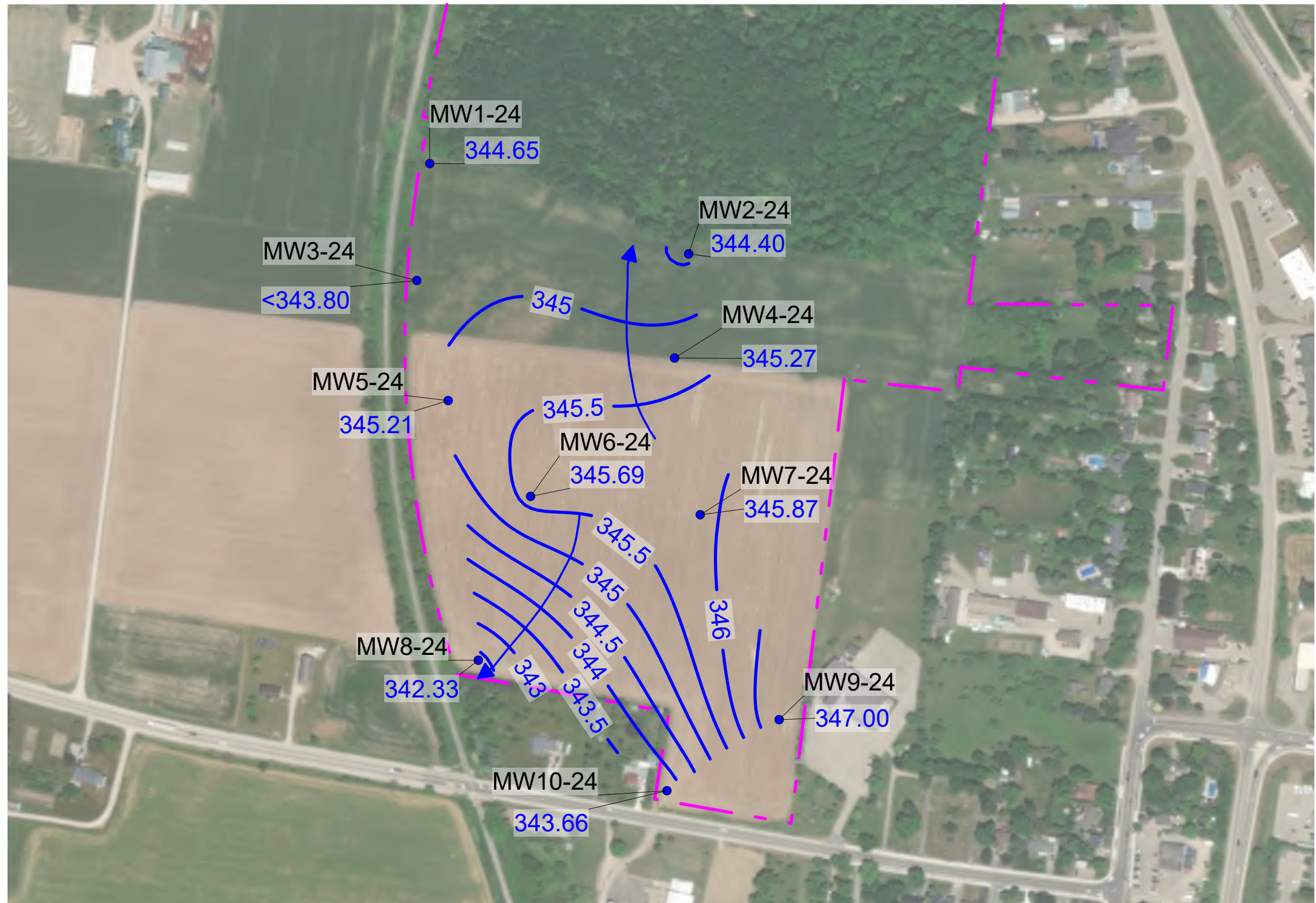


FIGURE 4.1



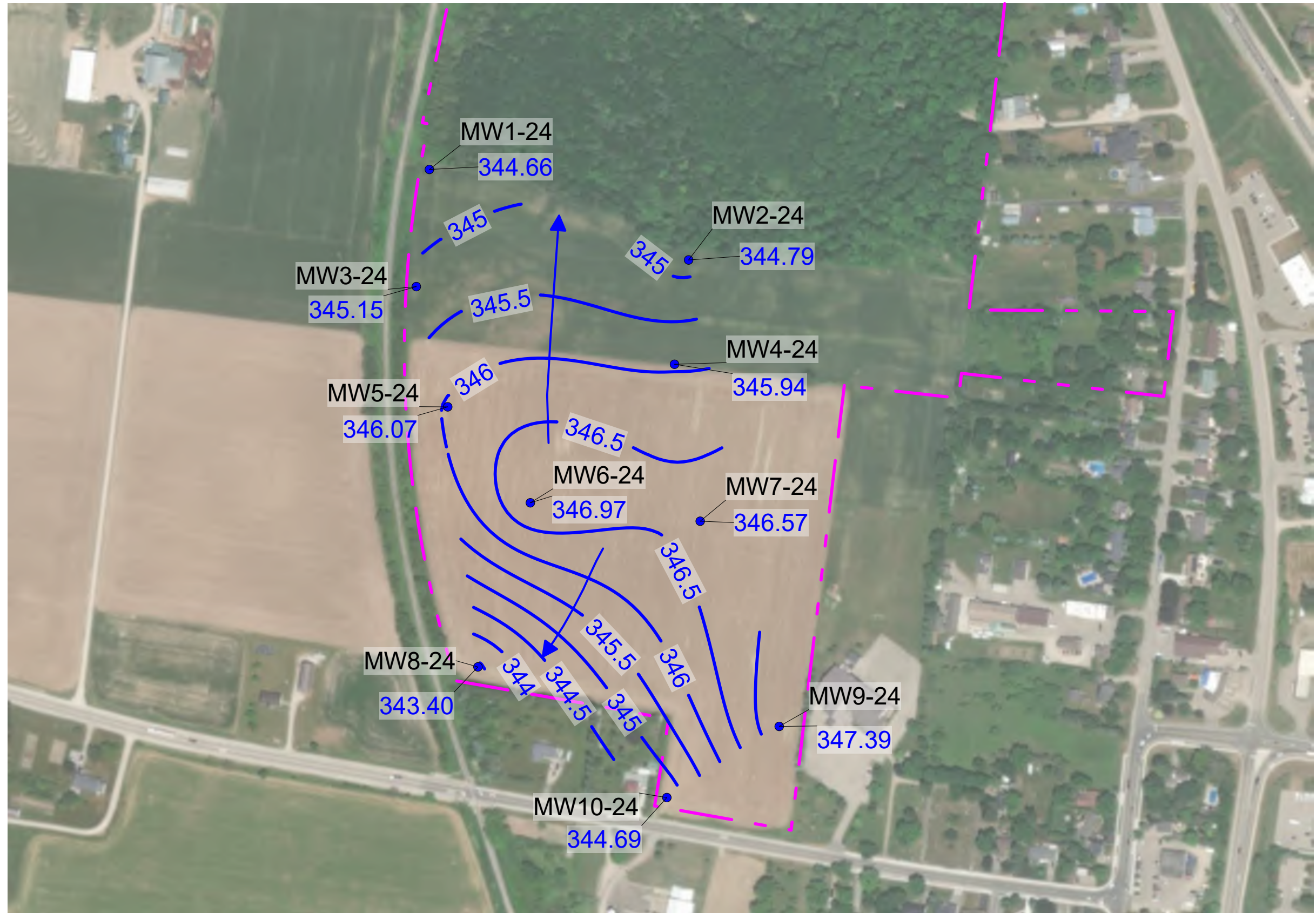


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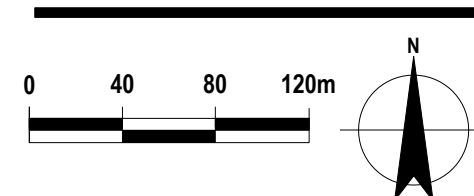
GROUNDWATER ELEVATION
CONTOURS - NOVEMBER 2024

Project No. 12637434
Date April 2025

FIGURE 4.3



- LEGEND**
- MW1-24 344.66 ● MONITORING WELL LOCATION AND GROUDNWEATER ELEVATION (mAMSL)
 - 343 — GROUNDWATER ELEVATION CONTOUR (mAMSL)
 - ← APPROXIMATE GROUNDWATER FLOW DIRECTION
 - SITE BOUNDARY

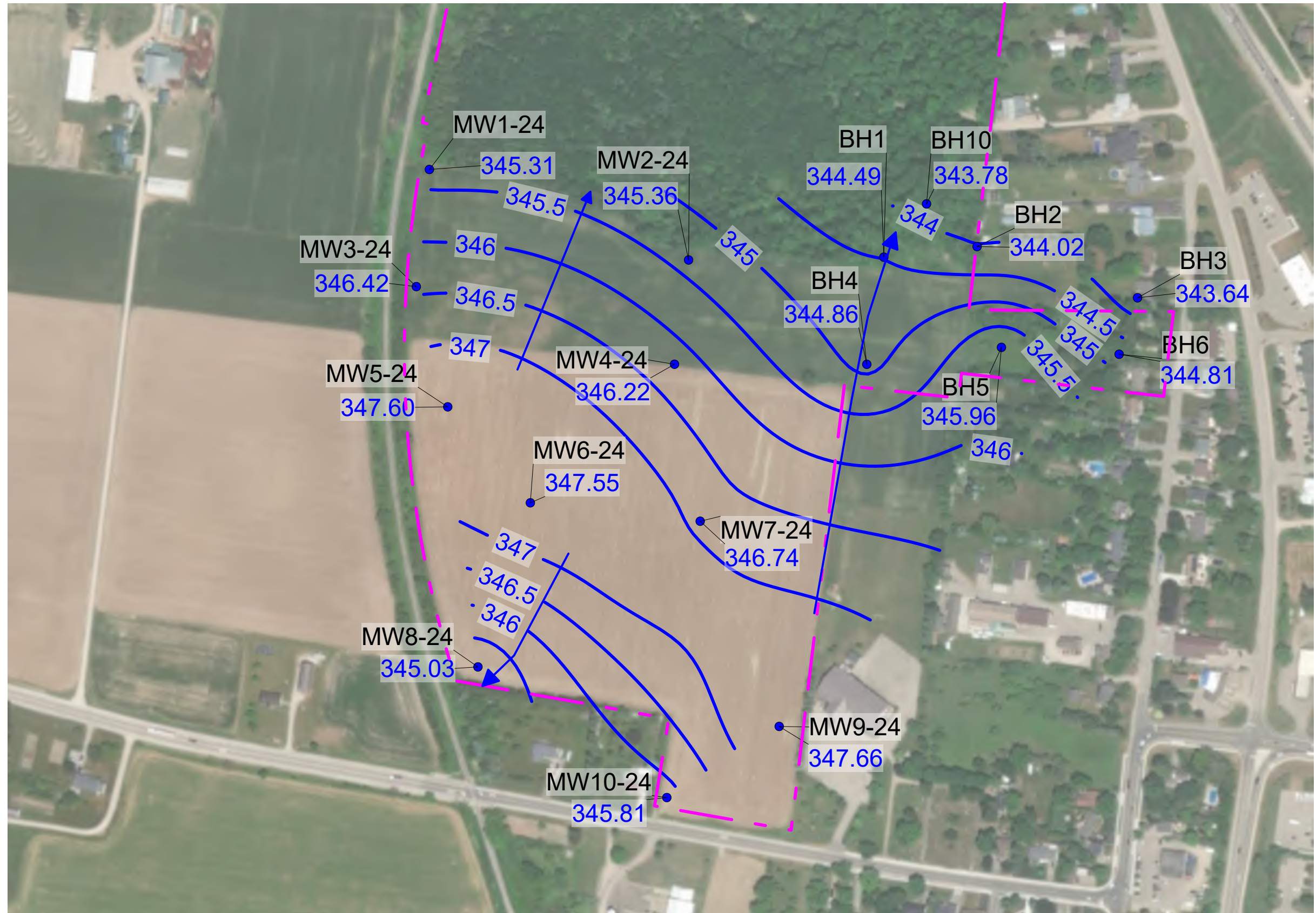


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ST. JACOBS, ON

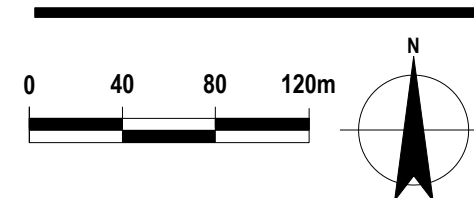
GROUNDWATER ELEVATION
CONTOURS - JANUARY 2025

Project No. 12637434
Date April 2025

FIGURE 4.4



- LEGEND**
- MW1-24 345.31 ● MONITORING WELL LOCATION AND GROUNDWATER ELEVATION (mAMS)
 - 343 — GROUNDWATER ELEVATION CONTOUR (mAMS)
 - ← APPROXIMATE GROUNDWATER FLOW DIRECTION
 - SITE BOUNDARY

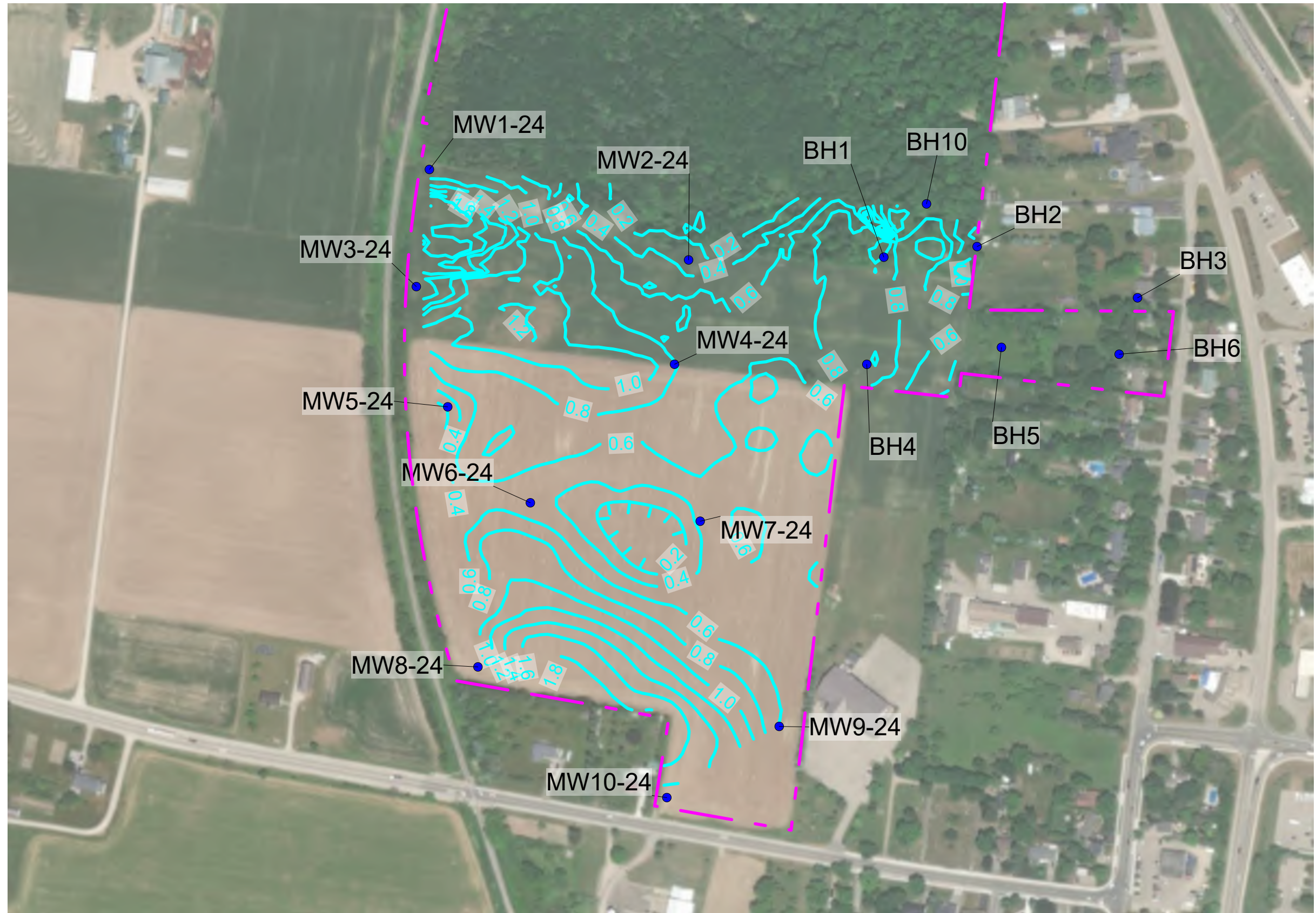


SCHLEGEL URBAN DEVELOPMENTS CORP.
ST JACOBS LANDS
ST. JACOBS, ON

GROUNDWATER ELEVATION
CONTOURS - APRIL 2025

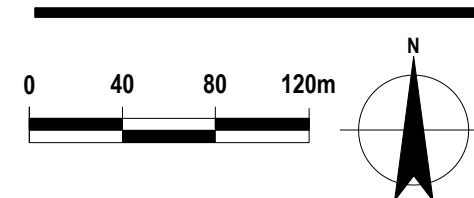
Project No. 12637434
Date April 2025

FIGURE 4.5



LEGEND

- MW1-24 ● MONITORING WELL LOCATION
- 0.5 — DEPTH TO GROUNDWATER (mBGS)
- SITE BOUNDARY



SCHLEGEL URBAN DEVELOPMENTS CORP.
ST JACOBS LANDS
ST. JACOBS, ON

Project No. 12637434
Date April 2025

DEPTH TO GROUNDWATER - APRIL 2025

FIGURE 4.6

Tables

Table 1

**Monitoring Well Completion Details
Hydrogeological Assessment
Schlegel Urban Developments Corp.
St. Jacobs, Ontario**

Location ID	Location - UTM Coordinate System		Completion Date	Ground	Top of Riser	Total Depth (mBGS)	Screened Interval		Sandpack Interval		Geologic Material at Screened Interval	
	Easting (m)	Northing (m)		Elevation (mAMSL)	Elevation (mAMSL)		Depth (mBGS)	Elevation (mAMSL)	Depth (mBGS)	Elevation (mAMSL)		
GHD Locations												
MW1-24	535496.3	4821913.4	10-Apr-24	346.16	346.99	6.10	2.13 - 5.18	344.03 - 340.98	1.68 - 5.49	344.48 - 340.67	Sand and Gravel/Clayey Sand	
MW2-24	535702.4	4821841.4	10-Apr-24	346.89	346.73	5.49	2.13 - 3.66	344.76 - 343.23	1.98 - 3.96	344.91 - 342.93	Sand/Silty Sand/Clay	
MW3-24	535485.9	4821820.2	10-Apr-24	347.15	347.99	4.88	2.13 - 3.35	345.02 - 343.80	1.98 - 3.66	345.17 - 343.49	Sand/Sandy Silt/Silty Clay	
MW4-24	535691.2	4821758.4	9-Apr-24	347.08	347.90	6.10	1.83 - 3.96	345.25 - 343.12	1.68 - 4.27	345.40 - 342.81	Sand	
MW5-24	535510.9	4821724.5	11-Apr-24	347.80	348.70	3.66	1.22 - 2.74	346.58 - 345.06	1.07 - 3.05	346.73 - 344.75	Sand/Clayey Sand/Silty Clay	
MW6-24	535576.6	4821648.2	11-Apr-24	347.82	348.71	4.12	1.52 - 3.05	346.30 - 344.77	1.37 - 3.35	346.45 - 344.47	Sand/Silty Clay/Silt and Clay	
MW7-24	535711.7	4821633.6	9-Apr-24	347.08	348.05	6.10	0.91 - 2.44	346.17 - 344.64	0.76 - 2.74	346.32 - 344.34	Sand/Silty Sand/Clayey Silt	
MW8-24	535534.9	4821517.7	12-Apr-24	345.90	346.68	6.10	3.05 - 6.10	342.85 - 339.80	2.90 - 6.10	343.00 - 339.80	Silty Clay Till	
MW9-24	535774.5	4821470.4	9-Apr-24	348.11	349.01	6.71	1.22 - 2.74	346.89 - 345.37	1.07 - 3.05	347.04 - 345.06	Sand/Silt	
MW10-24	535685.1	4821413.8	11-Apr-24	346.89	347.92	6.10	3.05 - 6.10	343.84 - 340.79	2.90 - 6.10	343.99 - 340.79	Clay Till	
CVD Locations ⁽¹⁾												
BH1	535857.7	4821843.6	15-Dec-21	345.23	346.04	6.55	1.50 - 4.50	343.73 - 340.73	1.20 - 4.90	344.03 - 340.33	Sand/Silty Clay Till	
BH2	535931.9	4821852.0	14-Dec-21	345.72	346.52	6.55	1.50 - 4.50	344.22 - 341.22	1.20 - 4.90	344.52 - 340.82	Sand and Silt/Sand/Silty Clay Till	
BH3	536059.5	4821811.3	15-Dec-21	346.51	347.40	6.55	1.50 - 4.50	345.01 - 342.01	1.20 - 4.90	345.31 - 341.61	Sand/Silty Clay Till	
BH4	535844.2	4821758.4	13-Dec-21	345.73	346.60	6.55	1.50 - 4.50	344.23 - 341.23	1.20 - 4.90	344.53 - 340.83	Silt/Silty Clay Till	
BH5	535951.3	4821771.8	13-Dec-21	346.35	347.08	6.55	1.50 - 4.50	344.85 - 341.85	1.20 - 4.90	345.15 - 341.45	Silt/Silty Clay Till	
BH6	536044.9	4821766.4	14-Dec-21	346.27	347.28	6.55	1.50 - 4.50	344.77 - 341.77	1.20 - 4.90	345.07 - 341.37	Sand/Silt/Silty Clay Till	
BH10	535891.7	4821886.0	14-Dec-21	345.57	346.34	6.55	1.50 - 4.50	344.07 - 341.07	1.20 - 4.90	344.37 - 340.67	Silty Sand/Sand	

Notes:

(1) Coordinates of CVD monitoring well locations are estimated based on CVD well location figure.

mAMSL Metres above mean sea level

mBGS Metres below ground surface

Table 2

Summary of Groundwater Level Measurements and Elevations

Hydrogeological Assessment

Schlegel Urban Developments Corp.

St. Jacobs, Ontario

Coordinates	Ground Elevation (mAMSL)	Top of Riser Elevation (mAMSL)	16-Apr-24 ⁽¹⁾			1-May-24			18-Jul-24			11-Oct-24			28-Nov-24			
			Depth to		Groundwater Elevation (mAMSL)	Depth to		Groundwater Elevation (mAMSL)	Depth to		Groundwater Elevation (mAMSL)	Depth to		Groundwater Elevation (mAMSL)	Depth to		Groundwater Elevation (mAMSL)	
			(mBTOR)	(mBGS)		(mBTOR)	(mBGS)		(mBTOR)	(mBGS)		(mBTOR)	(mBGS)		(mBTOR)	(mBGS)		
Northing																		
8	4821913.4	346.16	346.99	1.85	1.02	345.14	1.86	1.03	345.13	1.94	1.11	345.05	2.28	1.45	344.71	2.34	1.51	344.65
4	4821841.4	345.89	346.73	1.53	0.69	345.20	1.64	0.80	345.09	1.64	0.80	345.09	2.36	1.52	344.37	2.33	1.49	344.40
9	4821820.2	347.15	347.99	1.89	1.05	346.10	2.17	1.33	345.82	2.25	1.41	345.74	Dry		<343.80	Dry		<343.80
2	4821758.4	347.08	347.90	1.72	0.90	346.18	1.70	0.88	346.20	1.74	0.92	346.16	2.69	1.87	345.21	2.63	1.81	345.27
9	4821724.5	347.80	348.70	1.36	0.46	347.34	1.43	0.53	347.27	No Access			3.39	2.49	345.31	3.49	2.59	345.21
6	4821648.2	347.82	348.71	1.31	0.42	347.40	1.37	0.48	347.34	No Access			2.92	2.03	345.79	3.02	2.13	345.69
7	4821633.6	347.08	348.05	1.31	0.34	346.74	1.25	0.28	346.80	No Access			2.39	1.42	345.66	2.18	1.21	345.87
9	4821517.7	345.90	346.68	6.70	5.92	339.98	5.82 (2)	5.04	340.86	2.58 (2)	1.80	344.10	3.32 (2)	2.54	343.36	4.35 (2)	3.57	342.33
5	4821470.4	348.11	349.01	3.48	2.58	345.53	1.63 (2)	0.73	347.38	1.74 (2)	0.84	347.27	2.16 (2)	1.26	346.85	2.01 (2)	1.11	347.00
1	4821413.8	346.89	347.92	Dry			5.74 (2)	4.71	342.18	3.26 (2)	2.23	344.66	3.68 (2)	2.65	344.24	4.26 (2)	3.23	343.66
CVD Locations ⁽³⁾⁽⁴⁾																		
7	4821843.6	345.23	346.04															
9	4821852.0	345.72	346.52															
5	4821811.3	346.51	347.40															
2	4821758.4	345.73	346.60	No Access			No Access			No Access			No Access			No Access		
3	4821771.8	346.35	347.08															
9	4821766.4	346.27	347.28															
7	4821886.0	345.57	346.34															
Minimum Depth to Groundwater (mBGS) ⁽⁵⁾ :				-			0.28			-			1.42			1.21		
Maximum Depth to Groundwater (mBGS) ⁽⁵⁾ :				-			1.33			-			2.49			2.59		
Average Depth to Groundwater (mBGS) ⁽⁵⁾ :				-			0.76			-			1.80			1.79		

Table 2

Summary of Groundwater Level Measurements and Elevations
Hydrogeological Assessment
Schlegel Urban Developments Corp.
St. Jacobs, Ontario

Location	UTM Coordinates		Ground Elevation (mAMSL)	Top of Riser Elevation (mAMSL)	13-Dec-24			16-Jan-25			8-Apr-25		
					Depth to Groundwater		Groundwater Elevation (mAMSL)	Depth to Groundwater		Groundwater Elevation (mAMSL)	Depth to Groundwater		Groundwater Elevation (mAMSL)
	(mBTOR)	(mBGS)			(mBTOR)	(mBGS)		(mBTOR)	(mBGS)				
GHD Locations													
MW1-24	535496.3	4821913.4	346.16	346.99		NM		2.33	1.50	344.66	1.68	0.85	345.31
MW2-24	535702.4	4821841.4	345.89	346.73		NM		1.94	1.10	344.79	1.37	0.53	345.36
MW3-24	535485.9	4821820.2	347.15	347.99		NM		2.84	2.00	345.15	1.57	0.73	346.42
MW4-24	535691.2	4821758.4	347.08	347.90		NM		1.96	1.14	345.94	1.68	0.86	346.22
MW5-24	535510.9	4821724.5	347.80	348.70		NM		2.63	1.73	346.07	1.1	0.20	347.60
MW6-24	535576.6	4821648.2	347.82	348.71		NM		1.74	0.85	346.97	1.16	0.27	347.55
MW7-24	535711.7	4821633.6	347.08	348.05		NM		1.48	0.51	346.57	1.31	0.34	346.74
MW8-24	535534.9	4821517.7	345.90	346.68	4.85	4.07	341.83	3.28	2.50	343.40	1.65	0.87	345.03
MW9-24	535774.5	4821470.4	348.11	349.01	2.07	1.17	346.94	1.62	0.72	347.39	1.35	0.45	347.66
MW10-24	535685.1	4821413.8	346.89	347.92	4.85	3.82	343.07	3.23	2.20	344.69	2.11	1.08	345.81
CVD Locations ⁽³⁾⁽⁴⁾													
BH1	535857.7	4821843.6	345.23	346.04							1.55	0.74	344.49
BH2	535931.9	4821852.0	345.72	346.52							2.5	1.70	344.02
BH3	536059.5	4821811.3	346.51	347.40							3.76	2.87	343.64
BH4	535844.2	4821758.4	345.73	346.60		No Access			No Access		1.74	0.87	344.86
BH5	535951.3	4821771.8	346.35	347.08							1.12	0.39	345.96
BH6	536044.9	4821766.4	346.27	347.28							2.47	1.46	344.81
BH10	535891.7	4821886.0	345.57	346.34							2.56	1.79	343.78
Minimum Depth to Groundwater (mBGS) ⁽⁵⁾ :						-		0.51			0.20		
Maximum Depth to Groundwater (mBGS) ⁽⁵⁾ :						-		2.50			2.87		
Average Depth to Groundwater (mBGS) ⁽⁵⁾ :						-		1.42			0.94		

- Notes:
- (1) Initial groundwater levels measured shortly following well installation.
 - (2) Groundwater levels measured prior completing monitoring well development.
 - (3) Access to the CVD well locations was obtained beginning for the April 8, 2025 monitoring event.
 - (4) Coordinates of CVD monitoring well locations are estimated based on CVD well location figure.
 - (5) Minimum, maximum, and average depth to groundwater considers measurements obtained after completing monitoring well development and accounts for measurements obtained across the Site monitoring well network (and not when measurements were obtained for a subset of the monitoring wells, such as on July 18, 2024 and December 13, 2024).
- mAMSL Metres above mean sea level
mBTOR Metres below top of riser
mBGS Metres below ground surface
NM Not measured

**Hydraulic Conductivity Summary
Hydrogeological Assessment
Schlegel Urban Developments Corp.
St. Jacobs, Ontario**

		Geologic Unit	Screen Depth	Test	Interpretation	Hydraulic Conductivity
Location	Test Name	(Screened):	(mBGS)	Method	Aquifer Condition	(cm/s)
MW1-24	Rising Head Test 1	Sand and Gravel/Clayey Sand	2.13 - 5.18	Hvorslev	Confined	3.73E-02
	Rising Head Test 2					3.76E-02
	Rising Head Test 3					4.46E-02
	Rising Head Test 4					3.78E-02
	Rising Head Test 5					3.78E-02
	Rising Head Test 6					3.64E-02
MW2-24	Falling Head Test 1	Sand/Silty Sand/Clay	2.13 - 3.66	Hvorslev	Confined	2.10E-03
	Falling Head Test 2					1.77E-03
	Falling Head Test 3					1.87E-03
	Falling Head Test 4					1.78E-03
	Rising Head Test 1					2.44E-03
	Rising Head Test 2					1.84E-03
	Rising Head Test 3					1.83E-03
	Rising Head Test 4					1.71E-03
MW3-24	Falling Head Test 1	Sand/Sandy Silt/Silty Clay	1.83 - 3.35	Hvorslev	Confined	5.94E-04
	Falling Head Test 2					5.24E-04
	Falling Head Test 3					5.60E-04
	Rising Head Test 1					6.58E-04
	Rising Head Test 2					5.48E-04
	Rising Head Test 3					5.43E-04
MW4-24	Falling Head Test 1	Sand	1.83 - 3.96	Bouwer-Rice	Unconfined	2.17E-04
	Falling Head Test 2					2.10E-04
	Falling Head Test 3					2.38E-04
	Rising Head Test 1					1.55E-04
	Rising Head Test 2					1.74E-04
	Rising Head Test 3					1.78E-04
MW5-24	Falling Head Test 1	Sand/Clayey Sand/Silty Clay	1.22 - 2.74	Hvorslev	Confined	2.17E-03
	Falling Head Test 2					1.98E-03
	Falling Head Test 3					1.53E-03
	Rising Head Test 1					1.89E-03
	Rising Head Test 2					1.84E-03
	Rising Head Test 3					1.65E-03
MW6-24	Falling Head Test 1	Sand/Silty Clay/Silt and Clay	1.52 - 3.05	Bouwer-Rice	Unconfined	2.64E-04
	Falling Head Test 2					3.25E-04
	Rising Head Test 1					2.10E-04
	Rising Head Test 2					3.54E-04
MW7-24	Falling Head Test 1	Sand/Silty Sand/Clayey Silt	0.91 - 2.44	Bouwer-Rice	Unconfined	2.44E-04
	Falling Head Test 2					2.44E-04
	Falling Head Test 3					2.24E-04
	Rising Head Test 1					2.07E-04
	Rising Head Test 2					2.12E-04
	Rising Head Test 3					2.16E-04
MINIMUM						1.55E-04
MAXIMUM						4.46E-02
GEOMETRIC MEAN						1.08E-03

Notes:

mBGS Metres below ground surface

cm/s Centimetres per second

**Groundwater Analytical Results
Hydrogeological Assessment
Schlegel Urban Developments Corp.
St. Jacobs, Ontario**

		Sample Location:	MW1-24	MW4-24	MW7-24	MW7-24	Field Blank
		Sample ID:	GW-12637434- MW1-24	GW-12637434- MW4-24	GW-12637434- MW7-24	GW-12637434- MW7-24X	GW-12637434- FB
		Sample Date:	11-Oct-2024	11-Oct-2024	11-Oct-2024	11-Oct-2024 Duplicate	11-Oct-2024
Parameters	Units	Table 2 SCS ⁽¹⁾					
Physical Properties							
conductivity	µS/cm	-	865	624	586	590	<2.0
alkalinity, total (as CaCO ₃)	mg/L	-	3050	869	18300	18800	<2.0
colour, true	CU	-	<2.0	<2.0	3.6	3.0	<2.0
hardness (as CaCO ₃), dissolved	mg/L	-	442	271	255	257	<0.50
solids, total dissolved [TDS]	mg/L	-	572	405	370	359	<10
turbidity	NTU	-	>4000	>4000	>4000	>4000	<0.10
pH	pH units	-	7.81	7.87	7.80	7.79	5.66
Anions and Nutrients							
ammonia, total (as N)	mg/L	-	0.0196	0.0614	0.107	0.114	<0.0050
chloride	mg/L	790	31.6	10.8	8.86	8.79	<0.50
fluoride	mg/L	-	0.038	0.084	0.181	0.186	<0.020
nitrate (as N)	mg/L	-	31.2	13.7	2.54	2.52	<0.020
nitrite (as N)	mg/L	-	<0.010	0.072	0.014	0.013	<0.010
phosphate, ortho-, dissolved (as P)	mg/L	-	<0.0010	0.0027	0.0100	0.0092	<0.0010
sulfate (as SO ₄)	mg/L	-	55.7	32.3	40.6	40.3	<0.30
Dissolved Metals							
aluminum	mg/L	-	0.0083	0.0034	0.0806	0.198	<0.0010
antimony	mg/L	0.006	<0.00010	0.00016	0.00038	0.00038	<0.00010
arsenic	mg/L	0.025	0.00020	0.00028	0.00049	0.00054	<0.00010
barium	mg/L	1	0.0413	0.0517	0.0876	0.0881	<0.00010
beryllium	mg/L	0.004	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron	mg/L	5	0.017	0.027	0.053	0.053	<0.010
cadmium	mg/L	0.0027	0.0000074	<0.0000050	0.0000075	0.0000112	<0.0000050
calcium	mg/L	-	123	63.3	61.3	62.0	<0.050
chromium	mg/L	0.05	0.00056	<0.00050	<0.00050	<0.00050	<0.00050
cobalt	mg/L	0.0038	<0.00010	0.00016	0.00018	0.00026	<0.00010
copper	mg/L	0.087	0.00136	0.00152	0.00149	0.00250	<0.00020
iron	mg/L	-	<0.010	0.010	0.060	0.179	<0.010
lead	mg/L	0.01	<0.000050	<0.000050	0.000101	0.000283	<0.000050
magnesium	mg/L	-	32.8	27.4	24.7	24.8	<0.0050
manganese	mg/L	-	0.00042	0.0346	0.0660	0.0703	<0.00010
molybdenum	mg/L	0.07	0.000075	0.00208	0.00606	0.00580	<0.000050
nickel	mg/L	0.1	<0.00050	0.00083	0.00059	0.00076	<0.00050
phosphorus	mg/L	-	<0.050	<0.050	<0.050	<0.050	<0.050
potassium	mg/L	-	3.76	2.05	4.67	4.77	<0.050
selenium	mg/L	0.01	0.000145	0.000506	0.000267	0.000292	<0.000050
silicon	mg/L	-	5.26	5.34	5.89	6.07	<0.050
silver	mg/L	0.0015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium	mg/L	490	6.92	18.0	38.6	38.0	<0.050
strontium	mg/L	-	0.191	0.149	0.354	0.346	<0.00020
thallium	mg/L	0.002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium	mg/L	-	<0.00050	<0.00030	<0.00400	0.00902	<0.00030
tungsten	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium	mg/L	0.02	0.000283	0.00174	0.00346	0.00348	<0.000010
vanadium	mg/L	0.0062	<0.00050	0.00054	0.00103	0.00129	<0.00050
zinc	mg/L	1.1	0.0017	0.0013	0.0012	0.0026	<0.0010
zirconium	mg/L	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

(1) "Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", dated April 15, 2011.

Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition,
All Types of Property Use for coarse-textured soils

- No existing standard for this parameter

mg/L milligrams per litre

µS/cm microsiemens/centimetre

CU Colour Unit

NTU Number of transfer units

ND(0.50) Parameter not detected at value stated in parenthesis

Appendices

Appendix A

External Data

NOTES:

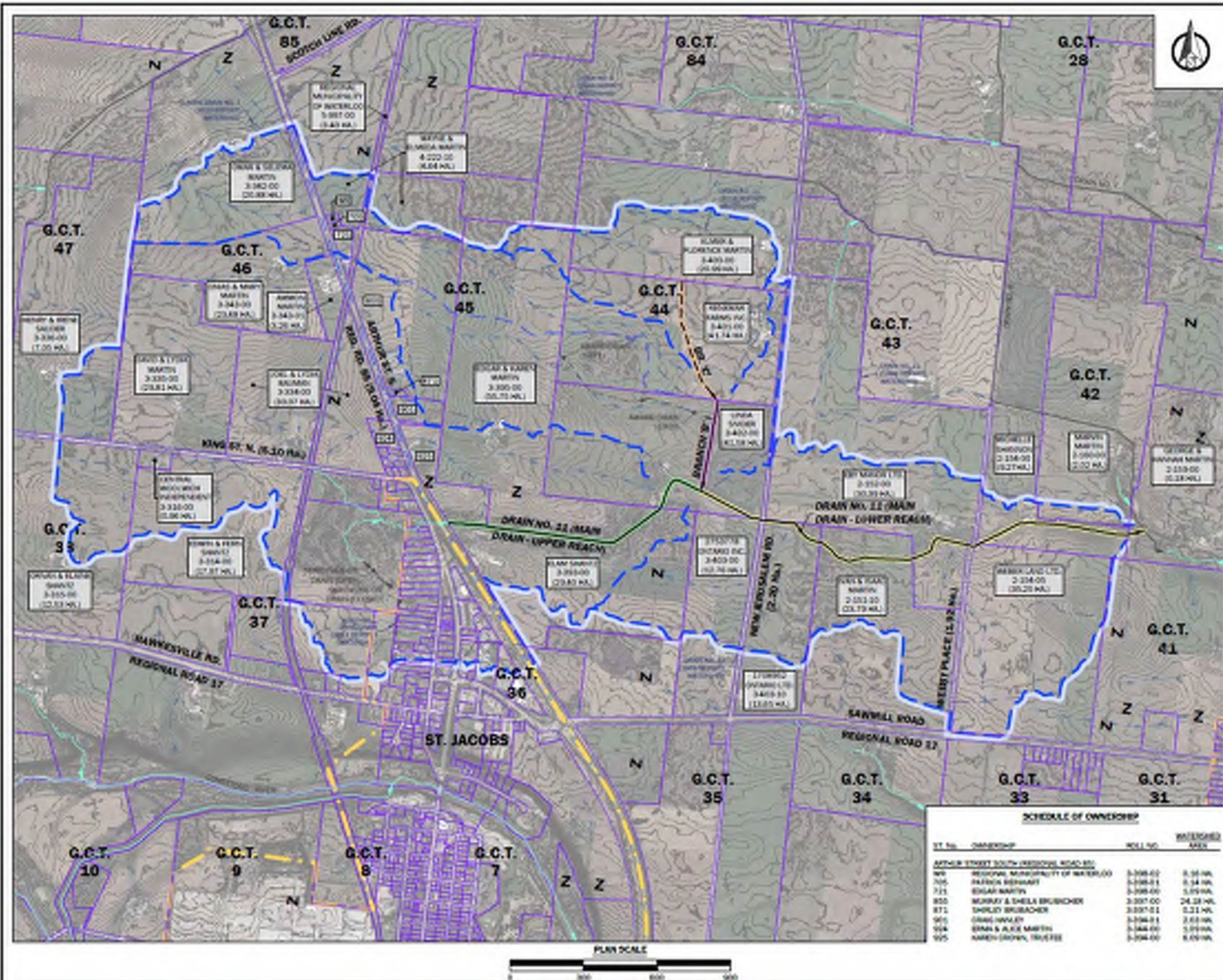
1. THIS MAP WAS CREATED USING REGION OF WATERLOO GEOGRAPHIC INFORMATION SYSTEM (DIGITAL DATA). THIS MAP IS A SECONDARY PRODUCT WHICH HAS NOT BEEN VERIFIED BY THE REGION OF WATERLOO.
2. THE CONTOURS WERE CREATED USING LAND-DERIVED DIGITAL DATA FROM LAND INFORMATION (LIDAR).
3. ASSESSMENT ROLL NUMBERS HAVE BEEN ABBREVIATED TO EXCLUDE THE FIRST FIVE (5) DIGITS, I.E. 3-333-00 IN FULL IS 302900000033300.

LEGEND

- USE/CONVESSION LINE
- PROPERTY LINE
- URBAN BOUNDARY
- WATER WATERSHED BOUNDARY
- WATER WATERSHED BOUNDARY
- LANDOWNER NAME(S)
- ASSESSMENT ROLL NO. (ABBREVIATED)
- AREA WITHIN WATERSHED
- EXISTING FEATURES
- OPEN DRAIN WITH FLOW DIRECTION
- CLOSED DRAIN WITH FLOW DIRECTION
- NATURAL WATERCOURSE WITH FLOW DIRECTION
- OVERLAP FLOW PICK
- PROPOSED FEATURES
- OPEN DRAIN WITH FLOW DIRECTION
- CLOSED DRAIN WITH FLOW DIRECTION



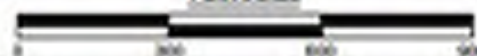
REPORT SUBMISSION	23-04-28
MAP/WORKSHEET CLOSURE	23-01-24
DATE	

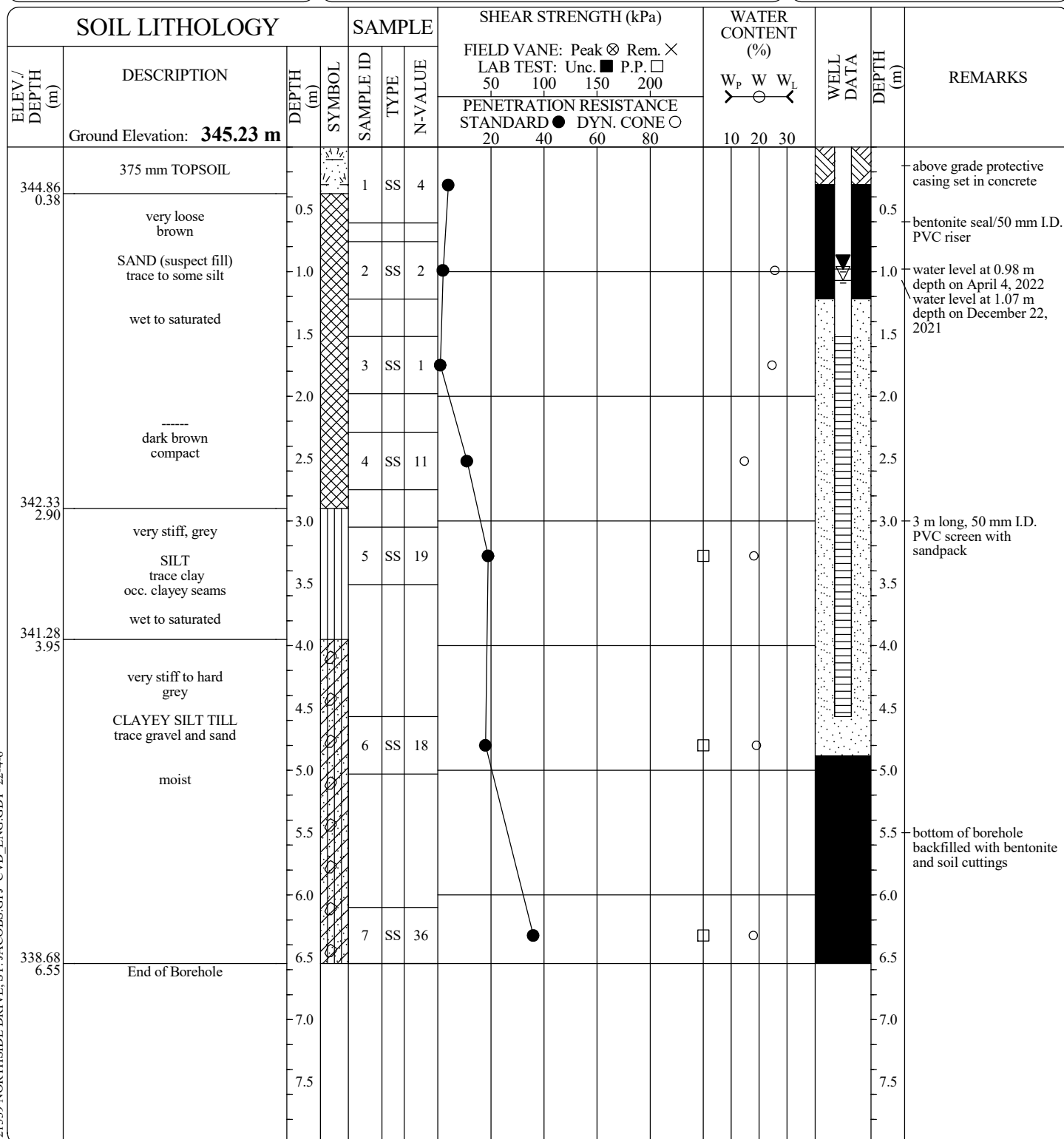


SCHEDULE OF OWNERSHIP

ST. NO.	OWNER	ROLL NO.	WATERSHED AREA
100	REGIONAL MUNICIPALITY OF WATERLOO	5-333-00	0.35 HA
705	BARBARA BISHOP	5-333-01	0.34 HA
711	EDGAR MARTIN	5-333-02	0.35 HA
800	MURRAY & SHEILA BRUBACHER	3-337-00	24.28 HA
871	SHIRLEY BRUBACHER	3-337-01	0.21 HA
901	DAVID HANLEY	5-334-01	2.63 HA
914	EDNA & ALICE MARTIN	5-334-02	0.35 HA
925	NAREN (DRAIN, TRUE FEE)	5-334-03	0.35 HA

PLAN SCALE

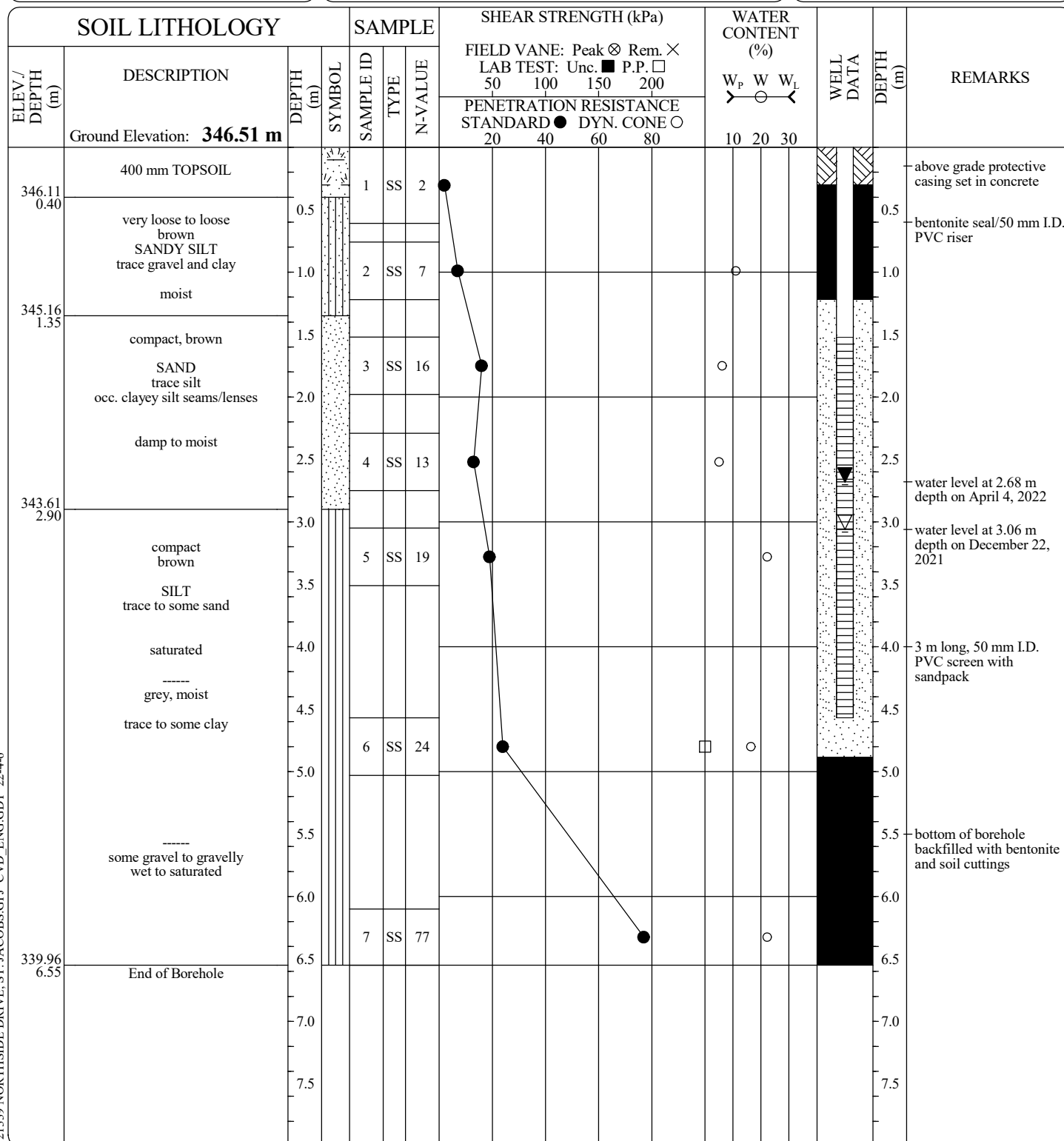


FILE No: G21339**BOREHOLE No. 1**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 15 - 21 TO Dec 15 - 21**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 2**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 14 - 21 TO Dec 14 - 21**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. ×				LAB TEST: Unc. ■ P.P. □					
							PENETRATION RESISTANCE				STANDARD ● DYN. CONE ○					
	Ground Elevation: 345.72 m						20	40	60	80	10	20	30			
345.57 0.15	150 mm TOPSOIL															
	loose dark brown to brown SANDY SILT trace gravel	0.5		1	SS	4	●									above grade protective casing set in concrete
	moist															bentonite seal/50 mm I.D. PVC riser
344.77 0.95	compact brown SILTY SAND moist	1.0		2	SS	11	●				○					
344.32 1.40	compact, brown SILT trace sand wet	1.5		3	SS	14	●				○					
343.57 2.15	compact, brown SAND AND SILT saturated	2.5		4	SS	20	●				○					water level at 1.97 m depth on April 4, 2022
342.82 2.90	compact, brown SAND trace silt	3.0		5	SS	16	●				○					water level at 2.31 m depth on December 22, 2021
	saturated	3.5														3 m long, 50 mm I.D. PVC screen with sandpack
341.77 3.95	very stiff grey CLAYEY SILT TILL some sand, trace gravel occ. silt seams	4.0		6	SS	21	●				□	○				
	moist	4.5														
		5.0														
		5.5														
		6.0														
339.17 6.55	End of Borehole	6.5		7	SS	24	●				□	○				bottom of borehole backfilled with bentonite and soil cuttings
		7.0														
		7.5														

PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
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Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 3**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **Dec 15 - 21 TO Dec 15 - 21**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 4**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 13 - 21 TO Dec 13 - 21**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □				W _p W W _L					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○				↔ — — ↔					
Ground Elevation: 345.73 m							20	40	60	80	10	20	30			
345.48 0.25	250 mm TOPSOIL															
	firm, mottled brown	0.5		1	SS	6	●									
	SANDY CLAYEY SILT															
	trace gravel															
	moist to wet	1.0		2	SS	6	●	□				○				
344.38 1.35	stiff mottled grey SILT	1.5														
	trace to some clay			3	SS	10	●					○				
	wet	2.0														
343.58 2.15	very stiff grey	2.5		4	SS	17	●				□	○				
	CLAYEY SILT TILL															
	trace gravel and sand															
	occ. silt seams															
	moist	3.0		5	SS	19	●									
		3.5														
		4.0														
		4.5														
		5.0		6	SS	21	●				□	○				
		5.5														
		6.0														
		6.5		7	SS	27	●				□	○				
339.18 6.55	End of Borehole															
		7.0														
		7.5														

above grade protective casing set in concrete
bentonite seal/50 mm I.D. PVC riser
water level at 0.62 m depth on April 4, 2022
water level at 0.67 m depth on December 22, 2021

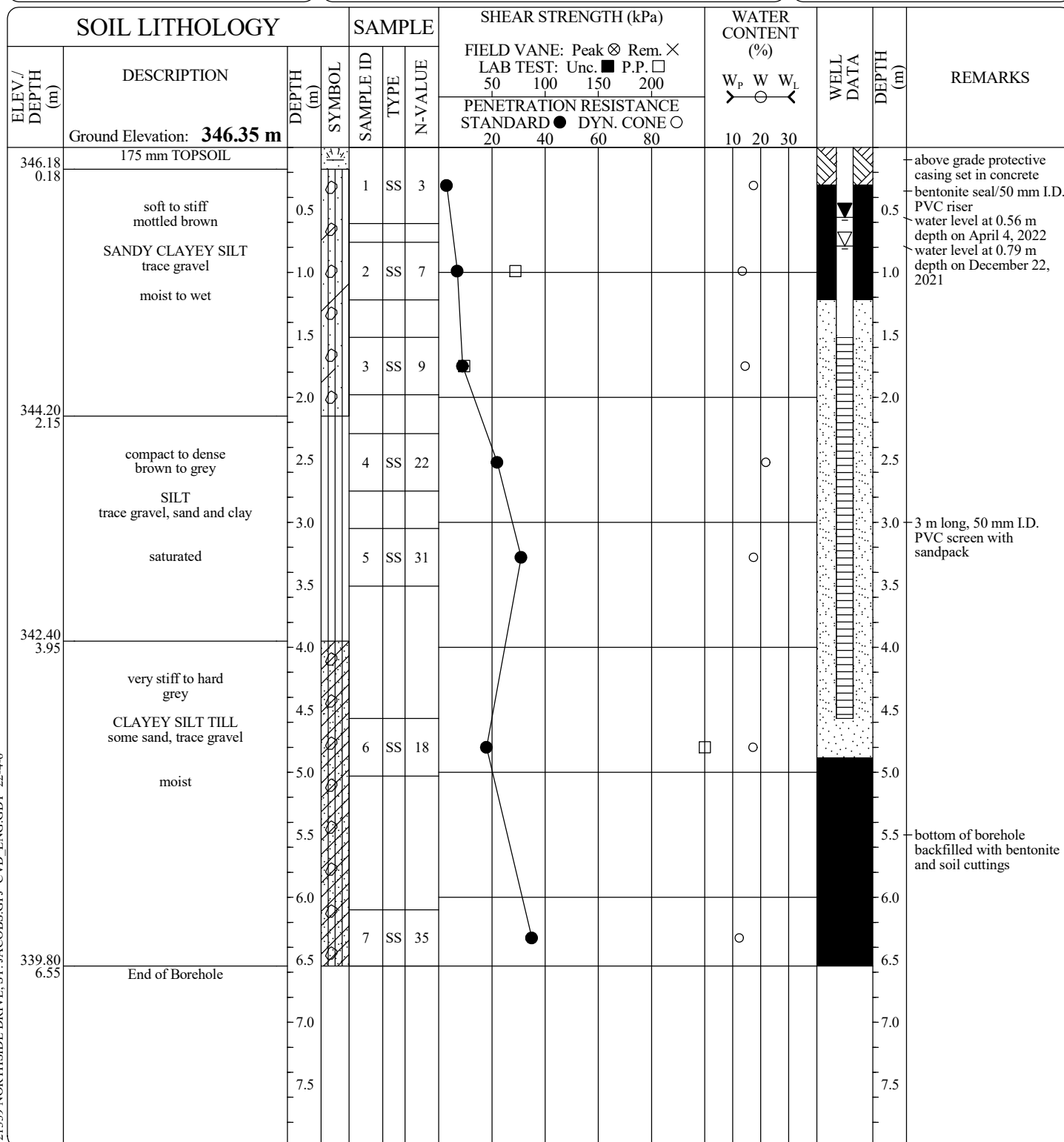
3 m long, 50 mm I.D. PVC screen with sandpack

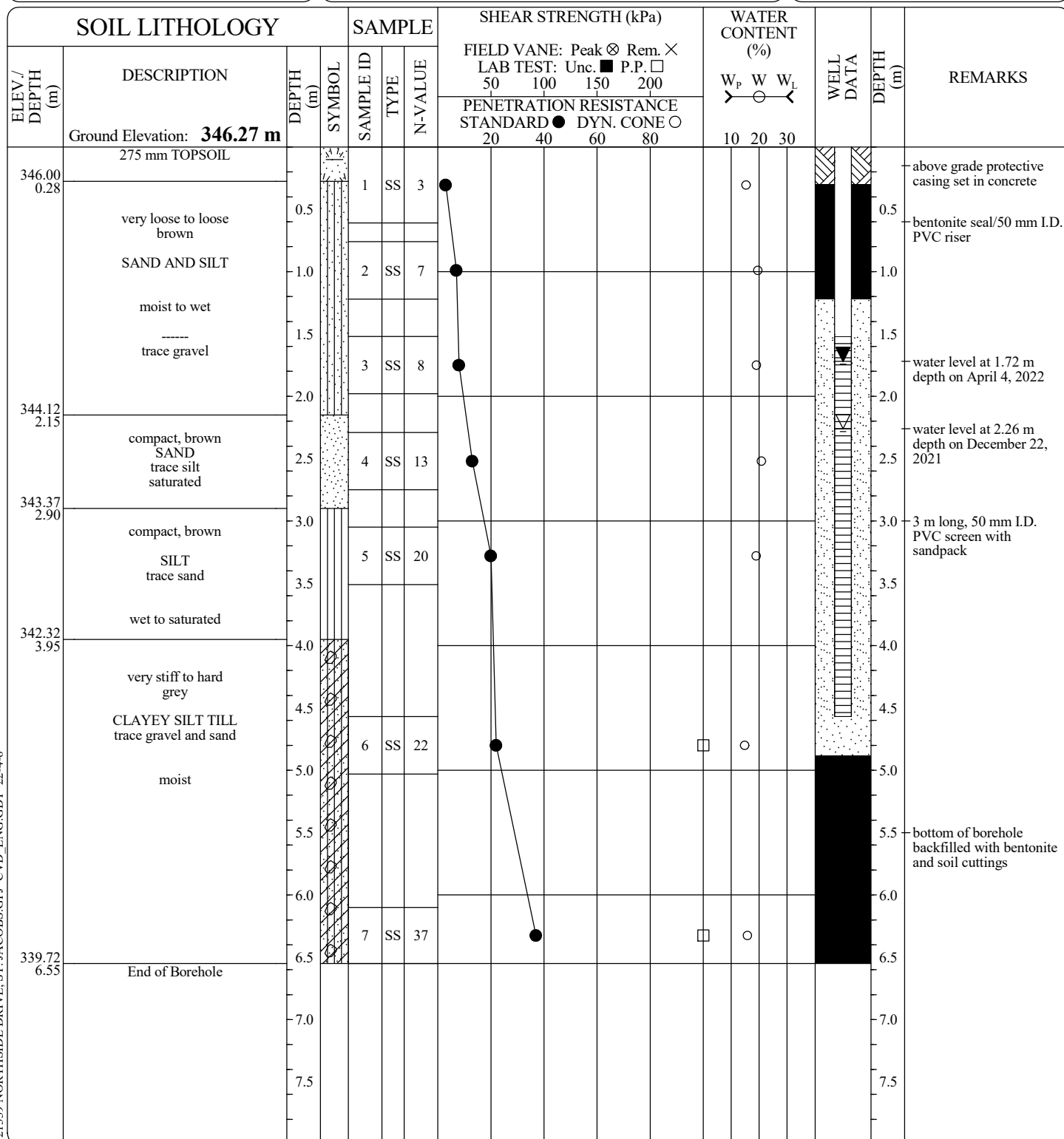
bottom of borehole backfilled with bentonite and soil cuttings

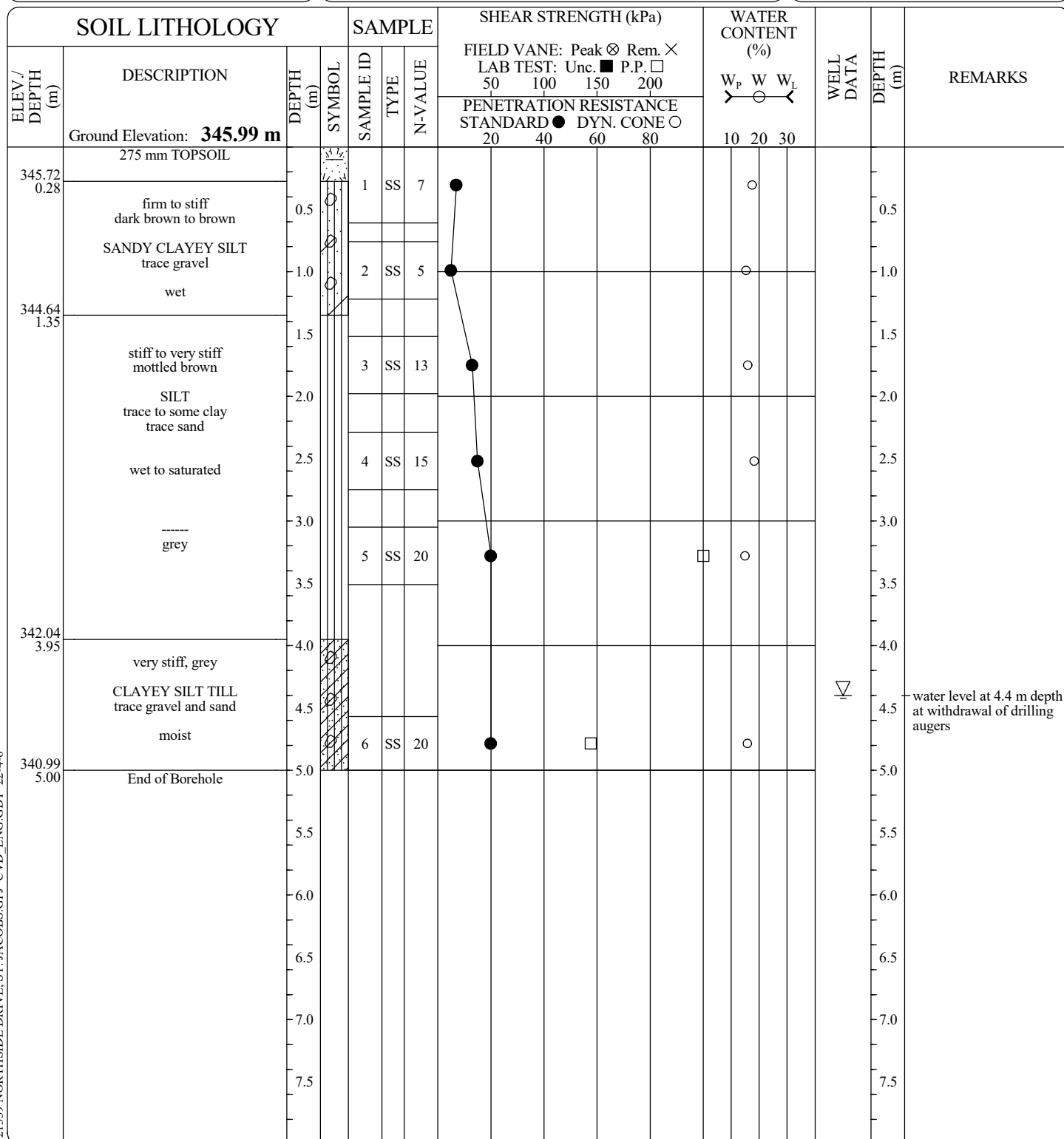
PROJECT MANAGER: **RVD**

**CHUNG & VANDER DOELEN
ENGINEERING LTD.**

311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 5**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 13 - 21 TO Dec 13 - 21**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 6**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 14 - 21 TO Dec 14 - 21**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 7**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 13 - 21 TO Dec 13 - 21**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 8**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 14 - 21 TO Dec 14 - 21**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				WATER CONTENT (%) W _p W W _L					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				↔ — ○ — ↔					
Ground Elevation: 346.39 m											10 20 30					
346.19 0.20	200 mm TOPSOIL															
	firm dark brown to brown SANDY CLAYEY SILT trace gravel wet	0.5		1	SS	6	●						○		0.5	
		1.0		2	SS	7	●						○		1.0	
345.09 1.30	compact, brown SAND AND SILT trace gravel occ. clayey lenses/seams	1.5		3	SS	10	●						○		1.5	
344.24 2.15	moist compact, brown SAND trace silt moist to saturated	2.5		4	SS	13	●						○		2.5	
		3.0													3.0	
343.14 3.25	very stiff brown to grey CLAYEY SILT TILL trace gravel and sand occ. silt seams/layers	3.5		5	SS	20	●			□			○		3.5	
	moist	4.0													4.0	
		4.5													4.5	
341.39 5.00	End of Borehole	5.0		6	SS	25	●				□	○			5.0	
		5.5													5.5	
		6.0													6.0	
		6.5													6.5	
		7.0													7.0	
		7.5													7.5	

▽

water level at 3.8 m depth
at withdrawal of drilling
augersPROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

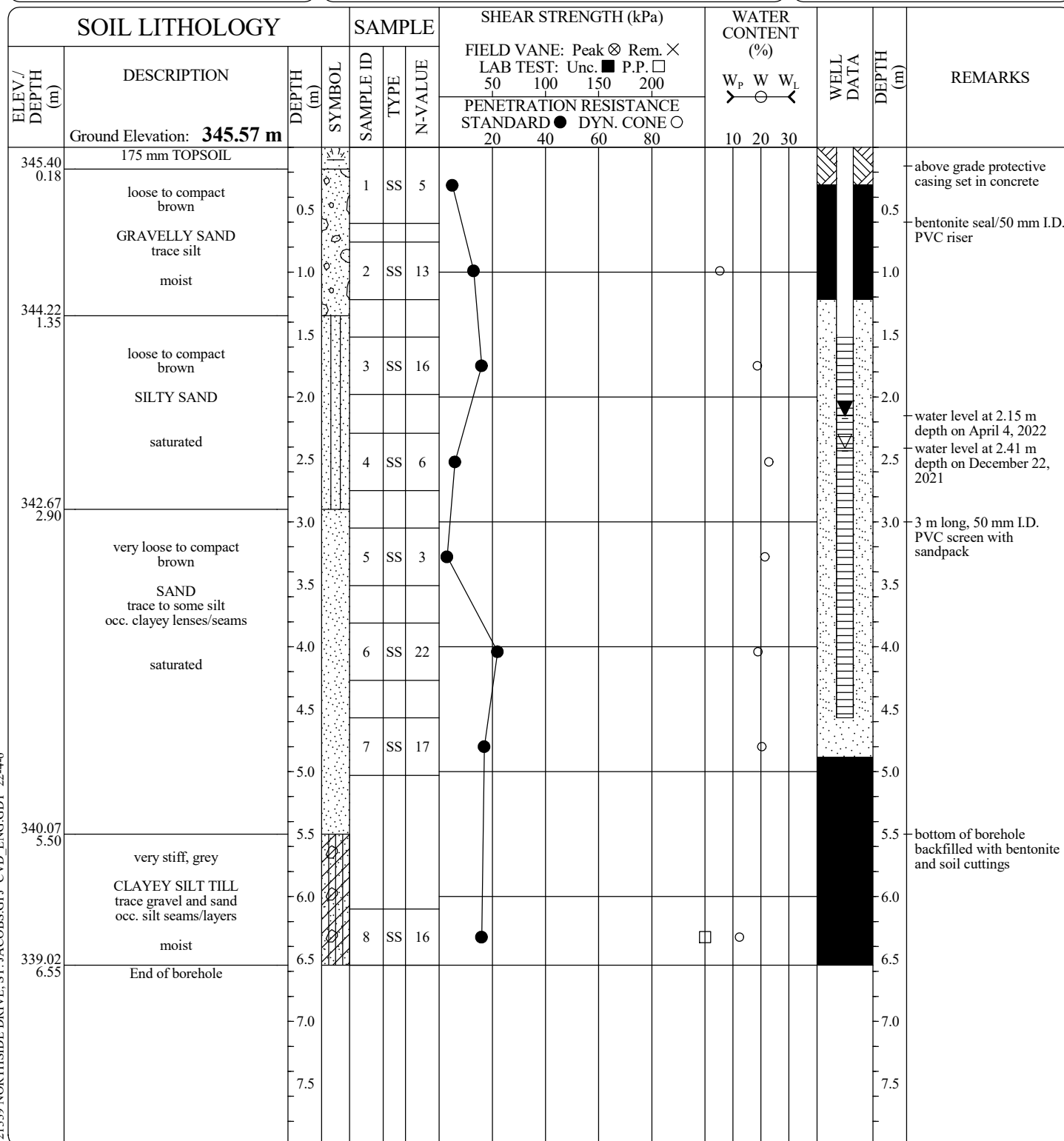
FILE No: G21339**BOREHOLE No. 9**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **Dec 15 - 21 TO Dec 15 - 21**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80					W _p W W _L ↗ — ○ — ↖ 10 20 30
	Ground Elevation: 346.02 m															
345.70 0.33	325 mm TOPSOIL			1	SS	6	●								○	
	soft to firm mottled brown	0.5														
	SILT some clay, trace rootlets	1.0		2	SS	4	●								○	
	wet	1.5														
		2.0		3	SS	3	●								○	
343.87 2.15	very loose, brown SAND trace silt and rootlets saturated	2.5		4	SS	1	●								○	
343.12 2.90	compact brown to grey SILT trace sand and clay saturated	3.0														
		3.5		5	SS	12	●								○	
		4.0														
		4.5		6	SS	18	●								○	
341.62 4.40	very stiff, grey CLAYEY SILT TILL trace gravel and sand occ. silt seams/layers moist	4.5														
341.02 5.00	End of Borehole	5.0		7	SS	20	●								□	
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														

▽
saturated cave-in at 2.7 m
depth at withdrawal of
drilling augers

PROJECT MANAGER: **RVD**
**CHUNG & VANDER DOELEN
ENGINEERING LTD.**

 311 Victoria Street North
 Kitchener, Ontario N2H 5E1
 ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21339**BOREHOLE No. 10**Client: **1604964 Ontario Inc.**Project: **Northside Drive Residential Subdivision**Location: **110 and 118 Northside Drive, St. Jacobs, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **Dec 14 - 21 TO Dec 14 - 21**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

53845-104

Hawkesville Road

Legend

BH101-23

BH102-23

BH104-23

BH105-23

BH103-23

BH106-23

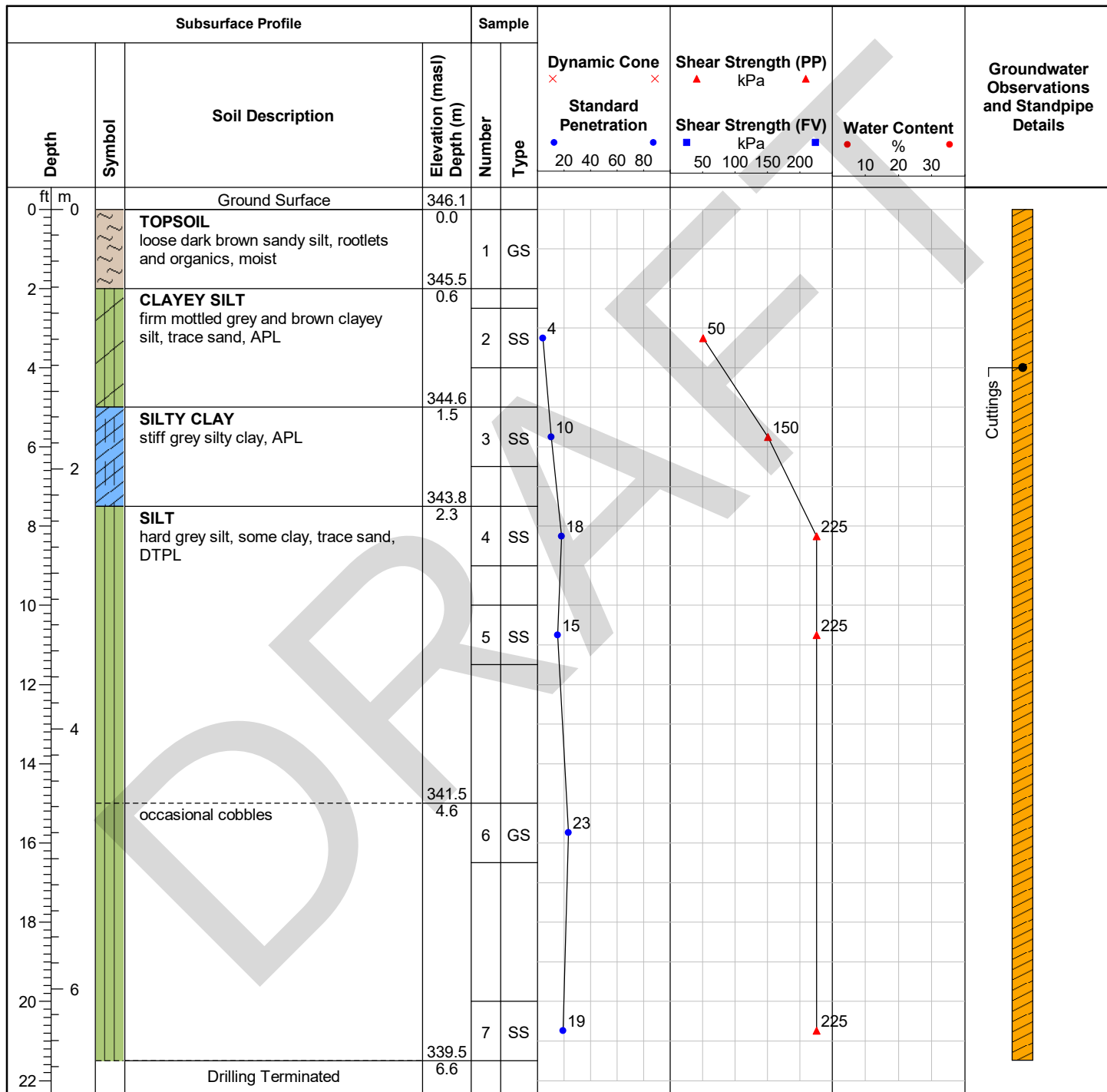
Galvary United Church

Olympicsoos Soccer Academy Kitchener

Google Earth

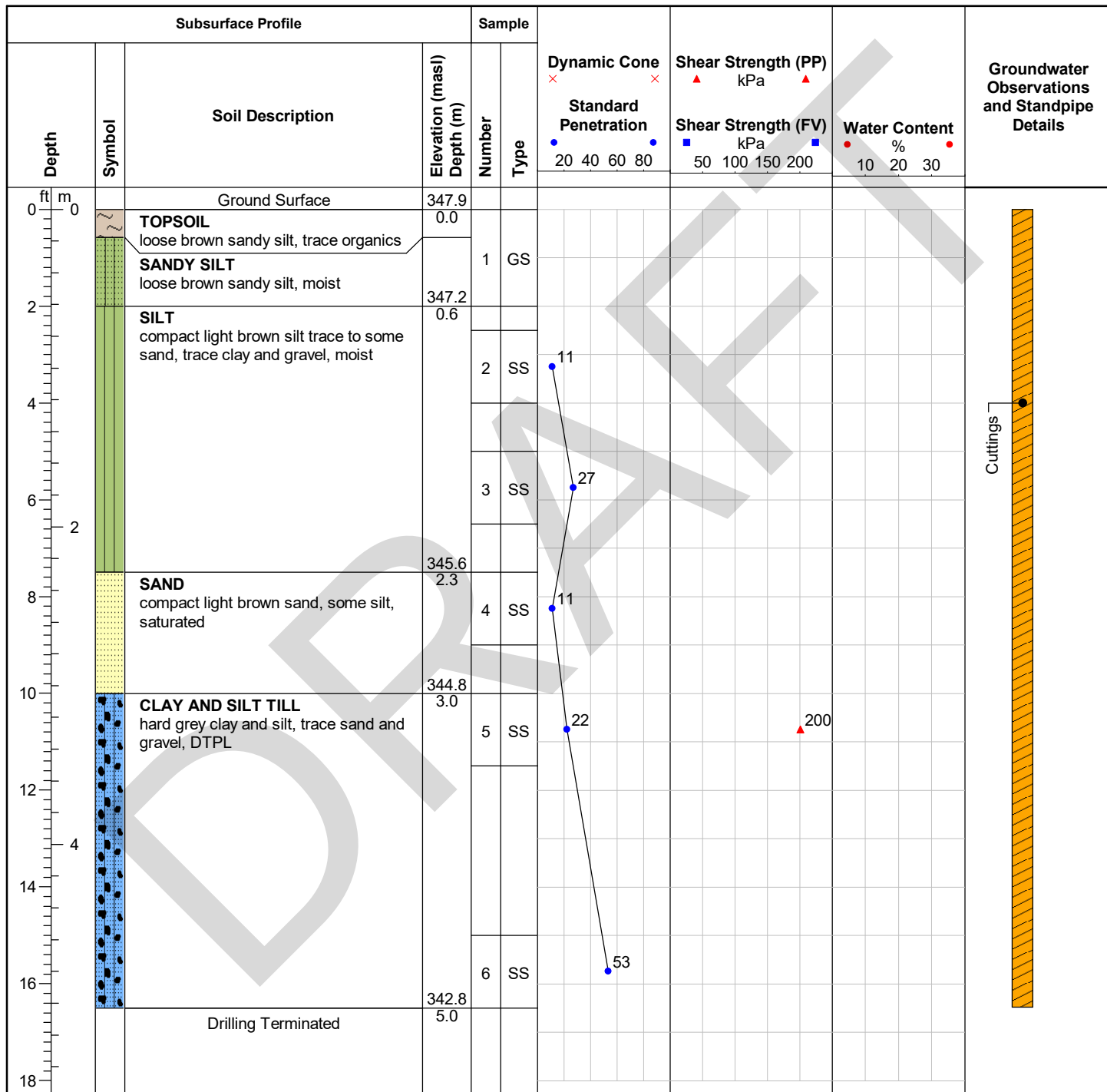
200 m



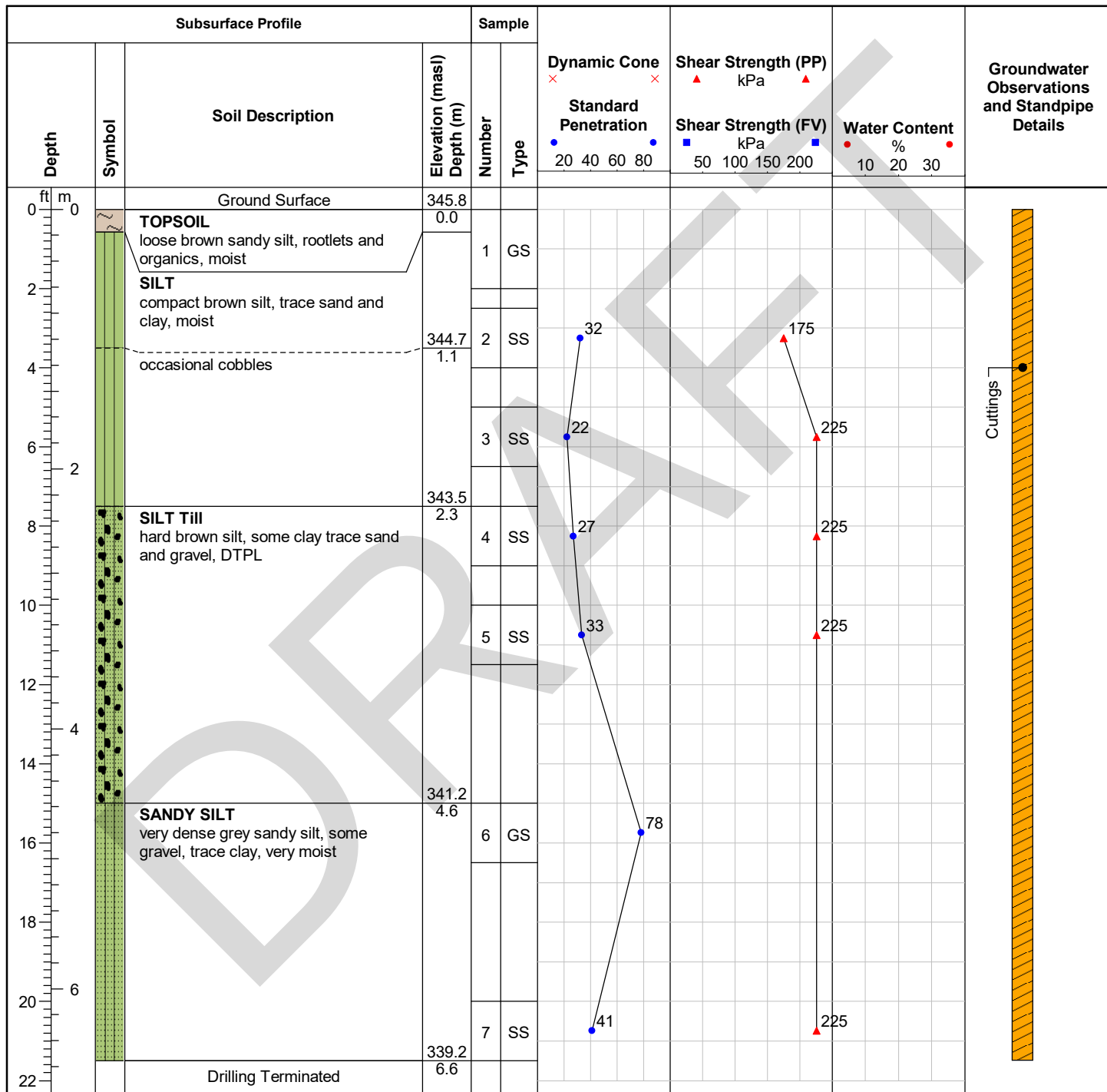
ID No.: BH102-23**Project Name:** St. Jacobs Subdivision**MTE File No.:** 53845-104**Client:** Nideva Properties Inc.**Site Location:** St. Jacobs**Date Completed:** 9/11/2023**Drilling Contractor:** London Soil Test Ltd**Drill Rig:** Diedrich D-50**Drill Method:** Hollow Stem Augers**Protective Cover:** N/A**Field Technician:** Chris M.**Drafted by:** Harman S.**Reviewed by:** Dan G.

Borehole dry upon completion

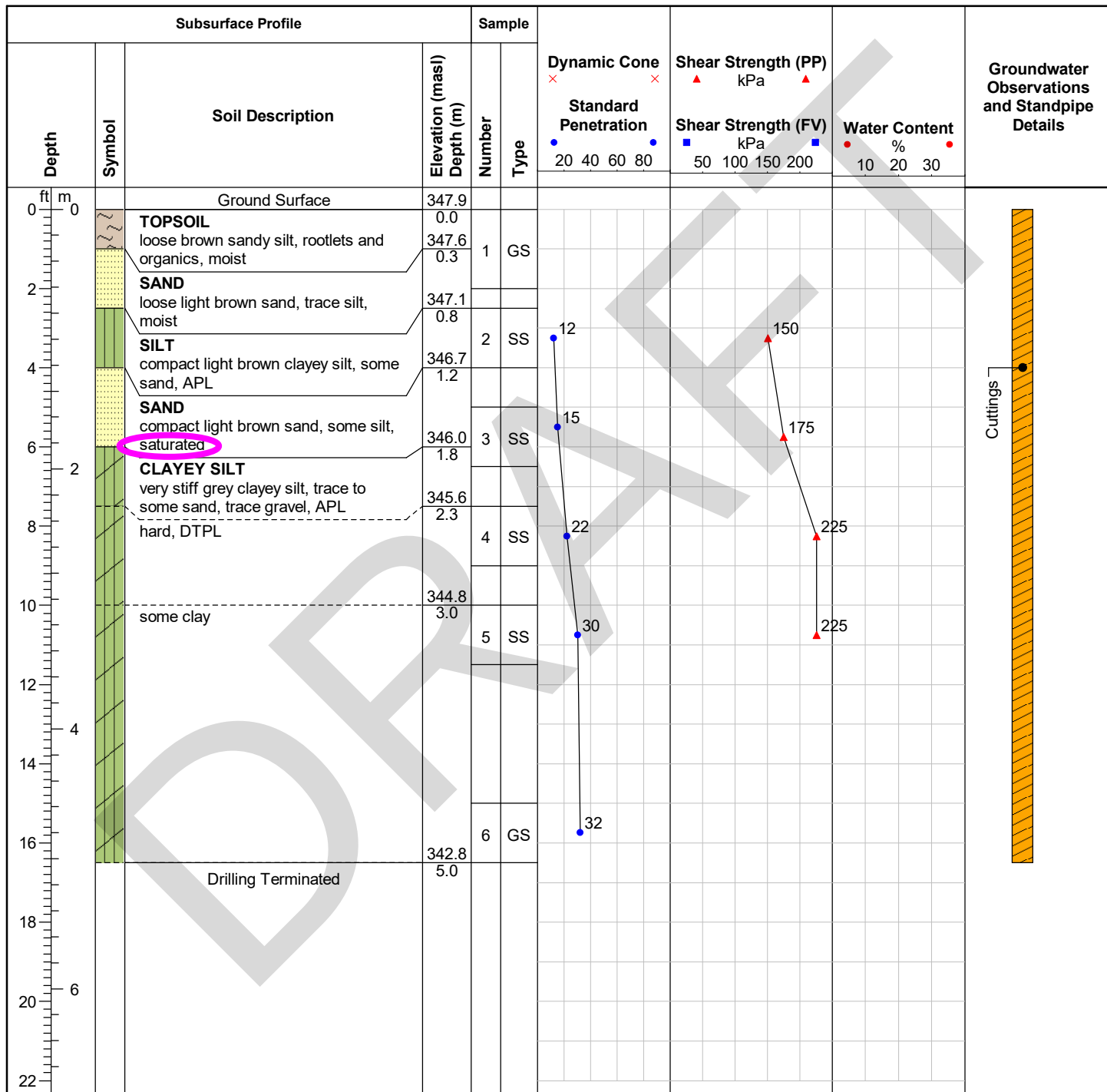
Sheet: 1 of 1

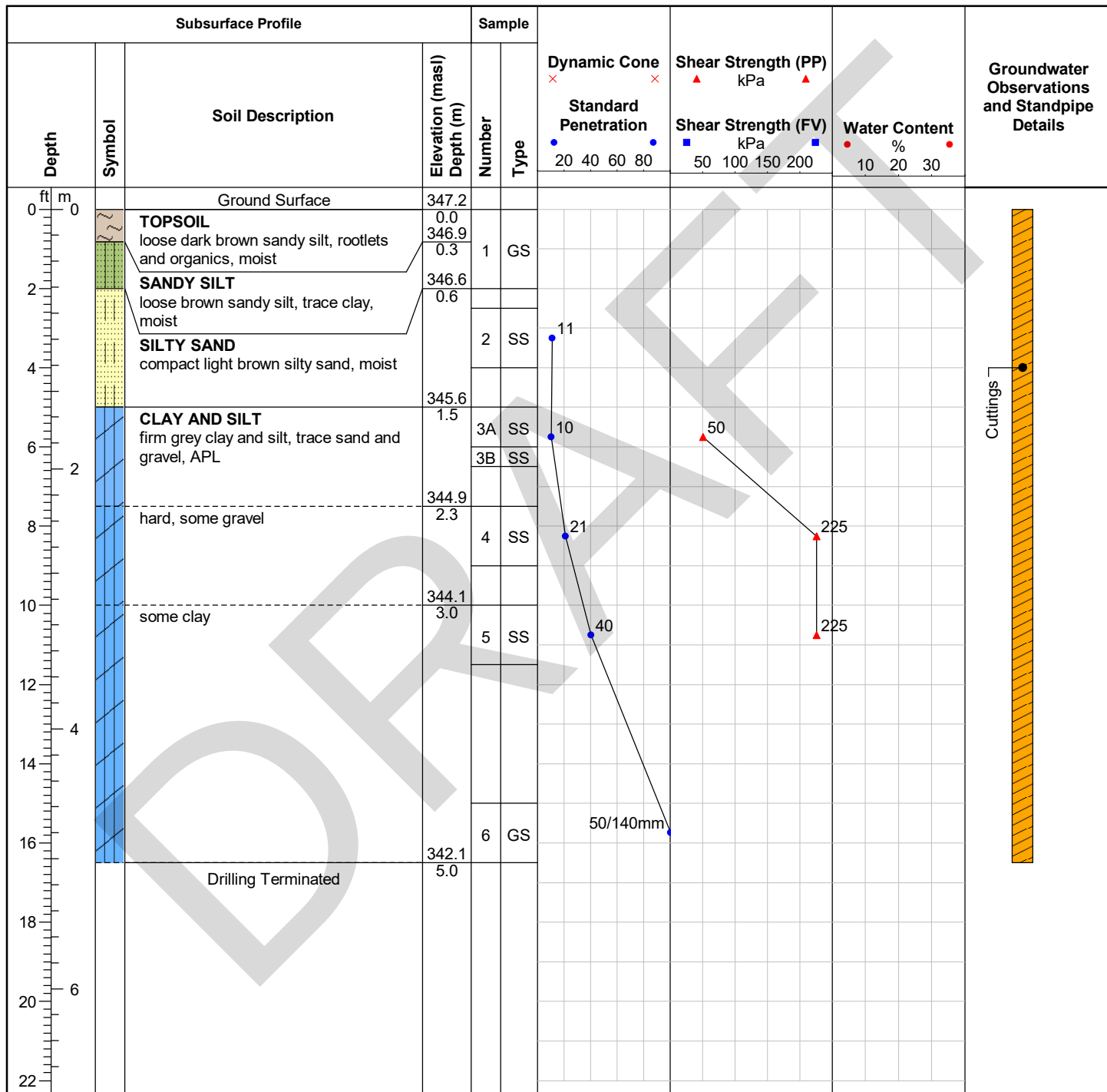
ID No.: BH101-23**Project Name:** St. Jacobs Subdivision**MTE File No.:** 53845-104**Client:** Nideva Properties Inc.**Site Location:** St. Jacobs**Date Completed:** 9/11/2023**Drilling Contractor:** London Soil Test Ltd**Drill Rig:** Diedrich D-50**Drill Method:** Hollow Stem Augers**Protective Cover:** N/A**Field Technician:** Chris M.**Drafted by:** Harman S.**Reviewed by:** Dan G.

Water encountered at 2.2 mbgs during drilling

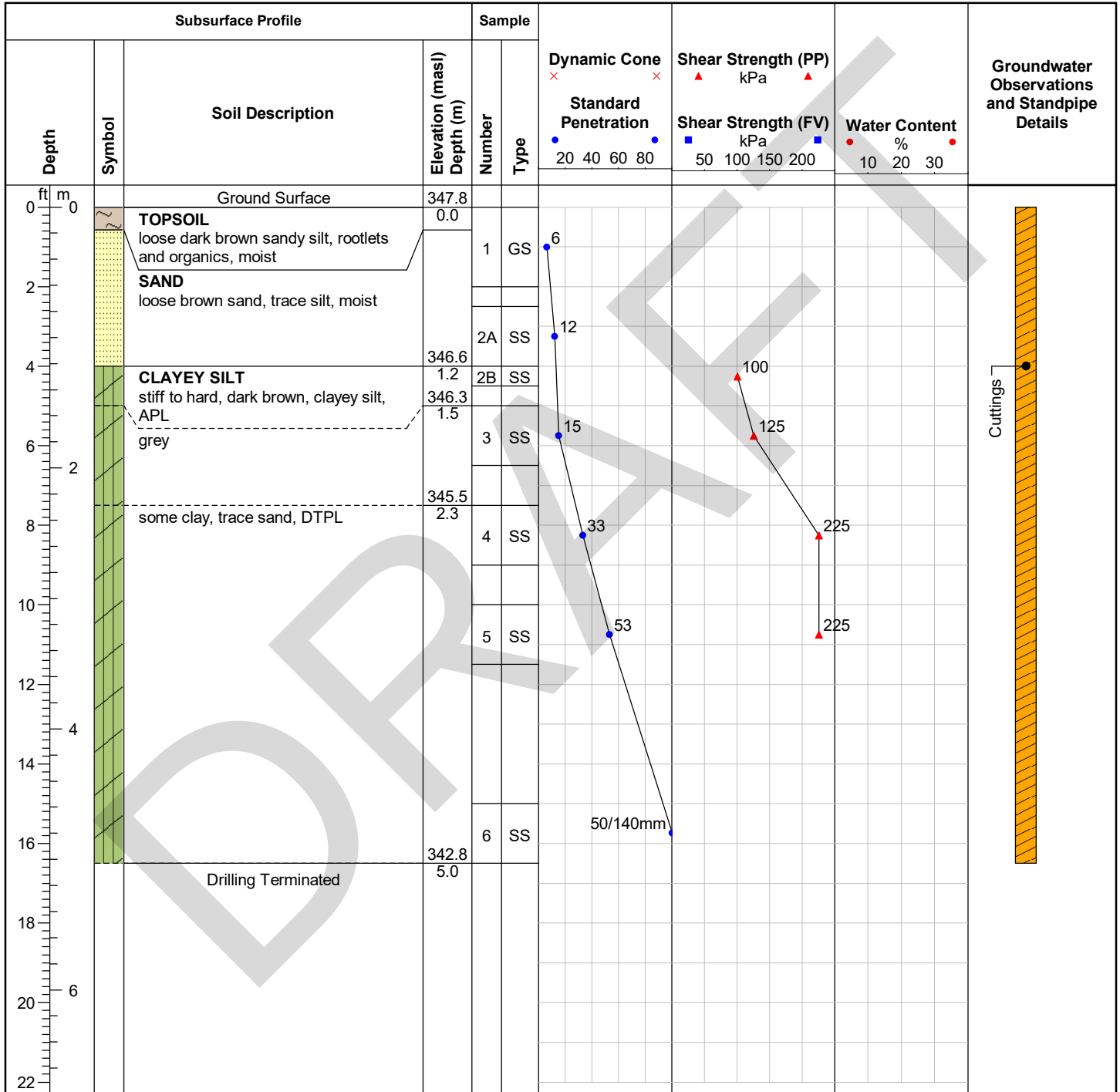
ID No.: BH103-23**Project Name:** St. Jacobs Subdivision**MTE File No.:** 53845-104**Client:** Nideva Properties Inc.**Site Location:** St. Jacobs**Date Completed:** 9/11/2023**Drilling Contractor:** London Soil Test Ltd**Drill Rig:** Diedrich D-50**Drill Method:** Hollow Stem Augers**Protective Cover:** N/A**Field Technician:** Chris M.**Drafted by:** Harman S.**Reviewed by:** Dan G.

Borehole dry upon completion

ID No.: BH104-23**Project Name:** St. Jacobs Subdivision**MTE File No.:** 53845-104**Client:** Nideva Properties Inc.**Site Location:** St. Jacobs**Date Completed:** 9/11/2023**Drilling Contractor:** London Soil Test Ltd**Drill Rig:** Diedrich D-50**Drill Method:** Hollow Stem Augers**Protective Cover:** N/A**Field Technician:** Chris M.**Drafted by:** Harman S.**Reviewed by:** Dan G.**Borehole dry upon completion**

ID No.: BH105-23**Project Name:** St. Jacobs Subdivision**MTE File No.:** 53845-104**Client:** Nideva Properties Inc.**Site Location:** St. Jacobs**Date Completed:** 9/11/2023**Drilling Contractor:** London Soil Test Ltd**Drill Rig:** Diedrich D-50**Drill Method:** Hollow Stem Augers**Protective Cover:** N/A**Field Technician:** Chris M.**Drafted by:** Harman S.**Reviewed by:** Dan G.

Borehole dry upon completion

ID No.: BH106-23**Project Name:** St. Jacobs Subdivision**MTE File No.:** 53845-104**Client:** Nideva Properties Inc.**Site Location:** St. Jacobs**Date Completed:** 9/11/2023**Drilling Contractor:** London Soil Test Ltd**Drill Rig:** Diedrich D-50**Drill Method:** Hollow Stem Augers**Protective Cover:** N/A**Field Technician:** Chris. M**Drafted by:** Harman S.**Reviewed by:** Dan G.

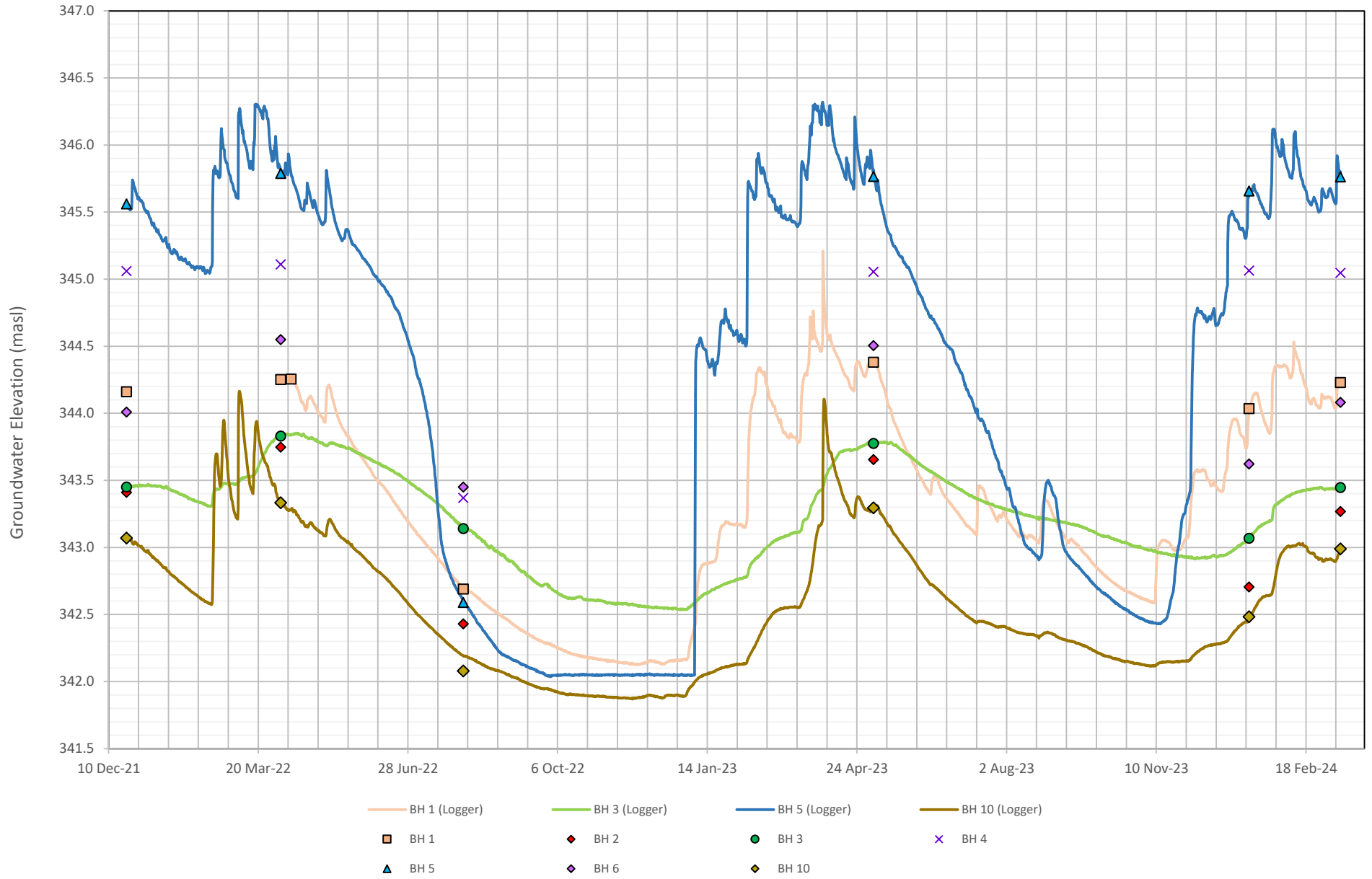
Borehole dry upon completion

Table 1: Summary of Water Levels, Elevations & Fluctuations

	Ground Elevation	Top Pipe Elevation	Hydraulic Conductivity (m/s)	Water Level (m Below Ground Surface)							Water Elevation (mASL)							Fluctuation (m)				
Location	(mASL)	(mASL)		22-Dec-21	04-Apr-22	11-Apr-22	04-Aug-22	05-May-23	11-Jan-24	12-Mar-24	22-Dec-21	04-Apr-22	11-Apr-22	04-Aug-22	05-May-23	11-Jan-24	12-Mar-24	22 Dec - 4 Apr	4 Apr - 4 Aug	4 Aug - 5 May	5 May - 11 Jan	11 Jan - 12 Mar
BH 1	345.23	346.04	1 x 10 ⁻⁵	1.07	0.98	0.97	2.54	0.85	1.20	1.00	344.16	344.25	344.26	342.69	344.38	344.04	344.23	0.09	-1.56	1.69	-0.34	0.19
BH 2	345.72	346.52	-	2.31	1.97		3.29	2.07	3.01	2.45	343.41	343.75		342.43	343.66	342.71	343.27	0.34	-1.32	1.22	-0.95	0.56
BH 3	346.51	347.40	2 x 10 ⁻⁶	3.06	2.68		3.37	2.74	3.44	3.06	343.45	343.83		343.14	343.78	343.07	343.45	0.38	-0.69	0.63	-0.71	0.38
BH 4	345.73	346.60	-	0.67	0.62		2.36	0.68	0.67	0.68	345.06	345.11		343.37	345.06	345.06	345.05	0.05	-1.74	1.69	0.01	-0.02
BH 5	346.35	347.08	7 x 10 ⁻⁷	0.79	0.56		3.76	0.59	0.69	0.59	345.56	345.79		342.59	345.77	345.66	345.76	0.23	-3.20	3.18	-0.11	0.11
BH 6	346.27	347.28	-	2.26	1.72		2.82	1.77	2.65	2.19	344.01	344.55		343.45	344.51	343.62	344.08	0.54	-1.10	1.06	-0.88	0.46
BH 10	345.48	346.34	6 x 10 ⁻⁶	2.41	2.15		3.40	2.19	3.00	2.49	343.07	343.33		342.08	343.30	342.48	342.99	0.26	-1.25	1.21	-0.81	0.51

Notes: 1) All Elevations Referenced to Geodetic Survey
2) Negative Water Level Fluctuation is a Decline in Water Elevation

H21182 Hydrograph: Northside Drive - December 2021 to March 2024



Appendix B

MECP Well Records

40 P10E

UT: 1 17 536000E

9 5R 4820/25N750

Elev. 5R 1125

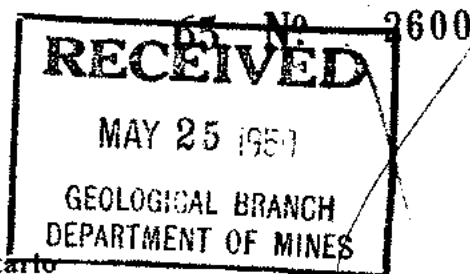
Basin 23



ONTARIO

The Well Drillers Act

Department of Mines, Province of Ontario



Water Well Record

Conc - G.C.T.

at l. at l. h. h. Con. 7. Lot. 8. Pt. Lot. 8. Acres. 32.5

Date Completed 1948 Cost of well (not including pump) 32.5

Pipe and Casing Record

Pumping Test

Casing diameter(s) 4" O.D.
 Length(s) of casing(s) 166
 Length of screen
 Type of screen
 Type of pump 3 1/2" casing
 Capacity of pump 1,000 gal per hr
 Depth of pump setting 75 ft

Date Aug. 22nd 1948
 Developed Capacity
 Duration of Test 12 hrs
 Pumping Rate 900 gal per hr
 Drawdown
 Static level of completed well 142' 31'
 Is well a gravel-wall type? Rock

Water Record

Kind (fresh or mineral)	Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
Fresh	31' 173'	Fresh	142
Quality (hard, soft, contains iron, sulphur etc.)			
Appearance (clear, cloudy, coloured)			
For what purpose(s) is the water to be used?			
How far is well from possible source of contamination?			
What is source of contamination?			
Enclose a copy of any mineral analysis that has been made of water			

Well Log

Drift and Bedrock Record

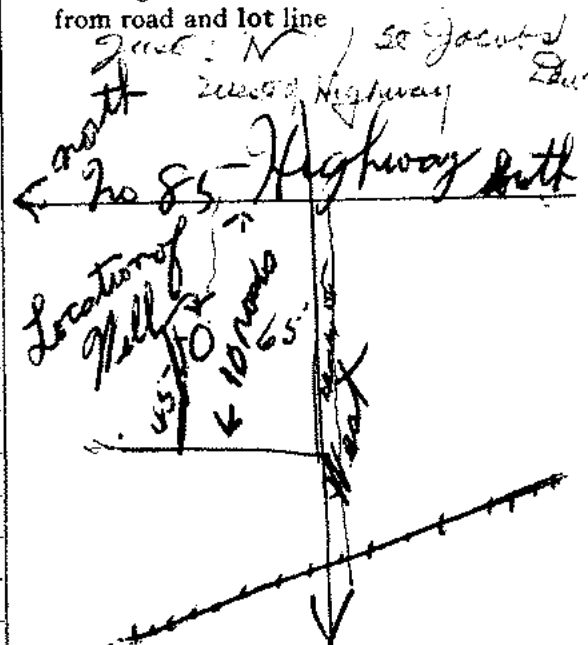
From

To

top soil	0 ft.	3 ft.
Blue clay	3	140
Sand	140	160
Hard Rock	160	173

Location of Well

In diagram below show distances of well from road and lot line



Situation: Is well on upland, in valley, or on hillside? hillside

Drilling Firm John Squader Driller Dial 2313 Clmira

Address R.R. #1 St. Jacobs Ont.

