



601 Scottsdale Drive, Guelph, ON

Preliminary Hydrogeological Investigation Report

Project Location:

601 Scottsdale Drive
Guelph, ON

Prepared for:

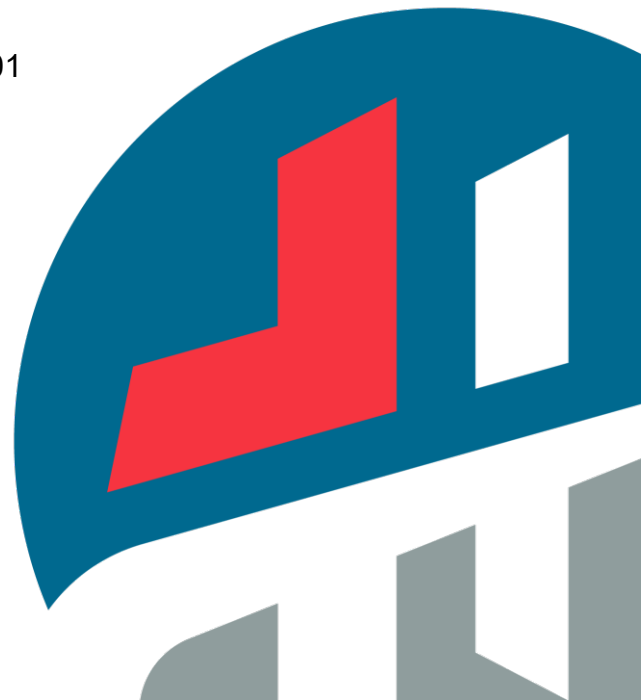
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MTE File No.: 49791-101





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1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by Forum 601 Scottsdale LP to conduct a Preliminary Hydrogeological Investigation for a proposed residential development at 601 Scottsdale Drive, Guelph, Ontario (herein referred to as the 'Site'). **Figure 1** illustrates the Site location.

The Site currently consists of a student residence building with asphalt-surfaced parking areas and access driveways on the east half of the Site, and a vacant grass field on the west half of the Site. MTE understands that the proposed development includes two 7-storey student residence buildings, and a single-storey common hub area. The development is proposed to have one level of underground parking. Further, it is understood that new asphalt-surfaced parking and access driveways will be constructed at the Site, including reworking some of the existing asphalt areas. The Site will be municipally serviced for water supply and wastewater. On-Site infiltration may be considered within the western portion of the Site in the vicinity of the north drive entrance to the underground parking.

1.1 Scope and Methodology

1.1.1 Background Review

- Topography, physiography, geological and hydrogeological mapping on file with the City of Guelph, Grand River Conservation Authority, the Ontario Geological Survey, and the Ministry of Natural Resources and Forestry (MNRF).
- Available nearby well records on file with the Ministry of the Environment, Conservation and Parks (MECP).

1.1.2 Field Investigation

- Installation of three monitoring wells installed during the concurrent geotechnical investigation.
- Development and collection of stabilized water levels from newly constructed monitoring wells.
- In-situ single well hydraulic response testing (slug testing) of two representative monitoring wells to determine the hydraulic conductivity of the saturated soils on-Site.
- Collection of two unfiltered groundwater samples for analysis of a suite of parameters and compared to the City of Guelph Storm and Sanitary Sewer By-Laws.
- Installation of electronic data loggers to monitor groundwater on a continuous basis in two newly constructed monitoring wells.

1.1.3 Preliminary Analysis and Reporting

Summarize findings in a letter report to be reviewed and signed by a Professional Geoscientist or Engineer licensed to practice in Ontario. The report will address the following items:

- The topography, physiography, and geology of the subsurface soils.
- A hydrogeologic characterization of the Site including groundwater levels, gradients, flow direction, and hydraulic conductivity.
- Assessment of potential for construction dewatering and required permitting/approvals.

- Preliminary assessment of groundwater quality for potential discharge to local storm and/or sanitary sewer should construction dewatering be required.
- Summary of identified groundwater receptors and discussion of the potential for the proposed development to impact these receptors.
- Recommendations for additional work, groundwater monitoring and/or mitigation, as appropriate.

2.0 SITE DESCRIPTION

The Site is approximately 6 acres in size, currently consisting of a student residence building with asphalt-surfaced parking areas and access driveways on the east half of the Site, and a vacant grass field on the west half of the Site. The Site is bordered by Stone Road West to the south, the Halon Parkway to the west, adjacent properties to the north, and Scottdale Drive to the east. The ground surface at the Site generally slopes down from the northeast end of the Site to the southwest end of the Site. Ground surface elevations measured at the borehole locations vary from Elevation 333.9 to 326.7 m above mean sea level (amsl). The Site features are shown on **Figure 2**.