Recorded by John Squader Address R.R. #1 St. Jacobs

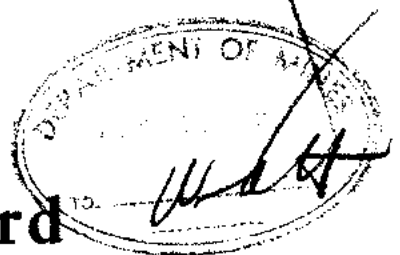
Date May 18th 1950 Licence Number 390

40 P10E 32
UTM 17 2 536050 E
15 R 4821050 N
Elev. 5 R 1125
Base 23 C. T.
Lot - 36



3-65 No 2664

The Well Drillers Act
Department of Mines, Province of Ontario



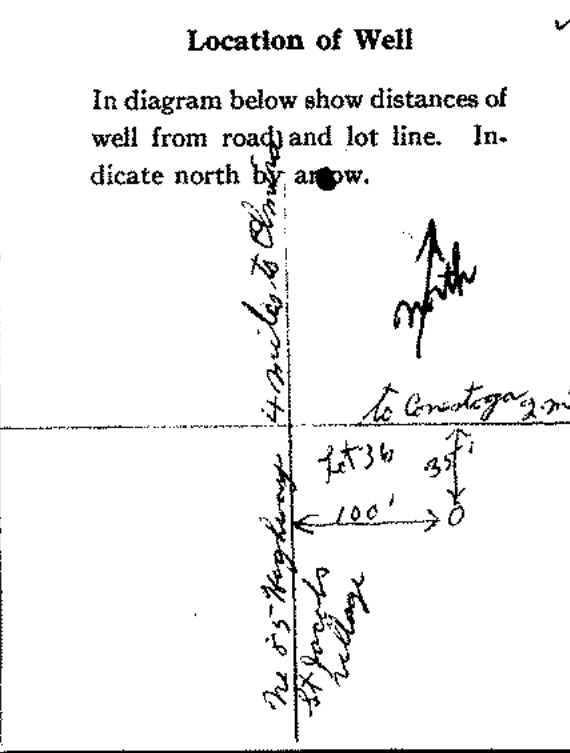
Water Well Record

Waterloo Township, Village, Town or City
Woolwich
St. Jacobs
Date Completed 22nd Dec 1951 Cost of Well (excluding pump) 4.50 per ft

Pipe and Casing Record		Pumping Test	
Casing diameter(s)	4.0 P.	Date	Oct 20, 1951
Length(s) of casing(s)	155 1/2	Static level	43'
Type of screen		Pumping level	
Length of screen		Pumping rate	900 gals per hr
Distance from top of screen to ground level		Duration of test	9 hrs
Is well a gravel-wall type?	Rock	Distance from cylinder or bowls to ground level	70'

Water Record			
Kind (fresh or mineral)	fresh	Depth(s) to Water Horizon(s)	No. of Feet Water Risen
Quality (hard, soft, contains iron, sulphur, etc.)	soft		
Appearance (clear, cloudy, coloured)	clear	164 1/2'	127 1/2'
For what purpose(s) is the water to be used?	house		
How far is well from possible source of contamination?	200		
What is the source of contamination?	prury		
Enclose a copy of any mineral analysis that has been made of water			

Well Log		
Overburden and Bedrock Record	From	To
OPEN WELL	0 ft.	28 ft.
hardpan	28'	35'
hardpan & stones	35'	41'
blue clay	41'	50'
hardpan & boulders	50'	67 1/2'
1 3/4" boulders	67 1/2'	70'
hardpan	70'	102'
Red clay	102'	120'
hardpan & stones	120'	130'
soft blue clay	130'	133'
crushed gravel	133'	138'
limestone rock	138'	146'
Shale rock	146'	150'
limestone rock	150'	164 1/2'



Situation: Is well on upland, in valley, or on hillside? Hillside
Drilling Firm.
Address.
Name of Driller JOHN SAUDER Address 2313 Elmira
Date Jan 12, 1952 - Well Drilling Licence Number 210
MR. L. ST. JACQUES, ONTARIO
John Sauder
Signature of Licensee

40P10E

RECEIVED

37

✓

 UTM 17Z 536073E
 5R 4821100N
 Elev. 5R 1125


ONTARIO

JUL - 2 1952 65 No. 2665

GEOLOGICAL BRANCH
DEPARTMENT OF MINES

The Well Drillers Act

Department of Mines, Province of Ontario

Water Well Record

 Basin 23 Company 1st
 Lot - 36

 Date Completed... 11 March 1952... Cost of Well (excluding pump)... 4.50
 (day) (month) (year)

Pipe and Casing Record

Pumping Test

 Casing diameter(s) 3 5/8 inch
 Length(s) of casing(s) 150 feet
 Type of screen X
 Length of screen X
 Distance from top of screen to ground level
 Is well a gravel-wall type? In Rock
 Date Mar 8th 1952
 Static level 122 4/6
 Pumping level
 Pumping rate 900 gal per hr
 Duration of test 10 hrs
 Distance from cylinder or bowls to ground level 75'

Water Record

Kind (fresh or mineral)	Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
Quality (hard, soft, contains iron, sulphur, etc.)	166	Fresh	122
Appearance (clear, cloudy, coloured)	168		
For what purpose(s) is the water to be used?	46'		
How far is well from possible source of contamination?	168		
What is the source of contamination?			
Enclose a copy of any mineral analysis that has been made of water			

Well Log

Overburden and Bedrock Record

From

To

top soil	0 ft.	06 ft.
Clay & Stones	06	14
Hard Pan	14	24
Soft Blue Clay	24	31
Clay & Stones	31	45
Sandy Clay	45	55
Soft Sandy Clay slightly silt	55	110
Hard Pan	110	125
Shooting sand	125	131
Hard Pan	131	150
Solid Rock	150	168

Location of Well

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

Situation: Is well on upland, in valley, or on hillside?

Drilling Firm...

Address...

Name of Driller...

Date...

Address...

Licence Number...

 John Sander
 Signature of Licensee

UTM 17 536200 E ³⁵
5 4821100 N
 Elev. 5 1125
 Basin 23

The Ontario



65 № 2667

The Ontario Water Resources Commission Act, 1957

WATER WELL RECORD

County or District Waterloo Township, Village, Town or City St. Jacobs
 Date completed 18 April 1961
 (day month year)
 Address St. Jacobs

Casing and Screen Record

Inside diameter of casing 30''
Total length of casing 26'
Type of screen *Shawlpack.*
Length of screen
Depth to top of screen
Diameter of finished hole 30''

Pumping Test

Static level 10'

Test-pumping rate 8 G.P.M.

Pumping level 23'

Duration of test pumping 1 1/2 hr.

Water clear or cloudy at end of test clear

Recommended pumping rate 4 G.P.M.

with pumping level of 23'

Well Log

Water Record

[illegible]

For what purpose(s) is the water to be used?

Domestic

Is well on upland, in valley, or on hillside?.....

Drilling Firm Hades Well Drilling

Address Elmira Ont

Licence Number.....591

Name of Driller R L Franklin

Address Alma

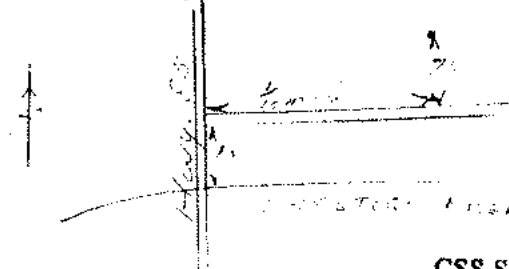
Date April 1861

(Signature of Licensed Drilling Contractor)

Location of Well

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

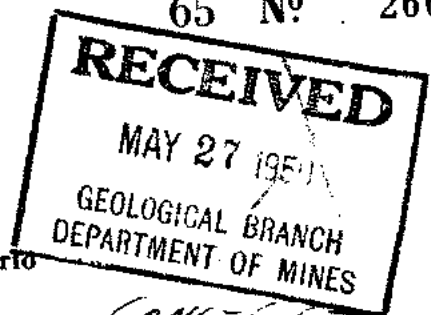
Follow Highway #85 north
into St. Jacobs, go over
concrete bridge at bottom of
hill, turn right just then
go down five lots, lot on
left side of road.



UTM 17 535900 E
9 4821050 N
Elev 1125
Basin 23



The Well Drillers Act
Department of Mines, Province of Ontario



65 No 2668

Water Well Record

CONC-S.C.T.
401-37

Date Completed Dec 23rd 1949 Cost of Well (not including pump) 425
R #1 ST JACOBS

Pipe and Casing Record

Pumping Test

Casing diameter(s) 4" O.D.
Length(s) of casing(s) 164'
Length of screen -
Type of screen -
Type of pump 3 1/4" casing
Capacity of pump 1000 gal per hr
Depth of pump setting 98'
Date Dec 22nd
Developed Capacity -
Duration of Test 10 hrs
Pumping Rate 950 gal per hr
Drawdown -
Static level of completed well 126' 46"
Is well a gravel-wall type? Rock

Water Record

Kind (fresh or mineral) Fresh
Quality (hard, soft, contains iron, sulphur etc.) Soft
Appearance (clear, cloudy, coloured) Clear
For what purpose(s) is the water to be used? Farm & Hatching
How far is well from possible source of contamination? 200'
What is source of contamination? Ven Stable
Enclose a copy of any mineral analysis that has been made of water

Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
46	Fresh	126

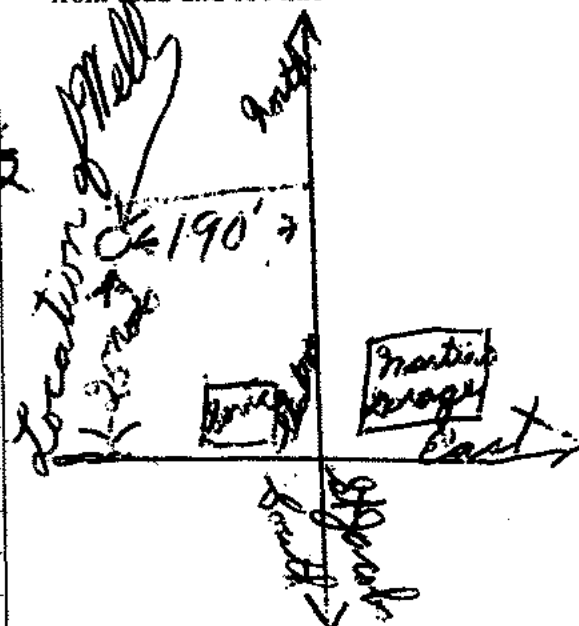
Well Log

Drift and Bedrock Record

	From 0 ft.	To ft.
Top Soil	2	14
Yellow Clay	14	148
Hard Pan & Shales	148	164
Shale Rock	164	172
Hard Rock		

Location of Well

In diagram below show distances of well from road and lot line



Situation: Is well on upland, in valley, or on hillside? Upland
Drilling Firm John Sander & Sons
Address R.R. #1 St. Jacobs Ont
Recorded by John Sander Address R.R. #1 St. Jacobs
Date May 23rd 1950 Licence Number 390

Map: Well records

This map allows you to search and view well record information from reported wells in Ontario.

Full dataset is available in the Open Data catalogue
(<https://data.ontario.ca/dataset/well-records>) .



[Go Back to Map](#)

Well ID

Well ID Number: 6502669

Well Audit Number:

Well Tag Number:

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location		
Township	WOOLWICH TOWNSHIP	
Lot	037	
Concession	GCT	
County/District/Municipality	WATERLOO	
City/Town/Village		

Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 535339.10 Northing: 4822223.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

	LOAM			0 ft	3 ft
YLLW	CLAY			3 ft	15 ft
	HPAN			15 ft	34 ft
	GRVL			34 ft	35 ft
BRWN	CLAY	MSND		35 ft	65 ft
	HPAN			65 ft	82 ft
BRWN	CLAY	MSND		82 ft	98 ft
BLUE	CLAY	STNS		98 ft	104 ft
	STNS			104 ft	106 ft

	HPAN			106 ft	142 ft
	MSND			142 ft	153 ft
	LMSN			153 ft	182 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed	

Method of Construction & Well Use

Method of Construction	Well Use	
Cable Tool	Domestic	
	Livestock	

Status of Well

Water Supply

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To	
4 inch	STEEL		164 ft	

4 inch	OPEN HOLE		182 ft
--------	-----------	--	--------

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To	

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 4725

Results of Well Yield Testing

After test of well yield, water was	CLEAR	
-------------------------------------	-------	--

If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	15 GPM
Duration of Pumping	8 h:0 m
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	PUMP

Disinfected?	
--------------	--

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL	48 ft		
1		1	
2		2	
3		3	
4		4	
5		5	

10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind	
182 ft	Fresh	

Hole Diameter

Depth From	Depth To	Diameter	

--	--	--

Audit Number:

Date Well Completed: September 08, 1951

Date Well Record Received by MOE: January 14, 1952

Related

How to use a Ministry of the Environment map (<https://www.ontario.ca/page/how-use-ministry-environment-map#wells>)

Technical documentation: Metadata record (<https://data.ontario.ca/dataset/well-records/resource/3031344e-e3f2-48d5-888c-c1deadfd2f77>)

Updated: January 10, 2024

Published: March 20, 2014

Form 5

40P10E



65 No. 2672

UTM 17Z 536025E

5R 4821450N

Elev. 541.25

Basin 23 Waterloo

Con. C.T. Lot 37

The Ontario Water Resources Commission Act

WATER WELL RECORD

Woolwich

Township, Village, Town or City (ST JACOBS)

Date completed July 3 1964 (day month year)

Address St. Jacobs

Casing and Screen Record

Inside diameter of casing 5"
Total length of casing 153 ft
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 5"

Pumping Test

Static level 52 ft
Test-pumping rate 10 G.P.M.
Pumping level 20
Duration of test pumping 24 hrs
Water clear or cloudy at end of test clear
Recommended pumping rate 10 or less G.P.M.
with pump setting of 25 feet below ground surface

Well Log

Overburden and Bedrock Record

From ft.	To ft.
0	3
3	15
15	105
105	115
115	135
135	146
146	153

Soil & Fill
clay
clay & HP
Red clay & HP
clay & HP
clay & sand & stones
Rock

Water Record

Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
147 to 153 ft	Fresh

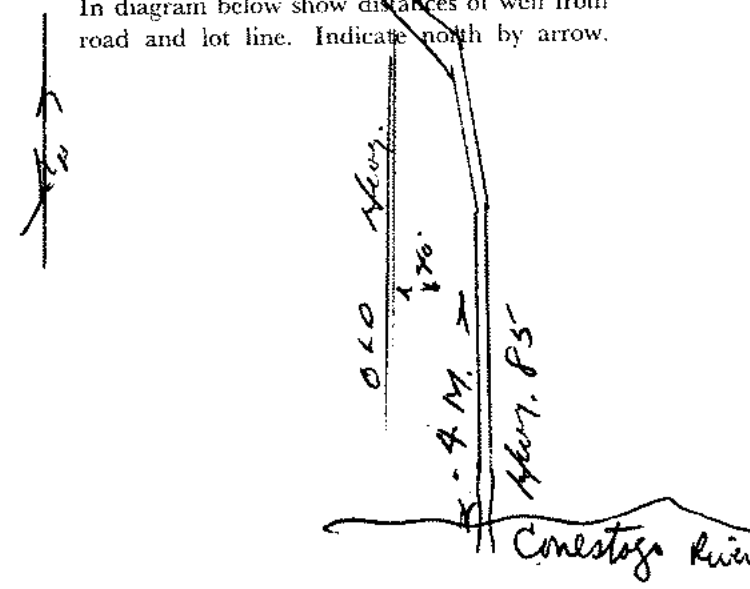
For what purpose(s) is the water to be used? House

Is well on upland, in valley, or on hillside? upland
Drilling or Boring Firm R. McLaughlin
Water well & Supply Ltd.
Address 236 Erbe W. Waterloo

Licence Number 1265
Name of Driller or Borer Bryan Carey
Address R.R. #3, Waterloo
Date Dec 31, 1964
(Signature of Licensed Drilling or Boring Contractor) R. McLaughlin

Location of Well

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



40P10E
39



65 No. 2672

UTM 17Z 536025E
5R 4821450N
Elev. 5' 1 1/2

The Ontario Water Resources Commission Act

WATER WELL RECORD

Woolwich

Basin 23
County or District Waterloo

Township, Village, Town or City ST JACOBS

Con. G.C.T. Lot 37

Date completed July 3 1964
(day month year)

Address St. Jacobs

Casing and Screen Record

Inside diameter of casing 5"
Total length of casing 153 ft
Type of screen
Length of screen
Depth to top of screen 5"
Diameter of finished hole

Pumping Test

Static level 52 ft
Test-pumping rate 10 G.P.M.
Pumping level 70
Duration of test pumping 24 hrs
Water clear or cloudy at end of test clear
Recommended pumping rate 10 or less G.P.M.
with pump setting of 75 feet below ground surface

Well Log

Overburden and Bedrock Record

Soil & Fill
clay
clay & HP
Red clay & HP
clay & HP
clay & sand & stones
Rock

From ft.

To ft.

Depth(s) at which water(s) found

Kind of water (fresh, salty, sulphur)

0	3		
3	15		
15	105		
105	115		
115	135		
135	146		
146	153	147 to 153 ft	Fresh

For what purpose(s) is the water to be used? House

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm R. McLaughlin
Water well & Supply Ltd.

Address 236 Erbe W.
Waterloo

Licence Number 1265

Name of Driller or Borer Bryan Carey

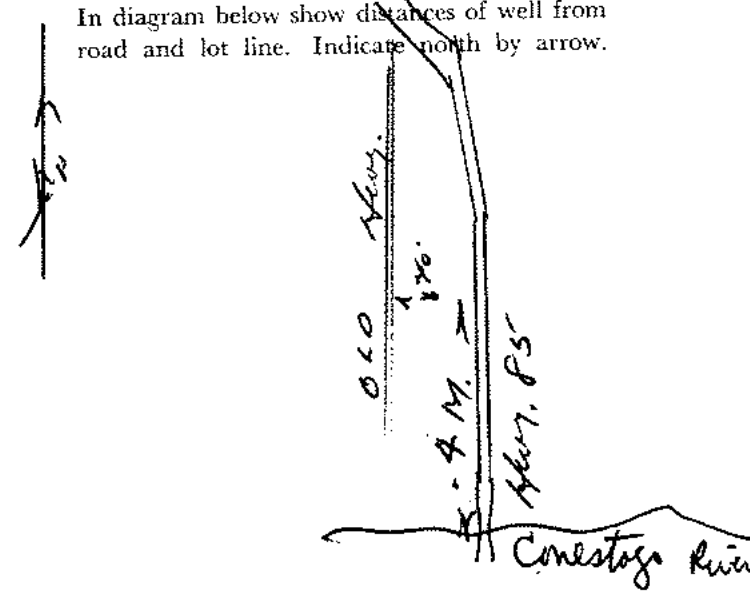
Address R.R. #3, Waterloo

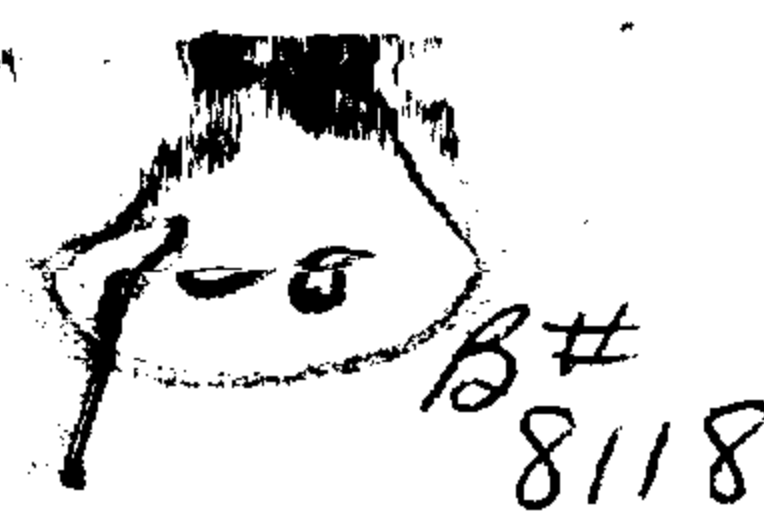
Date Dec 31 1964

(Signature of Licensed Drilling or Boring Contractor)
R. McLaughlin

Location of Well

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





11

CON

407

22 23
LOT 25-27

5

BASIN CODE
1 2

IV



WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6503542

MUNICIP.

65005

CON.

GCT

COUNTY OR DISTRICT WATERLOO	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE WOOLOWICH	CON., BLOCK, TRACT, SURVEY, ETC. GCT	LOT 037
OWNER (SURNAME FIRST) ST. JACQUES VILLAGE	ADDRESS St. Jacobs	DATE COMPLETED DAY 12 MO July YR 66	
ZONE 17	EASTING 535910	NORTHING 4821270	RC 4
		ELEVATION 430	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
	top soil			0	1
	sand		silty	1	23
	clay	sand	silty	23	33
	clay	till		33	138
blue-grey	shale	brown dolomite	(interbedded)	138	207

31	0001 02	0023 09	0033 050906	0138 051912	0309 317
32					

41 WATER RECORD		51 CASING & OPEN HOLE RECORD		60 PLUGGING & SEALING RECORD	
WATER SOUND FEET	KIND OF WATER	INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
0178 0130	☒ FRESH ☐ SALTY	10-11	☒ STEEL	312	0
0100 183	☐ SULPHUR ☐ MINERAL	12	☐ GALVANIZED		138-5
0100 183	☐ SULPHUR ☐ MINERAL	13-16	☐ CONCRETE		0198
0100 183	☐ SULPHUR ☐ MINERAL	17-18	☐ OPEN HOLE		0207
0100 183	☐ SULPHUR ☐ MINERAL	19	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	20-25	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	26	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	27-30	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	31-33	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	34-38	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	39-40	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	41-44	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	45-48	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	49-50	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	51-54	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	55-58	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	59-60	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	61-64	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	65-68	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	69-72	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	73-76	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	77-80	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	81-84	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	85-88	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	89-92	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	93-96	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	97-100	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	101-104	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	105-108	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	109-112	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	113-116	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	117-120	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	121-124	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	125-128	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	129-132	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	133-136	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	137-140	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	141-144	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	145-148	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	149-152	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	153-156	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	157-160	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	161-164	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	165-168	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	169-172	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	173-176	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	177-180	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	181-184	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	185-188	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	189-192	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	193-196	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	197-200	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	201-204	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	205-208	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	209-212	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	213-216	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	217-220	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	221-224	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	225-228	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	229-232	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	233-236	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	237-240	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	241-244	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	245-248	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	249-252	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	253-256	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	257-260	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	261-264	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	265-268	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	269-272	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	273-276	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	277-280	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	281-284	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	285-288	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	289-292	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	293-296	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	297-300	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	301-304	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	305-308	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	309-312	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	313-316	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	317-320	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	321-324	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	325-328	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	329-332	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	333-336	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	337-340	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	341-344	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	345-348	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	349-352	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	353-356	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	357-360	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	361-364	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	365-368	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	369-372	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	373-376	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	377-380	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	381-384	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	385-388	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	389-392	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	393-396	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	397-400	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	401-404	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	405-408	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	409-412	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	413-416	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	417-420	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	421-424	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	425-428	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	429-432	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	433-436	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	437-440	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	441-444	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	445-448	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	449-452	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	453-456	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	457-460	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	461-464	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	465-468	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	469-472	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	473-476	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	477-480	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	481-484	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	485-488	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	489-492	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	493-496	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	497-500	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	501-504	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	505-508	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	509-512	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	513-516	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	517-520	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	521-524	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	525-528	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	529-532	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	533-536	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	537-540	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	541-544	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	545-548	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	549-552	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	553-556	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	557-560	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	561-564	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	565-568	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	569-572	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	573-576	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	577-580	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	581-584	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	585-588	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	589-592	☐ GALVANIZED		
0100 183	☐ SULPHUR ☐ MINERAL	593-596	☐ CONCRETE		
0100 183	☐ SULPHUR ☐ MINERAL	597-600	☐ OPEN HOLE		
0100 183	☐ SULPHUR ☐ MINERAL	601-604	☐ STEEL		
0100 183	☐ SULPHUR ☐ MINERAL	605-608	☐ GALVANIZED		
0100 183	<				



WATER WELL RECORD

40P100

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6503543

MUNICIP.

65005

CON.

GCT

COUNTY OR DISTRICT WATERLOO	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE WOOLWICH	CON., BLOCK, TRACT, SURVEY, ETC. GCT	LOT 037
OWNER (SURNAME FIRST) ST JACOBS VILLAGE		DATE COMPLETED 15 Aug 66	
ADDRESS Police Village of St. Jacobs		DAY 15 MO Aug YR 66	

ZONE 17	EASTING 536050	NORTHING 4821720	RC 4	ELEVATION 1128	RC 5	BASEIN CODE 23
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LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	top soil			0	1
	gravel		fine	1	6
	clay		till	6	144
	clay	stones + broken rock		144	150
	rock		broken	150	153
blue-grey	Shale	brown dolomite	(interbedded)	153	191

31	0001 02	0006 11	0144 15	0150 25	0153 26	0191 31
32						

41	WATER RECORD	51	CASING & OPEN HOLE RECORD	61	PLUGGING & SEALING RECORD
WATER FOUND AT - FEET 183	KIND OF WATER ☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL	INSIDE DIAM. INCHES 08	MATERIAL ☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	WALL THICKNESS INCHES 3/2	DEPTH - FEET FROM 0 TO 153
20-23	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL	17-18	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE		
25-28	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL	24-25	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE		
30-33	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL				

71	PUMPING TEST	10	PUMPING RATE	11-14	DURATION OF PUMPING
☒ PUMP ☐ BAILER	25	WATER LEVELS DURING	☒ PUMPING ☐ RECOVERY	15-16	HOURS 00 MINS 50
STATIC LEVEL 051	WATER LEVEL END OF PUMPING 154	15 MINUTES 138	30 MINUTES 144	45 MINUTES 146	60 MINUTES 148
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT 180	WATER AT END OF TEST 180	☒ CLEAR ☐ CLOUDY		
RECOMMENDED PUMP TYPE ☐ SHALLOW ☒ DEEP	RECOMMENDED PUMP SETTING 180	RECOMMENDED PUMPING RATE 0055			
50-53	000-6	GPM./FT. SPECIFIC CAPACITY			

54	FINAL STATUS OF WELL	55-56	WATER USE	57	METHOD OF DRILLING
☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL	☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED	☐ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER	☐ COMMERCIAL ☒ MUNICIPAL ☐ COOLING OR AIR CONDITIONING ☐ NOT USED	☒ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION	☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR	NAME OF WELL CONTRACTOR McLAUGHLIN WATER WELLS	LICENCE NUMBER 3518	58	CONTRACTOR 3518	59-62	DATE RECEIVED 130372
	ADDRESS AND Supply LTD.		DATE OF INSPECTION	INSPECTOR		
	NAME OF DRILLER OR BORER L. WEBBER	LICENCE NUMBER				
	SIGNATURE OF CONTRACTOR McLaughlin	SUBMISSION DATE 4 4 72				

OWRC COPY

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

6509413

Municipality
65005

Con,
GCT

County or District Waterloo	Township/Borough/City/Town/Village Woolwich Twp.	Con block tract survey, etc. Con. GCT	Lot Pt. 37
	Address 192 Edgehill Dr. Kitchener, Ont	Date completed 5 day	Feb 03 month year

[illegible]

41 WATER RECORD					
Water found at - feet		Kind of water			
154	10-13	1 ☒ Fresh	7 ☐ Sulphur		14
		2 ☐ Salty	4 ☐ Minerals		
			6 ☐ Gas		
	15-18	1 ☐ Fresh	3 ☐ Sulphur		19
		2 ☐ Salty	4 ☐ Minerals		
			6 ☐ Gas		
	20-23	1 ☐ Fresh	3 ☐ Sulphur		24
		2 ☐ Salty	1 ☐ Minerals		
			6 ☐ Gas		
	25-28	1 ☐ Fresh	3 ☐ Sulphur		29
		2 ☐ Salty	4 ☐ Minerals		
			6 ☐ Gas		
	30-33	1 ☐ Fresh	3 ☐ Sulphur		34
		2 ☐ Salty	4 ☐ Minerals		
			5 ☐ Gas		

CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
10-11	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			
6		.188	+2-1	154
17-18	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			
				20-23
24-25	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			
				27-30

SCREEN	Sizes of opening (Slot No.)	Diameter	Length
	# 30 slot	5.75 inches	3 feet
	Material and type Stainless Steel	Depth at top of screen 151 feet	

61				PLUGGING & SEALING RECORD			
☒ Annular space				☐ Abandonment			
Depth set at - feet		Material and type (Cement grout, bentonite, etc.)					
From	To						
10-13	14-17	Bentonite grout Holeplug					
154	20						
18-21	22-25						
20	0						
26-29	30-33	40					

PUMPING TEST	71 Pumping test method ¹⁶ 1 ☒ Pump 2 ☐ Baller		Pumping rate ¹¹⁻¹⁴ 12 GPM		Duration of pumping ¹⁵⁻¹⁶ 2 Hours 30 ¹⁷⁻¹⁸ Mins	
	Static level		25 Water level end of pumping		1 ☐ Pumping 2 ☒ Recovery	
	19-21	22-24	15 minutes ²⁶⁻²⁸	30 minutes ²⁹⁻³¹	45 minutes ³²⁻³⁴	60 minutes ³⁵⁻³⁷
	41 feet	61 feet	51 feet	41 feet	41 feet	41 feet
	If flowing give rate ³⁸⁻⁴¹ GPM		Pump intake set at ⁴² 100 feet		Water at end of test ☒ Clear ☐ Cloudy	
	Recommended pump type ☐ Shallow ☒ Deep		Recommended pump setting ⁴³⁻⁴⁵ 100 feet		Recommended pump rate ⁴⁶⁻⁴⁹ 10 GPM	

FINAL STATUS OF WELL			54
1 ☒ Water supply	5 ☐ Abandoned, insufficient supply	9 ☐ Unfinished	
2 ☐ Observation well	6 ☐ Abandoned, poor quality	10 ☐ Replacement well	
3 ☐ Test hole	7 ☐ Abandoned (Other)		
4 ☐ Recharge well	8 ☐ Dewatering		

WATER USE			55-56
1 ☒ Domestic	5 ☐ Commercial	9 ☐ Not use	
2 ☐ Stock	6 ☐ Municipal	10 ☐ Other	
3 ☐ Irrigation	7 ☐ Public supply		
4 ☐ Industrial	8 ☐ Cooling & air conditioning		

METHOD OF CONSTRUCTION			57
1 ☐ Cable tool	5 ☐ Air percussion	9 ☐ Driving	
2 ☒ Rotary (conventional)	6 ☐ Boring	10 ☐ Digging	
3 ☐ Rotary (reverse)	7 ☐ Diamond	11 ☐ Other	
4 ☐ Rotary (air)	8 ☐ Jetting		

LOCATION OF WELL

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

The diagram illustrates the location of a well (marked 'X') within a property lot. A vertical line on the left represents the 'COUNTY ROAD 15'. A horizontal dashed line represents the 'LOT LINE'. The well is located 60 feet from the road and 40 feet from the lot line. A 'House' is located above the well, and a 'SHOP' is located to the right of the well. A north arrow points towards the top right of the diagram.

Name of Well Contractor Davidson Well Drilling Ltd.	Well Contractor's Licence No. 1737
Address Box 486, Wingham, Ontario NOG 2W0	
Name of Well Technician K. Losch	Well Technician's Licence No. T0927
Signature of Technician/Contractor <i>[Signature]</i> G. C. Davidson	Submission date 19 Feb 03

MINISTRY USE ONLY	Data source	58 Contractor	59-62	Date received	63-66	67
		1737		AUG 05 2003		
	Date of inspection	Inspector				
	Remarks					

Appendix C

**GHD Stratigraphic & Instrumentation
Records**

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 10/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821913 m

Easting: 535496 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 346.16 m

Elevation Datum:

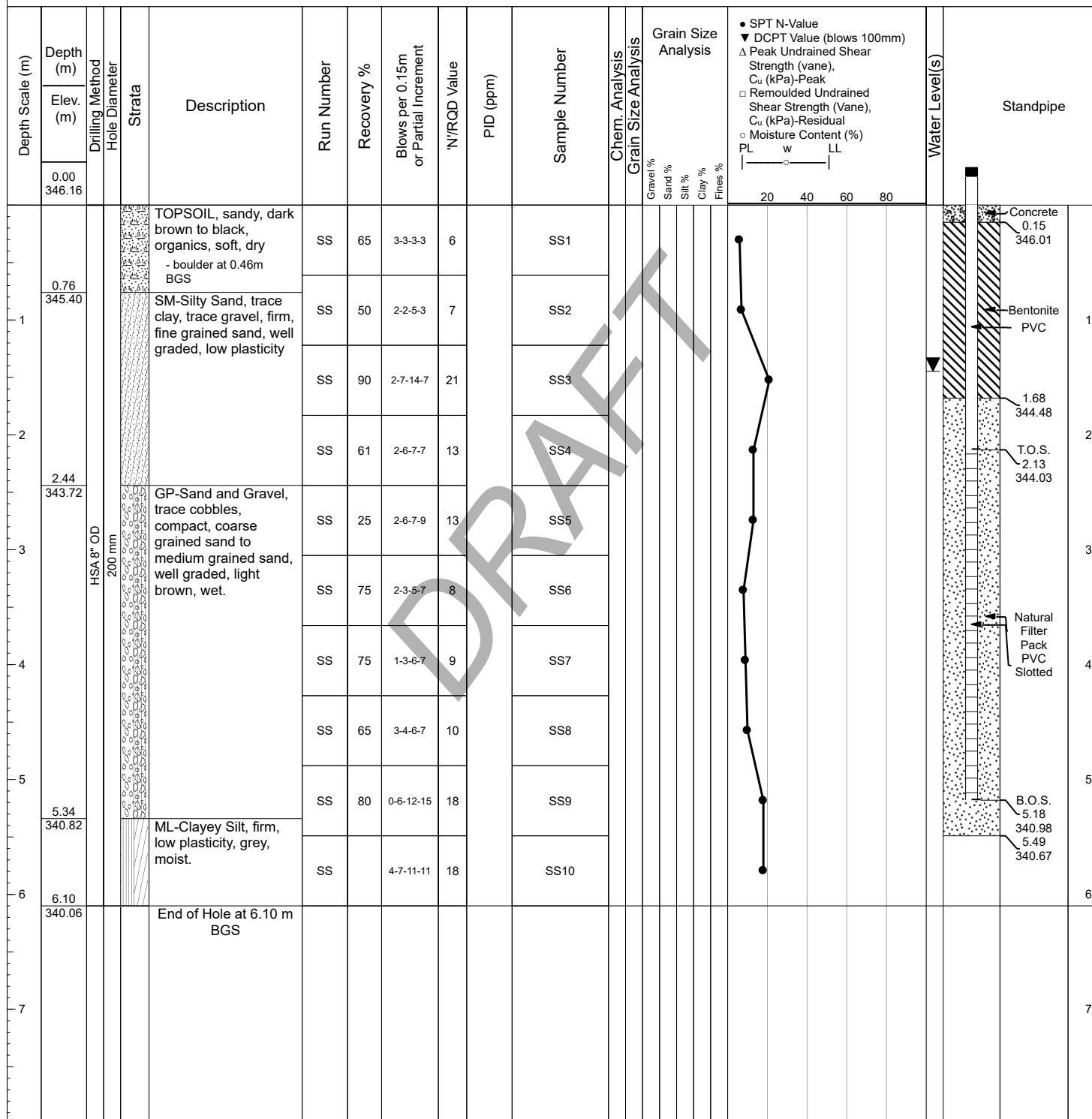
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 6.10 m

Coordinates and Elevation Values are Approximate

Page 1 of 1



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling:

Upon Completion of Drilling: 1.45 m on 11/10/2024

Well - Reference Elevation(s)

Location	Elevation (m)
MW1-24	346.95

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen

Screen Diameter: 50 mm

Screen Slot Size: 50 mm

Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 10/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821841 m

Easting: 535702 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 346.89 m

Elevation Datum:

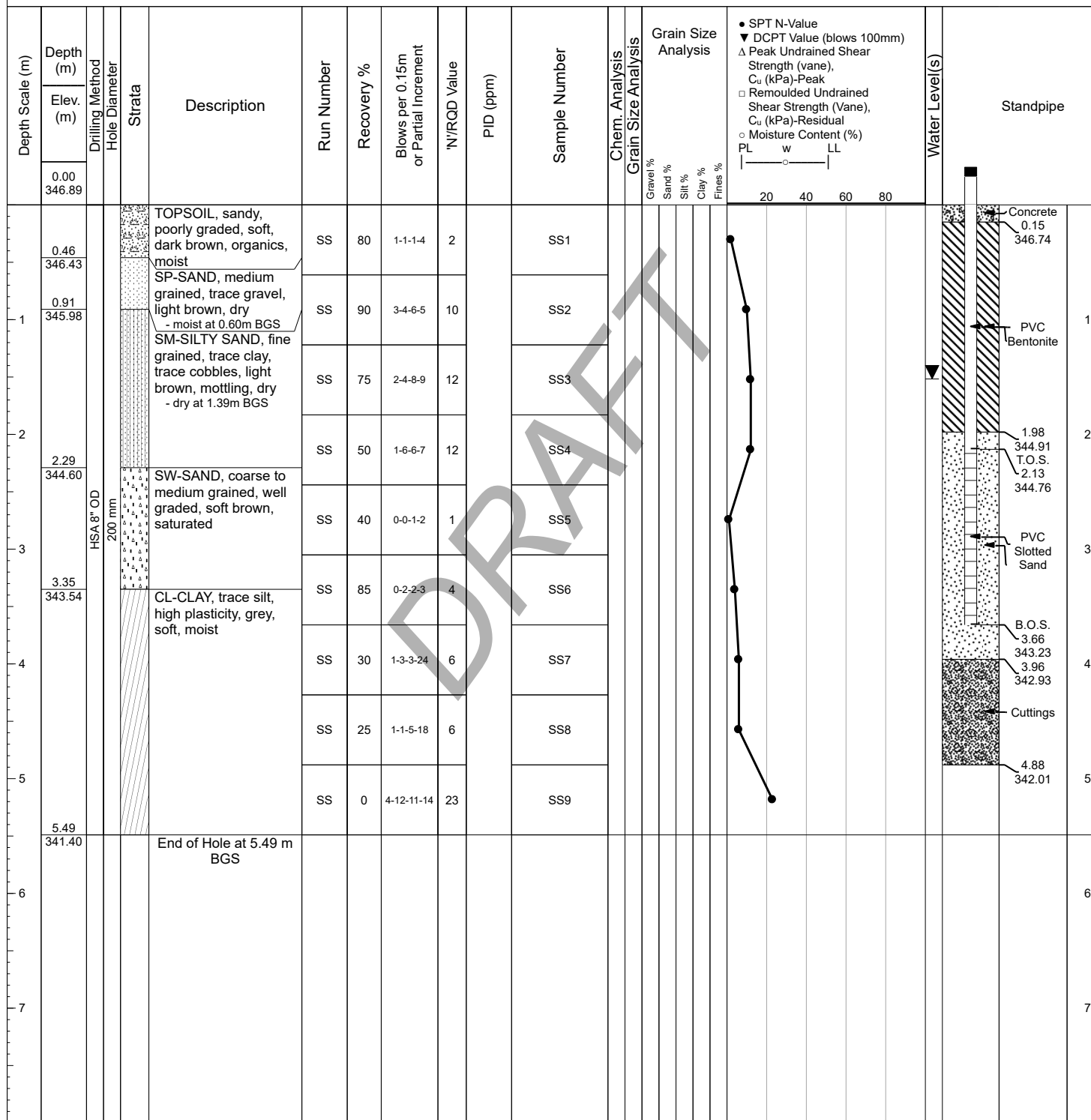
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 5.49 m

Coordinates and Elevation Values are Approximate

Page 1 of 1



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table



At Time of Drilling:

Upon Completion of Drilling: 1.52 m on 11/10/2024 Depth of water at 1.28 m BTOR after drilling

Well - Reference Elevation(s)

Location	Elevation (m)
MW2-24	347.63

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen

Screen Diameter: 50 mm

Screen Slot Size: 50 mm
Material: PVC

Material: PVC



STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW3-24

Project Number: 12637434-DEL.2

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 10/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821820 m

Easting: 535486 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 347.15 m

Elevation Datum:

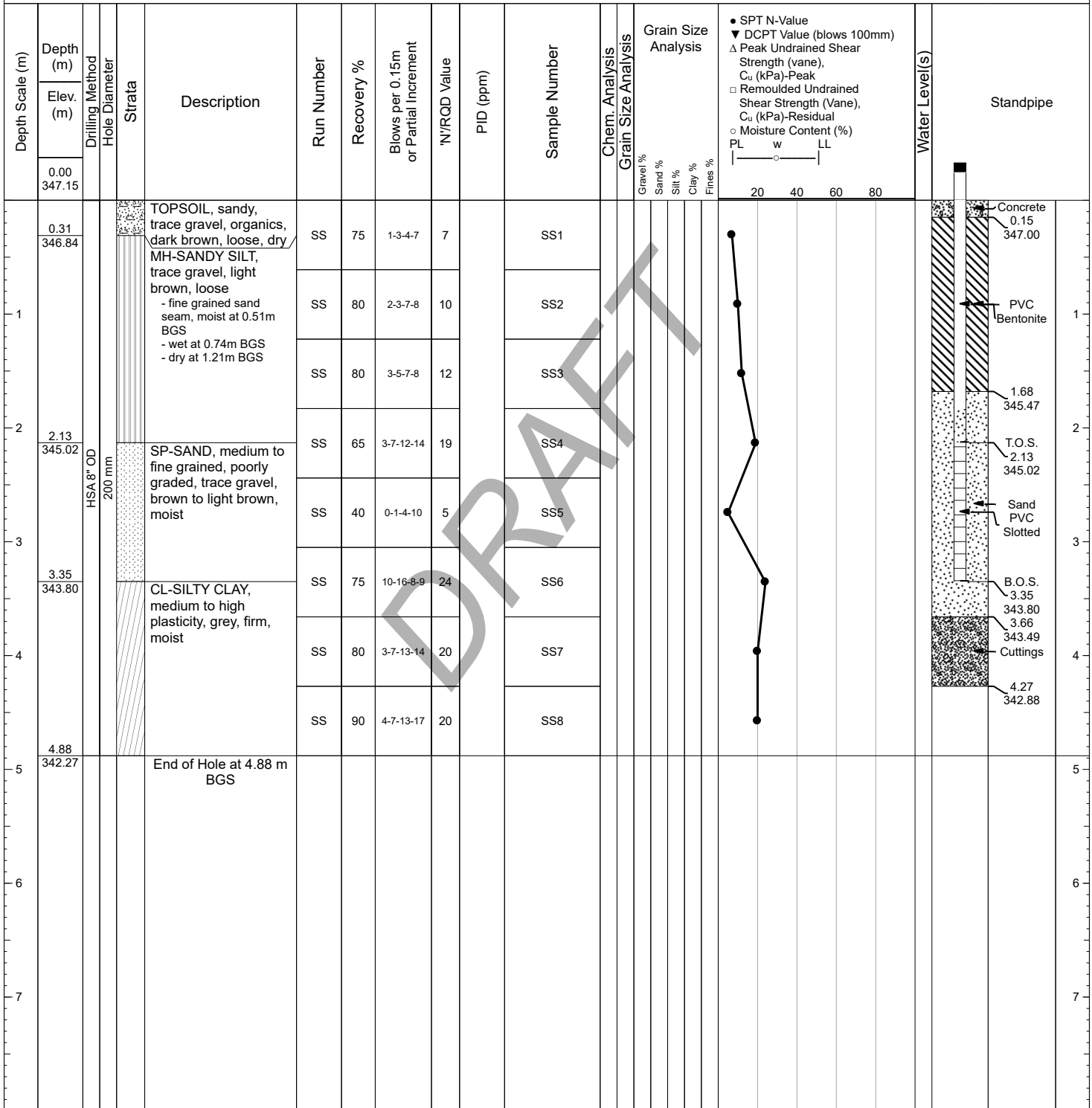
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 4.88 m

Coordinates and Elevation Values are Approximate

Page 1 of 1



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling:

Upon Completion of Drilling:

Well - Reference Elevation(s)

Location: MW3-24, Elevation (m): 347.90

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 50 mm
Screen Slot Size: 50 mm
Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 09/04/2024 - 10/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821758 m

Easting: 535691 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 347.08 m

Elevation Datum:

Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 6.10 m

Page 1 of 1

Coordinates and Elevation Values are Approximate

[illegible]

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling: 1.87 m on 11/10/2024 Depth of
Upon Completion of Drilling: water at 2.41 m BTOR after drilling

N Value: R - Refusal

Created with OpenGround Template: GHD-CA-GEN-ENV-Overburden-Rev02 / Strip Set: GHD-CA-GEN-Overburden Log-V5 25/4/25

Well - Reference Elevation(s)

Location	Elevation (m)
MW4-24	347.80

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen
Screen Diameter: 50 mm
Screen Slot Size: 50 mm
Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 11/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821725 m

Easting: 535511 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 347.80 m

Elevation Datum:

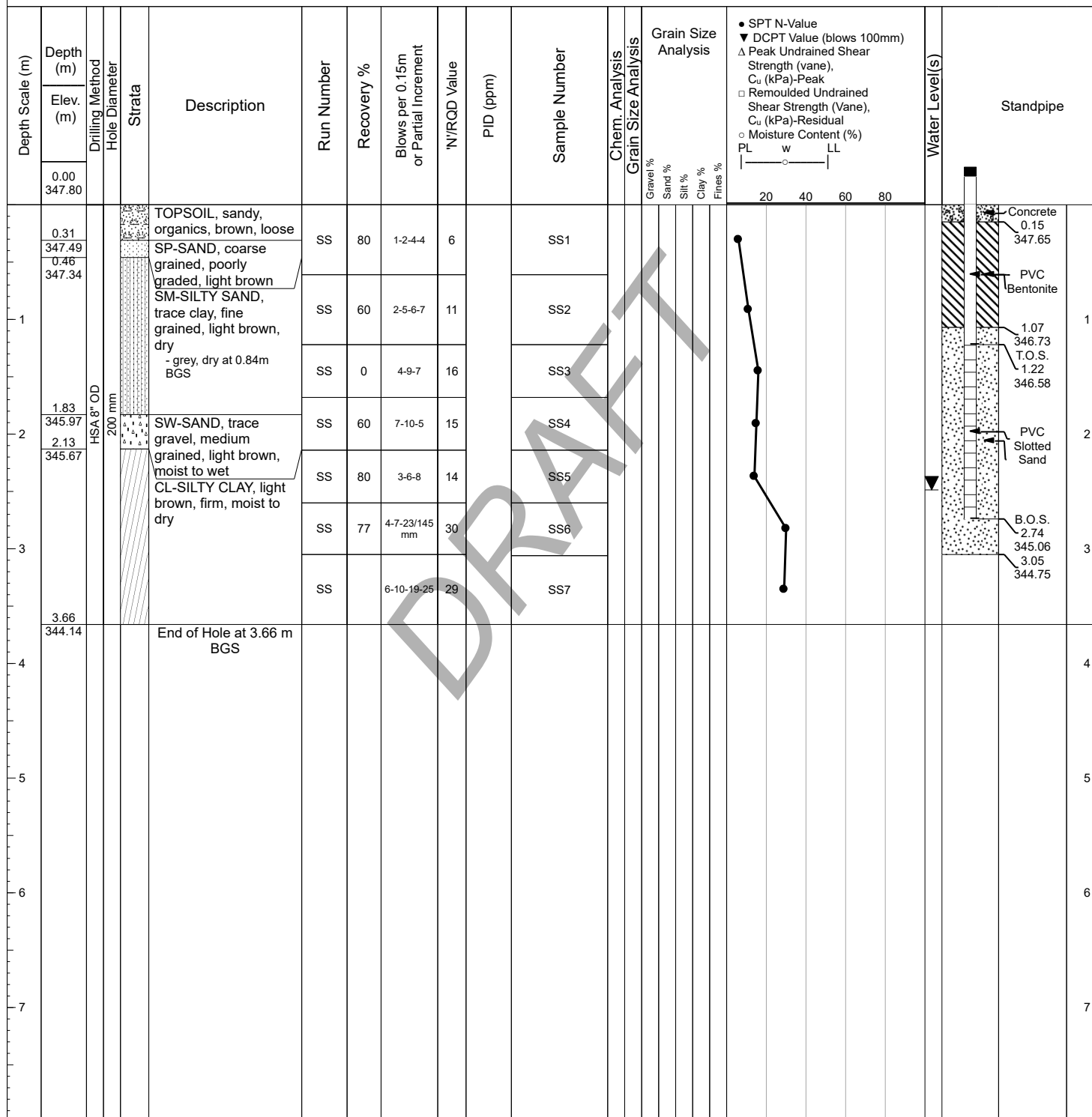
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 3.66 m

Coordinates and Elevation Values are Approximate

Page 1 of 1



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table



At Time of Drilling:

Upon Completion of Drilling: 2.49 m on 11/10/2024 Depth of water at 2.38 m BTOR after drilling

Well - Reference Elevation(s)

Location	Elevation (m)
MW5-24	348.59

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen

Screen Diameter: 50 mm

Screen Slot Size: 50 mm

Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 11/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821648 m

Easting: 535577 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 347.82 m

Elevation Datum:

Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 4.12 m

Page 1 of 1

Coordinates and Elevation Values are Approximate

[illegible]

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table



At Time of Drilling:

Upon Completion of Drilling: 2.03 m on 11/10/2024 Depth of water at 1.84 m BTOR after drilling

Well - Reference Elevation(s)

Location	Elevation (m)
MW6-24	348.56

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen

Screen Diameter: 50 mm

Screen Slot Size: 50 mm

Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 09/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821634 m

Easting: 535712 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 347.08 m

Elevation Datum:

Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 6.10 m

Coordinates and Elevation Values are Approximate

Page 1 of 1

[illegible]

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling: 1.42 m on 11/10/2024 Depth of
Upon Completion of Drilling: water at 2.41 m BTOR after drilling

N Value: R - Refusal

Created with OpenGround Template: GHD-CA-GEN-ENV-Overburden-Rev02 / Strip Set: GHD-CA-GEN-Overburden Log-V5 25/4/25

Well - Reference Elevation(s)

Location	Elevation (m)
MW7-24	347.94

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 50 mm
Screen Slot Size: 50 mm
Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 12/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821518 m

Easting: 535535 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 345.90 m

Elevation Datum:

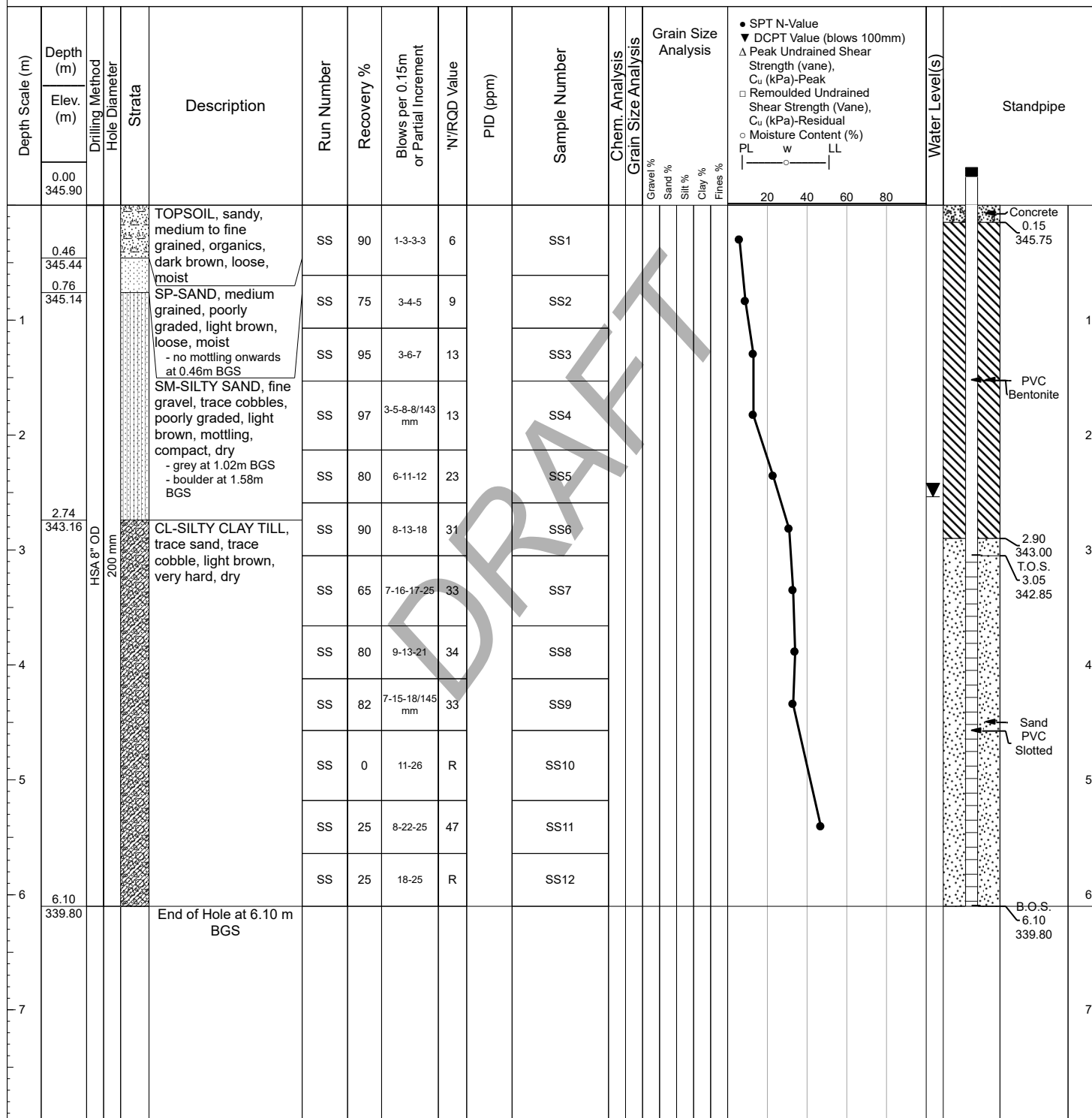
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 6.10 m

Page 1 of 1

Coordinates and Elevation Values are Approximate



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling: 2.54 m on 11/10/2024 Dry after
Upon Completion of Drilling: drilling

N Value: R - Refusal

Created with OpenGround Template: GHD-CA-GEN-ENV-Overburden-Rev02 / Strip Set: GHD-CA-GEN-Overburden Log-V5 25/4/25

Well - Reference Elevation(s)

Location	Elevation (m)
MW8-24	346.66

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen
Screen Diameter: 50 mm
Screen Slot Size: 50 mm
Material: PVC

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 09/04/2024

Drilling Co. (Driller): Anrdvark(John)

Northing: 4821470 m

Easting: 535775 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 348.11 m

Elevation Datum:

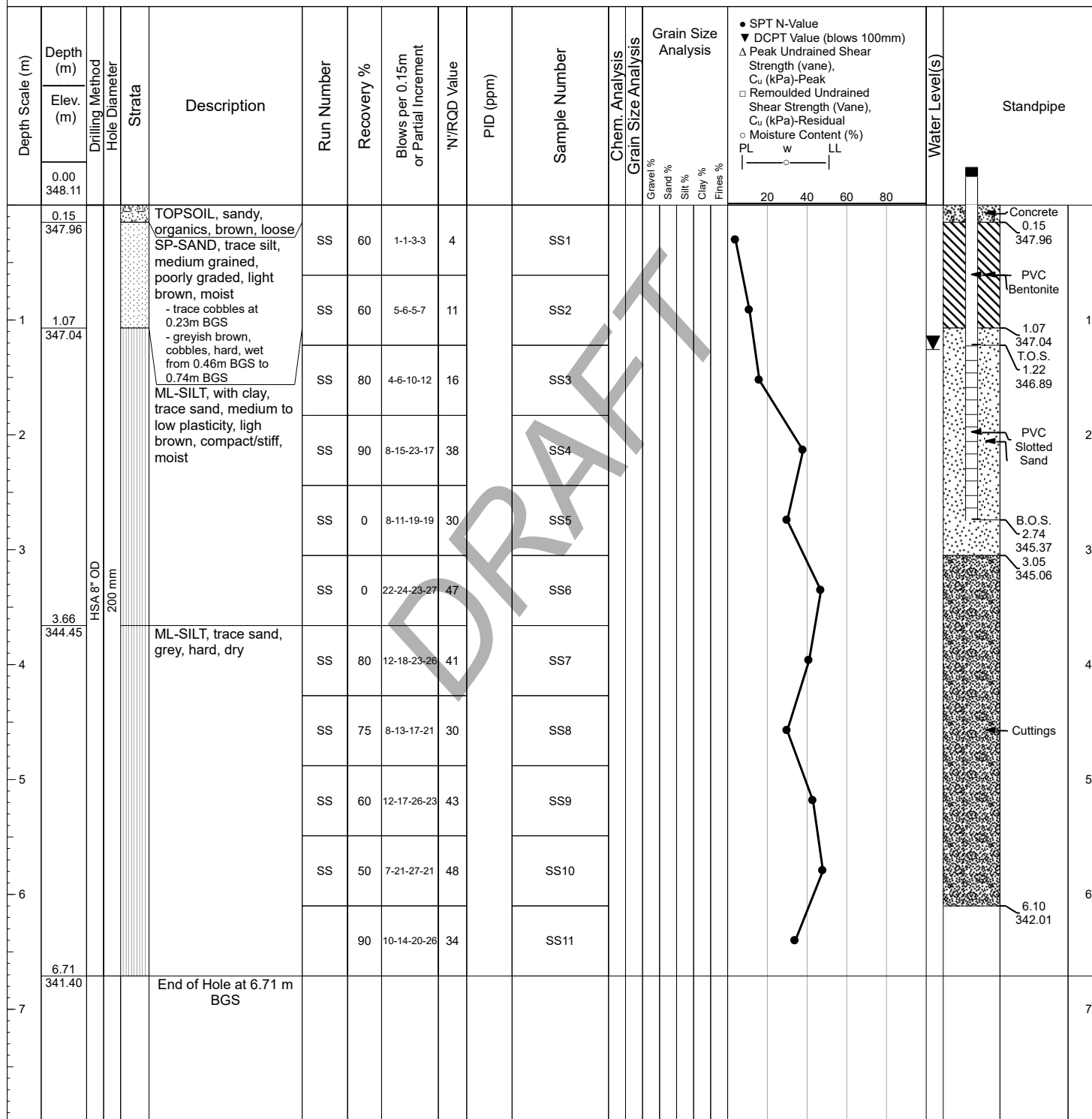
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 6.71 m

Coordinates and Elevation Values are Approximate

Page 1 of 1



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table



At Time of Drilling:

At Time of Drilling: Not Encountered Dry at the time of
Upon Completion of Drilling: drilling

Well - Reference Elevation(s)

Location	Elevation (m)
MW9-24	348.96

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen

Screen Diameter: 50 mm

Screen Slot Size: 50 mm
Material: PVC

Material: PVC

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW10-24

Project Number: 12637434-DEL.2

Client: Schlegel Urban Developments Corp.

Project: St. Jacobs Lands

Location: 52 Hawkesville Road, St. Jacobs, Ontario

Date Range (dd/mm/yyyy): 11/04/2024

Drilling Co. (Driller): Aardvark(John)

Northing: 4821414 m

Easting: 535685 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 346.89 m

Elevation Datum:

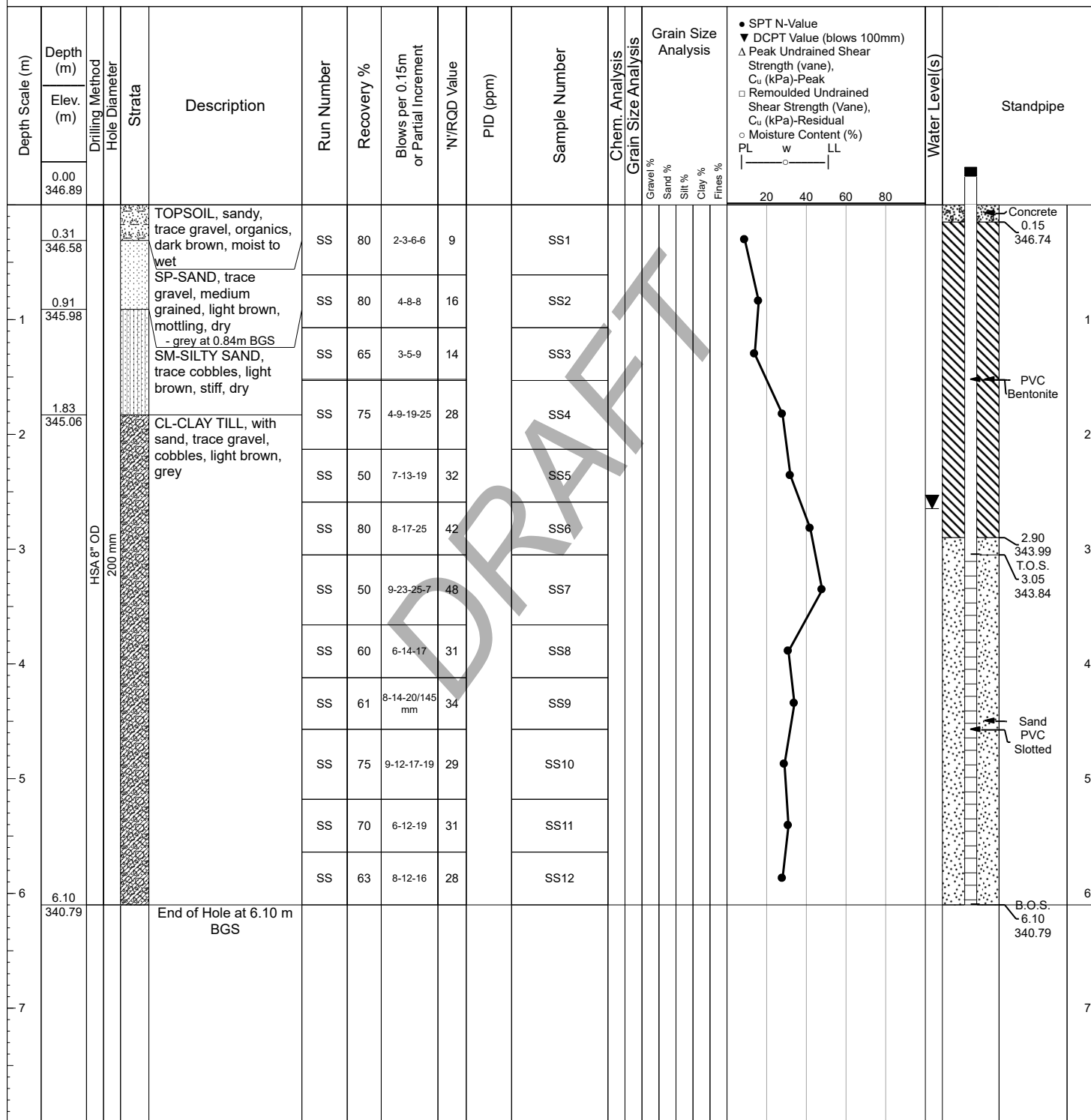
Logged By: Loden Ozaki

Approved By: L. Ozaki

Final Depth: 6.10 m

Coordinates and Elevation Values are Approximate

Page 1 of 1



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

 At Time of Drilling:

Upon Completion of Drilling: Not Encountered Dry at the time of drilling

Well - Reference Elevation(s)

Location	Elevation (m)
MW10-24	347.67

T.O.S.: Top of Screen

B.O.S.: Bottom of Screen

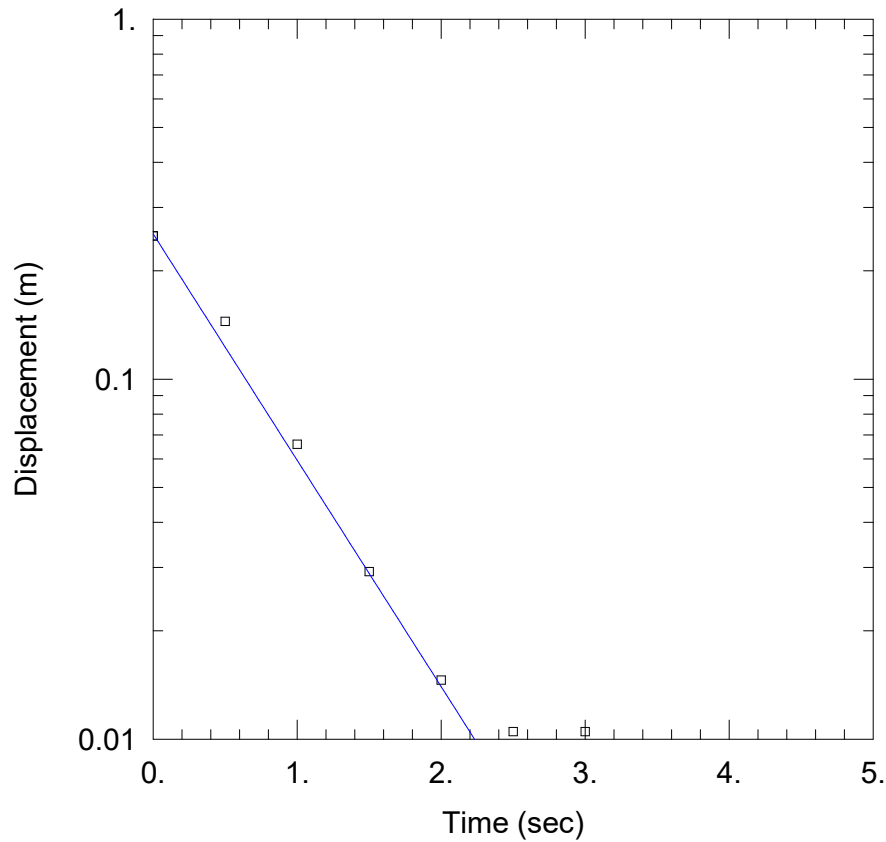
Screen Diameter: 50 mm

Screen Slot Size: 50 mm
Material: PVC

Material: PVC

Appendix D

Single Well Response Test Analysis Results



MW1-24 RISING HEAD TEST 1

Data Set: C:\...\MW1-24_RH1.aqt

Date: 07/12/24

Time: 12:25:32

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW1-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.03733$ cm/sec

$y_0 = 0.253$ m

AQUIFER DATA

Saturated Thickness: 2.9 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW1-24)

Initial Displacement: 0.25 m

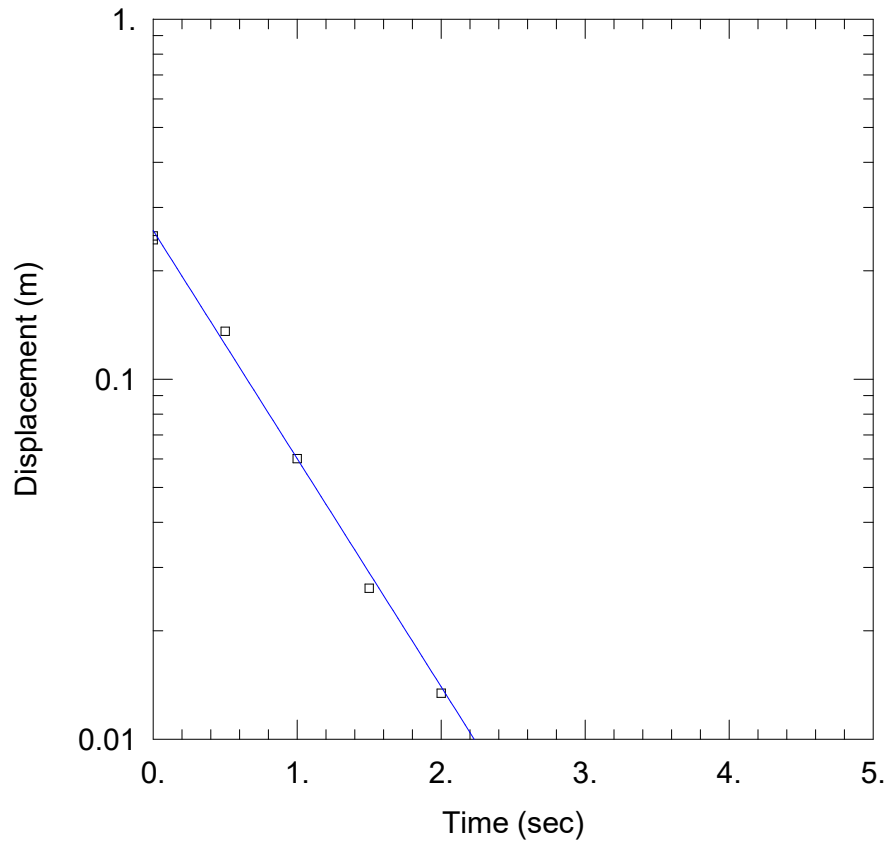
Total Well Penetration Depth: 2.9 m

Casing Radius: 0.0254 m

Static Water Column Height: 4.4 m

Screen Length: 2.9 m

Well Radius: 0.1016 m



MW1-24 RISING HEAD TEST 2

Data Set: C:\...\MW1-24_RH2.aqt

Date: 07/12/24

Time: 12:26:10

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW1-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.03762 cm/sec

y0 = 0.2586 m

AQUIFER DATA

Saturated Thickness: 2.9 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-24)

Initial Displacement: 0.25 m

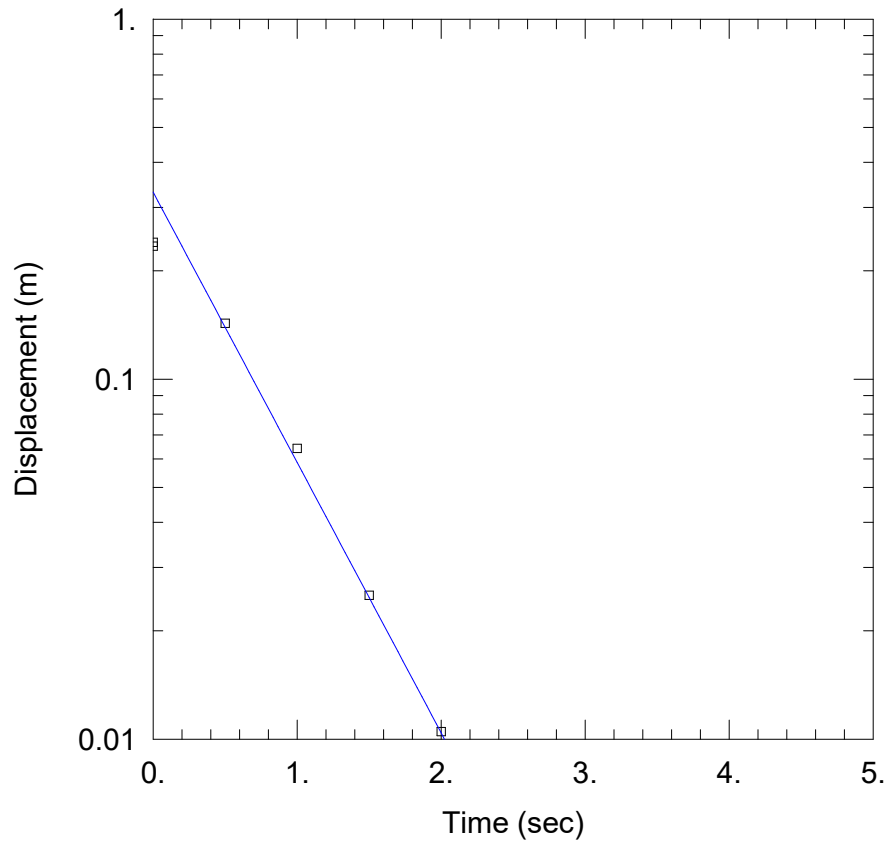
Total Well Penetration Depth: 2.9 m

Casing Radius: 0.0254 m

Static Water Column Height: 4.4 m

Screen Length: 2.9 m

Well Radius: 0.1016 m



MW1-24 RISING HEAD TEST 3

Data Set: C:\...\MW1-24_RH3.aqt

Date: 07/12/24

Time: 12:24:04

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW1-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.04458$ cm/sec

$y_0 = 0.3305$ m

AQUIFER DATA

Saturated Thickness: 2.9 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW1-24)

Initial Displacement: 0.24 m

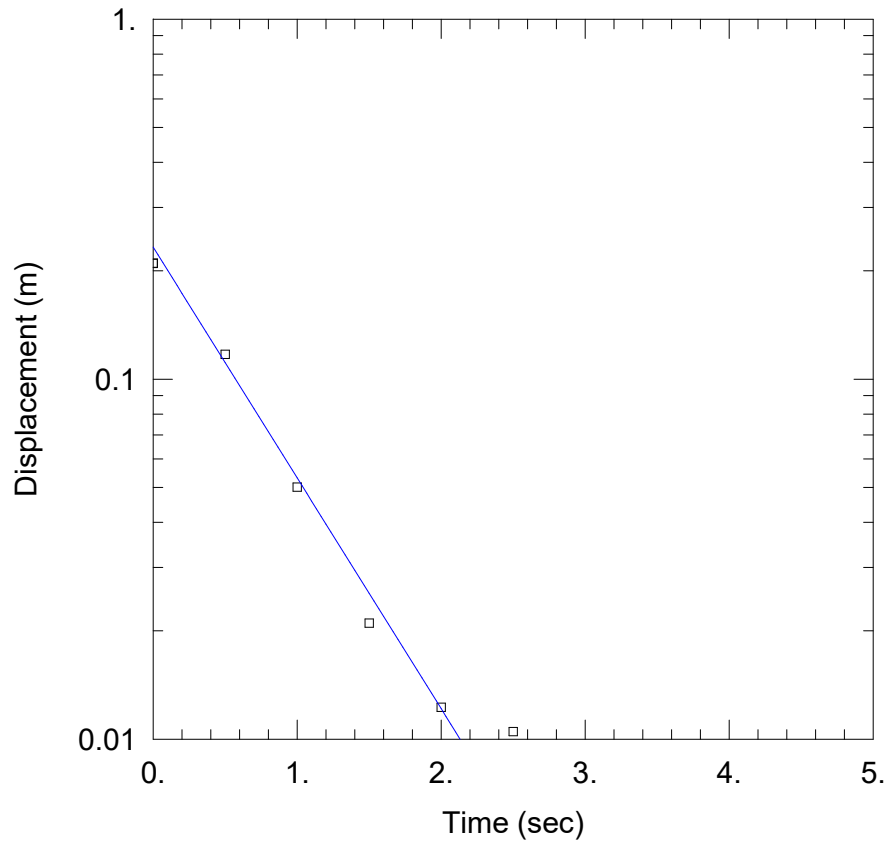
Total Well Penetration Depth: 2.9 m

Casing Radius: 0.0254 m

Static Water Column Height: 4.4 m

Screen Length: 2.9 m

Well Radius: 0.1016 m



MW1-24 RISING HEAD TEST 4

Data Set: C:\...\MW1-24_RH4.aqt

Date: 07/12/24

Time: 12:31:00

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW1-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.0378$ cm/sec

$y_0 = 0.2325$ m

AQUIFER DATA

Saturated Thickness: 2.9 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW1-24)

Initial Displacement: 0.21 m

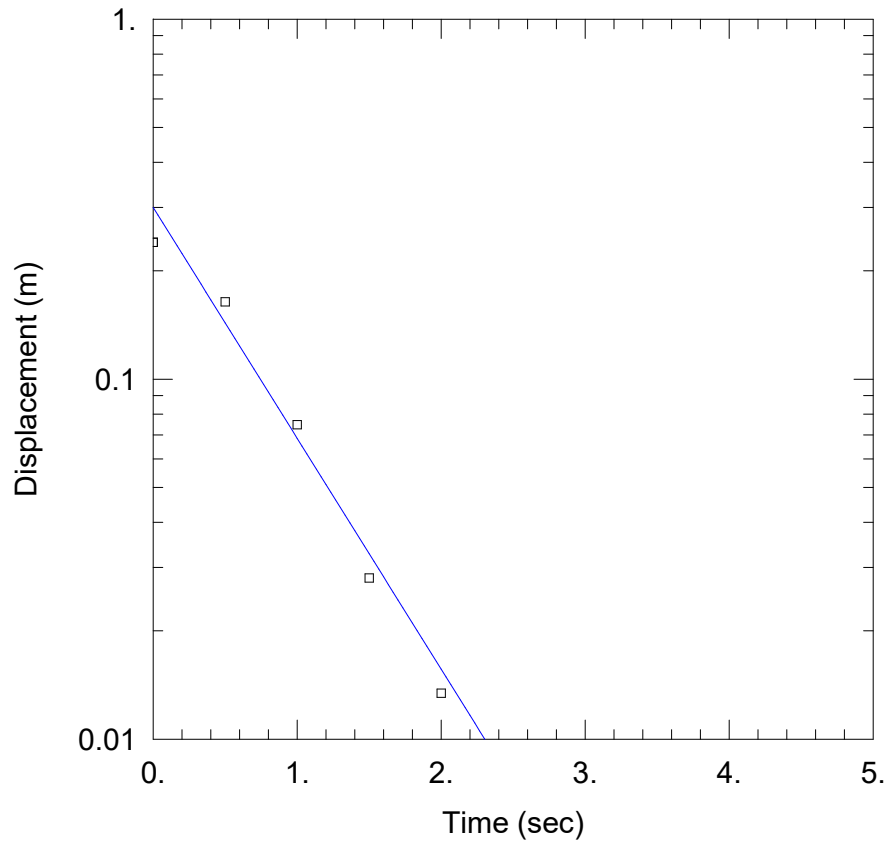
Total Well Penetration Depth: 2.9 m

Casing Radius: 0.0254 m

Static Water Column Height: 4.4 m

Screen Length: 2.9 m

Well Radius: 0.1016 m



MW1-24 RISING HEAD TEST 5

Data Set: C:\...\MW1-24_RH5.aqt

Date: 07/12/24

Time: 12:31:28

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW1-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.03782 cm/sec

y0 = 0.2999 m

AQUIFER DATA

Saturated Thickness: 2.9 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-24)

Initial Displacement: 0.24 m

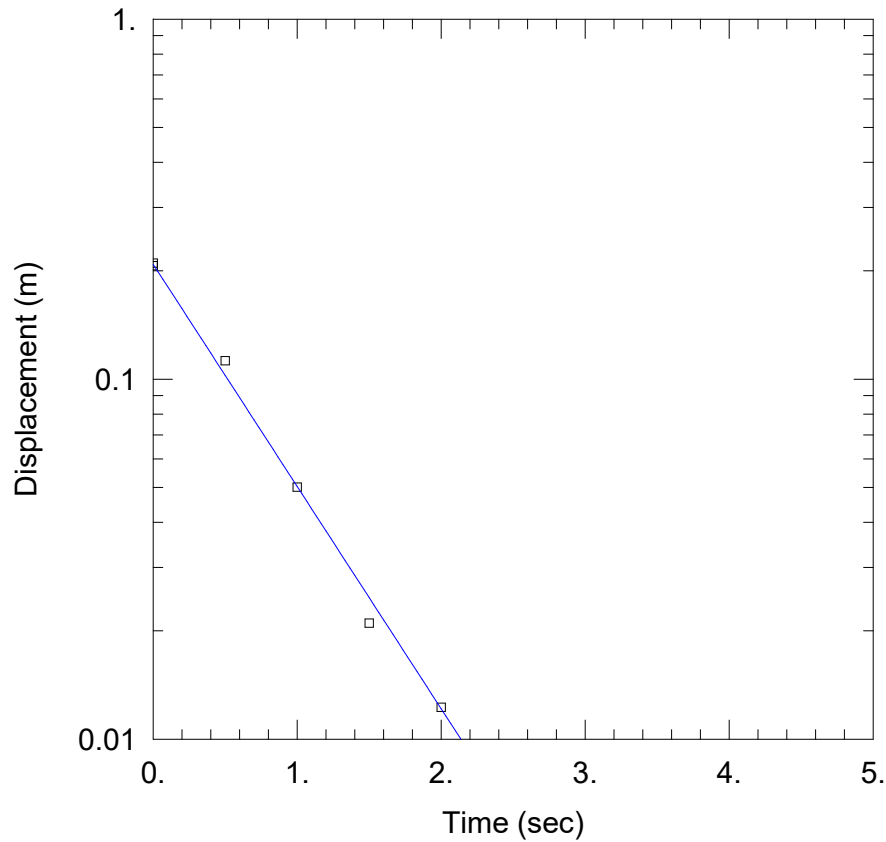
Total Well Penetration Depth: 2.9 m

Casing Radius: 0.0254 m

Static Water Column Height: 4.4 m

Screen Length: 2.9 m

Well Radius: 0.1016 m



MW1-24 RISING HEAD TEST 6

Data Set: C:\...\MW1-24_RH6.aqt

Date: 07/12/24

Time: 12:32:04

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW1-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.03641 cm/sec

y0 = 0.2085 m

AQUIFER DATA

Saturated Thickness: 2.9 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-24)

Initial Displacement: 0.21 m

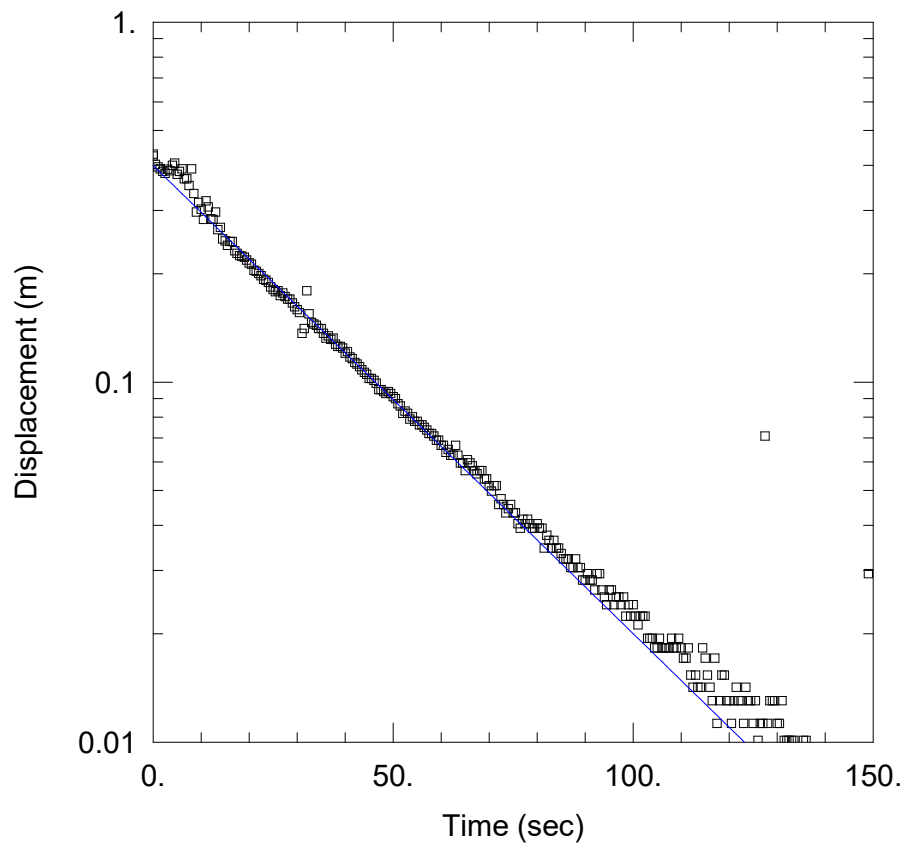
Total Well Penetration Depth: 2.9 m

Casing Radius: 0.0254 m

Static Water Column Height: 4.4 m

Screen Length: 2.9 m

Well Radius: 0.1016 m



MW2-24 FALLING HEAD TEST 1

Data Set: C:\...\MW2-24_FH1.aqt

Date: 07/12/24

Time: 09:13:07

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.002098$ cm/sec

$y_0 = 0.3995$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.43 m

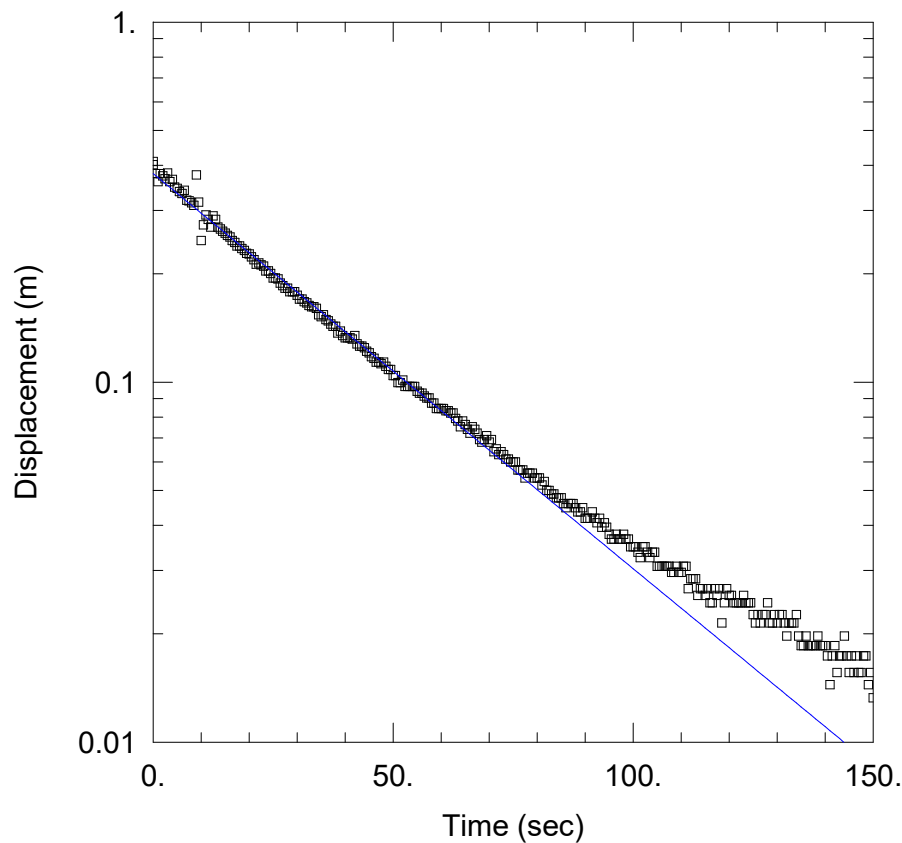
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 FALLING HEAD TEST 2

Data Set: C:\...\MW2-24_FH2.aqt

Date: 07/12/24

Time: 09:14:43

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.00177$ cm/sec

$y_0 = 0.3793$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.41 m

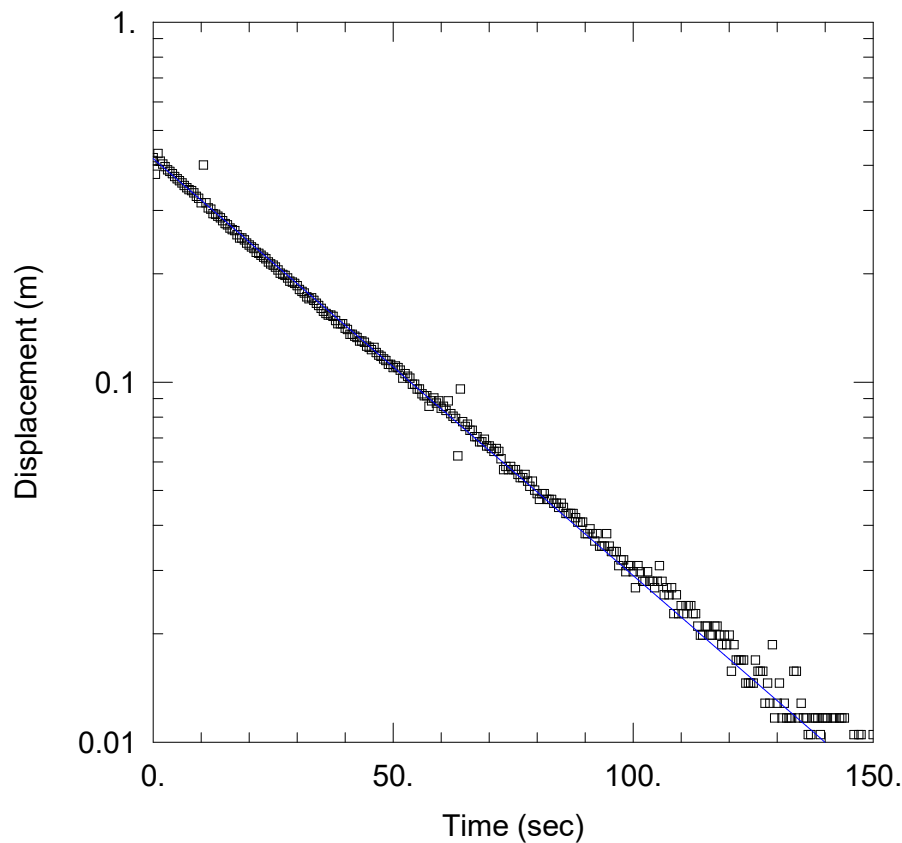
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 FALLING HEAD TEST 3

Data Set: C:\...\MW2-24_FH3.aqt

Date: 07/12/24

Time: 09:16:46

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001869$ cm/sec

$y_0 = 0.4178$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.42 m

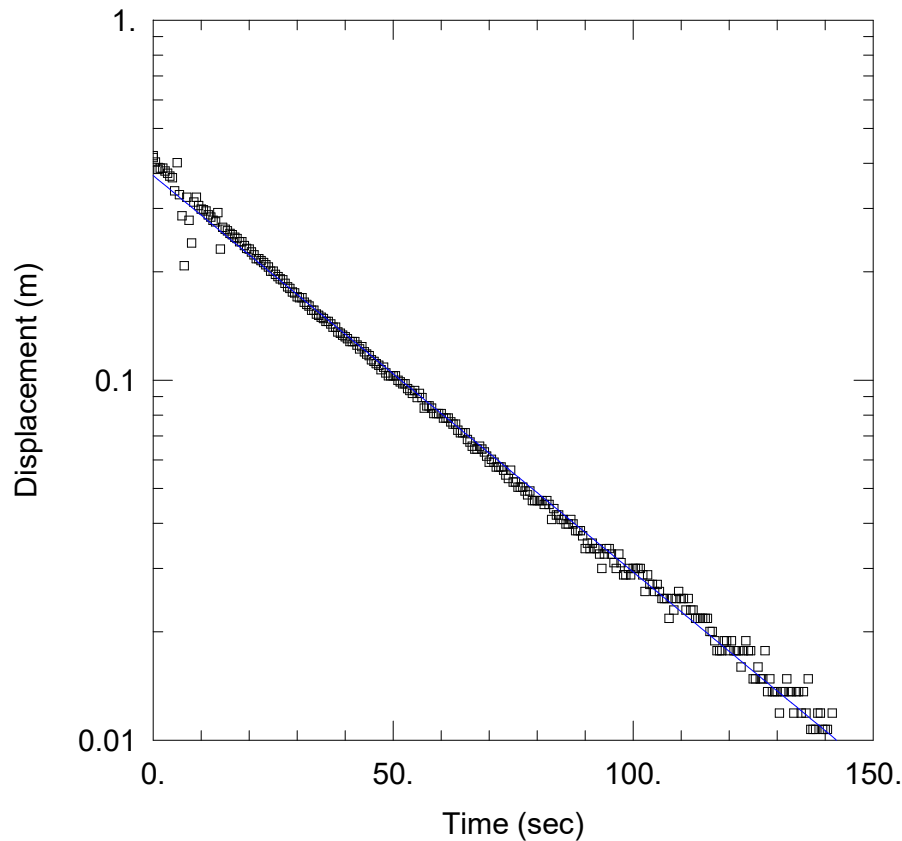
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 FALLING HEAD TEST 4

Data Set: C:\...\MW2-24_FH4.aqt

Date: 07/12/24

Time: 09:19:00

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001777$ cm/sec

$y_0 = 0.37$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.42 m

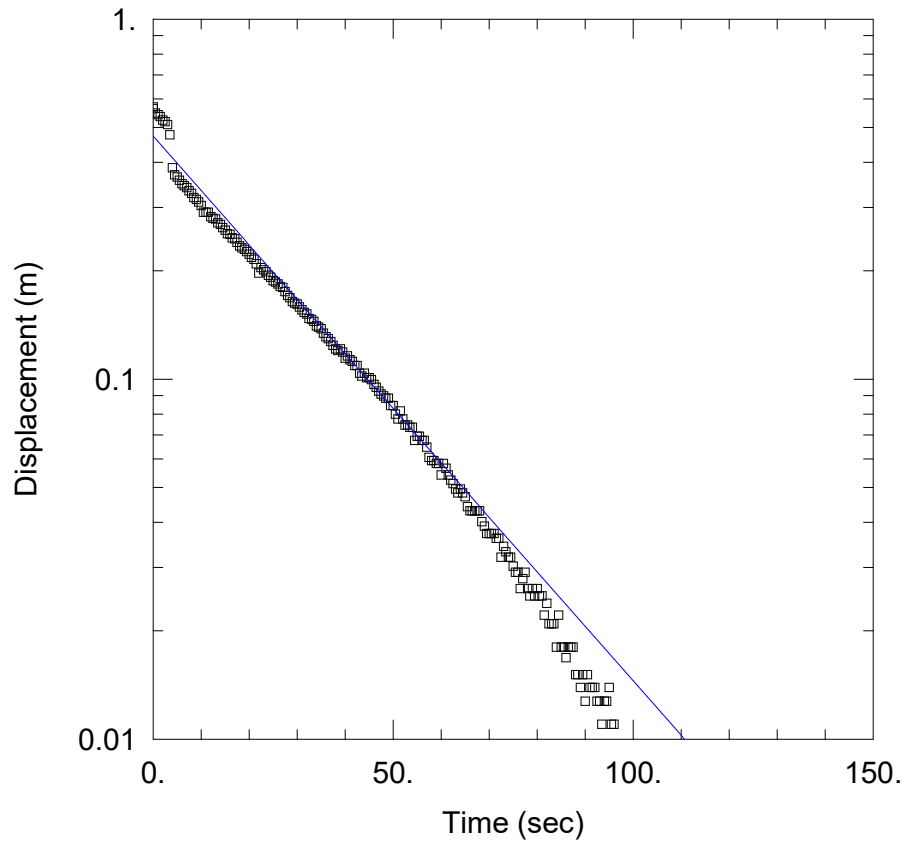
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 RISING HEAD TEST 1

Data Set: C:\...\MW2-24_RH1.aqt

Date: 07/12/24

Time: 09:11:09

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.002441$ cm/sec

$y_0 = 0.4732$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.57 m

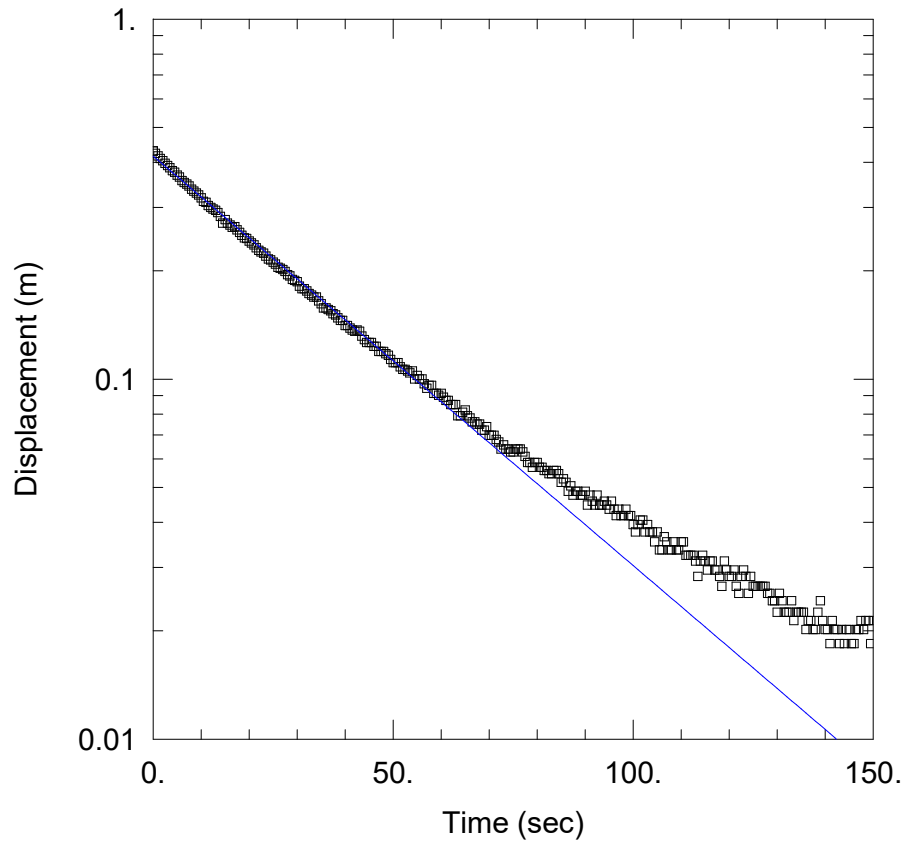
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 RISING HEAD TEST 2

Data Set: C:\...\MW2-24_RH2.aqt

Date: 07/12/24

Time: 09:16:16

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001835$ cm/sec

$y_0 = 0.4164$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.43 m

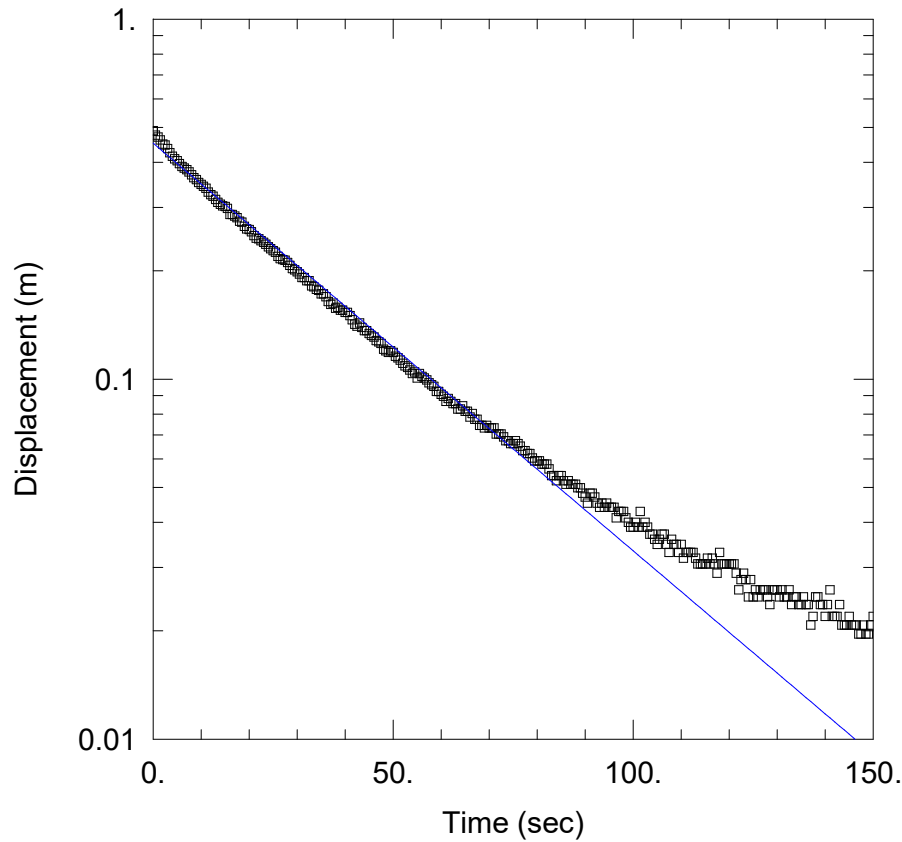
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 RISING HEAD TEST 3

Data Set: C:\...\MW2-24_RH3.aqt

Date: 07/12/24

Time: 09:17:20

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001826$ cm/sec

$y_0 = 0.452$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.49 m

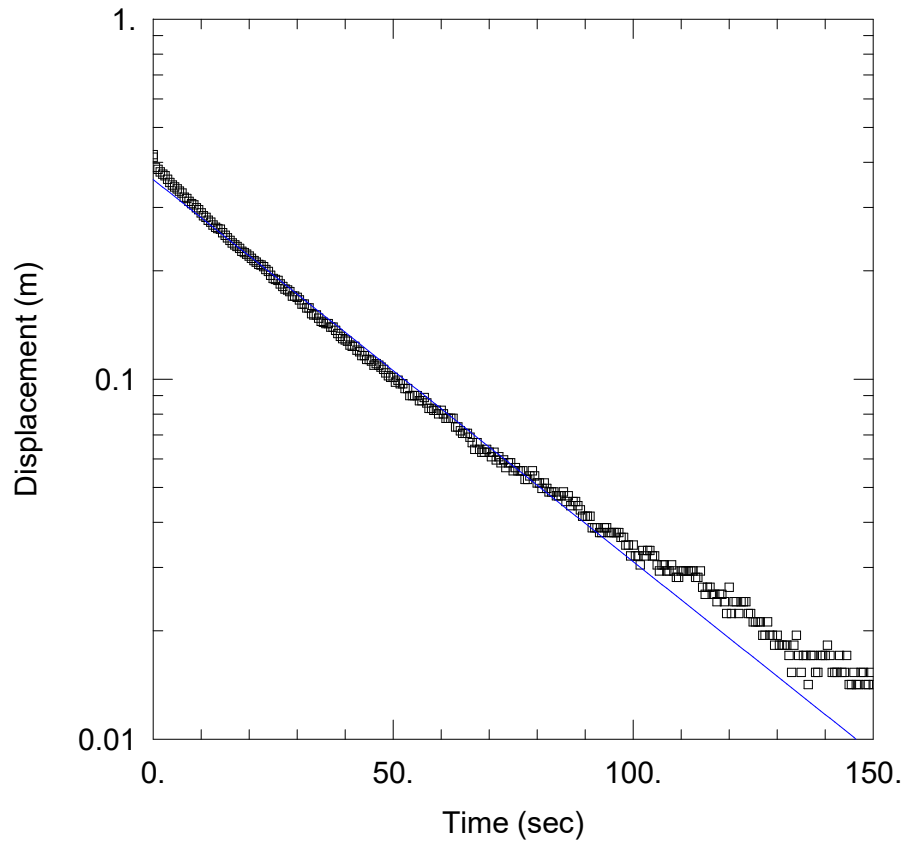
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW2-24 RISING HEAD TEST 4

Data Set: C:\...\MW2-24_RH4.aqt

Date: 07/12/24

Time: 09:19:36

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW2-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001713$ cm/sec

$y_0 = 0.3585$ m

AQUIFER DATA

Saturated Thickness: 1.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW2-24)

Initial Displacement: 0.42 m

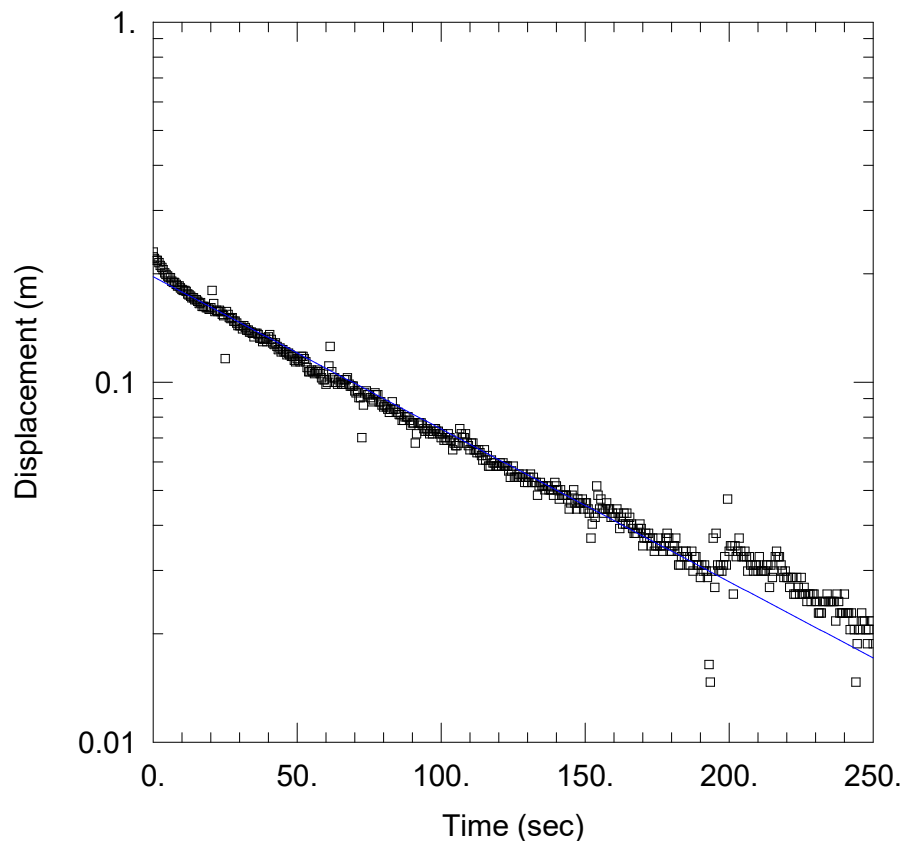
Total Well Penetration Depth: 1.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.76 m

Screen Length: 1.06 m

Well Radius: 0.1016 m



MW3-24 FALLING HEAD TEST 1

Data Set: C:\...\MW3-24_FH1.aqt

Date: 07/12/24

Time: 09:39:14

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW3-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.0005936$ cm/sec

$y_0 = 0.1963$ m

AQUIFER DATA

Saturated Thickness: 1.22 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW3-24)

Initial Displacement: 0.23 m

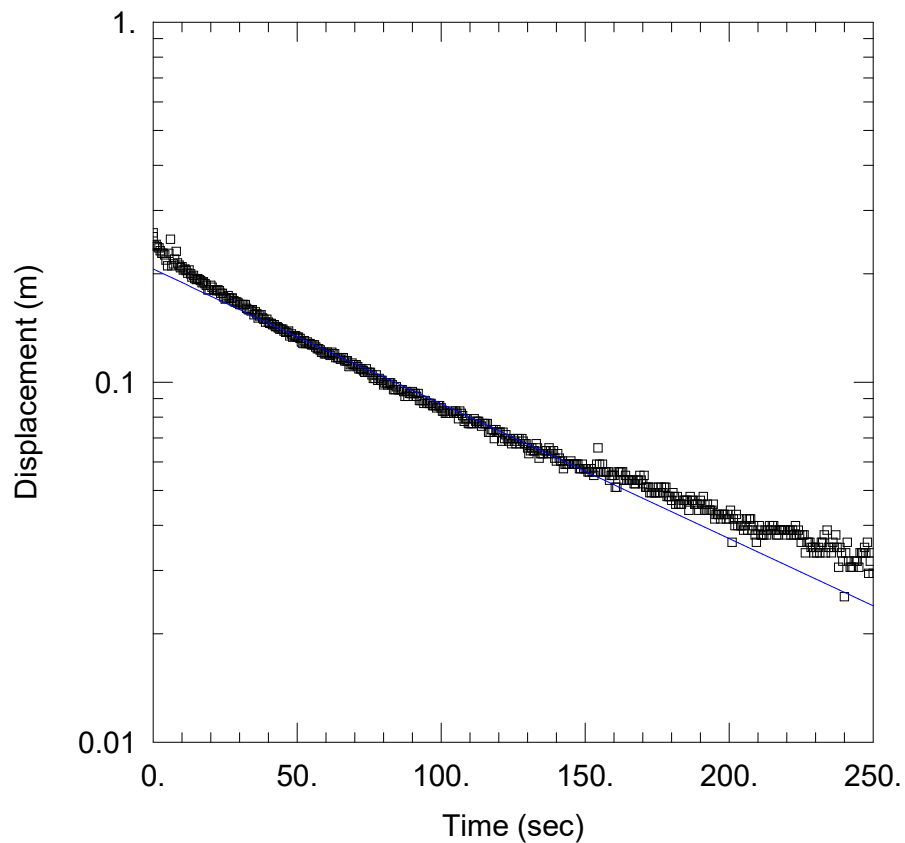
Total Well Penetration Depth: 1.22 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.24 m

Screen Length: 1.22 m

Well Radius: 0.1016 m



MW3-24 FALLING HEAD TEST 2

Data Set: C:\...\MW3-24_FH2.aqt

Date: 07/12/24

Time: 09:37:52

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW3-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.0005242$ cm/sec

$y_0 = 0.206$ m

AQUIFER DATA

Saturated Thickness: 1.22 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW3-24)

Initial Displacement: 0.26 m

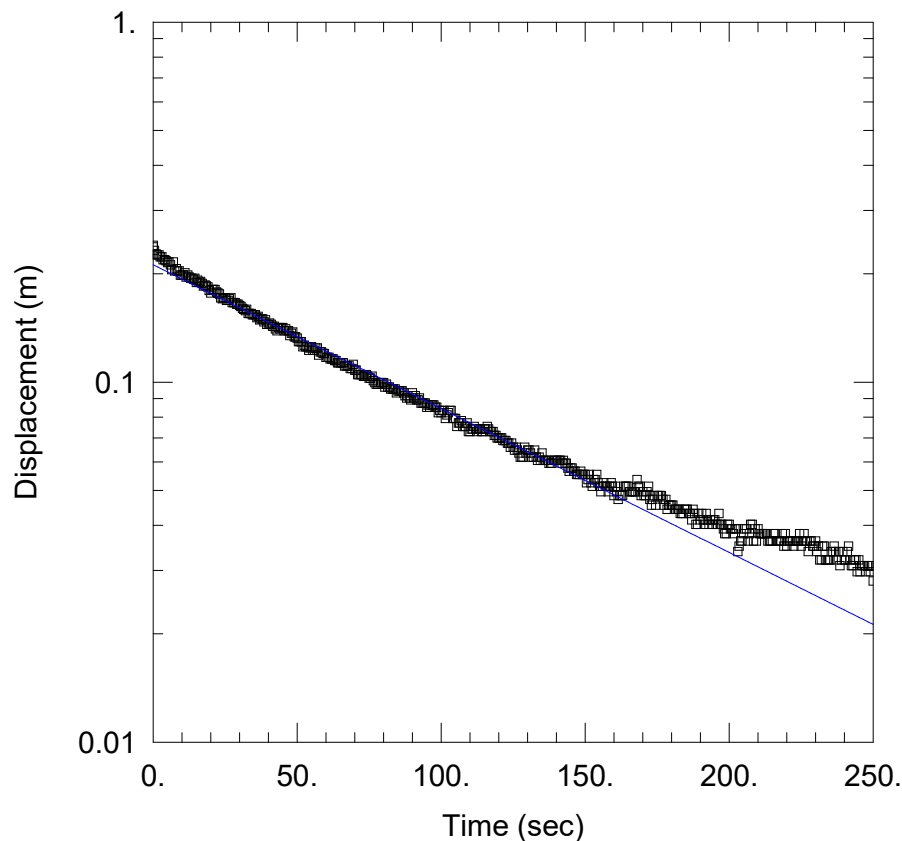
Total Well Penetration Depth: 1.22 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.24 m

Screen Length: 1.22 m

Well Radius: 0.1016 m



MW3-24 FALLING HEAD TEST 3

Data Set: C:\...\MW3-24_FH3.aqt

Date: 07/12/24

Time: 09:37:15

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW3-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.0005599$ cm/sec

$y_0 = 0.2119$ m

AQUIFER DATA

Saturated Thickness: 1.22 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW3-24)

Initial Displacement: 0.24 m

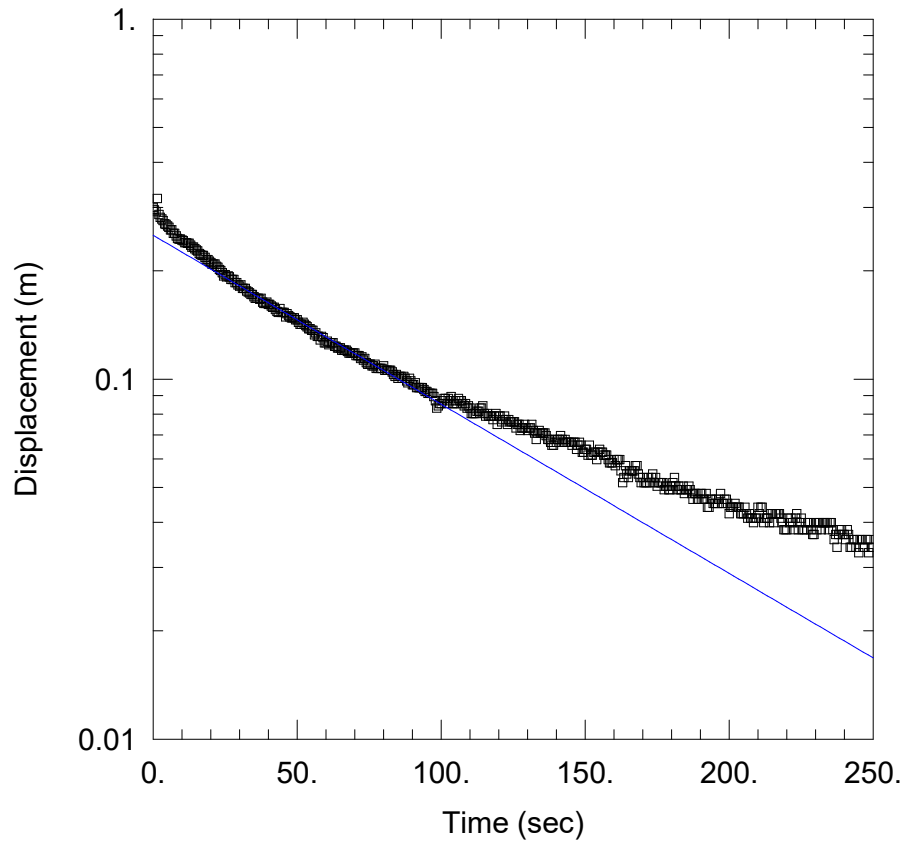
Total Well Penetration Depth: 1.22 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.24 m

Screen Length: 1.22 m

Well Radius: 0.1016 m



MW3-24 RISING HEAD TEST 1

Data Set: C:\...\MW3-24_RH1.aqt

Date: 07/12/24

Time: 09:38:36

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW3-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.0006579$ cm/sec

$y_0 = 0.2509$ m

AQUIFER DATA

Saturated Thickness: 1.22 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW3-24)

Initial Displacement: 0.3 m

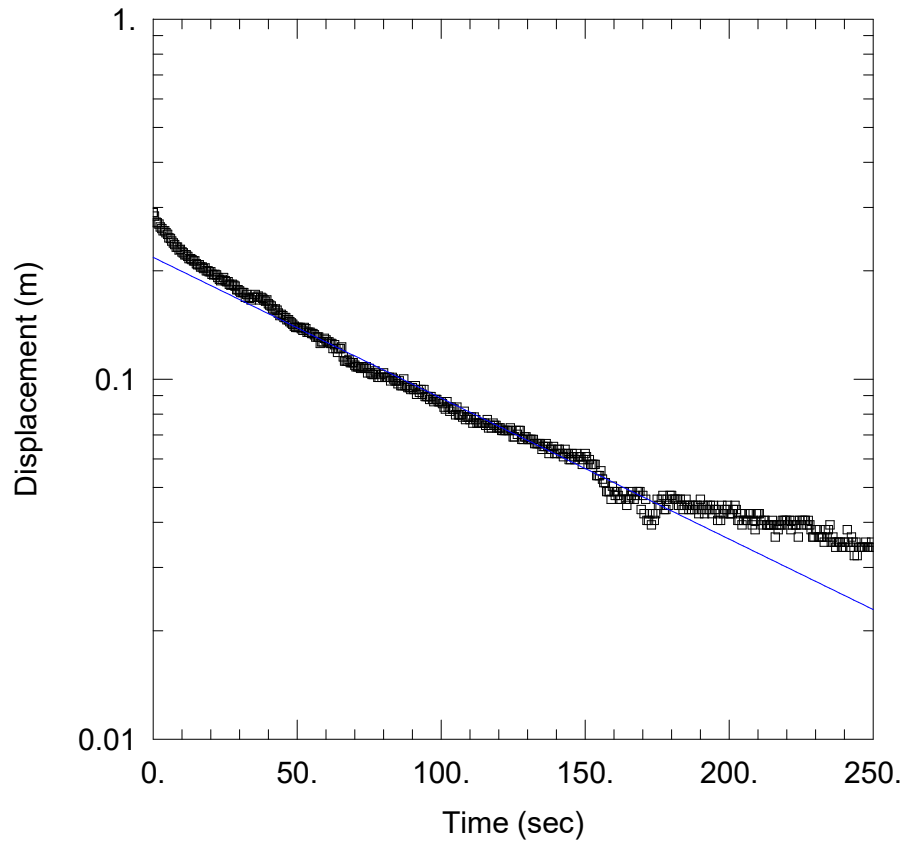
Total Well Penetration Depth: 1.22 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.24 m

Screen Length: 1.22 m

Well Radius: 0.1016 m



MW3-24 RISING HEAD TEST 2

Data Set: C:\...\MW3-24_RH2.aqt

Date: 07/12/24

Time: 09:37:33

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW3-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.0005483$ cm/sec

$y_0 = 0.2179$ m

AQUIFER DATA

Saturated Thickness: 1.22 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW3-24)

Initial Displacement: 0.29 m

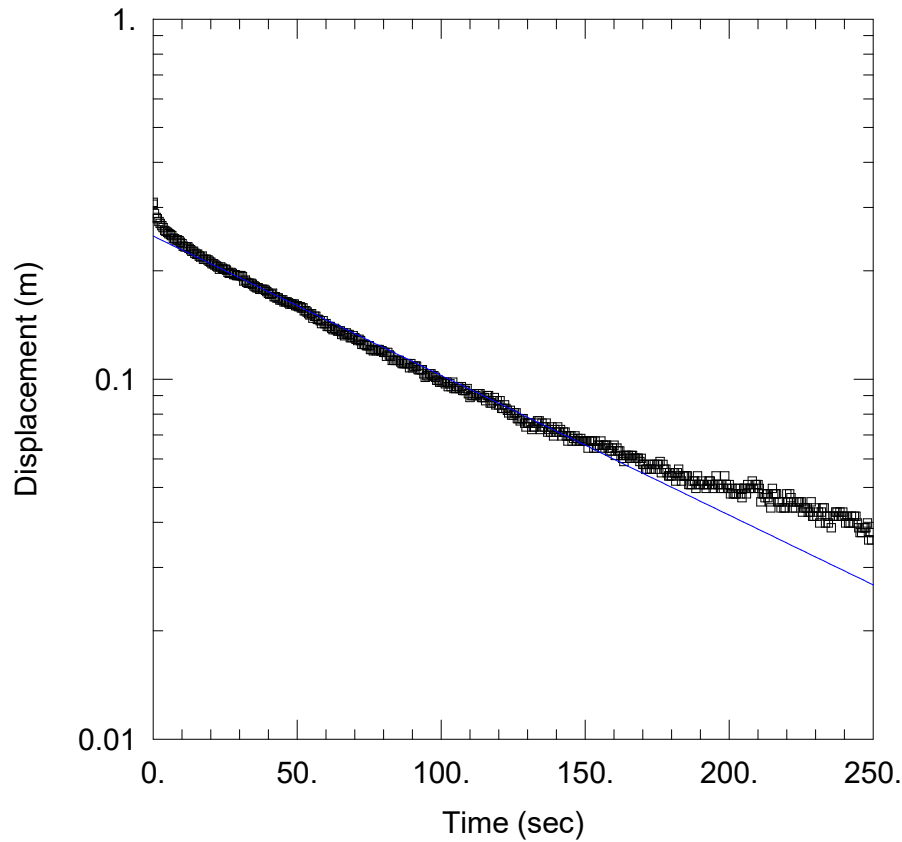
Total Well Penetration Depth: 1.22 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.24 m

Screen Length: 1.22 m

Well Radius: 0.1016 m



MW3-24 RISING HEAD TEST 3

Data Set: C:\...\MW3-24_RH3.aqt

Date: 07/12/24

Time: 09:36:56

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW3-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.000543$ cm/sec

$y_0 = 0.2497$ m

AQUIFER DATA

Saturated Thickness: 1.22 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW3-24)

Initial Displacement: 0.31 m

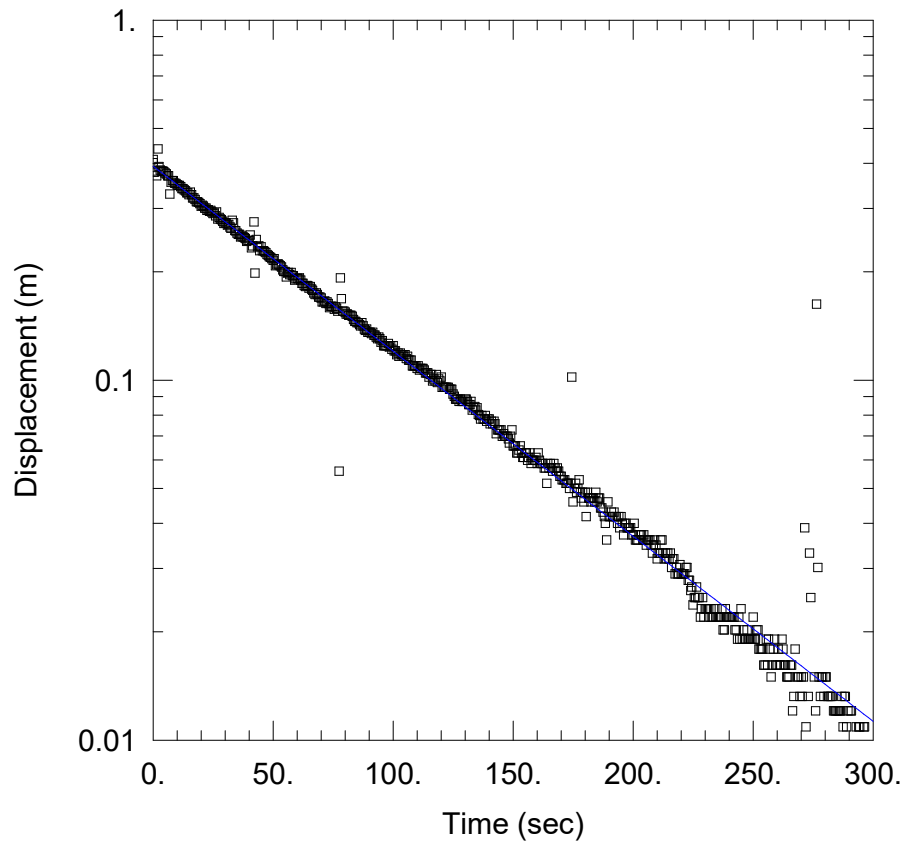
Total Well Penetration Depth: 1.22 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.24 m

Screen Length: 1.22 m

Well Radius: 0.1016 m



MW4-24 FALLING HEAD TEST 1

Data Set: C:\...\MW4-24_FH1.aqt

Date: 07/12/24

Time: 10:20:01

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW4-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002168$ cm/sec

$y_0 = 0.3927$ m

AQUIFER DATA

Saturated Thickness: 3.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW4-24)

Initial Displacement: 0.41 m

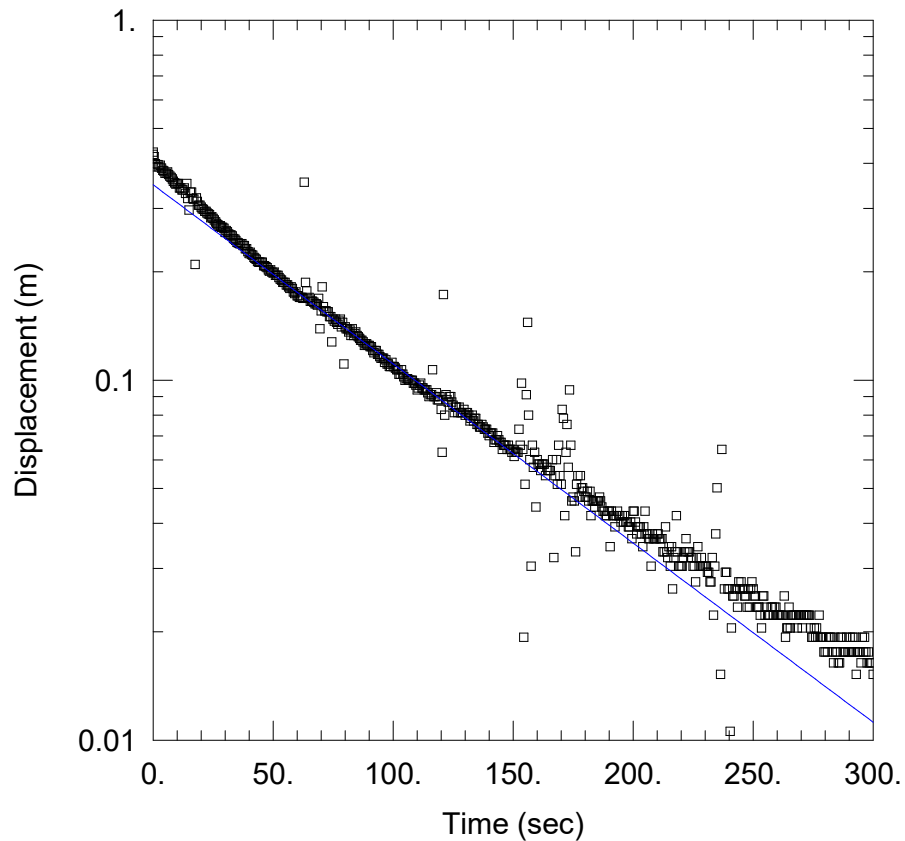
Total Well Penetration Depth: 3.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.06 m

Screen Length: 2.13 m

Well Radius: 0.1016 m



MW4-24 FALLING HEAD TEST 2

Data Set: C:\...\MW4-24_FH2.aqt

Date: 07/12/24

Time: 10:17:51

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW4-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002099$ cm/sec

$y_0 = 0.3487$ m

AQUIFER DATA

Saturated Thickness: 3.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW4-24)

Initial Displacement: 0.43 m

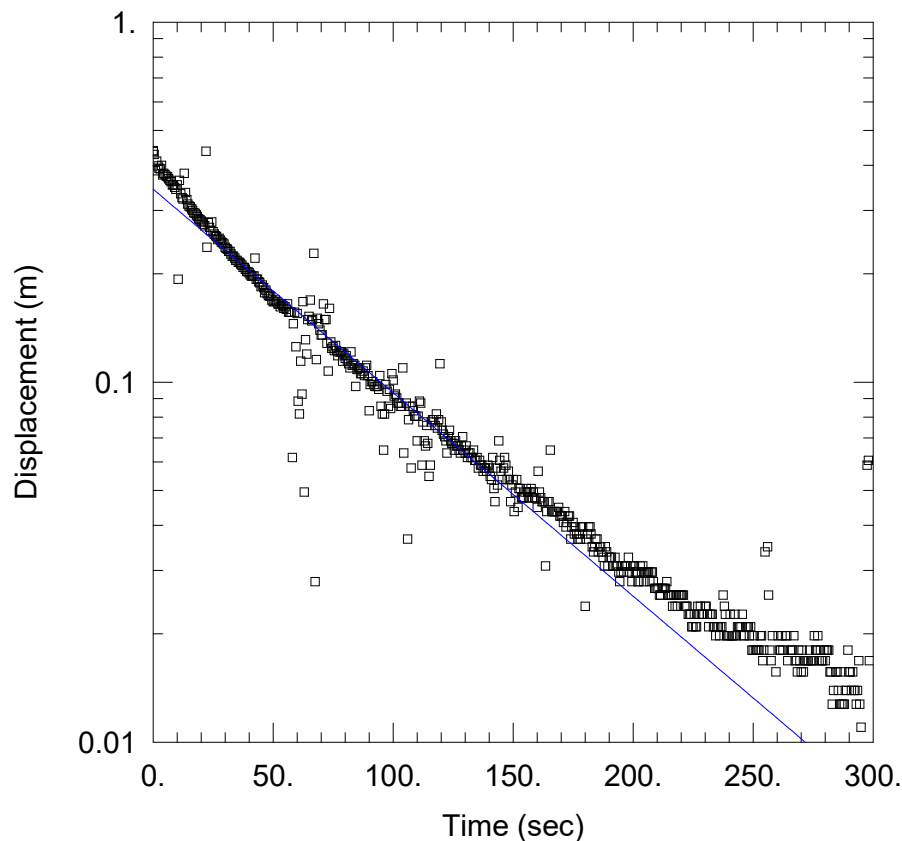
Total Well Penetration Depth: 3.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.06 m

Screen Length: 2.13 m

Well Radius: 0.1016 m



MW4-24 FALLING HEAD TEST 3

Data Set: C:\...\MW4-24_FH3.aqt

Date: 07/12/24

Time: 10:17:38

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW4-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002384$ cm/sec

$y_0 = 0.3434$ m

AQUIFER DATA

Saturated Thickness: 3.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW4-24)

Initial Displacement: 0.44 m

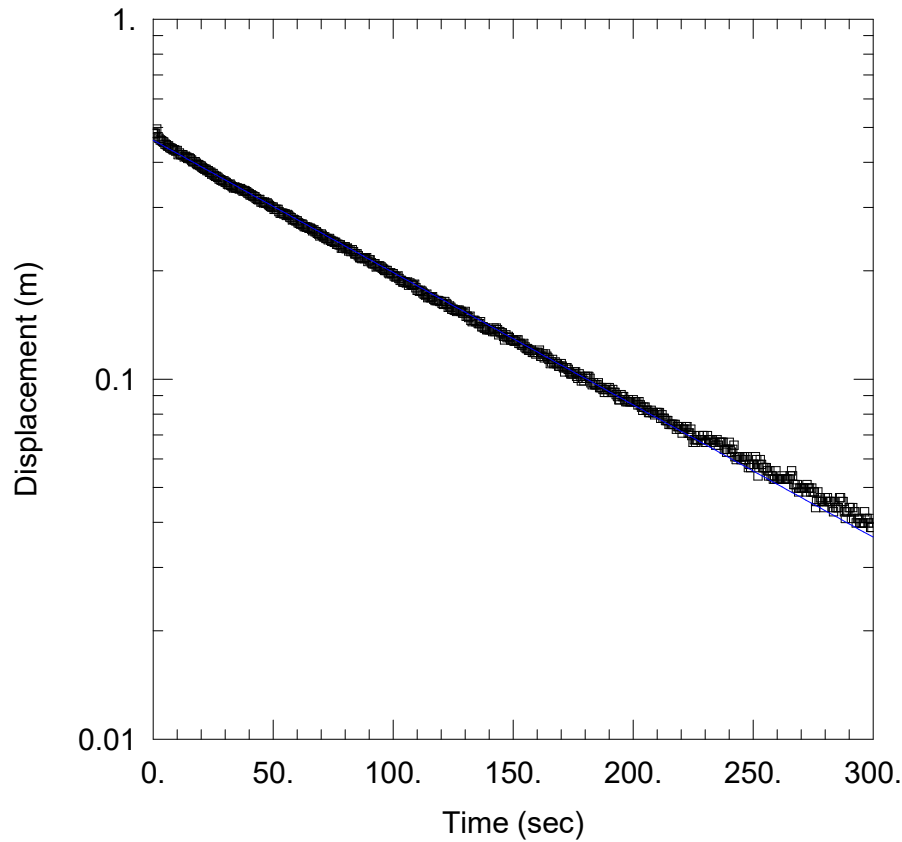
Total Well Penetration Depth: 3.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.06 m

Screen Length: 2.13 m

Well Radius: 0.1016 m



MW4-24 RISING HEAD TEST 1

Data Set: C:\...\MW4-24_RH1.aqt

Date: 07/12/24

Time: 10:18:20

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW4-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.000155$ cm/sec

$y_0 = 0.461$ m

AQUIFER DATA

Saturated Thickness: 3.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW4-24)

Initial Displacement: 0.48 m

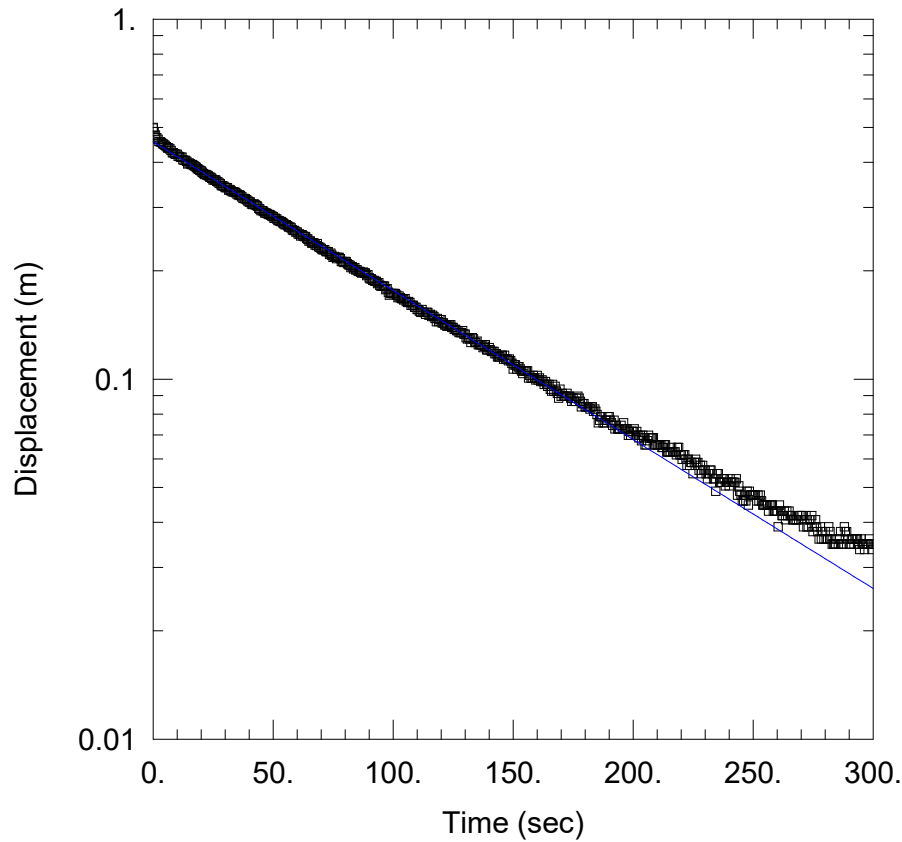
Total Well Penetration Depth: 3.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.06 m

Screen Length: 2.13 m

Well Radius: 0.1016 m



MW4-24 RISING HEAD TEST 2

Data Set: C:\...\MW4-24_RH2.aqt

Date: 07/12/24

Time: 10:18:05

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW4-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0001744$ cm/sec

$y_0 = 0.4559$ m

AQUIFER DATA

Saturated Thickness: 3.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW4-24)

Initial Displacement: 0.5 m

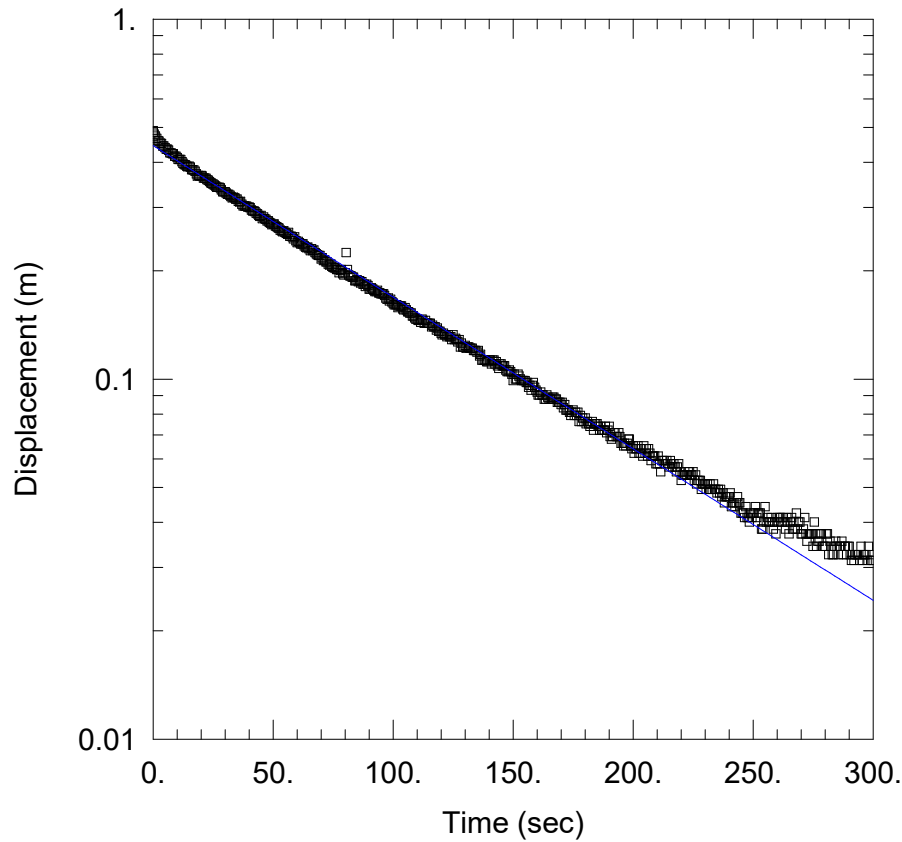
Total Well Penetration Depth: 3.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.06 m

Screen Length: 2.13 m

Well Radius: 0.1016 m



MW4-24 RISING HEAD TEST 3

Data Set: C:\...\MW4-24_RH3.aqt

Date: 07/12/24

Time: 10:17:16

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW4-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0001776$ cm/sec

$y_0 = 0.4452$ m

AQUIFER DATA

Saturated Thickness: 3.06 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW4-24)

Initial Displacement: 0.49 m

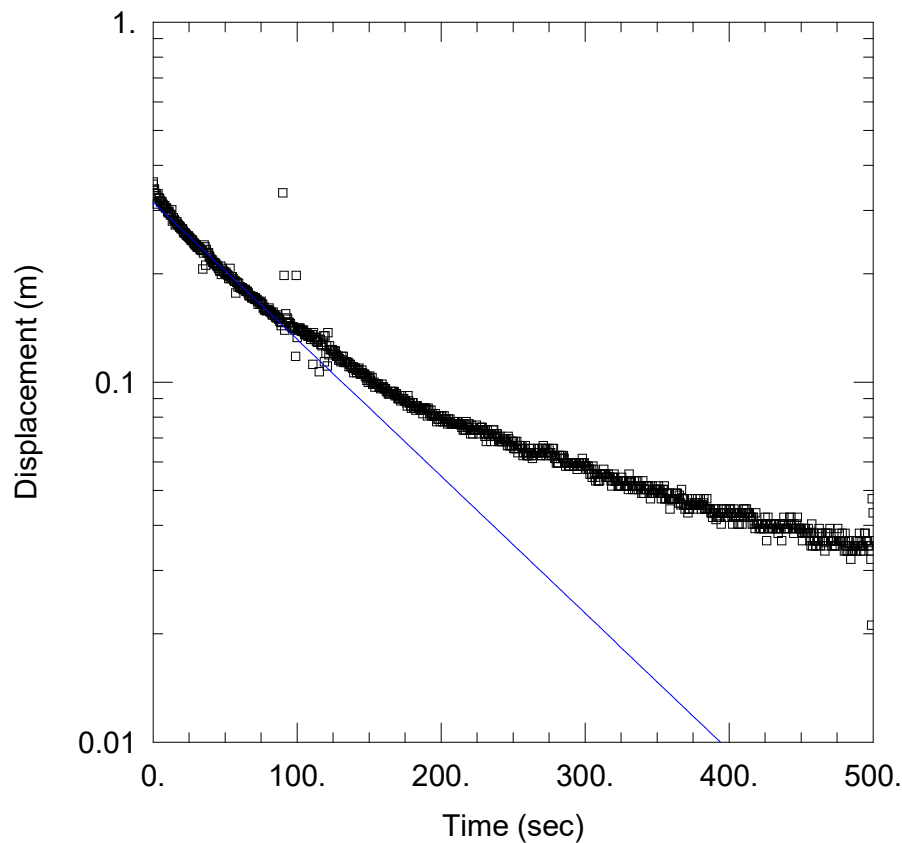
Total Well Penetration Depth: 3.06 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.06 m

Screen Length: 2.13 m

Well Radius: 0.1016 m



MW5-24 FALLING HEAD TEST 1

Data Set: C:\...\MW5-24_FH1.aqt

Date: 07/12/24

Time: 10:56:44

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW5-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.002169$ cm/sec

$y_0 = 0.3161$ m

AQUIFER DATA

Saturated Thickness: 0.3 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW5-24)

Initial Displacement: 0.36 m

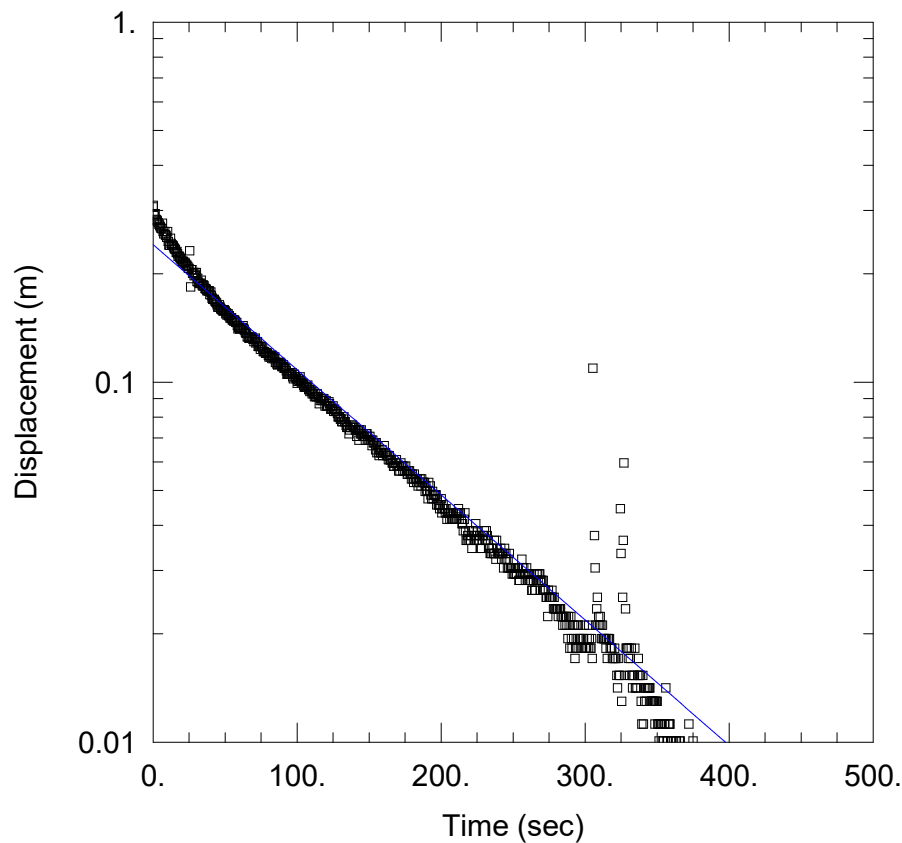
Total Well Penetration Depth: 0.3 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.05 m

Screen Length: 0.3 m

Well Radius: 0.1016 m



MW5-24 FALLING HEAD TEST 2

Data Set: C:\...\MW5-24_FH2.aqt

Date: 07/12/24

Time: 10:54:37

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW5-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001981$ cm/sec

$y_0 = 0.241$ m

AQUIFER DATA

Saturated Thickness: 0.3 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW5-24)

Initial Displacement: 0.31 m

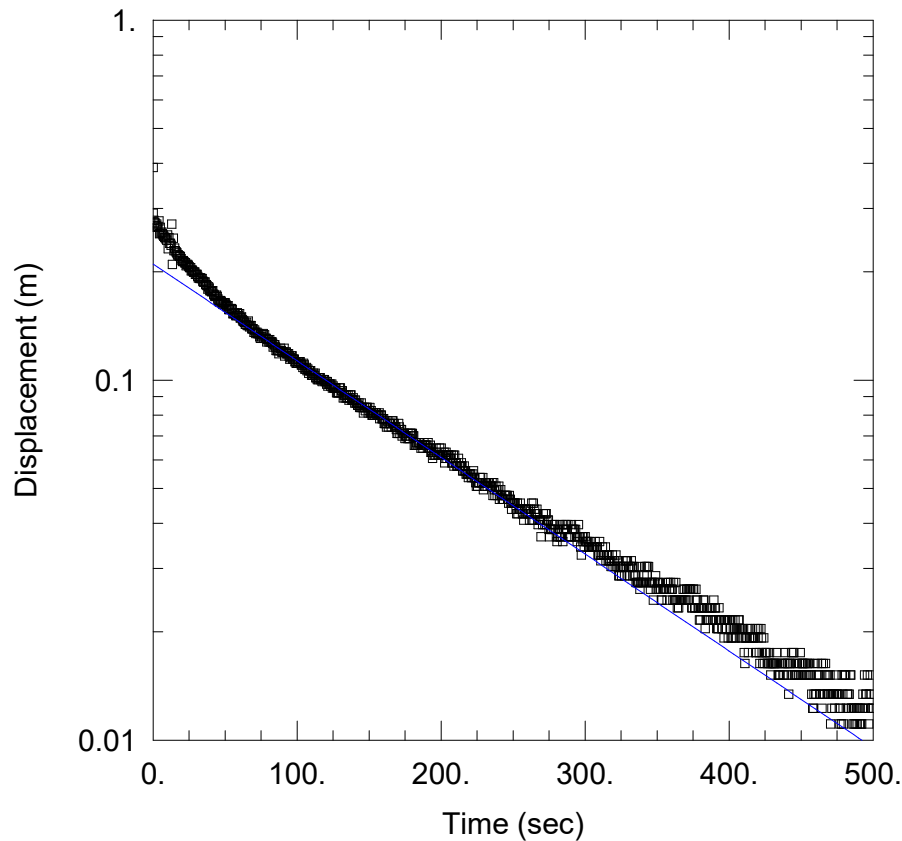
Total Well Penetration Depth: 0.3 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.05 m

Screen Length: 0.3 m

Well Radius: 0.1016 m



MW5-24 FALLING HEAD TEST 3

Data Set: C:\...\MW5-24_FH3.aqt

Date: 07/12/24

Time: 10:54:17

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW5-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001531$ cm/sec

$y_0 = 0.2101$ m

AQUIFER DATA

Saturated Thickness: 0.3 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW5-24)

Initial Displacement: 0.39 m

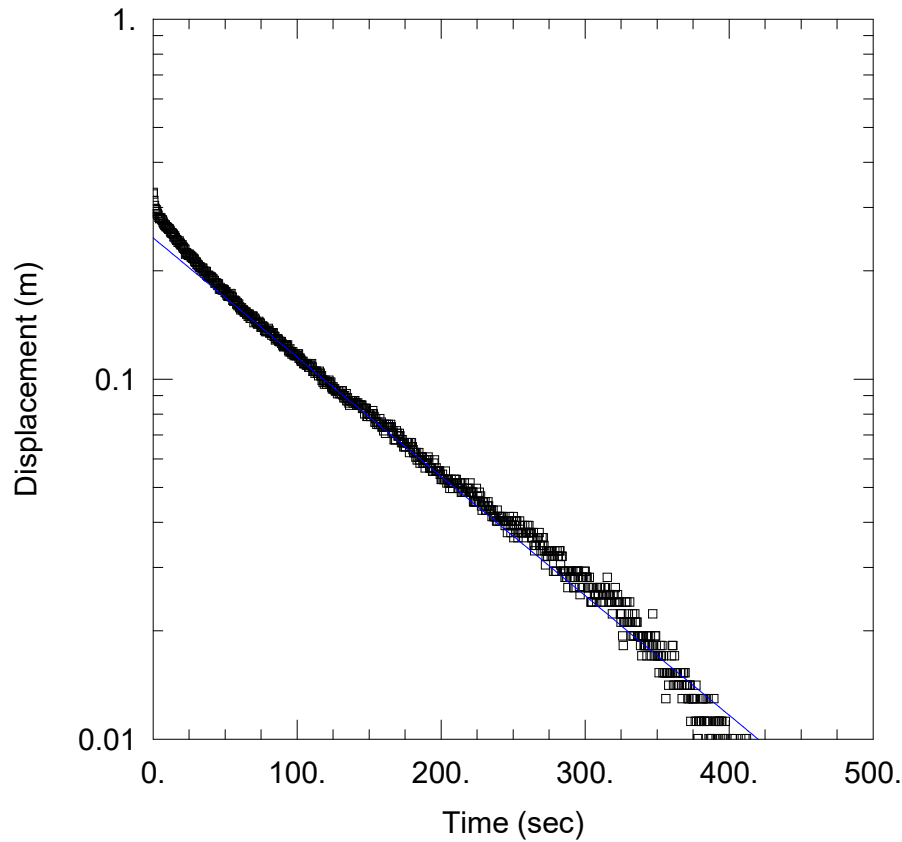
Total Well Penetration Depth: 0.3 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.05 m

Screen Length: 0.3 m

Well Radius: 0.1016 m



MW5-24 RISING HEAD TEST1

Data Set: C:\...\MW5-24_RH1.aqt

Date: 07/12/24

Time: 10:55:07

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW5-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001889$ cm/sec

$y_0 = 0.2468$ m

AQUIFER DATA

Saturated Thickness: 0.3 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW5-24)

Initial Displacement: 0.33 m

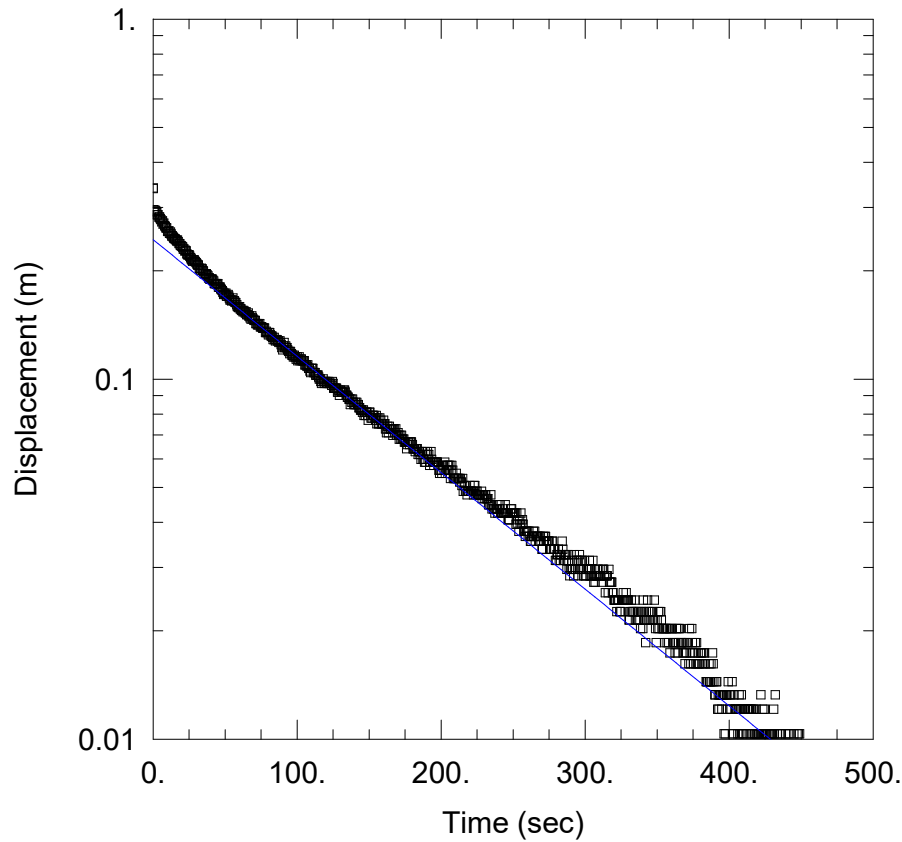
Total Well Penetration Depth: 0.3 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.05 m

Screen Length: 0.3 m

Well Radius: 0.1016 m



MW5-24 RISING HEAD TEST 2

Data Set: C:\...\MW5-24_RH2.aqt

Date: 07/12/24

Time: 10:55:30

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW5-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001844$ cm/sec

$y_0 = 0.2439$ m

AQUIFER DATA

Saturated Thickness: 0.3 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW5-24)

Initial Displacement: 0.34 m

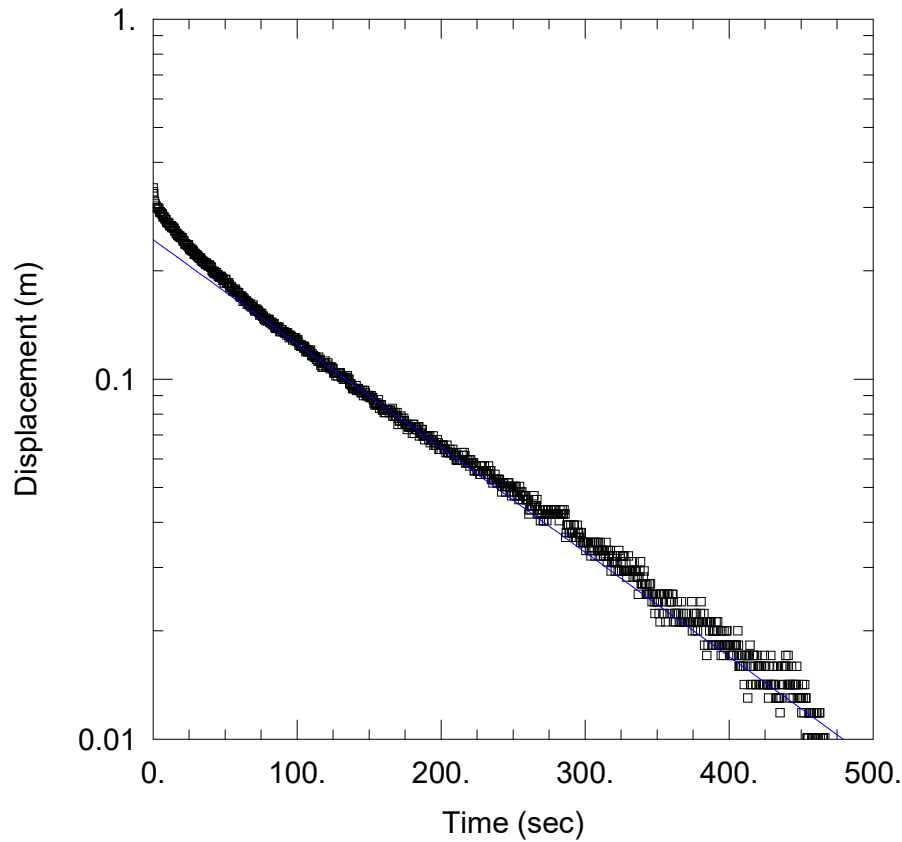
Total Well Penetration Depth: 0.3 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.05 m

Screen Length: 0.3 m

Well Radius: 0.1016 m



MW5-24 RISING HEAD TEST 3

Data Set: C:\...\MW5-24_RH3.aqt

Date: 07/12/24

Time: 10:54:02

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW5-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.001649$ cm/sec

$y_0 = 0.2438$ m

AQUIFER DATA

Saturated Thickness: 0.3 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW5-24)

Initial Displacement: 0.34 m

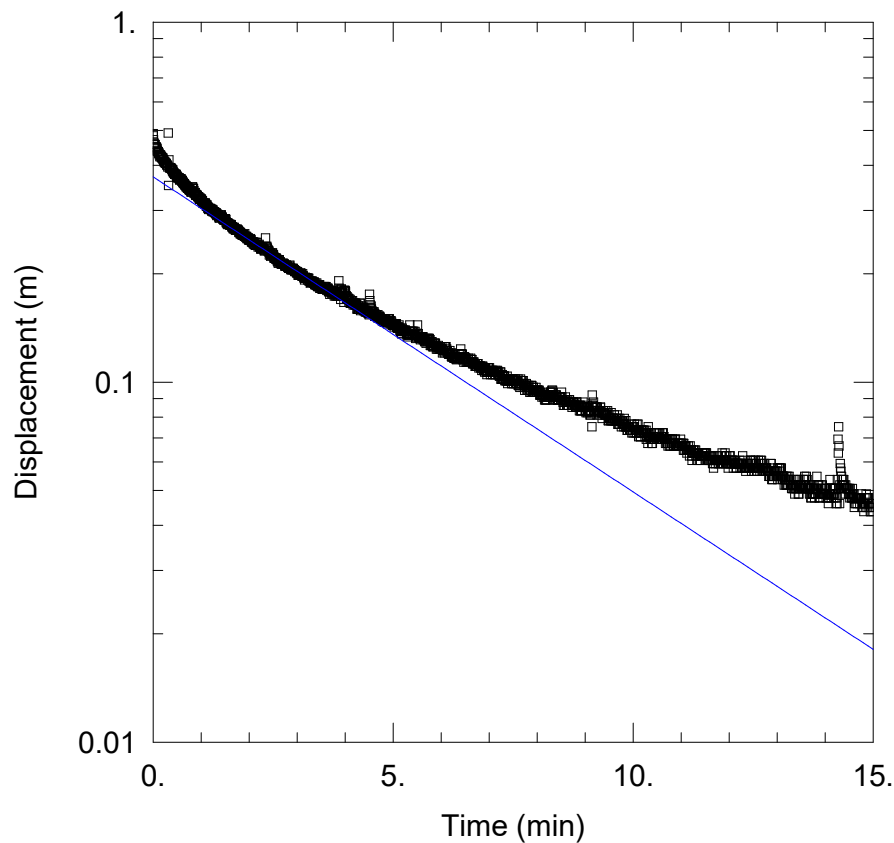
Total Well Penetration Depth: 0.3 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.05 m

Screen Length: 0.3 m

Well Radius: 0.1016 m



MW6-24 FALLING HEAD TEST 1

Data Set: C:\...\MW6-24_FH1.aqt

Date: 07/12/24

Time: 11:29:51

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW6-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002635$ cm/sec

$y_0 = 0.3716$ m

AQUIFER DATA

Saturated Thickness: 1.19 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW6-24)

Initial Displacement: 0.49 m

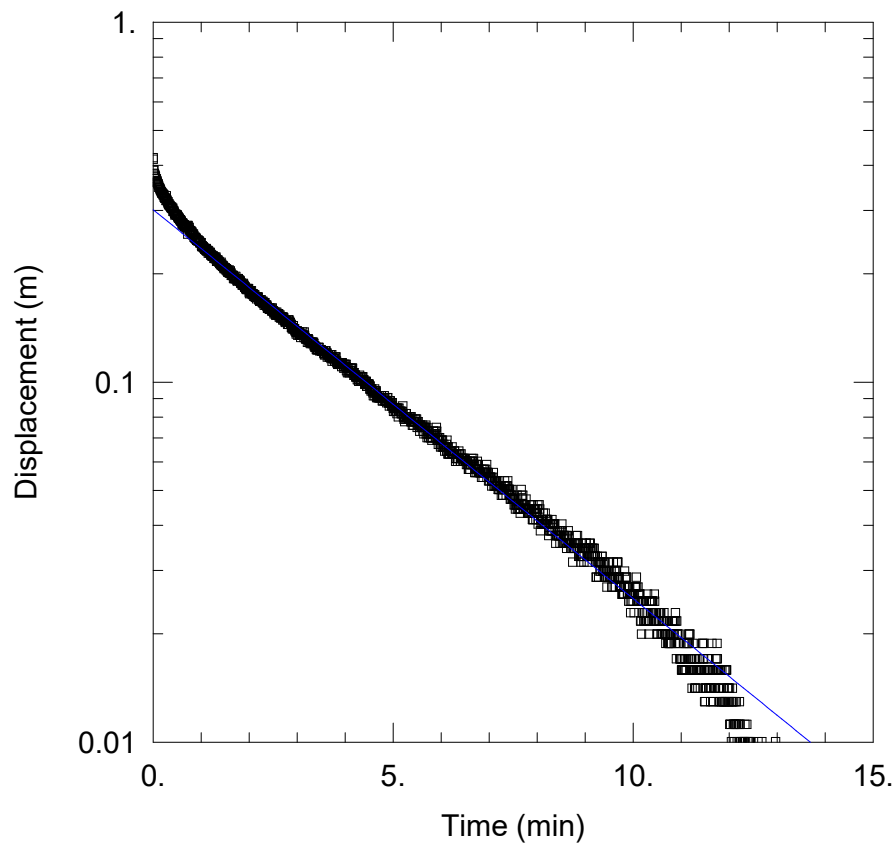
Total Well Penetration Depth: 1.19 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.99 m

Screen Length: 0.31 m

Well Radius: 0.1016 m



MW6-24 FALLING HEAD TEST 2

Data Set: C:\...\MW6-24_FH2.aqt

Date: 07/12/24

Time: 11:29:18

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW6-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0003254$ cm/sec

$y_0 = 0.3013$ m

AQUIFER DATA

Saturated Thickness: 1.19 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW6-24)

Initial Displacement: 0.42 m

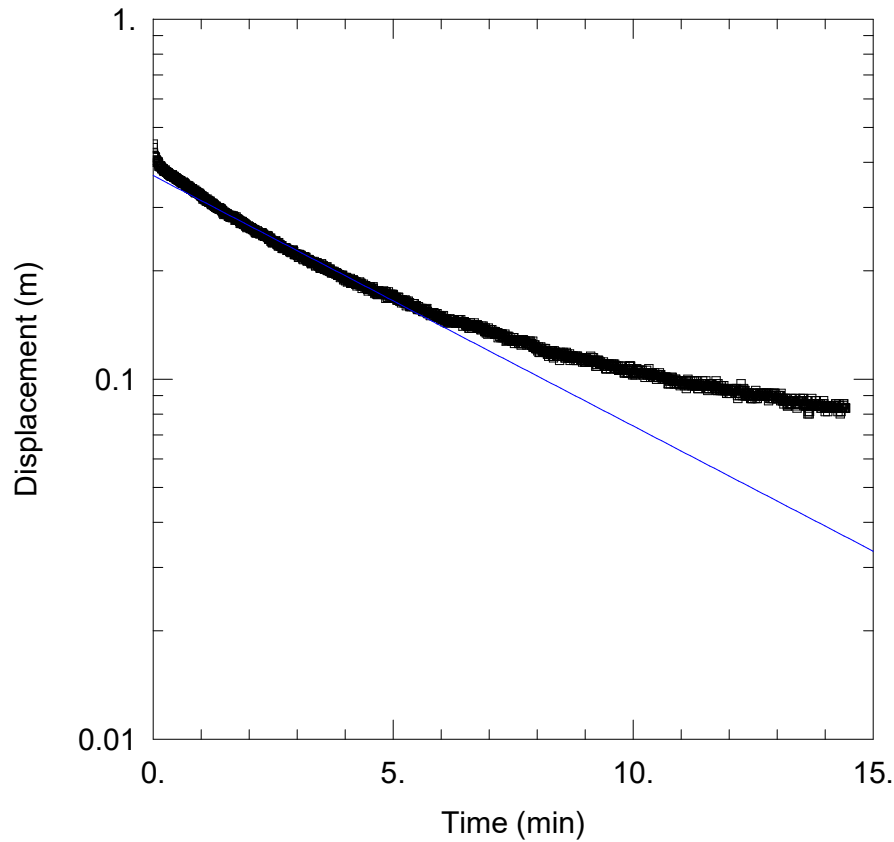
Total Well Penetration Depth: 1.19 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.99 m

Screen Length: 0.31 m

Well Radius: 0.1016 m



MW6-24 RISING HEAD TEST 1

Data Set: C:\...\MW6-24_rH1.aqt

Date: 07/12/24

Time: 11:29:36

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW6-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002095$ cm/sec

$y_0 = 0.3676$ m

AQUIFER DATA

Saturated Thickness: 1.19 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW6-24)

Initial Displacement: 0.45 m

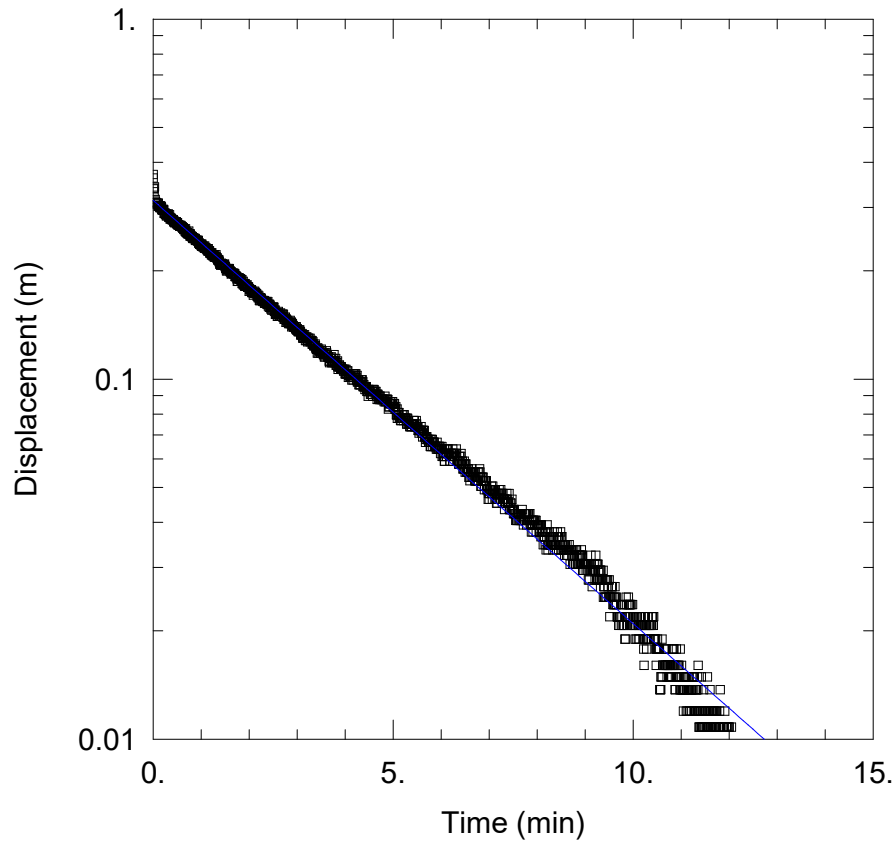
Total Well Penetration Depth: 1.19 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.99 m

Screen Length: 0.31 m

Well Radius: 0.1016 m



MW6-24 RISING HEAD TEST 2

Data Set: C:\...\MW6-24_RH2.aqt

Date: 07/12/24

Time: 11:29:04

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW6-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0003541$ cm/sec

$y_0 = 0.3135$ m

AQUIFER DATA

Saturated Thickness: 1.19 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW6-24)

Initial Displacement: 0.37 m

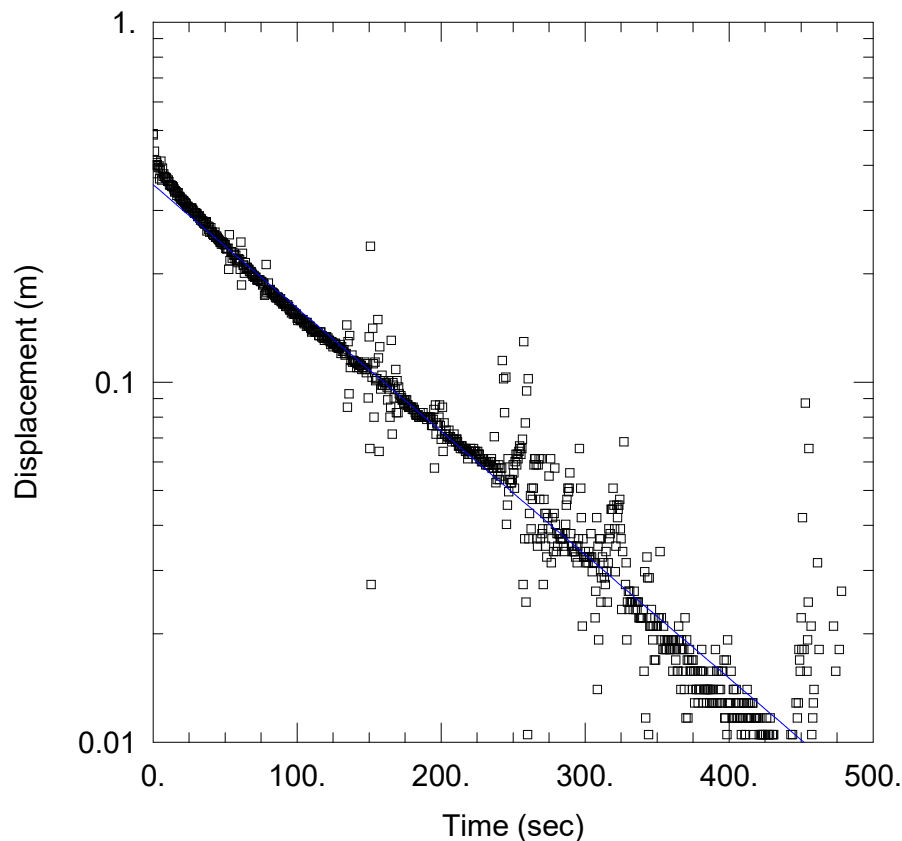
Total Well Penetration Depth: 1.19 m

Casing Radius: 0.0254 m

Static Water Column Height: 2.99 m

Screen Length: 0.31 m

Well Radius: 0.1016 m



MW7-24 FALLING HEAD TEST 1

Data Set: C:\...\MW7-24_FH1.aqt

Date: 07/12/24

Time: 12:21:20

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW7-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002435$ cm/sec

$y_0 = 0.3535$ m

AQUIFER DATA

Saturated Thickness: 1.51 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW7-24)

Initial Displacement: 0.49 m

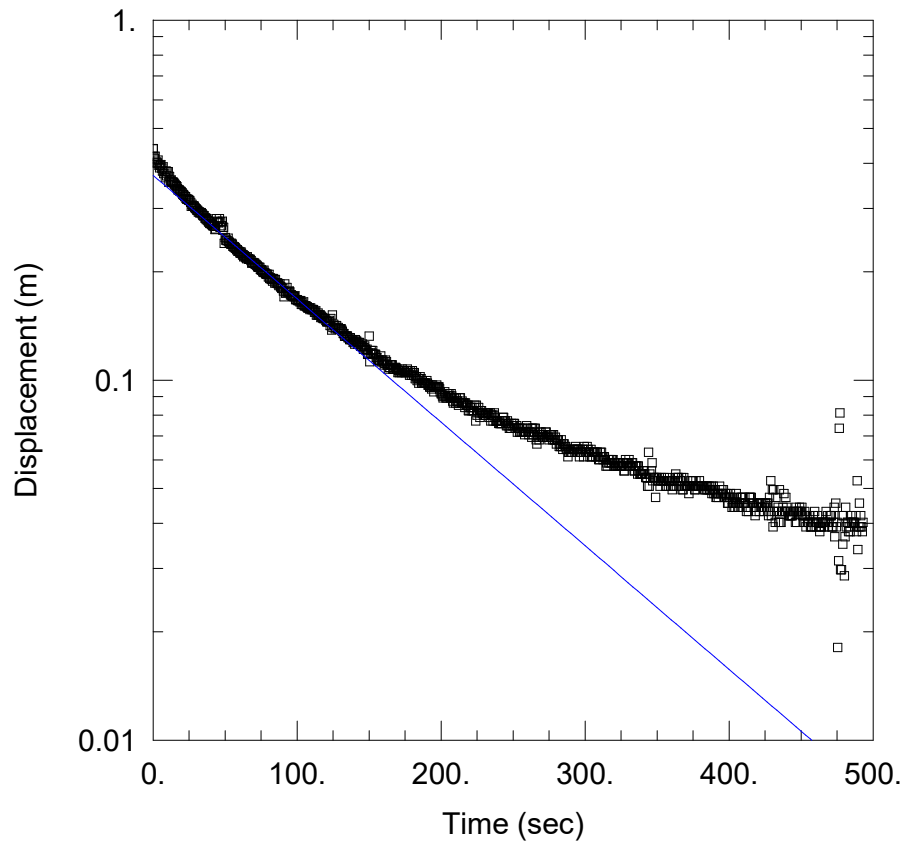
Total Well Penetration Depth: 1.51 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.26 m

Screen Length: 0.97 m

Well Radius: 0.1016 m



MW7-24 FALLING HEAD TEST 2

Data Set: C:\...\MW7-24_FH2.aqt

Date: 07/12/24

Time: 12:20:49

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW7-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002438$ cm/sec

$y_0 = 0.3705$ m

AQUIFER DATA

Saturated Thickness: 1.51 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW7-24)

Initial Displacement: 0.44 m

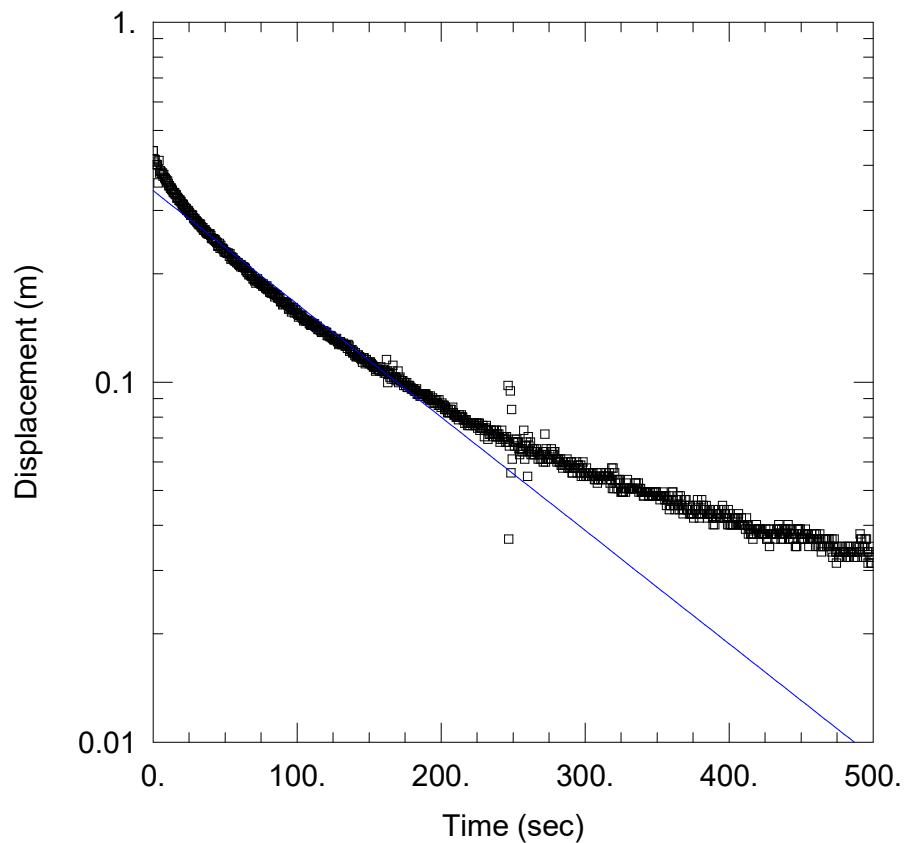
Total Well Penetration Depth: 1.51 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.26 m

Screen Length: 0.97 m

Well Radius: 0.1016 m



MW7-24 FALLING HEAD TEST 3

Data Set: C:\...\MW7-24_FH3.aqt

Date: 07/12/24

Time: 12:17:01

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW7-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002236$ cm/sec

$y_0 = 0.3401$ m

AQUIFER DATA

Saturated Thickness: 1.51 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW7-24)

Initial Displacement: 0.44 m

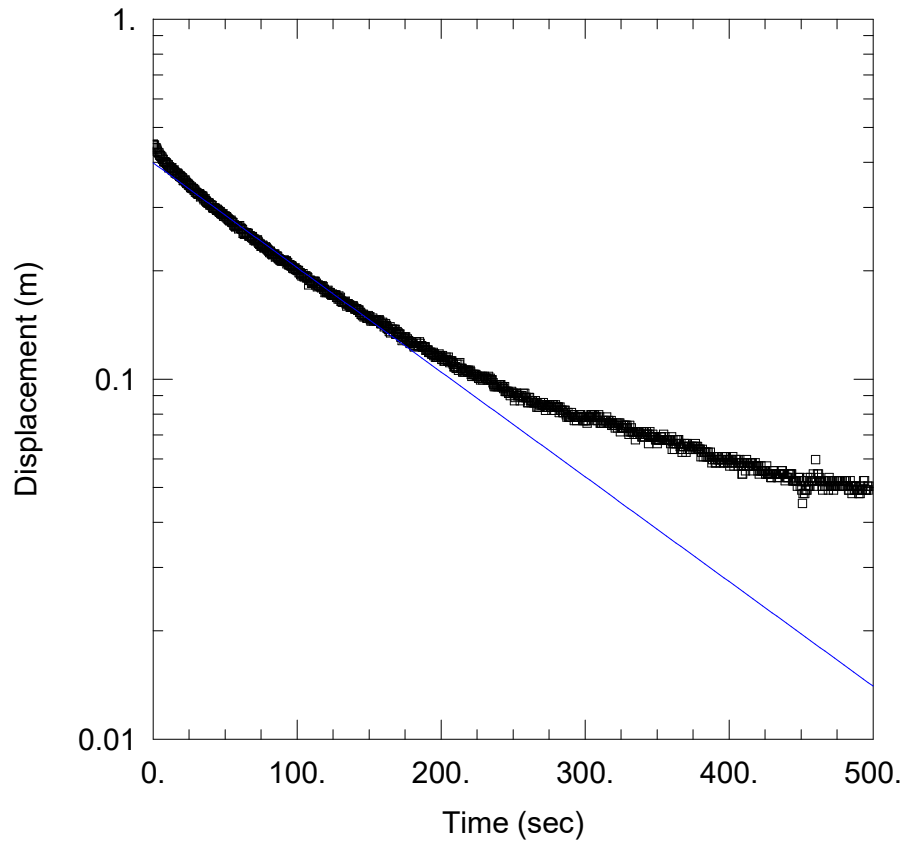
Total Well Penetration Depth: 1.51 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.26 m

Screen Length: 0.97 m

Well Radius: 0.1016 m



MW7-24 RISING HEAD TEST 1

Data Set: C:\...\MW7-24_RH1.aqt

Date: 07/12/24

Time: 12:21:07

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW7-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002066$ cm/sec

$y_0 = 0.3988$ m

AQUIFER DATA

Saturated Thickness: 1.51 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW7-24)

Initial Displacement: 0.45 m

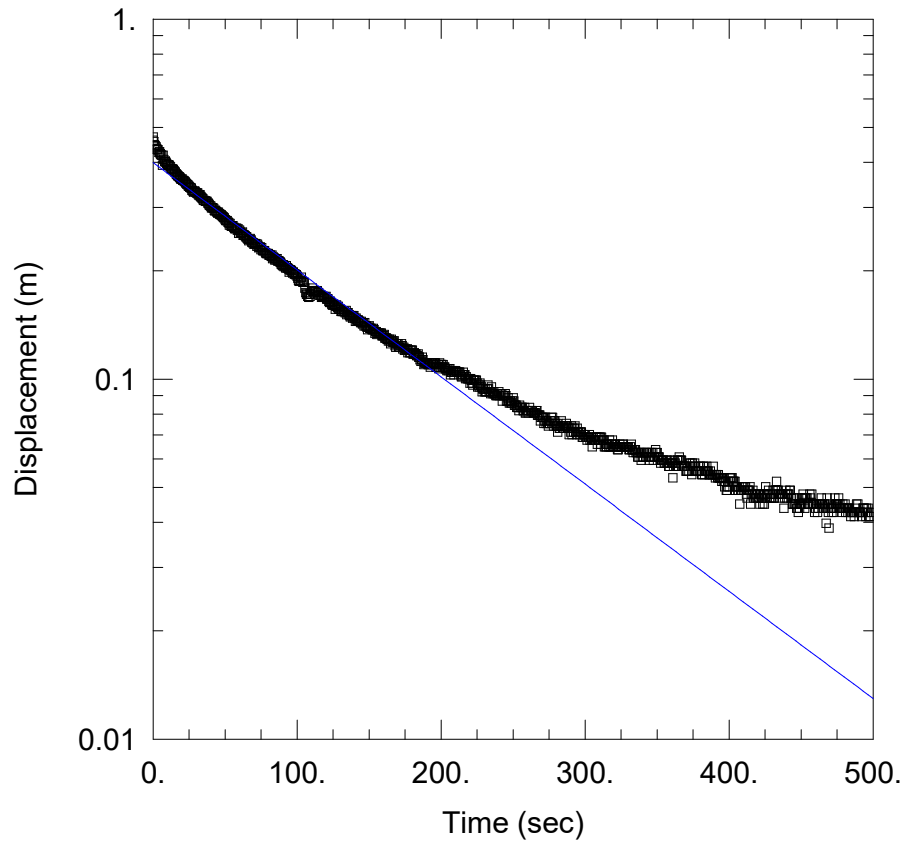
Total Well Penetration Depth: 1.51 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.26 m

Screen Length: 0.97 m

Well Radius: 0.1016 m



MW7-24 RISING HEAD TEST 2

Data Set: C:\...\MW7-24_RH2.aqt

Date: 07/12/24

Time: 12:29:04

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW7-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002115$ cm/sec

$y_0 = 0.3993$ m

AQUIFER DATA

Saturated Thickness: 1.51 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW7-24)

Initial Displacement: 0.47 m

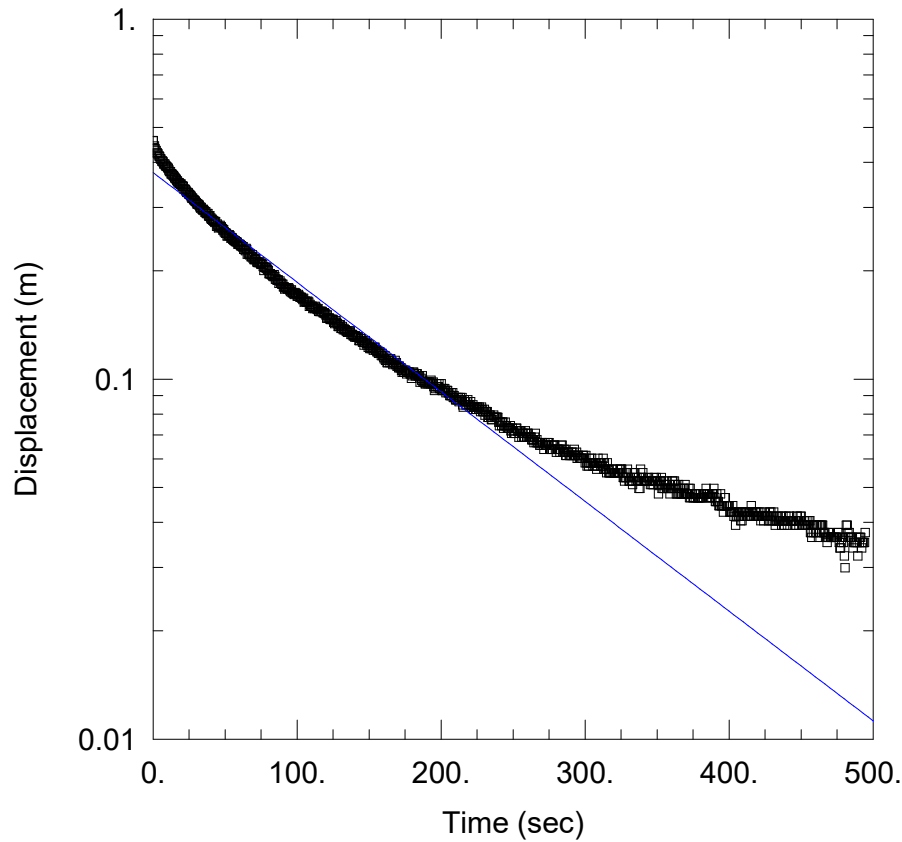
Total Well Penetration Depth: 1.51 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.26 m

Screen Length: 0.97 m

Well Radius: 0.1016 m



MW7-24 RISING HEAD TEST 3

Data Set: C:\...\MW7-24_RH3.aqt

Date: 07/12/24

Time: 12:29:31

PROJECT INFORMATION

Company: GHD Ltd.

Client: Schlegel Urban Developments

Project: 12637434

Location: St. Jacobs, ON

Test Well: MW7-24

Test Date: 5/1/2024

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0002164$ cm/sec

$y_0 = 0.3745$ m

AQUIFER DATA

Saturated Thickness: 1.51 m

Anisotropy Ratio (K_z/K_r): 0.5

WELL DATA (MW7-24)

Initial Displacement: 0.46 m

Total Well Penetration Depth: 1.51 m

Casing Radius: 0.0254 m

Static Water Column Height: 3.26 m

Screen Length: 0.97 m

Well Radius: 0.1016 m

Appendix E

Laboratory Certificate of Analysis



CERTIFICATE OF ANALYSIS

Work Order	: WT2430612	Page	: 1 of 10
Client	: GHD Limited	Laboratory	: ALS Environmental - Waterloo
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12637434-DEL.2	Date Samples Received	: 11-Oct-2024 14:30
PO	: 735-011910	Date Analysis	: 12-Oct-2024
		Commenced	
		Issue Date	: 21-Oct-2024 16:14
C-O-C number	: ----		
Sampler	: L. Ozalio		
Site	: ----		
Quote number	: SSOW-12637434-DEL-2-2024-735-011910		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
Walt Kippenhuck	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	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).
Measurement Uncertainty: The reported uncertainties in this report are expanded uncertainties calculated using a coverage factor of 2, which gives a level of confidence of approximately 95%.
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.

Unit	Description
-	no units
µS/cm	microsiemens per centimetre
CU	colour units (1 cu = 1 mg/l pt)
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.

<: less than.

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.
DLUI	Detection Limit Raised: Unknown interference generated an apparent false positive test result.
TMV	Turbidity exceeded upper limit of the nephelometric method. Minimum value reported.



Analytical Results

WT2430612-001

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12637434-MW1-24
Client sampling date / time: 11-Oct-2024 12:00

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Physical Tests								
Colour, true	----	<2.0	2.0	CU	E329-L/WT	15-Oct-2024	16-Oct-2024	1708371
Conductivity	----	865	2.0	µS/cm	E100/WT	15-Oct-2024	16-Oct-2024	1708368
Hardness (as CaCO3), dissolved	----	442	0.50	mg/L	EC100/WT	-	16-Oct-2024	-
pH	----	7.81	0.10	pH units	E108/WT	15-Oct-2024	16-Oct-2024	1708367
Solids, total dissolved [TDS]	----	572	D.L.S. 20	mg/L	E162/WT	-	16-Oct-2024	1711401
Turbidity	----	>4000	T.M.V. 0.10	NTU	E121/WT	-	12-Oct-2024	1708657
Alkalinity, total (as CaCO3)	----	3050	10.0	mg/L	E290/WT	15-Oct-2024	16-Oct-2024	1708369
Anions and Nutrients								
Ammonia, total (as N)	7664-41-7	0.0196	0.0050	mg/L	E298/WT	16-Oct-2024	18-Oct-2024	1710782
Chloride	16887-00-6	31.6	0.50	mg/L	E235.Cl/WT	15-Oct-2024	16-Oct-2024	1708365
Fluoride	16984-48-8	0.038	0.020	mg/L	E235.F/WT	15-Oct-2024	16-Oct-2024	1708362
Nitrate (as N)	14797-55-8	31.2	0.020	mg/L	E235.NO3/WT	15-Oct-2024	16-Oct-2024	1708363
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	15-Oct-2024	16-Oct-2024	1708364
Phosphate, ortho-, dissolved (as P)	14265-44-2	<0.0010	0.0010	mg/L	E378-U/WT	15-Oct-2024	16-Oct-2024	1708370
Sulfate (as SO4)	14808-79-8	55.7	0.30	mg/L	E235.SO4/WT	15-Oct-2024	16-Oct-2024	1708366
Dissolved Metals								
Aluminum, dissolved	7429-90-5	0.0083	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Antimony, dissolved	7440-36-0	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Arsenic, dissolved	7440-38-2	0.00020	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Barium, dissolved	7440-39-3	0.0413	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Bismuth, dissolved	7440-69-9	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Boron, dissolved	7440-42-8	0.017	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cadmium, dissolved	7440-43-9	0.0000074	0.0000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Calcium, dissolved	7440-70-2	123	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cesium, dissolved	7440-46-2	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Chromium, dissolved	7440-47-3	0.00056	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cobalt, dissolved	7440-48-4	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Copper, dissolved	7440-50-8	0.00136	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Iron, dissolved	7439-89-6	<0.010	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lead, dissolved	7439-92-1	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lithium, dissolved	7439-93-2	<0.0010	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Magnesium, dissolved	7439-95-4	32.8	0.0050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Manganese, dissolved	7439-96-5	0.00042	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Molybdenum, dissolved	7439-98-7	0.000075	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Nickel, dissolved	7440-02-0	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Phosphorus, dissolved	7723-14-0	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Potassium, dissolved	7440-09-7	3.76	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Rubidium, dissolved	7440-17-7	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Selenium, dissolved	7782-49-2	0.000145	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silicon, dissolved	7440-21-3	5.26	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sodium, dissolved	7440-23-5	6.92	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Strontium, dissolved	7440-24-6	0.191	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sulfur, dissolved	7704-34-9	20.5	0.50	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694



Analytical Results

WT2430612-001

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW1-24

Client sampling date / time: 11-Oct-2024 12:00

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Dissolved Metals								
Tellurium, dissolved	13494-80-9	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thorium, dissolved	7440-29-1	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tin, dissolved	7440-31-5	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Titanium, dissolved	7440-32-6	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tungsten, dissolved	7440-33-7	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Uranium, dissolved	7440-61-1	0.000283	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zinc, dissolved	7440-66-6	0.0017	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zirconium, dissolved	7440-67-7	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Dissolved metals filtration location	----	Field	-	-	EP421/WT	-	15-Oct-2024	1708694

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2430612-002

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW4-24

Client sampling date / time: 11-Oct-2024 12:50

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Physical Tests								
Colour, true	----	<2.0	2.0	CU	E329-L/WT	15-Oct-2024	16-Oct-2024	1708371
Conductivity	----	624	2.0	µS/cm	E100/WT	15-Oct-2024	16-Oct-2024	1708368
Hardness (as CaCO3), dissolved	----	271	0.50	mg/L	EC100/WT	-	16-Oct-2024	-
pH	----	7.87	0.10	pH units	E108/WT	15-Oct-2024	16-Oct-2024	1708367
Solids, total dissolved [TDS]	----	405	20	mg/L	E162/WT	-	16-Oct-2024	1711401
Turbidity	----	>4000	0.10	NTU	E121/WT	-	12-Oct-2024	1706857
Alkalinity, total (as CaCO3)	----	869	10.0	mg/L	E290/WT	15-Oct-2024	16-Oct-2024	1708369
Anions and Nutrients								
Ammonia, total (as N)	7664-41-7	0.0614	0.0050	mg/L	E298/WT	16-Oct-2024	17-Oct-2024	1710971
Chloride	16887-00-6	10.8	0.50	mg/L	E235.Cl/WT	15-Oct-2024	16-Oct-2024	1708365
Fluoride	16984-48-8	0.084	0.020	mg/L	E235.F/WT	15-Oct-2024	16-Oct-2024	1708362
Nitrate (as N)	14797-55-8	13.7	0.020	mg/L	E235.NO3/WT	15-Oct-2024	16-Oct-2024	1708363
Nitrite (as N)	14797-65-0	0.072	0.010	mg/L	E235.NO2/WT	15-Oct-2024	16-Oct-2024	1708364
Phosphate, ortho-, dissolved (as P)	14265-44-2	0.0027	0.0010	mg/L	E378-U/WT	15-Oct-2024	16-Oct-2024	1708370
Sulfate (as SO4)	14808-79-8	32.3	0.30	mg/L	E235.SO4/WT	15-Oct-2024	16-Oct-2024	1708366
Dissolved Metals								
Aluminum, dissolved	7429-90-5	0.0034	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Antimony, dissolved	7440-36-0	0.00016	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Arsenic, dissolved	7440-38-2	0.00028	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Barium, dissolved	7440-39-3	0.0517	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Bismuth, dissolved	7440-69-9	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Boron, dissolved	7440-42-8	0.027	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694



Analytical Results

WT2430612-002

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW4-24

Client sampling date / time: 11-Oct-2024 12:50

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Dissolved Metals								
Cadmium, dissolved	7440-43-9	<0.0000050	0.0000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Calcium, dissolved	7440-70-2	63.3	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cesium, dissolved	7440-46-2	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cobalt, dissolved	7440-48-4	0.00016	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Copper, dissolved	7440-50-8	0.00152	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Iron, dissolved	7439-89-6	0.010	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lead, dissolved	7439-92-1	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lithium, dissolved	7439-93-2	0.0012	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Magnesium, dissolved	7439-95-4	27.4	0.0050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Manganese, dissolved	7439-96-5	0.0346	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Molybdenum, dissolved	7439-98-7	0.00208	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Nickel, dissolved	7440-02-0	0.00083	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Phosphorus, dissolved	7723-14-0	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Potassium, dissolved	7440-09-7	2.05	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Rubidium, dissolved	7440-17-7	0.00066	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Selenium, dissolved	7782-49-2	0.000506	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silicon, dissolved	7440-21-3	5.34	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sodium, dissolved	7440-23-5	18.0	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Strontium, dissolved	7440-24-6	0.149	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sulfur, dissolved	7704-34-9	11.4	0.50	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tellurium, dissolved	13494-80-9	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thorium, dissolved	7440-29-1	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tin, dissolved	7440-31-5	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Titanium, dissolved	7440-32-6	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tungsten, dissolved	7440-33-7	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Uranium, dissolved	7440-61-1	0.00174	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Vanadium, dissolved	7440-62-2	0.00054	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zinc, dissolved	7440-66-6	0.0013	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zirconium, dissolved	7440-67-7	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Dissolved metals filtration location	----	Field	-	-	EP421/WT	-	15-Oct-2024	1708694

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2430612-003

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW7-24

Client sampling date / time: 11-Oct-2024 13:45

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Physical Tests								
Colour, true	----	3.6	2.0	CU	E329-L/WT	15-Oct-2024	16-Oct-2024	1708371



Analytical Results

WT2430612-003

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12637434-MW7-24
Client sampling date / time: 11-Oct-2024 13:45

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QC/Lot
Physical Tests								
Conductivity	----	586	2.0	µS/cm	E100/WT	15-Oct-2024	16-Oct-2024	1708368
Hardness (as CaCO3), dissolved	----	255	0.50	mg/L	EC100/WT	-	16-Oct-2024	-
pH	----	7.80	0.10	pH units	E108/WT	15-Oct-2024	16-Oct-2024	1708367
Solids, total dissolved [TDS]	----	370 ^{D.L.D.S.}	20	mg/L	E162/WT	-	16-Oct-2024	1711401
Turbidity	----	>4000 ^{T.M.V.}	0.10	NTU	E121/WT	-	12-Oct-2024	1706857
Alkalinity, total (as CaCO3)	----	18300	500	mg/L	E290/WT	15-Oct-2024	17-Oct-2024	1708369
Anions and Nutrients								
Ammonia, total (as N)	7664-41-7	0.107	0.0050	mg/L	E298/WT	16-Oct-2024	17-Oct-2024	1710971
Chloride	16887-00-6	8.86	0.50	mg/L	E235.CI/WT	15-Oct-2024	16-Oct-2024	1708365
Fluoride	16984-48-8	0.181	0.020	mg/L	E235.F/WT	15-Oct-2024	16-Oct-2024	1708362
Nitrate (as N)	14797-55-8	2.54	0.020	mg/L	E235.NO3/WT	15-Oct-2024	16-Oct-2024	1708363
Nitrite (as N)	14797-65-0	0.014	0.010	mg/L	E235.NO2/WT	15-Oct-2024	16-Oct-2024	1708364
Phosphate, ortho-, dissolved (as P)	14265-44-2	0.0100	0.0010	mg/L	E378-U/WT	15-Oct-2024	16-Oct-2024	1708370
Sulfate (as SO4)	14808-79-8	40.6	0.30	mg/L	E235.SO4/WT	15-Oct-2024	16-Oct-2024	1708366
Dissolved Metals								
Aluminum, dissolved	7429-90-5	0.0806	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Antimony, dissolved	7440-36-0	0.00038	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Arsenic, dissolved	7440-38-2	0.00049	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Barium, dissolved	7440-39-3	0.0876	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Bismuth, dissolved	7440-69-9	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Boron, dissolved	7440-42-8	0.053	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cadmium, dissolved	7440-43-9	0.0000075	0.0000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Calcium, dissolved	7440-70-2	61.3	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cesium, dissolved	7440-46-2	0.000014	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cobalt, dissolved	7440-48-4	0.00018	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Copper, dissolved	7440-50-8	0.00149	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Iron, dissolved	7439-89-6	0.060	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lead, dissolved	7439-92-1	0.000101	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lithium, dissolved	7439-93-2	0.0010	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Magnesium, dissolved	7439-95-4	24.7	0.0050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Manganese, dissolved	7439-96-5	0.0660	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Molybdenum, dissolved	7439-98-7	0.00606	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Nickel, dissolved	7440-02-0	0.00059	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Phosphorus, dissolved	7723-14-0	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Potassium, dissolved	7440-09-7	4.67	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Rubidium, dissolved	7440-17-7	0.00161	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Selenium, dissolved	7782-49-2	0.000267	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silicon, dissolved	7440-21-3	5.89	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sodium, dissolved	7440-23-5	38.6	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Strontium, dissolved	7440-24-6	0.354	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sulfur, dissolved	7704-34-9	13.9	0.50	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tellurium, dissolved	13494-80-9	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694



Analytical Results

WT2430612-003

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW7-24
Client sampling date / time: 11-Oct-2024 13:45

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Dissolved Metals								
Thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thorium, dissolved	7440-29-1	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tin, dissolved	7440-31-5	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Titanium, dissolved	7440-32-6	<0.00400 ^{DLUI}	0.00400	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tungsten, dissolved	7440-33-7	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Uranium, dissolved	7440-61-1	0.00346	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Vanadium, dissolved	7440-62-2	0.00103	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zinc, dissolved	7440-66-6	0.0012	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zirconium, dissolved	7440-67-7	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Dissolved metals filtration location	----	Field	-	-	EP421/WT	-	15-Oct-2024	1708694

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2430612-004

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW7-24X
Client sampling date / time: 11-Oct-2024 13:50

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Physical Tests								
Colour, true	----	3.0	2.0	CU	E329-L/WT	15-Oct-2024	16-Oct-2024	1708371
Conductivity	----	590	2.0	µS/cm	E100/WT	15-Oct-2024	16-Oct-2024	1708368
Hardness (as CaCO3), dissolved	----	257	0.50	mg/L	EC100/WT	-	16-Oct-2024	-
pH	----	7.79	0.10	pH units	E108/WT	15-Oct-2024	16-Oct-2024	1708367
Solids, total dissolved [TDS]	----	359 ^{DLDS}	20	mg/L	E162/WT	-	16-Oct-2024	1711401
Turbidity	----	>4000 ^{TMV}	0.10	NTU	E121/WT	-	12-Oct-2024	1706857
Alkalinity, total (as CaCO3)	----	18800	500	mg/L	E290/WT	15-Oct-2024	17-Oct-2024	1708369
Anions and Nutrients								
Ammonia, total (as N)	7664-41-7	0.114	0.0050	mg/L	E298/WT	16-Oct-2024	17-Oct-2024	1710971
Chloride	16887-00-6	8.79	0.50	mg/L	E235.Cl/WT	15-Oct-2024	16-Oct-2024	1708365
Fluoride	16984-48-8	0.186	0.020	mg/L	E235.F/WT	15-Oct-2024	16-Oct-2024	1708362
Nitrate (as N)	14797-55-8	2.52	0.020	mg/L	E235.NO3/WT	15-Oct-2024	16-Oct-2024	1708363
Nitrite (as N)	14797-65-0	0.013	0.010	mg/L	E235.NO2/WT	15-Oct-2024	16-Oct-2024	1708364
Phosphate, ortho-, dissolved (as P)	14265-44-2	0.0092	0.0010	mg/L	E378-U/WT	15-Oct-2024	16-Oct-2024	1708370
Sulfate (as SO4)	14808-79-8	40.3	0.30	mg/L	E235.SO4/WT	15-Oct-2024	16-Oct-2024	1708366
Dissolved Metals								
Aluminum, dissolved	7429-90-5	0.198	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Antimony, dissolved	7440-36-0	0.00038	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Arsenic, dissolved	7440-38-2	0.00054	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Barium, dissolved	7440-39-3	0.0881	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Bismuth, dissolved	7440-69-9	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Boron, dissolved	7440-42-8	0.053	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cadmium, dissolved	7440-43-9	0.0000112	0.0000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694



Analytical Results

WT2430612-004

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-MW7-24X

Client sampling date / time: 11-Oct-2024 13:50

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Dissolved Metals								
Calcium, dissolved	7440-70-2	62.0	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cesium, dissolved	7440-46-2	0.000023	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cobalt, dissolved	7440-48-4	0.00026	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Copper, dissolved	7440-50-8	0.00250	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Iron, dissolved	7439-89-6	0.179	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lead, dissolved	7439-92-1	0.000283	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lithium, dissolved	7439-93-2	<0.0010	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Magnesium, dissolved	7439-95-4	24.8	0.0050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Manganese, dissolved	7439-96-5	0.0703	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Molybdenum, dissolved	7439-98-7	0.00580	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Nickel, dissolved	7440-02-0	0.00076	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Phosphorus, dissolved	7723-14-0	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Potassium, dissolved	7440-09-7	4.77	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Rubidium, dissolved	7440-17-7	0.00195	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Selenium, dissolved	7782-49-2	0.000292	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silicon, dissolved	7440-21-3	6.07	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sodium, dissolved	7440-23-5	38.0	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Strontium, dissolved	7440-24-6	0.346	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sulfur, dissolved	7704-34-9	13.6	0.50	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tellurium, dissolved	13494-80-9	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thorium, dissolved	7440-29-1	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tin, dissolved	7440-31-5	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Titanium, dissolved	7440-32-6	0.00902	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tungsten, dissolved	7440-33-7	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Uranium, dissolved	7440-61-1	0.00348	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Vanadium, dissolved	7440-62-2	0.00129	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zinc, dissolved	7440-66-6	0.0026	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zirconium, dissolved	7440-67-7	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Dissolved metals filtration location	----	Field	-	-	EP421/WT	-	15-Oct-2024	1708694

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2430612-005

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-FB

Client sampling date / time: 11-Oct-2024 14:05

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Physical Tests								
Colour, true	----	<2.0	2.0	CU	E329-L/WT	15-Oct-2024	16-Oct-2024	1708371
Conductivity	----	<2.0	2.0	µS/cm	E100/WT	15-Oct-2024	16-Oct-2024	1708368



Analytical Results

WT2430612-005

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12637434-FB

Client sampling date / time: 11-Oct-2024 14:05

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Physical Tests								
Hardness (as CaCO3), dissolved	----	<0.50	0.50	mg/L	EC100/WT	-	16-Oct-2024	-
pH	----	5.66	0.10	pH units	E108/WT	15-Oct-2024	16-Oct-2024	1708367
Solids, total dissolved [TDS]	----	<10	10	mg/L	E162/WT	-	16-Oct-2024	1711401
Turbidity	----	<0.10	0.10	NTU	E121/WT	-	12-Oct-2024	1706858
Alkalinity, total (as CaCO3)	----	<2.0	2.0	mg/L	E290/WT	15-Oct-2024	16-Oct-2024	1708369
Anions and Nutrients								
Ammonia, total (as N)	7664-41-7	<0.0050	0.0050	mg/L	E298/WT	17-Oct-2024	18-Oct-2024	1713772
Chloride	16887-00-6	<0.50	0.50	mg/L	E235.Cl/WT	15-Oct-2024	16-Oct-2024	1708365
Fluoride	16984-48-8	<0.020	0.020	mg/L	E235.F/WT	15-Oct-2024	16-Oct-2024	1708362
Nitrate (as N)	14797-55-8	<0.020	0.020	mg/L	E235.NO3/WT	15-Oct-2024	16-Oct-2024	1708363
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	15-Oct-2024	16-Oct-2024	1708364
Phosphate, ortho-, dissolved (as P)	14265-44-2	<0.0010	0.0010	mg/L	E378-U/WT	15-Oct-2024	16-Oct-2024	1708370
Sulfate (as SO4)	14808-79-8	<0.30	0.30	mg/L	E235.SO4/WT	15-Oct-2024	16-Oct-2024	1708366
Dissolved Metals								
Aluminum, dissolved	7429-90-5	<0.0010	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Antimony, dissolved	7440-36-0	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Arsenic, dissolved	7440-38-2	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Barium, dissolved	7440-39-3	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Bismuth, dissolved	7440-69-9	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Boron, dissolved	7440-42-8	<0.010	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cadmium, dissolved	7440-43-9	<0.0000050	0.0000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Calcium, dissolved	7440-70-2	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cesium, dissolved	7440-46-2	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Cobalt, dissolved	7440-48-4	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Copper, dissolved	7440-50-8	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Iron, dissolved	7439-89-6	<0.010	0.010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lead, dissolved	7439-92-1	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Lithium, dissolved	7439-93-2	<0.0010	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Magnesium, dissolved	7439-95-4	<0.0050	0.0050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Manganese, dissolved	7439-96-5	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Molybdenum, dissolved	7439-98-7	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Nickel, dissolved	7440-02-0	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Phosphorus, dissolved	7723-14-0	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Potassium, dissolved	7440-09-7	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Rubidium, dissolved	7440-17-7	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Selenium, dissolved	7782-49-2	<0.000050	0.000050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silicon, dissolved	7440-21-3	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sodium, dissolved	7440-23-5	<0.050	0.050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Strontium, dissolved	7440-24-6	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Sulfur, dissolved	7704-34-9	<0.50	0.50	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tellurium, dissolved	13494-80-9	<0.00020	0.00020	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694



Analytical Results

WT2430612-005

Sub-Matrix:Water

(Matrix: Water)

Client sample ID: GW-12637434-FB
Client sampling date / time: 11-Oct-2024 14:05

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Dissolved Metals								
Thorium, dissolved	7440-29-1	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tin, dissolved	7440-31-5	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Titanium, dissolved	7440-32-6	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Tungsten, dissolved	7440-33-7	<0.00010	0.00010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Uranium, dissolved	7440-61-1	<0.000010	0.000010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zinc, dissolved	7440-66-6	<0.0010	0.0010	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Zirconium, dissolved	7440-67-7	<0.00030	0.00030	mg/L	E421/WT	15-Oct-2024	15-Oct-2024	1708694
Dissolved metals filtration location	----	Field	-	-	EP421/WT	-	15-Oct-2024	1708694

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: WT2430612	Page	: 1 of 15
Client	: GHD Limited	Laboratory	: ALS Environmental - Waterloo
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12637434-DEL.2	Date Samples Received	: 11-Oct-2024 14:30
PO	: 735-011910	Issue Date	: 21-Oct-2024 16:14
C-O-C number	: ----		
Sampler	: L. Ozalio		
Site	: ----		
Quote number	: SSOW-12637434-DEL-2-2024-735-011910		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

- No Quality Control Sample Frequency Outliers occur.



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 : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] GW-12637434-MW1-24	E298	11-Oct-2024	16-Oct-2024	28 days	5 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] GW-12637434-MW4-24	E298	11-Oct-2024	16-Oct-2024	28 days	5 days	✓	17-Oct-2024	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] GW-12637434-MW7-24	E298	11-Oct-2024	16-Oct-2024	28 days	5 days	✓	17-Oct-2024	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] GW-12637434-MW7-24X	E298	11-Oct-2024	16-Oct-2024	28 days	5 days	✓	17-Oct-2024	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] GW-12637434-FB	E298	11-Oct-2024	17-Oct-2024	28 days	6 days	✓	18-Oct-2024	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] GW-12637434-FB	E235.Cl	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] GW-12637434-MW1-24	E235.Cl	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] GW-12637434-MW4-24	E235.Cl	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24	E235.Cl	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24X	E235.Cl	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)										
HDPE [ON MECP] GW-12637434-FB	E378-U	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)										
HDPE [ON MECP] GW-12637434-MW1-24	E378-U	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)										
HDPE [ON MECP] GW-12637434-MW4-24	E378-U	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)										
HDPE [ON MECP] GW-12637434-MW7-24	E378-U	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)										
HDPE [ON MECP] GW-12637434-MW7-24X	E378-U	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] GW-12637434-FB	E235.F	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓



Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] GW-12637434-MW1-24	E235.F	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] GW-12637434-MW4-24	E235.F	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24	E235.F	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24X	E235.F	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] GW-12637434-FB	E235.NO3	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] GW-12637434-MW1-24	E235.NO3	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] GW-12637434-MW4-24	E235.NO3	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24	E235.NO3	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24X	E235.NO3	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] GW-12637434-FB	E235.NO2	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] GW-12637434-MW1-24	E235.NO2	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] GW-12637434-MW4-24	E235.NO2	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24	E235.NO2	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24X	E235.NO2	11-Oct-2024	15-Oct-2024	7 days	4 days	✓	16-Oct-2024	7 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] GW-12637434-FB	E235.SO4	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] GW-12637434-MW1-24	E235.SO4	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] GW-12637434-MW4-24	E235.SO4	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24	E235.SO4	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓



Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] GW-12637434-MW7-24X	E235.SO4	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12637434-FB	E421	11-Oct-2024	15-Oct-2024	180 days	4 days	✓	15-Oct-2024	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12637434-MW1-24	E421	11-Oct-2024	15-Oct-2024	180 days	4 days	✓	15-Oct-2024	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12637434-MW4-24	E421	11-Oct-2024	15-Oct-2024	180 days	4 days	✓	15-Oct-2024	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12637434-MW7-24	E421	11-Oct-2024	15-Oct-2024	180 days	4 days	✓	15-Oct-2024	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12637434-MW7-24X	E421	11-Oct-2024	15-Oct-2024	180 days	4 days	✓	15-Oct-2024	180 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] GW-12637434-FB	E290	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] GW-12637434-MW1-24	E290	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] GW-12637434-MW4-24	E290	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] GW-12637434-MW7-24	E290	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] GW-12637434-MW7-24X	E290	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] GW-12637434-FB	E329-L	11-Oct-2024	15-Oct-2024	53 hrs	93 hrs	✗ EHT	16-Oct-2024	53 hrs	119 hrs	✗ EHT
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] GW-12637434-MW7-24	E329-L	11-Oct-2024	15-Oct-2024	54 hrs	93 hrs	✗ EHT	16-Oct-2024	54 hrs	119 hrs	✗ EHT
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] GW-12637434-MW7-24X	E329-L	11-Oct-2024	15-Oct-2024	54 hrs	93 hrs	✗ EHT	16-Oct-2024	54 hrs	119 hrs	✗ EHT
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] GW-12637434-MW4-24	E329-L	11-Oct-2024	15-Oct-2024	55 hrs	94 hrs	✗ EHT	16-Oct-2024	55 hrs	120 hrs	✗ EHT
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] GW-12637434-MW1-24	E329-L	11-Oct-2024	15-Oct-2024	55 hrs	95 hrs	✗ EHT	16-Oct-2024	55 hrs	121 hrs	✗ EHT
Physical Tests : Conductivity in Water										
HDPE [ON MECP] GW-12637434-FB	E100	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] GW-12637434-MW1-24	E100	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : Conductivity in Water										
HDPE [ON MECP] GW-12637434-MW4-24	E100	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] GW-12637434-MW7-24	E100	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] GW-12637434-MW7-24X	E100	11-Oct-2024	15-Oct-2024	28 days	4 days	✓	16-Oct-2024	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-12637434-FB	E108	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-12637434-MW1-24	E108	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-12637434-MW4-24	E108	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-12637434-MW7-24	E108	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-12637434-MW7-24X	E108	11-Oct-2024	15-Oct-2024	14 days	4 days	✓	16-Oct-2024	14 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-12637434-FB	E162	11-Oct-2024	----	----	----		16-Oct-2024	7 days	5 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-12637434-MW1-24	E162	11-Oct-2024	----	----	----		16-Oct-2024	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-12637434-MW4-24	E162	11-Oct-2024	----	----	----		16-Oct-2024	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-12637434-MW7-24	E162	11-Oct-2024	----	----	----		16-Oct-2024	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-12637434-MW7-24X	E162	11-Oct-2024	----	----	----		16-Oct-2024	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-12637434-FB	E121	11-Oct-2024	----	----	----		12-Oct-2024	48 hrs	24 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-12637434-MW7-24X	E121	11-Oct-2024	----	----	----		12-Oct-2024	48 hrs	24 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-12637434-MW4-24	E121	11-Oct-2024	----	----	----		12-Oct-2024	48 hrs	25 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-12637434-MW7-24	E121	11-Oct-2024	----	----	----		12-Oct-2024	48 hrs	25 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-12637434-MW1-24	E121	11-Oct-2024	----	----	----		12-Oct-2024	48 hrs	26 hrs	✓

[Legend & Qualifier Definitions](#)

Page : 11 of 15
Work Order : WT2430612
Client : GHD Limited
Project : 12637434-DEL.2



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	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
Analytical Methods							
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	1708369	1	20	5.0	5.0	✔
Ammonia by Fluorescence	E298	1710782	3	42	7.1	5.0	✔
Chloride in Water by IC	E235.Cl	1708365	1	20	5.0	5.0	✔
Colour (True) by Spectrometer (2 CU)	E329-L	1708371	1	5	20.0	5.0	✔
Conductivity in Water	E100	1708368	1	12	8.3	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1708694	1	20	5.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1708370	1	12	8.3	5.0	✔
Fluoride in Water by IC	E235.F	1708362	1	12	8.3	5.0	✔
Nitrate in Water by IC	E235.NO3	1708363	1	20	5.0	5.0	✔
Nitrite in Water by IC	E235.NO2	1708364	1	20	5.0	5.0	✔
pH by Meter	E108	1708367	1	12	8.3	5.0	✔
Sulfate in Water by IC	E235.SO4	1708366	1	20	5.0	5.0	✔
TDS by Gravimetry	E162	1711401	1	14	7.1	5.0	✔
Turbidity by Nephelometry	E121	1706857	2	21	9.5	5.0	✔
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1708369	1	20	5.0	5.0	✔
Ammonia by Fluorescence	E298	1710782	3	42	7.1	5.0	✔
Chloride in Water by IC	E235.Cl	1708365	1	20	5.0	5.0	✔
Colour (True) by Spectrometer (2 CU)	E329-L	1708371	1	5	20.0	5.0	✔
Conductivity in Water	E100	1708368	1	12	8.3	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1708694	1	20	5.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1708370	1	12	8.3	5.0	✔
Fluoride in Water by IC	E235.F	1708362	1	12	8.3	5.0	✔
Nitrate in Water by IC	E235.NO3	1708363	1	20	5.0	5.0	✔
Nitrite in Water by IC	E235.NO2	1708364	1	20	5.0	5.0	✔
pH by Meter	E108	1708367	1	12	8.3	5.0	✔
Sulfate in Water by IC	E235.SO4	1708366	1	20	5.0	5.0	✔
TDS by Gravimetry	E162	1711401	1	14	7.1	5.0	✔
Turbidity by Nephelometry	E121	1706857	2	21	9.5	5.0	✔
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1708369	1	20	5.0	5.0	✔
Ammonia by Fluorescence	E298	1710782	3	42	7.1	5.0	✔
Chloride in Water by IC	E235.Cl	1708365	1	20	5.0	5.0	✔
Colour (True) by Spectrometer (2 CU)	E329-L	1708371	1	5	20.0	5.0	✔
Conductivity in Water	E100	1708368	1	12	8.3	5.0	✔



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							
Dissolved Metals in Water by CRC ICPMS	E421	1708694	1	20	5.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1708370	1	12	8.3	5.0	✔
Fluoride in Water by IC	E235.F	1708362	1	12	8.3	5.0	✔
Nitrate in Water by IC	E235.NO3	1708363	1	20	5.0	5.0	✔
Nitrite in Water by IC	E235.NO2	1708364	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	1708366	1	20	5.0	5.0	✔
TDS by Gravimetry	E162	1711401	1	14	7.1	5.0	✔
Turbidity by Nephelometry	E121	1708657	2	21	9.5	5.0	✔
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	1710782	3	42	7.1	5.0	✔
Chloride in Water by IC	E235.Cl	1708365	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1708694	1	20	5.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1708370	1	12	8.3	5.0	✔
Fluoride in Water by IC	E235.F	1708362	1	12	8.3	5.0	✔
Nitrate in Water by IC	E235.NO3	1708363	1	20	5.0	5.0	✔
Nitrite in Water by IC	E235.NO2	1708364	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	1708366	1	20	5.0	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
Conductivity in Water	E100 ALS Environmental - Waterloo	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 ALS Environmental - Waterloo	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally $20 \pm 5^\circ\text{C}$). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 ALS Environmental - Waterloo	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 ALS Environmental - Waterloo	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 $180 \pm 2^\circ\text{C}$ for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl ALS Environmental - Waterloo	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 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 ALS Environmental - Waterloo	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 ALS Environmental - Waterloo	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 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Waterloo	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.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ammonia by Fluorescence	E298 ALS Environmental - Waterloo	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 (True) by Spectrometer (2 CU)	E329-L ALS Environmental - Waterloo	Water	APHA 2120 C (mod)	Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. 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 (Ultra Trace Level 0.001 mg/L)	E378-U ALS Environmental - Waterloo	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a 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.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Waterloo	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Waterloo	Water	APHA 2340B	"Hardness (as CaCO ₃), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO ₃ 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.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 ALS Environmental - Waterloo	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Dissolved Metals Water Filtration	EP421 ALS Environmental - Waterloo	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO ₃ .

QUALITY CONTROL REPORT

Work Order	: WT2430612	Page	: 1 of 13
Client	: GHD Limited	Laboratory	: ALS Environmental - Waterloo
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12637434-DEL.2	Date Samples Received	: 11-Oct-2024 14:30
PO	: 735-011910	Date Analysis Commenced	: 12-Oct-2024
C-O-C number	: ----	Issue Date	: 21-Oct-2024 16:14
Sampler	: L. Ozalio		
Site	: ----		
Quote number	: SSOW-12637434-DEL-2-2024-735-011910		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	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: 1706857)											
WT2430569-001	Anonymous	Turbidity	----	E121	0.10	NTU	296	297	0.337%	15%	----
Physical Tests (QC Lot: 1706858)											
WT2430612-005	GW-12637434-FB	Turbidity	----	E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 1708367)											
WT2430562-001	Anonymous	pH	----	E108	0.10	pH units	7.99	8.05	0.748%	4%	----
Physical Tests (QC Lot: 1708368)											
WT2430562-001	Anonymous	Conductivity	----	E100	1.0	µS/cm	619	640	3.34%	10%	----
Physical Tests (QC Lot: 1708369)											
WT2430562-001	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	309	316	1.97%	20%	----
Physical Tests (QC Lot: 1708371)											
WT2430612-001	GW-12637434-MW1-24	Colour, true	----	E329-L	2.0	CU	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 1711401)											
WT2430569-001	Anonymous	Solids, total dissolved [TDS]	----	E162	20	mg/L	486	503	3.44%	20%	----
Anions and Nutrients (QC Lot: 1708362)											
WT2430562-001	Anonymous	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.167	0.162	0.005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1708363)											
WT2430562-001	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: 1708364)											
WT2430562-001	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: 1708365)											
WT2430562-001	Anonymous	Chloride	16887-00-6	E235.Cl	0.50	mg/L	11.0	11.0	0.136%	20%	----
Anions and Nutrients (QC Lot: 1708366)											
WT2430562-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	33.4	33.3	0.218%	20%	----
Anions and Nutrients (QC Lot: 1708370)											
WT2430562-002	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	0.0014	0.0004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1710782)											
WT2430612-001	GW-12637434-MW1-24	Ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0196	0.0197	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1710971)											
WT2430441-001	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1713772)											



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
Anions and Nutrients (QC Lot: 1713772) - continued											
HA2402041-001	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.126	0.126	0.635%	20%	----
Dissolved Metals (QC Lot: 1708694)											
WT2430314-001	Anonymous	Aluminum, dissolved	7429-90-5	E421	0.0100	mg/L	<0.0100	0.0108	0.0008	Diff <2x LOR	----
		Antimony, dissolved	7440-36-0	E421	0.00100	mg/L	<1.00 µg/L	<0.00100	0	Diff <2x LOR	----
		Arsenic, dissolved	7440-38-2	E421	0.00100	mg/L	<1.00 µg/L	<0.00100	0	Diff <2x LOR	----
		Barium, dissolved	7440-39-3	E421	0.00100	mg/L	84.3 µg/L	0.0867	2.86%	20%	----
		Beryllium, dissolved	7440-41-7	E421	0.000200	mg/L	<0.200 µg/L	<0.000200	0	Diff <2x LOR	----
		Bismuth, dissolved	7440-69-9	E421	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		Boron, dissolved	7440-42-8	E421	0.100	mg/L	<100 µg/L	<0.100	0	Diff <2x LOR	----
		Cadmium, dissolved	7440-43-9	E421	0.0000500	mg/L	0.145 µg/L	0.000148	0.0000031	Diff <2x LOR	----
		Calcium, dissolved	7440-70-2	E421	0.500	mg/L	151	155	2.62%	20%	----
		Cesium, dissolved	7440-46-2	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		Chromium, dissolved	7440-47-3	E421	0.00500	mg/L	<5.00 µg/L	<0.00500	0	Diff <2x LOR	----
		Cobalt, dissolved	7440-48-4	E421	0.00100	mg/L	6.57 µg/L	0.00661	0.00004	Diff <2x LOR	----
		Copper, dissolved	7440-50-8	E421	0.00200	mg/L	<2.00 µg/L	0.00218	0.00018	Diff <2x LOR	----
		Iron, dissolved	7439-89-6	E421	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		Lead, dissolved	7439-92-1	E421	0.000500	mg/L	<0.500 µg/L	<0.000500	0	Diff <2x LOR	----
		Lithium, dissolved	7439-93-2	E421	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0500	mg/L	18.0	18.1	0.621%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00100	mg/L	0.0170	0.0171	0.268%	20%	----
		Molybdenum, dissolved	7439-98-7	E421	0.000500	mg/L	1.34 µg/L	0.00133	0.000018	Diff <2x LOR	----
		Nickel, dissolved	7440-02-0	E421	0.00500	mg/L	<5.00 µg/L	<0.00500	0	Diff <2x LOR	----
		Phosphorus, dissolved	7723-14-0	E421	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
		Potassium, dissolved	7440-09-7	E421	0.500	mg/L	6.52	6.61	1.41%	20%	----
		Rubidium, dissolved	7440-17-7	E421	0.00200	mg/L	0.00380	0.00396	0.00016	Diff <2x LOR	----
		Selenium, dissolved	7782-49-2	E421	0.000500	mg/L	2.92 µg/L	0.00273	0.000193	Diff <2x LOR	----
		Silicon, dissolved	7440-21-3	E421	0.500	mg/L	5.42	5.54	2.17%	20%	----
		Silver, dissolved	7440-22-4	E421	0.000100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		Sodium, dissolved	7440-23-5	E421	0.500	mg/L	1540000 µg/L	1530	0.320%	20%	----
		Strontium, dissolved	7440-24-6	E421	0.00200	mg/L	0.549	0.566	3.05%	20%	----
		Sulfur, dissolved	7704-34-9	E421	5.00	mg/L	22.6	23.4	0.82	Diff <2x LOR	----
		Tellurium, dissolved	13494-80-9	E421	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		Thallium, dissolved	7440-28-0	E421	0.000100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		Thorium, dissolved	7440-29-1	E421	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
Dissolved Metals (QC Lot: 1708694) - continued											
WT2430314-001	Anonymous	Tin, dissolved	7440-31-5	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		Titanium, dissolved	7440-32-6	E421	0.00300	mg/L	<0.00300	<0.00300	0	Diff <2x LOR	----
		Tungsten, dissolved	7440-33-7	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		Uranium, dissolved	7440-61-1	E421	0.000100	mg/L	2.34 µg/L	0.00236	1.14%	20%	----
		Vanadium, dissolved	7440-62-2	E421	0.00500	mg/L	<5.00 µg/L	<0.00500	0	Diff <2x LOR	----
		Zinc, dissolved	7440-66-6	E421	0.0100	mg/L	<10.0 µg/L	<0.0100	0	Diff <2x LOR	----
		Zirconium, dissolved	7440-67-7	E421	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: 1706857)						
Turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 1706858)						
Turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 1708368)						
Conductivity	----	E100	1	µS/cm	1.1	----
Physical Tests (QCLot: 1708369)						
Alkalinity, total (as CaCO ₃)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 1708371)						
Colour, true	----	E329-L	2	CU	<2.0	----
Physical Tests (QCLot: 1711401)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 1708362)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1708363)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1708364)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 1708365)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1708366)						
Sulfate (as SO ₄)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1708370)						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 1710782)						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 1710971)						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 1713772)						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 1708694)						
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 1708694) - continued						
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----



Sub-Matrix: **Water**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
Dissolved Metals (QCLot: 1708694) - continued						
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Zirconium, dissolved	7440-67-7	E421	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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1706857)									
Turbidity	----	E121	0.1	NTU	200 NTU	99.5	85.0	115	----
Physical Tests (QCLot: 1706858)									
Turbidity	----	E121	0.1	NTU	200 NTU	100.0	85.0	115	----
Physical Tests (QCLot: 1708367)									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 1708368)									
Conductivity	----	E100	1	µS/cm	1410 µS/cm	98.4	90.0	110	----
Physical Tests (QCLot: 1708369)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	101	85.0	115	----
Physical Tests (QCLot: 1708371)									
Colour, true	----	E329-L	2	CU	25 CU	98.8	85.0	115	----
Physical Tests (QCLot: 1711401)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	92.6	85.0	115	----
Anions and Nutrients (QCLot: 1708362)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 1708363)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 1708364)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	99.1	90.0	110	----
Anions and Nutrients (QCLot: 1708365)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 1708366)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 1708370)									
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.05 mg/L	102	80.0	120	----
Anions and Nutrients (QCLot: 1710782)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	96.1	85.0	115	----
Anions and Nutrients (QCLot: 1710971)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.0	85.0	115	----
Anions and Nutrients (QCLot: 1713772)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	103	85.0	115	----



Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 1708694)									
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	0.1 mg/L	95.5	80.0	120	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	0.05 mg/L	95.8	80.0	120	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.012 mg/L	102	80.0	120	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.005 mg/L	96.8	80.0	120	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	0.05 mg/L	101	80.0	120	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	0.05 mg/L	93.3	80.0	120	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.005 mg/L	102	80.0	120	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	100	80.0	120	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.002 mg/L	100	80.0	120	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.012 mg/L	98.5	80.0	120	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.012 mg/L	98.0	80.0	120	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.012 mg/L	97.9	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	0.05 mg/L	95.1	80.0	120	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.025 mg/L	101	80.0	120	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.012 mg/L	87.5	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	95.9	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.012 mg/L	99.7	80.0	120	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.012 mg/L	99.7	80.0	120	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.025 mg/L	97.9	80.0	120	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	0.5 mg/L	98.1	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	97.4	80.0	120	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.005 mg/L	100	80.0	120	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	0.05 mg/L	99.0	80.0	120	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	0.5 mg/L	99.7	60.0	140	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.005 mg/L	93.6	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	93.2	80.0	120	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.012 mg/L	99.7	80.0	120	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	2.5 mg/L	89.5	80.0	120	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.005 mg/L	101	80.0	120	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	0.05 mg/L	101	80.0	120	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.005 mg/L	99.1	80.0	120	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.025 mg/L	97.8	80.0	120	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.012 mg/L	94.0	80.0	120	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.005 mg/L	102	80.0	120	----



Sub-Matrix: Water					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Target Concentration	LCS	Low	High	Qualifier
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 1708694) - continued									
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0 mg/L	105	80.0	120	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.025 mg/L	98.9	80.0	120	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.025 mg/L	97.2	80.0	120	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.005 mg/L	94.1	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: 1708362)										
WT2430562-001	Anonymous	Fluoride	16984-48-8	E235.F	0.936 mg/L	1 mg/L	93.6	75.0	125	----
Anions and Nutrients (QCLot: 1708363)										
WT2430562-001	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	2.42 mg/L	2.5 mg/L	97.0	75.0	125	----
Anions and Nutrients (QCLot: 1708364)										
WT2430562-001	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.462 mg/L	0.5 mg/L	92.5	75.0	125	----
Anions and Nutrients (QCLot: 1708365)										
WT2430562-001	Anonymous	Chloride	16887-00-6	E235.Cl	98.4 mg/L	100 mg/L	98.4	75.0	125	----
Anions and Nutrients (QCLot: 1708366)										
WT2430562-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	103 mg/L	100 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 1708370)										
WT2430562-002	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0209 mg/L	0.02 mg/L	106	70.0	130	----
Anions and Nutrients (QCLot: 1710782)										
WT2430612-001	GW-12637434-MW1-24	Ammonia, total (as N)	7664-41-7	E298	0.0895 mg/L	0.1 mg/L	89.5	75.0	125	----
Anions and Nutrients (QCLot: 1710971)										
WT2430441-001	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.108 mg/L	0.1 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 1713772)										
HA2402041-001	Anonymous	Ammonia, total (as N)	7664-41-7	E298	ND mg/L	----	ND	75.0	125	----
Dissolved Metals (QCLot: 1708694)										
WT2430314-004	Anonymous	Aluminum, dissolved	7429-90-5	E421	0.959 mg/L	1 mg/L	95.9	70.0	130	----
		Antimony, dissolved	7440-36-0	E421	0.474 mg/L	0.5 mg/L	94.8	70.0	130	----
		Arsenic, dissolved	7440-38-2	E421	0.513 mg/L	0.5 mg/L	102	70.0	130	----
		Barium, dissolved	7440-39-3	E421	0.122 mg/L	0.125 mg/L	97.2	70.0	130	----
		Beryllium, dissolved	7440-41-7	E421	0.0479 mg/L	0.05 mg/L	95.8	70.0	130	----
		Bismuth, dissolved	7440-69-9	E421	0.456 mg/L	0.5 mg/L	91.2	70.0	130	----
		Boron, dissolved	7440-42-8	E421	0.433 mg/L	0.5 mg/L	86.7	70.0	130	----
		Cadmium, dissolved	7440-43-9	E421	0.0478 mg/L	0.05 mg/L	95.7	70.0	130	----
		Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Cesium, dissolved	7440-46-2	E421	0.0248 mg/L	0.025 mg/L	99.1	70.0	130	----
		Chromium, dissolved	7440-47-3	E421	0.121 mg/L	0.125 mg/L	96.8	70.0	130	----
		Cobalt, dissolved	7440-48-4	E421	0.116 mg/L	0.125 mg/L	93.2	70.0	130	----
		Copper, dissolved	7440-50-8	E421	0.113 mg/L	0.125 mg/L	90.7	70.0	130	----
		Iron, dissolved	7439-89-6	E421	0.458 mg/L	0.5 mg/L	91.7	70.0	130	----
		Lead, dissolved	7439-92-1	E421	0.236 mg/L	0.25 mg/L	94.4	70.0	130	----
		Lithium, dissolved	7439-93-2	E421	0.112 mg/L	0.125 mg/L	89.8	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
Dissolved Metals (QCLot: 1708694) - continued										
WT2430314-004	Anonymous	Magnesium, dissolved	7439-95-4	E421	24.8 mg/L	25 mg/L	99.3	70.0	130	----
		Manganese, dissolved	7439-96-5	E421	0.119 mg/L	0.125 mg/L	95.1	70.0	130	----
		Molybdenum, dissolved	7439-98-7	E421	0.128 mg/L	0.125 mg/L	103	70.0	130	----
		Nickel, dissolved	7440-02-0	E421	0.229 mg/L	0.25 mg/L	91.7	70.0	130	----
		Phosphorus, dissolved	7723-14-0	E421	4.99 mg/L	5 mg/L	99.9	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	24.1 mg/L	25 mg/L	96.3	70.0	130	----
		Rubidium, dissolved	7440-17-7	E421	0.0507 mg/L	0.05 mg/L	101	70.0	130	----
		Selenium, dissolved	7782-49-2	E421	0.474 mg/L	0.5 mg/L	94.8	70.0	130	----
		Silicon, dissolved	7440-21-3	E421	ND mg/L	----	ND	70.0	130	----
		Silver, dissolved	7440-22-4	E421	0.0447 mg/L	0.05 mg/L	89.4	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	ND mg/L	----	ND	70.0	130	----
		Strontium, dissolved	7440-24-6	E421	ND mg/L	----	ND	70.0	130	----
		Sulfur, dissolved	7704-34-9	E421	24.0 mg/L	25 mg/L	96.1	70.0	130	----
		Tellurium, dissolved	13494-80-9	E421	0.0490 mg/L	0.05 mg/L	98.0	70.0	130	----
		Thallium, dissolved	7440-28-0	E421	0.467 mg/L	0.5 mg/L	93.5	70.0	130	----
		Thorium, dissolved	7440-29-1	E421	0.0472 mg/L	0.05 mg/L	94.4	70.0	130	----
		Tin, dissolved	7440-31-5	E421	0.245 mg/L	0.25 mg/L	98.0	70.0	130	----
		Titanium, dissolved	7440-32-6	E421	0.120 mg/L	0.125 mg/L	96.2	70.0	130	----
		Tungsten, dissolved	7440-33-7	E421	0.0500 mg/L	0.05 mg/L	100	70.0	130	----
		Uranium, dissolved	7440-61-1	E421	0.00238 mg/L	0.002 mg/L	95.2	70.0	130	----
		Vanadium, dissolved	7440-62-2	E421	0.248 mg/L	0.25 mg/L	99.2	70.0	130	----
		Zinc, dissolved	7440-66-6	E421	0.229 mg/L	0.25 mg/L	91.5	70.0	130	----
		Zirconium, dissolved	7440-67-7	E421	0.0481 mg/L	0.05 mg/L	96.1	70.0	130	----



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Canada Toll Free: 1 800 668 9878

COC Number: 20 -

Page of

Environmental Division
Waterloo
Work Order Reference
WT2430612



Telephone: +1 519 886 6910

Report To Contact and company name below will appear on the final report		Reports / Recipients		Turnaround Time (TAT) Requested	
Company:	GHD Ltd. (Acct.GHDL100)	Select Report Format:	☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)	☒ Routine [R] if received by 3pm M-F - no surcharges apply	
Contact:	Pascal Renella	Merge QC/QCI Reports with COA	☐ YES ☐ NO ☐ N/A	☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum	
Phone:	519-884-0510	☐ Compare Results to Criteria on Report - provide details below if box checked		☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum	
Company address below will appear on the final report		Select Distribution:	☒ EMAIL ☐ MAIL ☐ FAX	☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum	
Street:	455 Phillip St.	Email 1 or Fax:	pascal.renella@ghd.com	☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum	
City/Province:	Waterloo, ON	Email 2:	See SSOW/PO	☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.	
Postal Code:	N2L 3X2	Email 3:		fees may apply to rush requests on weekends, statutory holidays a routine tests	
Invoice To:	Same as Report To ☒ YES ☐ NO	Invoice Recipients		Date and Time Required for all E&P YATs:	
	Copy of Invoice with Report ☐ YES ☒ NO	Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX	For tests that can not be performed according to th	
Company:	GHD Ltd. (GHDL100)	Email 1 or Fax:	accountspayableCDN@ghd.com	Analysis Req	
Contact:		Email 2:		Indicate Filtered (F), Preserved (P) or Filtered and	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	WT2024GHDL1000166	AFE/Cost Center:	PO#
Job #:	12637434-DEL 2	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only):		ALS Contact: Rick H		Sampler: L. Oude	
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS
	GW-12637434- MW1-24	11-08-24	12:00	WATER	3
	GW-12637434- MW4-24		12:50	WATER	
	GW-12637434- MW7-24		13:45	WATER	
	GW-12637434- MW7-24X		13:50	WATER	
	GW-12637434- FB		14:05	WATER	

Drinking Water (DW) Samples (client use)		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)		SAMPLE RECEIPT DETAILS (lab use only)	
Are samples taken from a Regulated DW System? ☐ YES ☐ NO		7-24 very silty, 7-24 metals 2/3 full, 4/6 closed.		Cooling Method: ☐ NONE ☒ ICE ☐ PACKS ☐ FROZEN ☐ COOLING INITIATED	
Are samples for human consumption use? ☐ YES ☐ NO				Submission Comments Identified on Sample Receipt Notification: ☐ YES ☐ NO	
				Cooler Custody Seals Intact: ☐ YES ☒ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A	
				INITIAL COOLER TEMPERATURES °C	
				FINAL COOLER TEMPERATURES °C	
				14.1	
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)	
Released by:	Date:	Time:	Received by:	Date:	Time:
L. Oude	10/11/2024	14:20		Oct 11/24	14:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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.

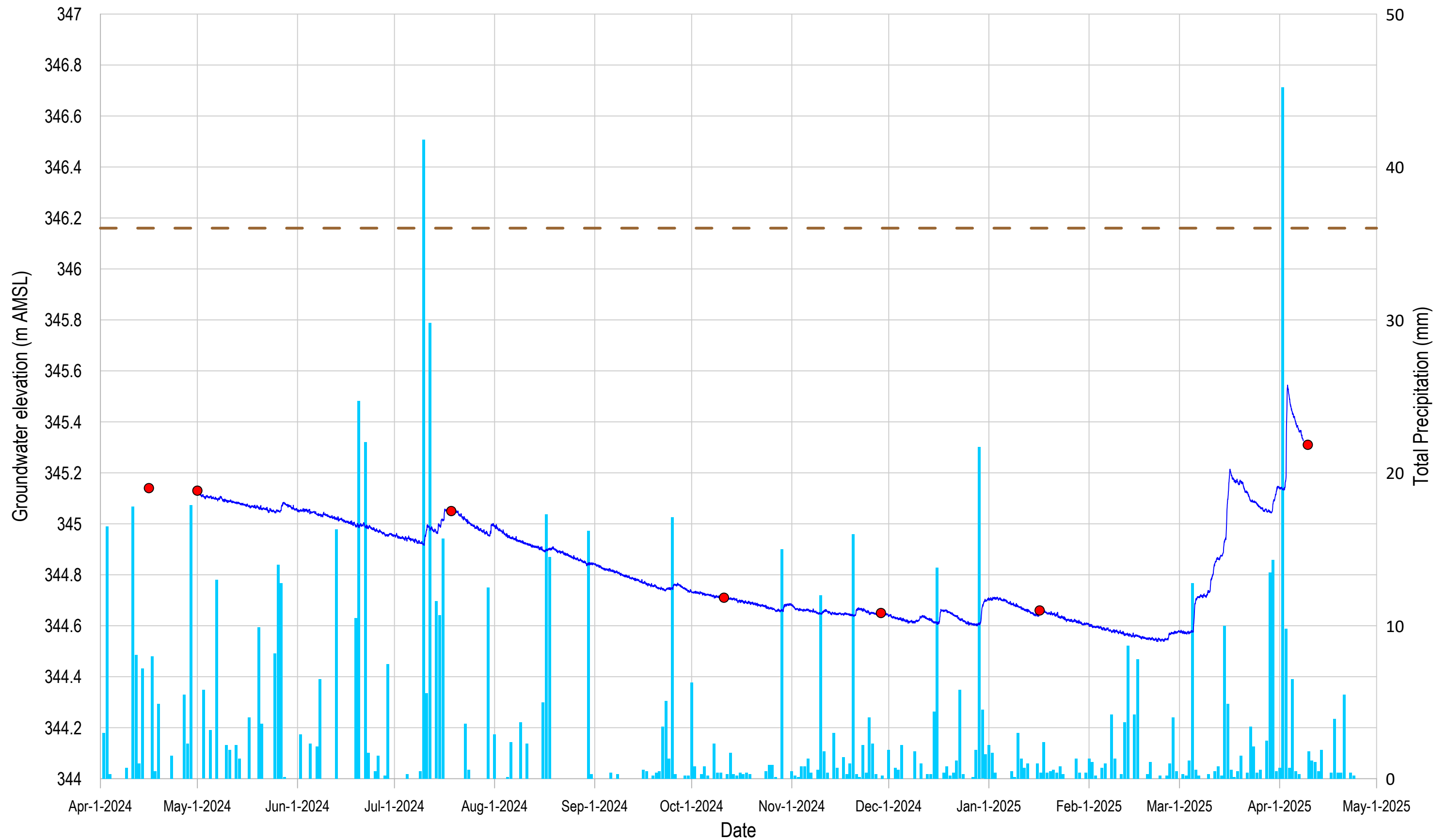
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AC-981/MM-247/N-214

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Appendix F

Groundwater Elevation Hydrographs



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

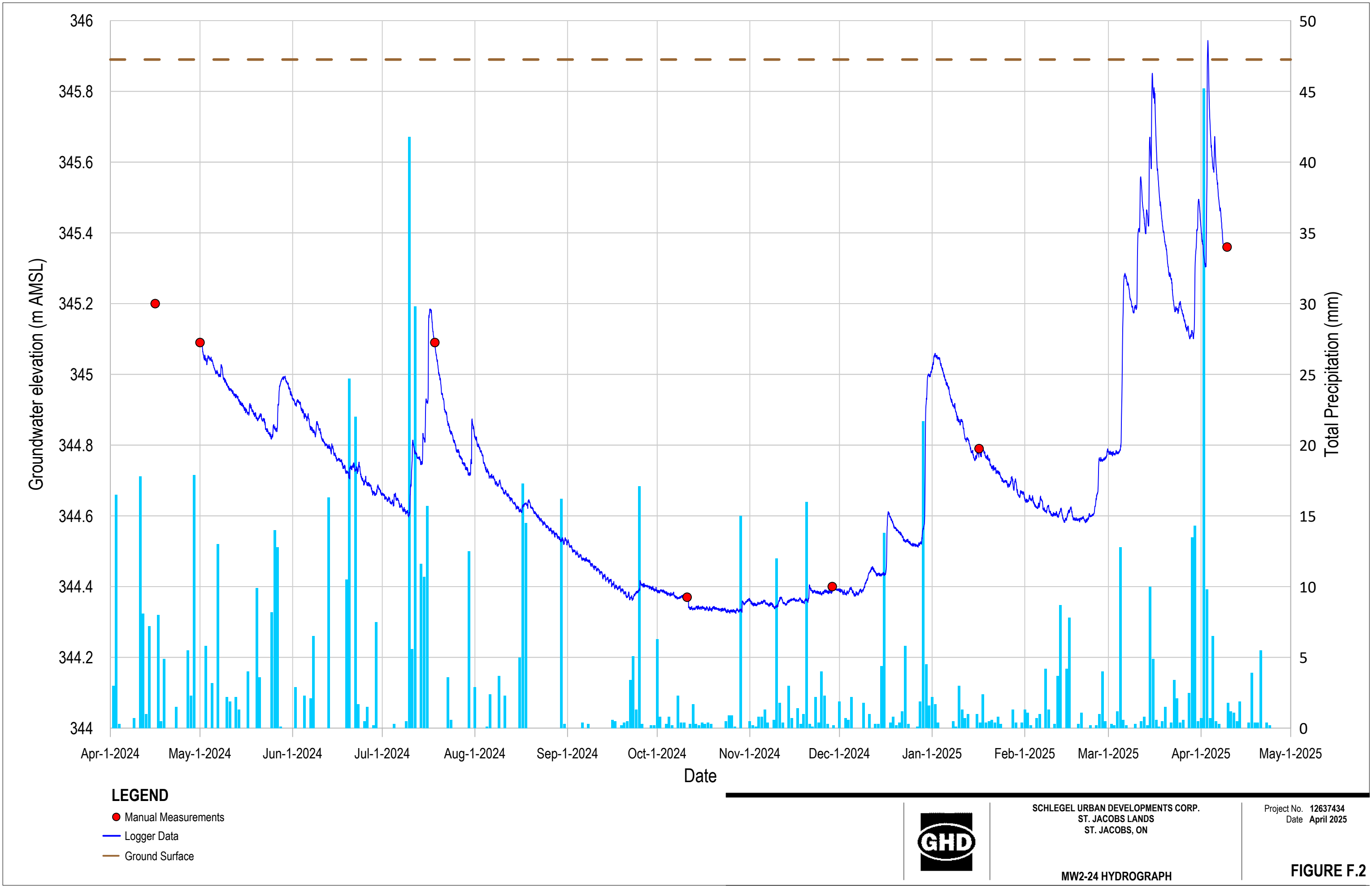


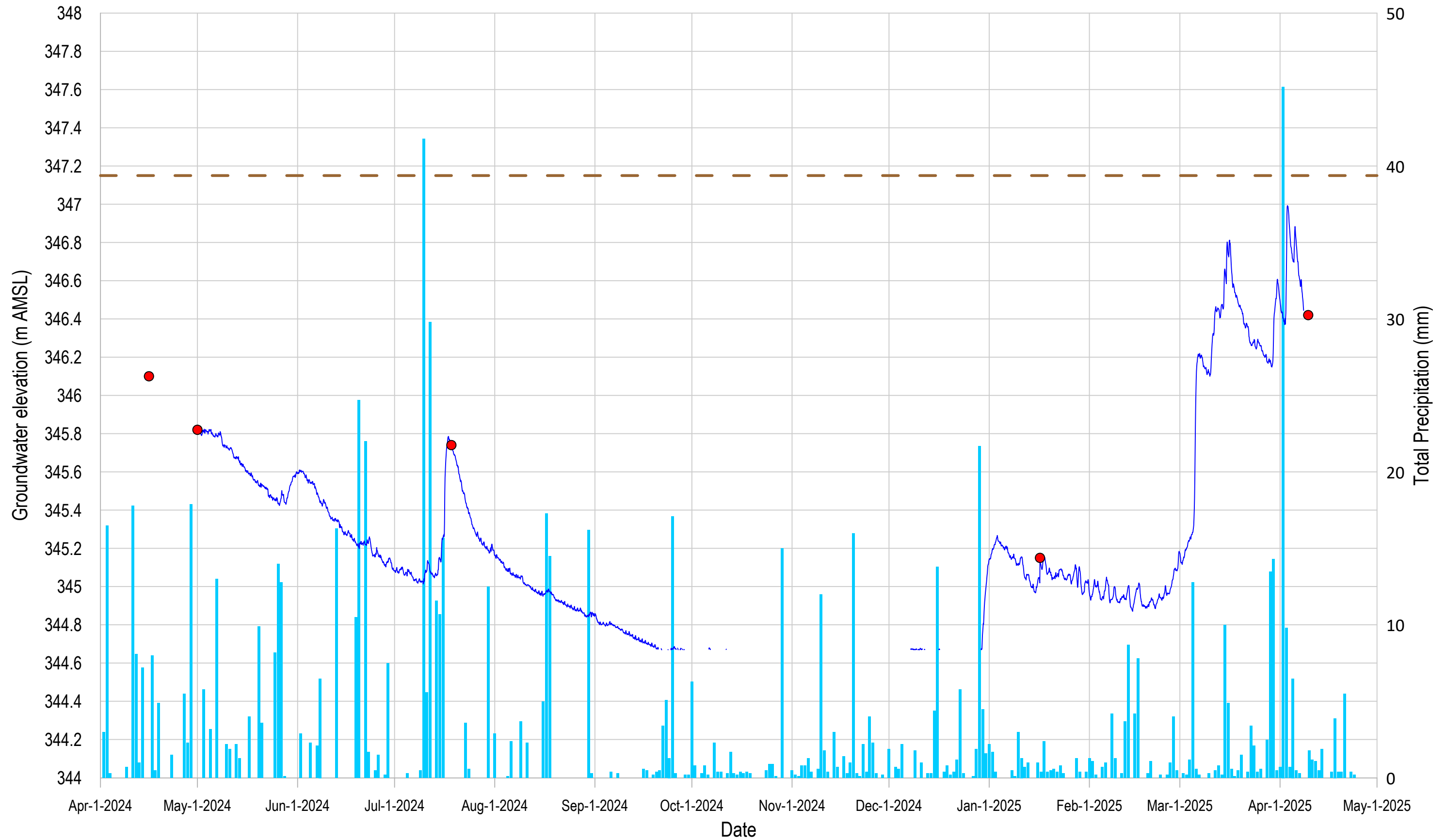
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Date April 2025

MW1-24 HYDROGRAPH

FIGURE F.1





LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

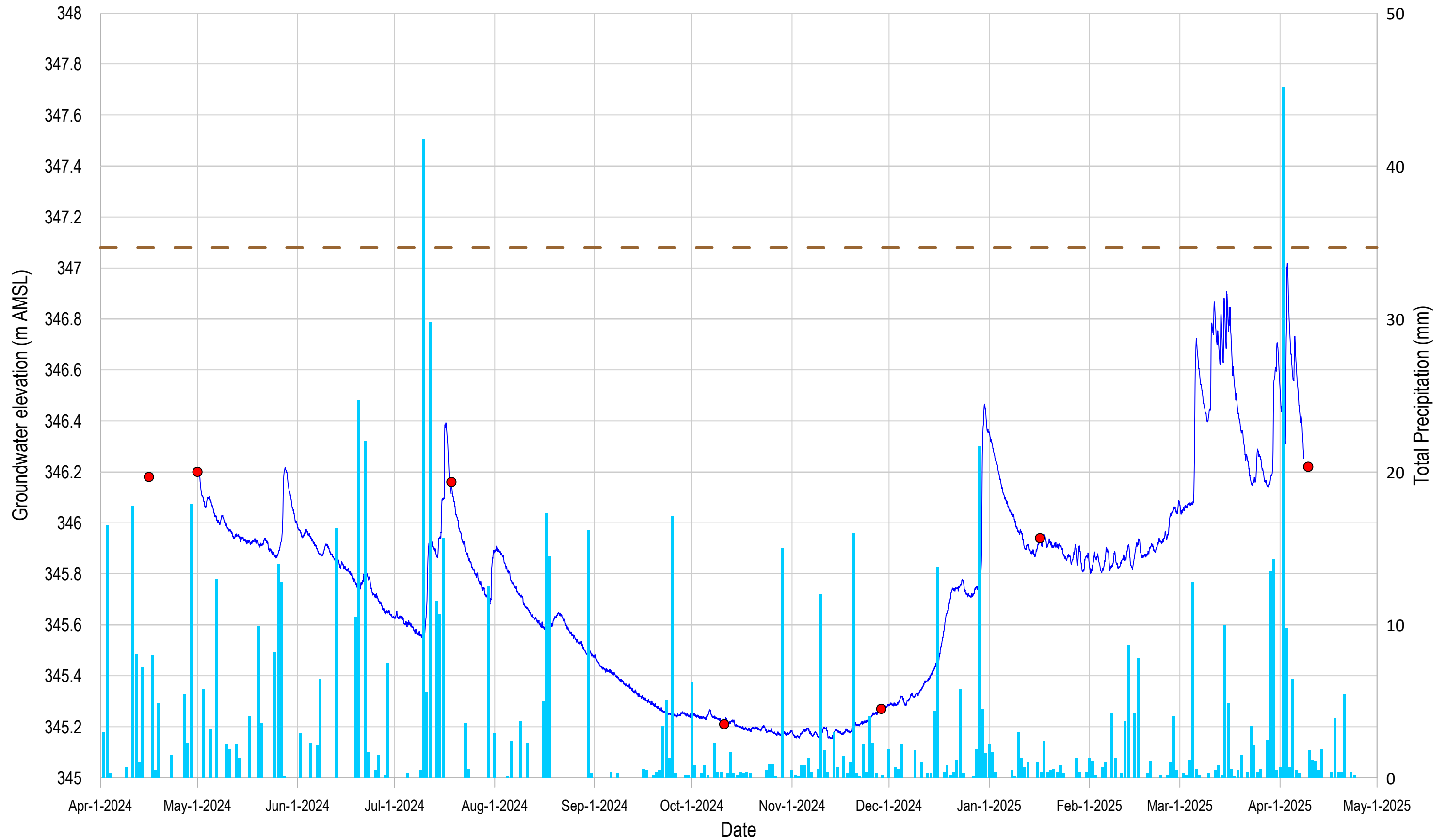


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MW3-24 HYDROGRAPH

FIGURE F.3



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

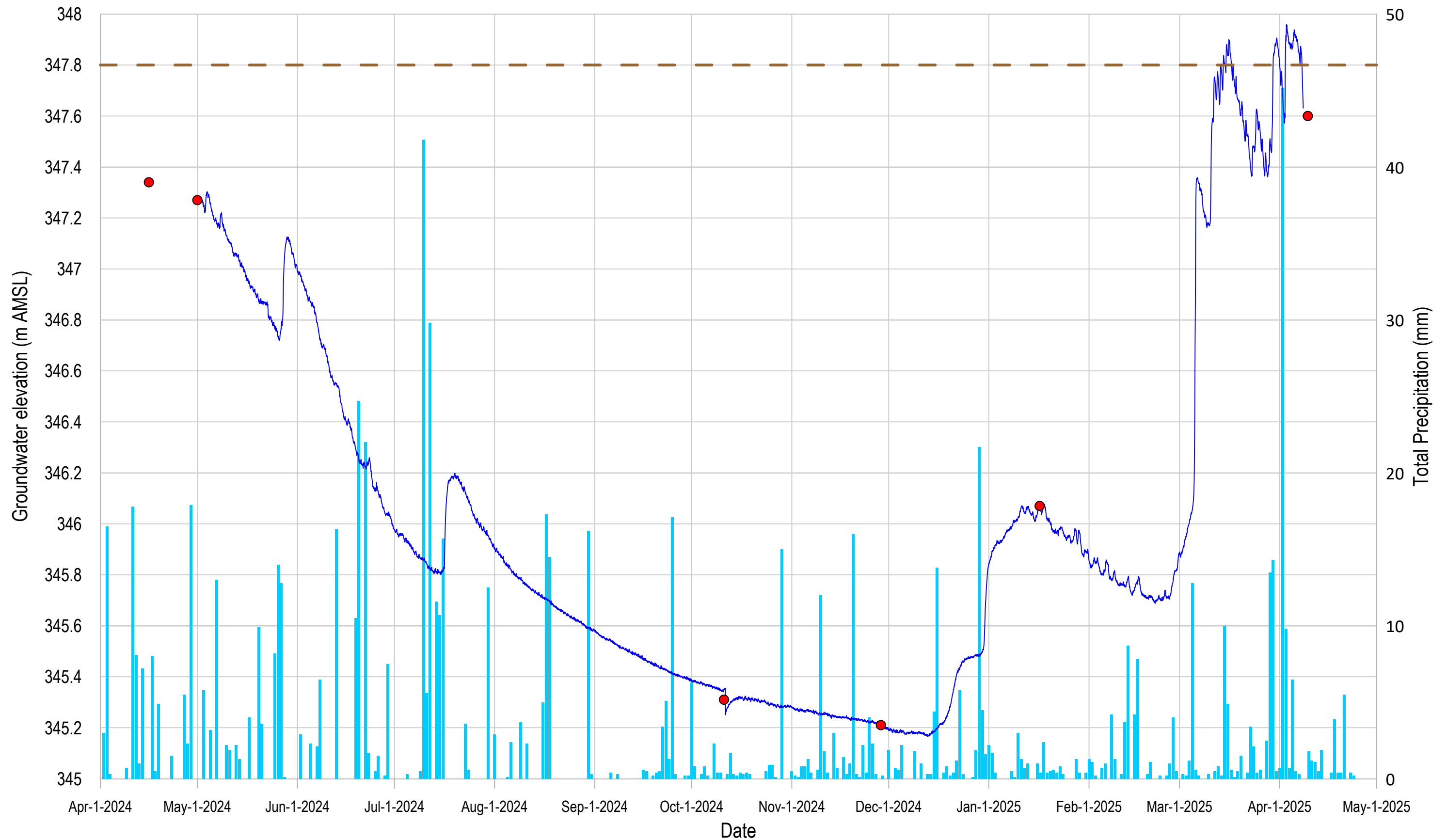


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MW4-24 HYDROGRAPH

FIGURE F.4



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

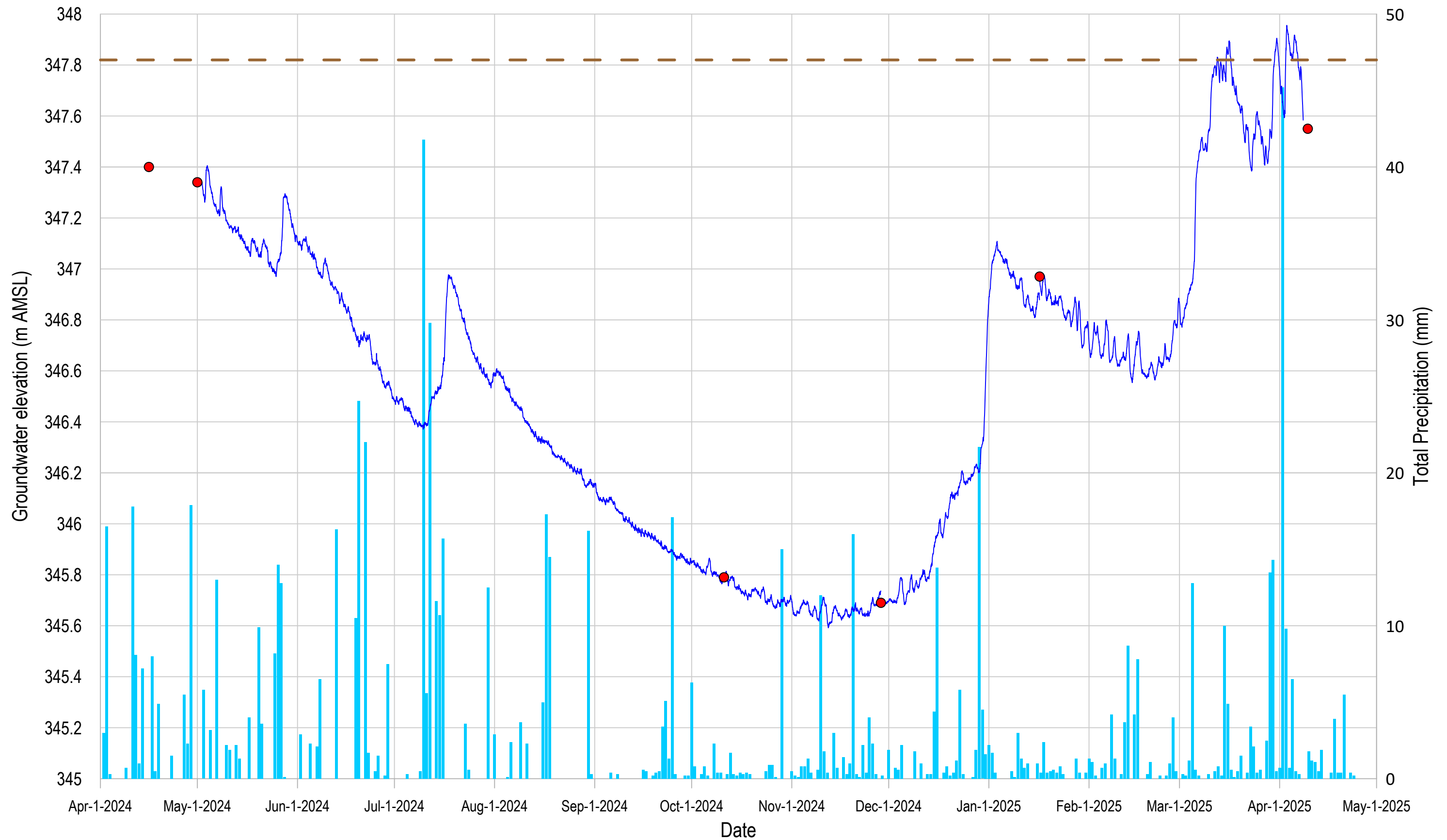


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MW5-24 HYDROGRAPH

FIGURE F.5



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

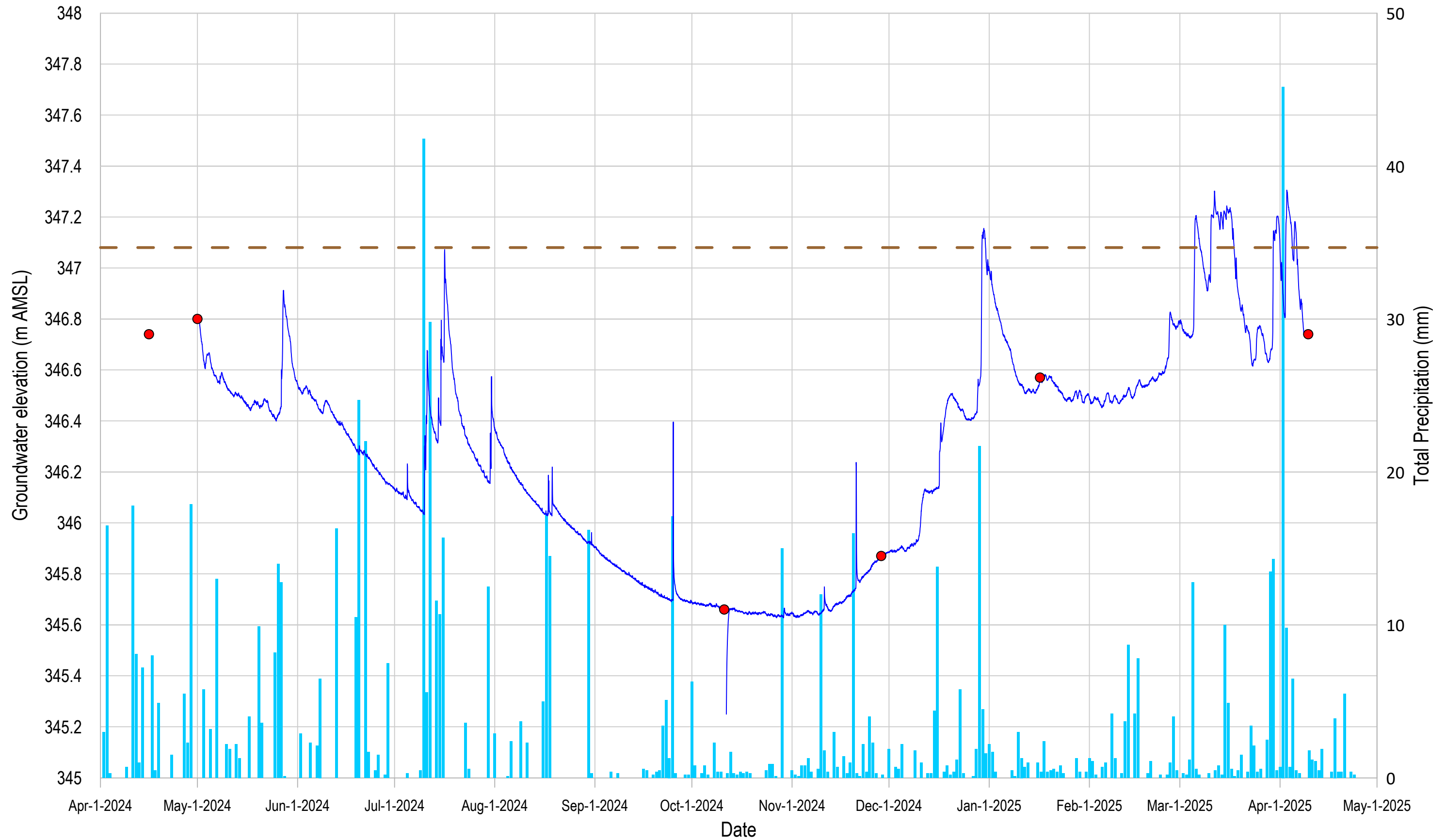


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MW6-24 HYDROGRAPH

FIGURE F.6



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

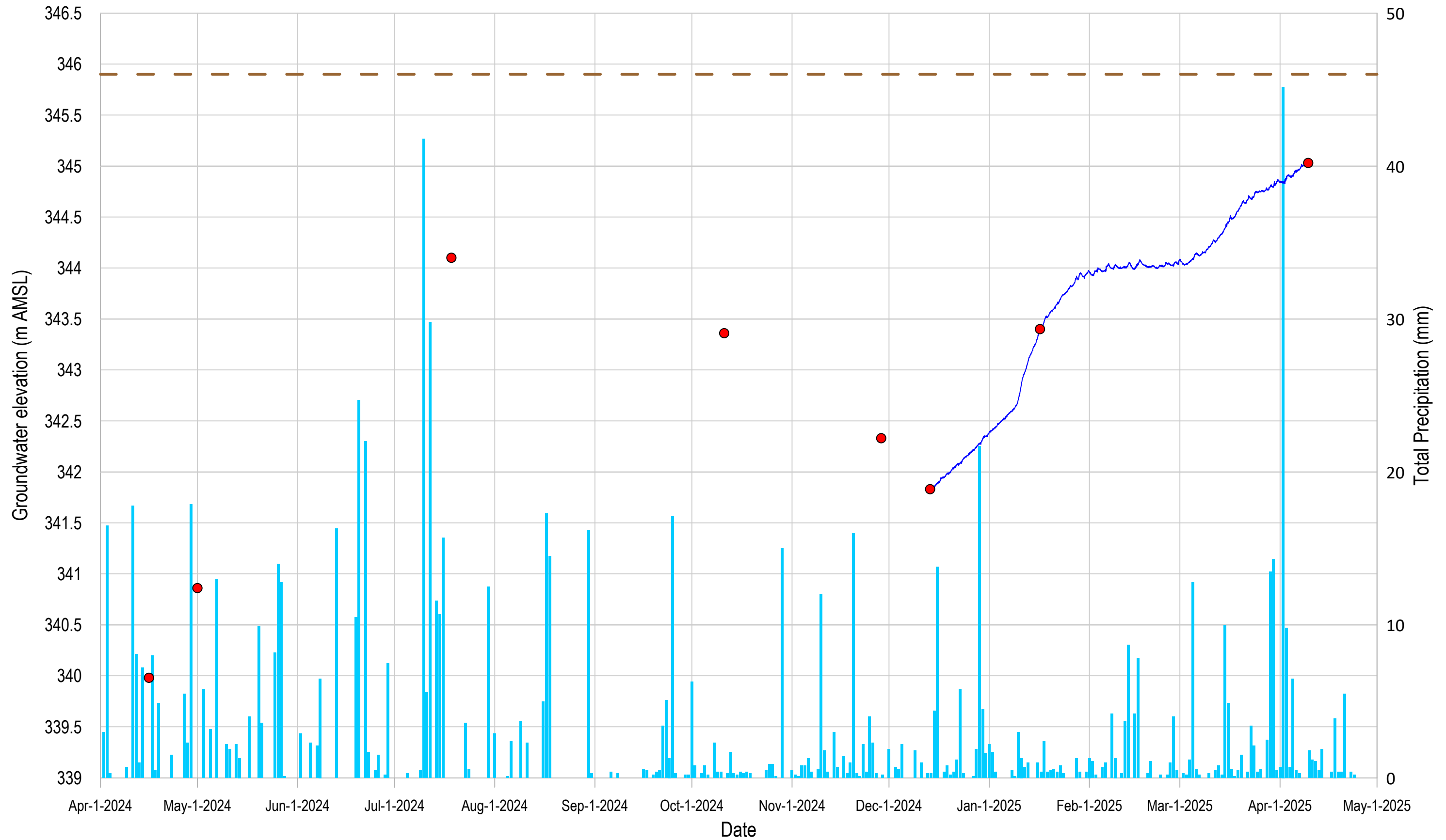


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MW7-24 HYDROGRAPH

FIGURE F.7



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

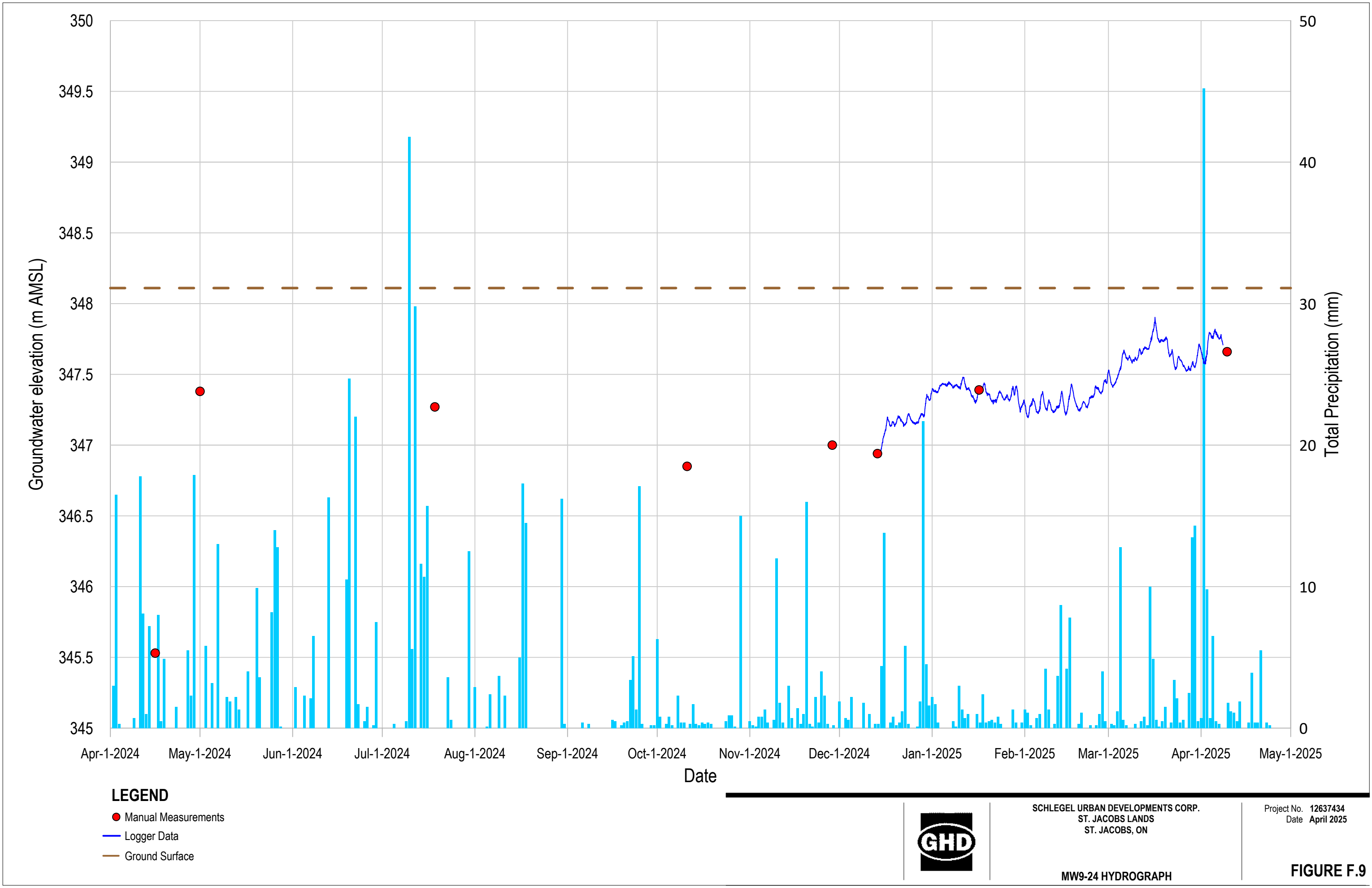


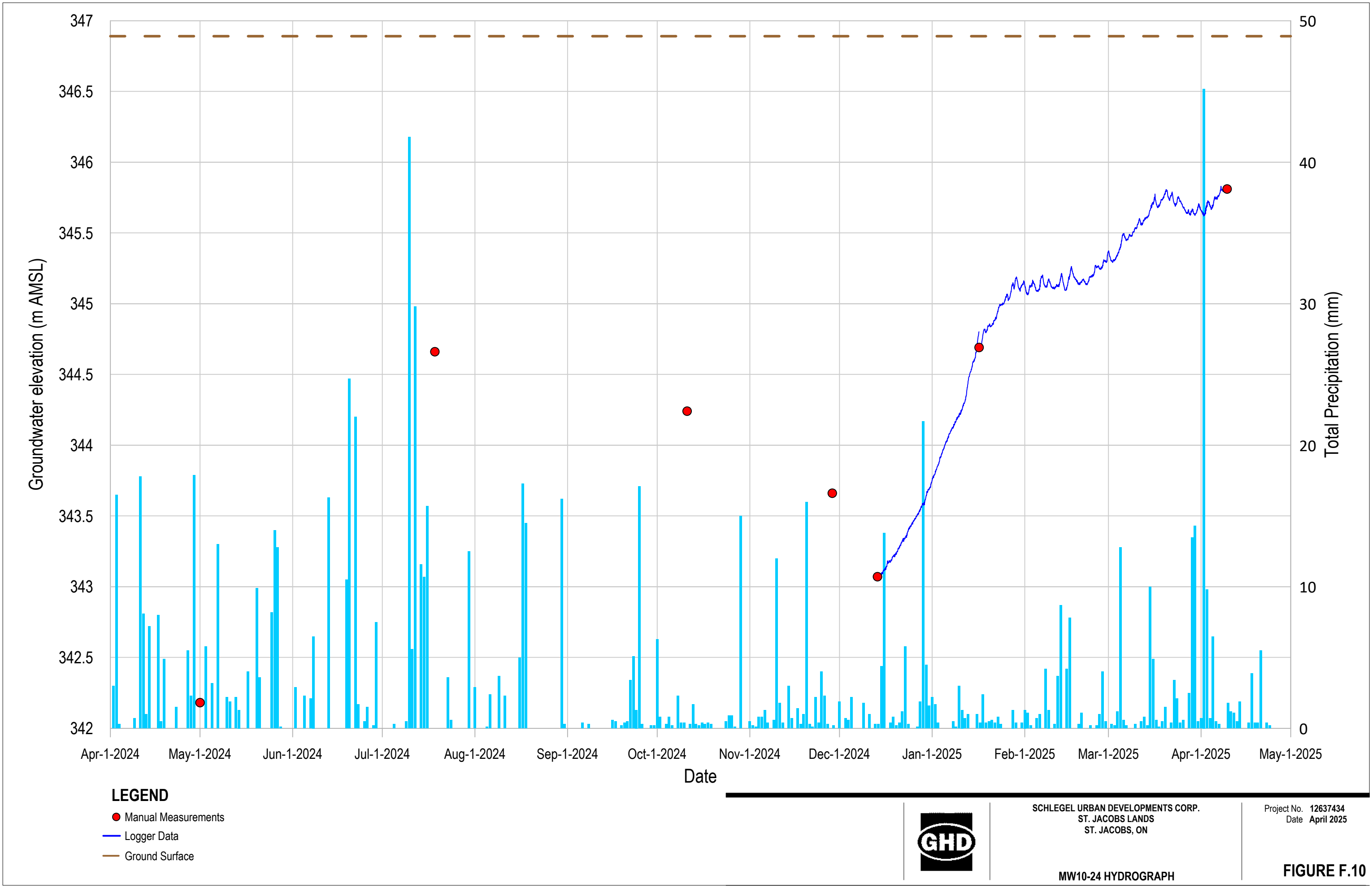
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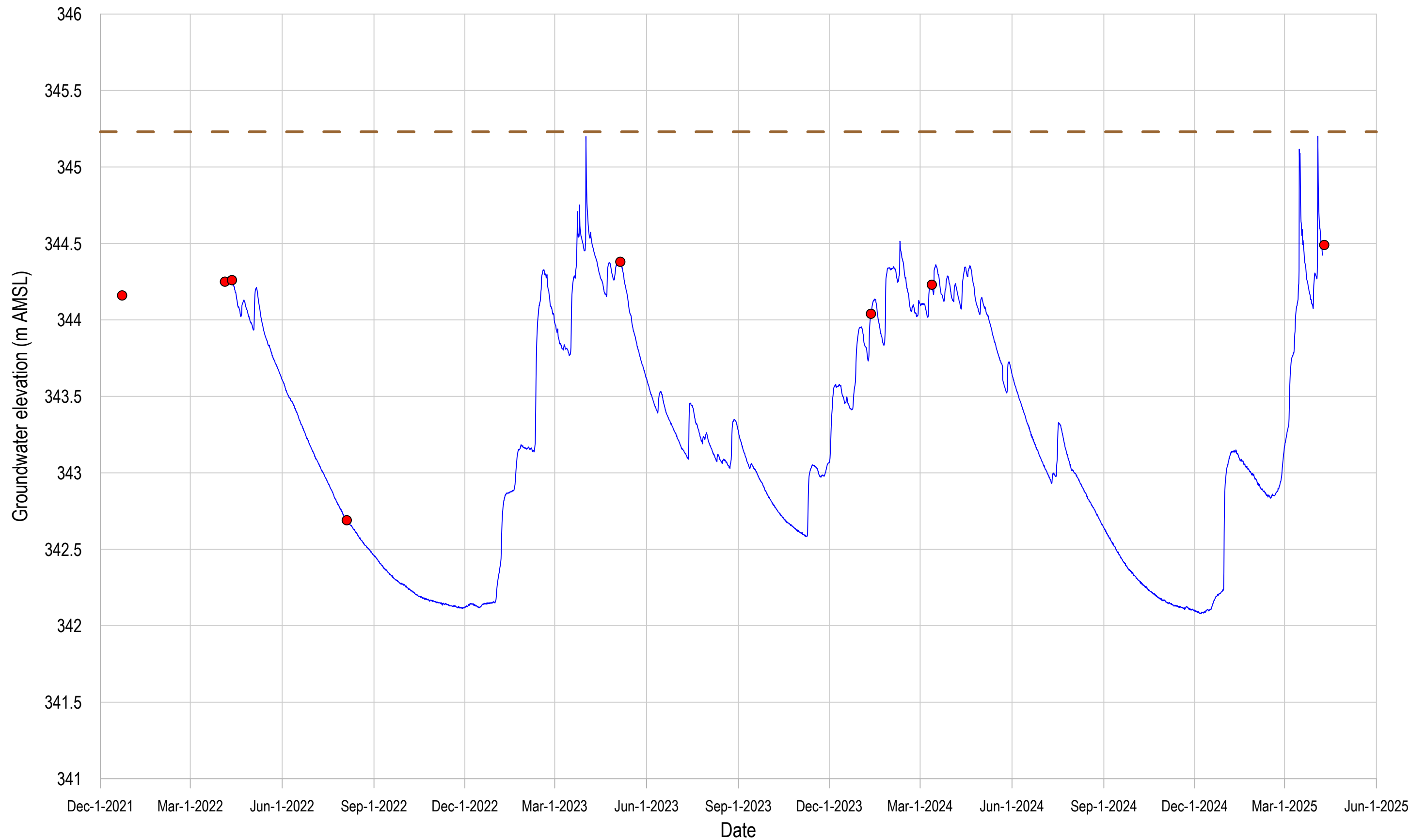
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MW8-24 HYDROGRAPH

FIGURE F.8







LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

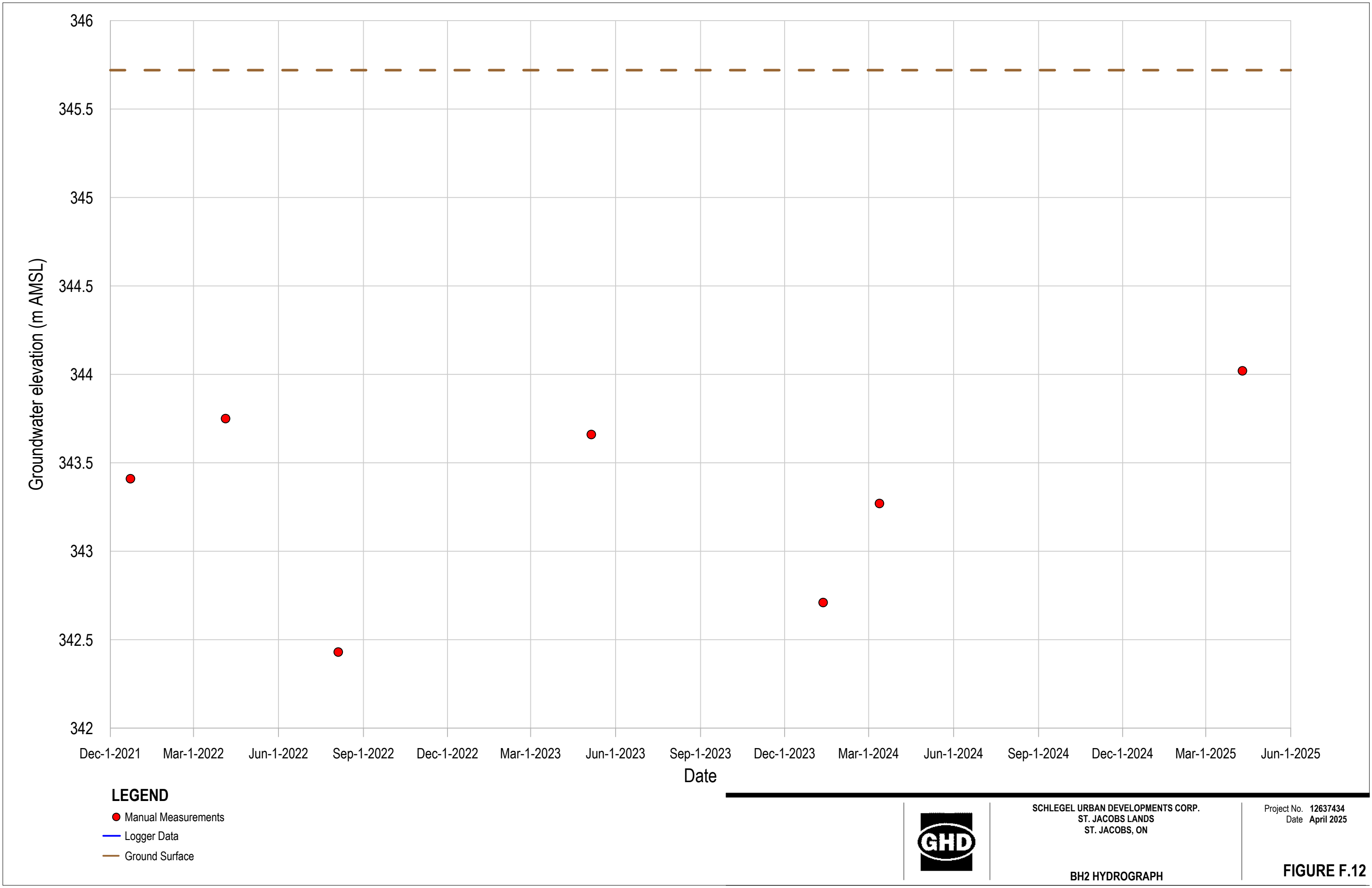


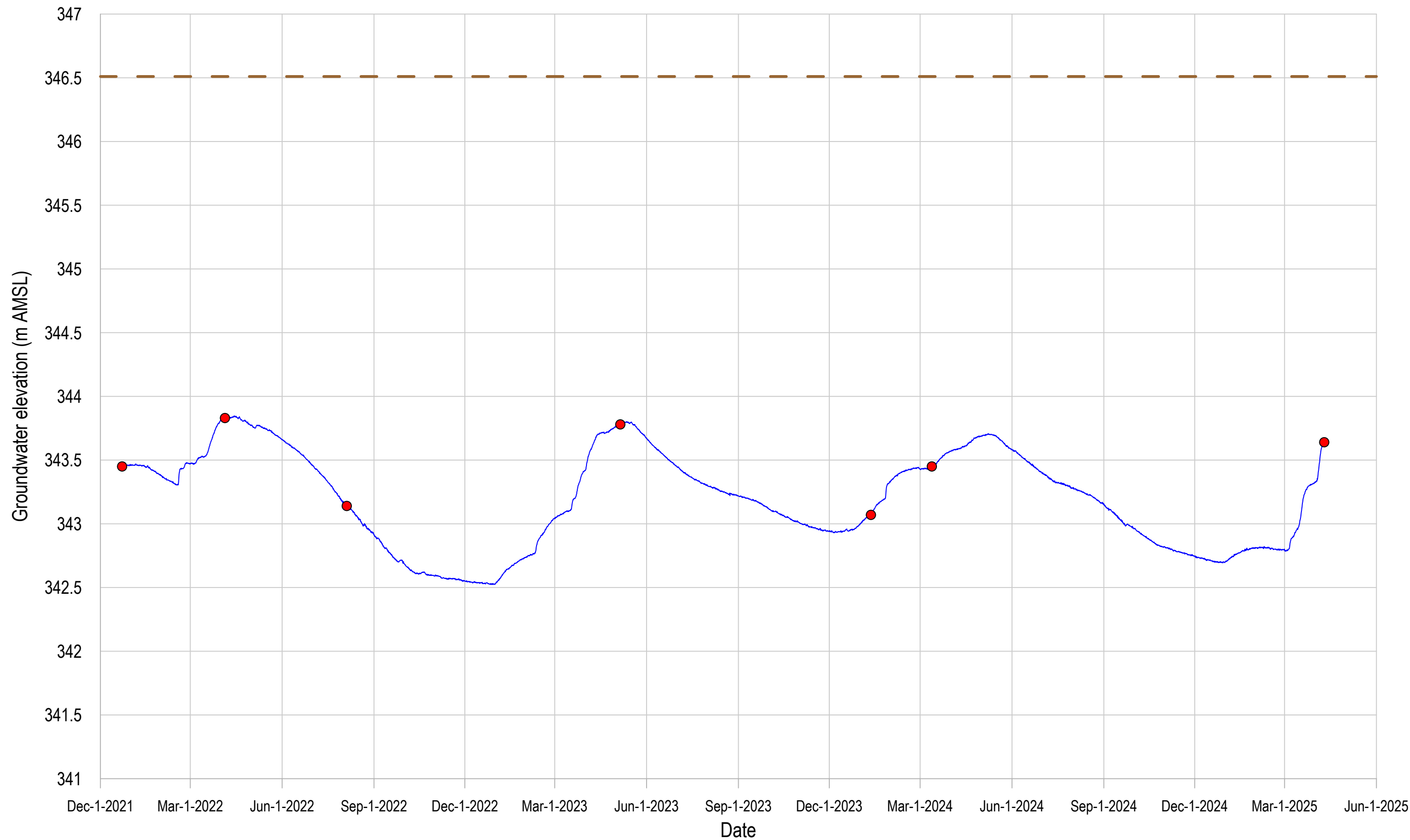
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BH1 HYDROGRAPH

FIGURE F.11





LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

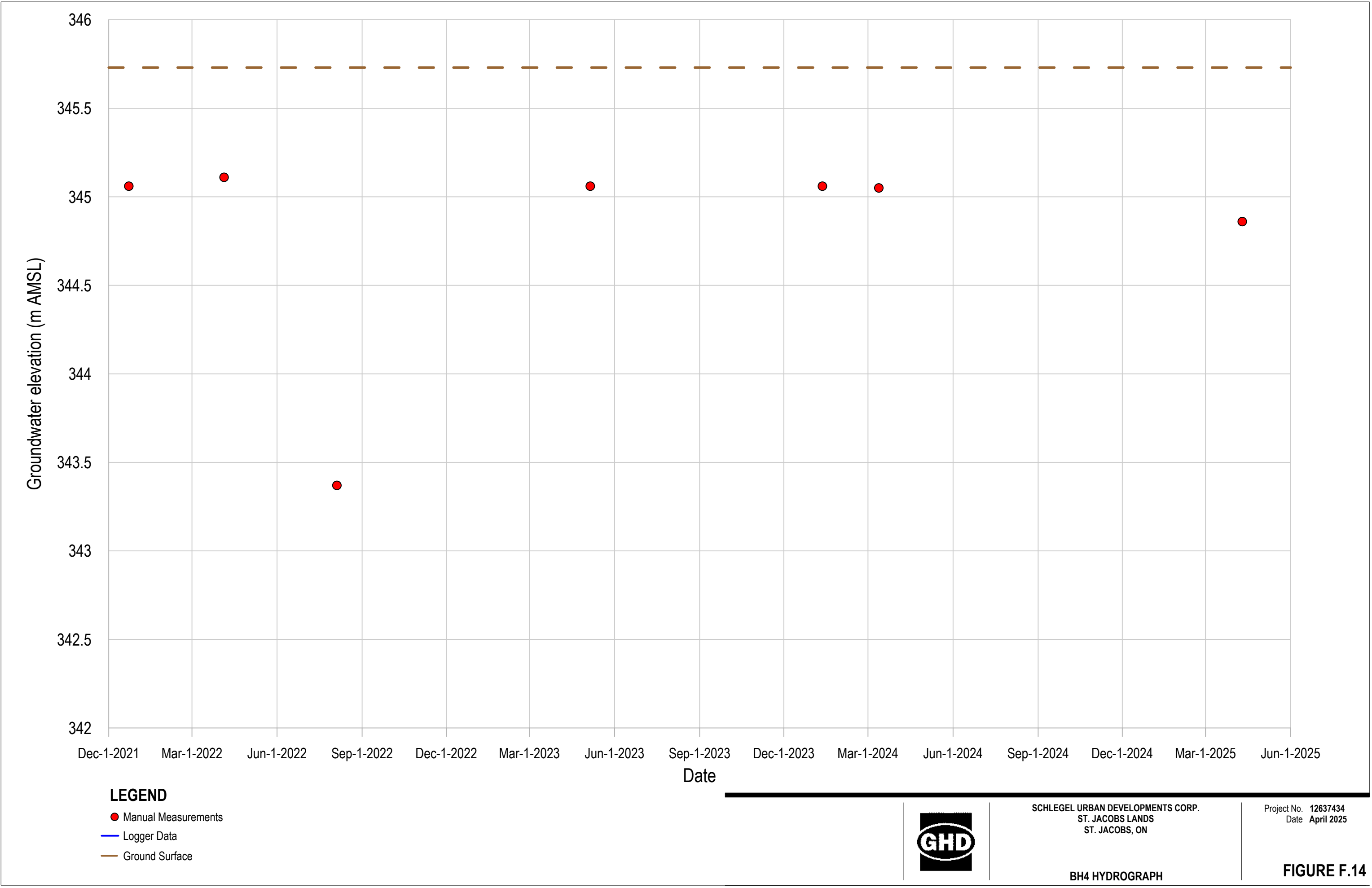


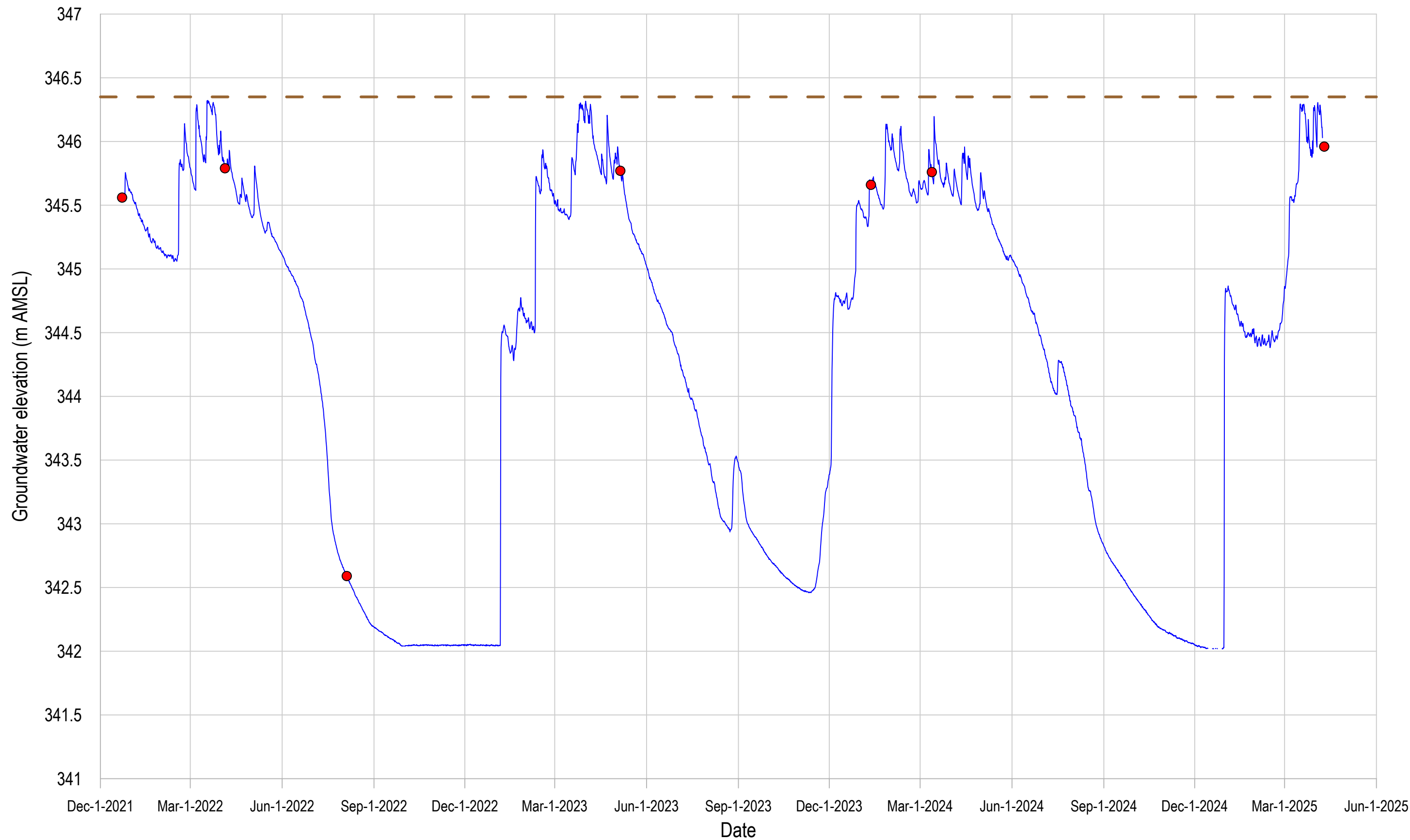
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BH3 HYDROGRAPH

FIGURE F.13





LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

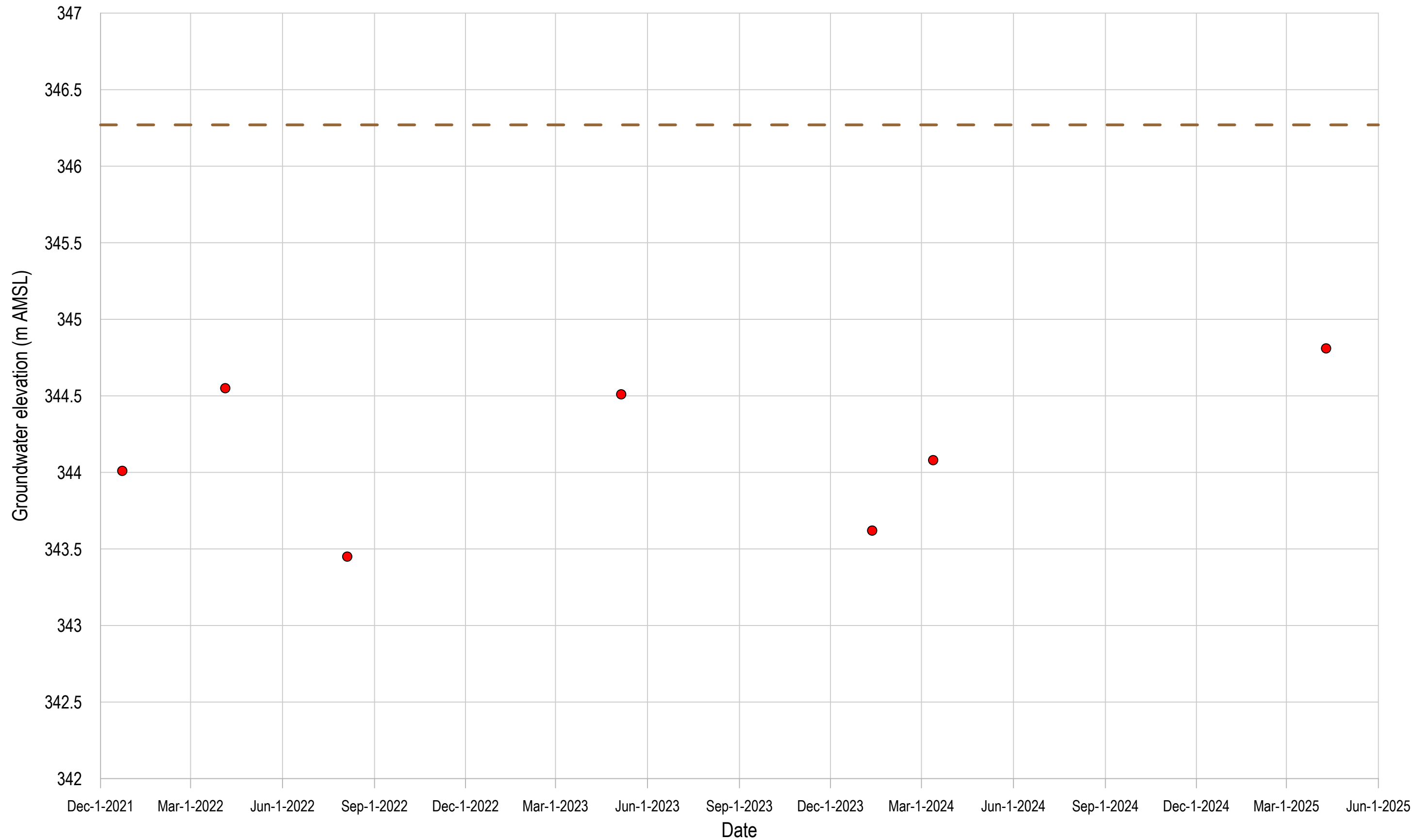


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BH5 HYDROGRAPH

FIGURE F.15



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface

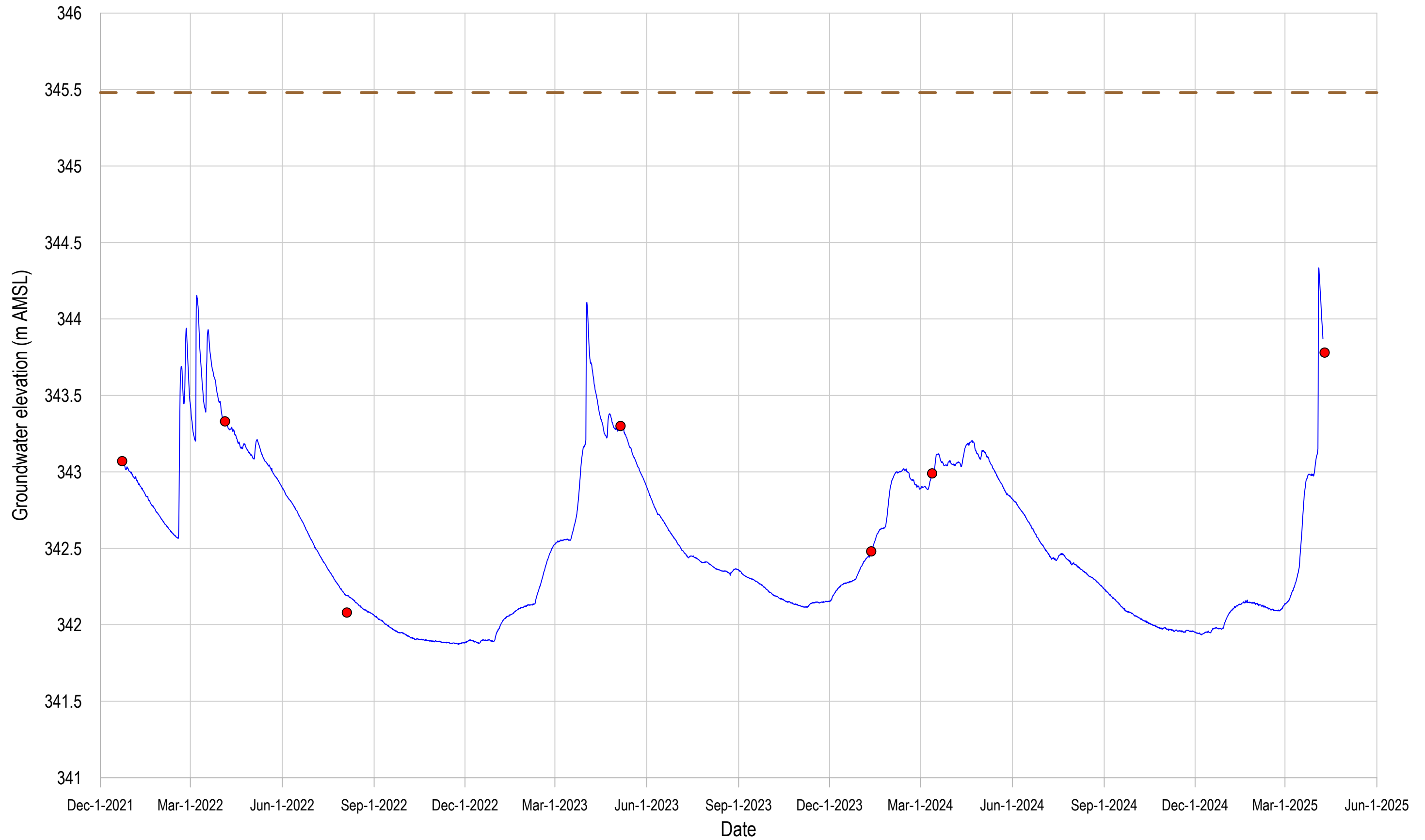


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BH6 HYDROGRAPH

FIGURE F.16



LEGEND

- Manual Measurements
- Logger Data
- Ground Surface



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BH10 HYDROGRAPH

FIGURE F.17