A Preliminary Concept Plan for the proposed development is provided in **Appendix A**. The plan includes two 7-storey student residence buildings, a single-storey common hub area, and associated surface parking.

3.0 FIELD PROGRAM

3.1 Borehole Advancement and Monitoring Well Construction

In conjunction with the Geotechnical investigation, boreholes were advanced and monitoring wells installed across the Site. Between February 21 and 27, 2023, London Soil Test Ltd. used a track-mounted D50 Turbo drill rig to complete the advancement and installation of monitoring wells BH102-23 to BH107-23, MW108-23, BH109-23, BH110-23 and BH112-23 to BH116-23. On March 8, 2023, Direct Environmental Drilling Inc. used a track-mounted Geoprobe 7822DT drill rig to advance boreholes and install monitoring wells MW101-23 and MW111-23. Boreholes and monitoring wells were advanced to depths ranging from 3.5 m to 11.9 m below ground surface (bgs).

The monitoring wells at the Site were surveyed by MTE to a geodetic benchmark. Borehole and monitoring well locations are illustrated on **Figure 2**. Borehole logs are provided in **Appendix B**.

3.2 Monitoring Well Development

The monitoring wells were developed on March 22, 2023 using Waterra™ Surge Blocks to remove any accumulated sediments from the bottom of the well and to remove fine materials from the well screen and sand pack. Monitoring well development included the removal of three well volumes and/or purging the well dry on three occasions. Monitoring well development was completed prior to the installation of the data loggers.

3.3 Groundwater Levels

Manual groundwater levels were collected from on-Site monitoring wells on eight occasions between March 2023 and March 2024. Manually measured groundwater levels and elevations within on-Site monitoring wells are presented in **Table 1**. In addition, data loggers were installed in two of the on-Site monitoring wells (MW101-23 and MW108-23). Data loggers measure the

pressure of water (in cm) above the logger, which can then be compensated for atmospheric pressure to determine a groundwater level. The continuous hourly groundwater level information collected by data loggers allows for an assessment of seasonal groundwater trends and responses to precipitation events. On June 29, 2023 the data logger within MW108-23 was removed and installed within MW111-23, due to silting issues within MW108-23. Hydrographs are presented in **Appendix C**.

3.4 Groundwater Quality

Groundwater samples were collected from MW101-23 and MW108-23 on March 23, 2023. Prior to sampling, all monitoring wells were either purged a minimum of three standing well volumes or purged dry three times to ensure representative samples were collected from the shallow groundwater flow system. Following purging, groundwater samples were collected using dedicated Waterra tubing and foot valves, placed into laboratory supplied bottles and shipped under chain-of-custody, in an ice packed cooler to ALS Laboratory Group in Waterloo, ON. The groundwater analytical results for the Site were compared to the City of Guelph Storm and Sanitary Sewer Use By-Law (1996)-15202

4.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

4.1 Physiography

The Site is located within the broad physiographic region known as the Guelph Drumlin Field. The Guelph Drumlin Field occupies an approximate area of 830 km² and these drumlins are generally broad and oval in shape. The drumlins mainly consist of loamy and calcareous till derived from the dolostone of the Amabel Formation. Within this physiographic region the materials encountered are stony tills which are sand rich based on grain sizes (Chapman and Putnam, 1984).

The Site is located in the physiographic landform known as till plains (drumlinized). The physiographic landforms are presented on **Figure 3** (Chapman and Putnam, 1984).

4.2 Quaternary Geology

Geology throughout the City of Guelph is generally comprised of three distinct till units identified from youngest to oldest as the Wentworth Till, the Middle Maryhill Till and the Catfish Creek Till, overlying bedrock. The Wentworth Till is described as a coarse-grained sandy to silty sand till which is often bouldery or stony (Karrow, 1968). This unit is generally found at ground surface throughout the City of Guelph and includes glacial features such as drumlins, found within the Guelph Drumlin Field, and the Galt and Paris moraines. The till thickness is described as variable, ranging between 15 to 30 m below drumlins and moraines, while thicknesses are much lower within low-lying areas.

Quaternary geology mapping (**Figure 4**) indicates that the surficial geology beneath the Site is mapped as glaciofluvial outwash and ice stratified deposits. The glaciofluvial outwash deposits are described as gravel and sand, including proglacial river and deltaic deposits (*Ontario Geologic Survey*, 2010).

4.3 Paleozoic Geology

The Site is underlain by the Upper Silurian dolomite of the Guelph Formation. The Guelph formation is described as tan to brown, fine- to medium-crystalline, fossiliferous, dolostone that is locally biohermal (Armstrong and Carter, 2010). Bedrock was not encountered during the geotechnical drilling program.

Based on water well records in the area, the bedrock surface is expected to be encountered at depths of approximately 25 m to 50 m bgs. The water well records also indicate that the primary water supply aquifer in the area is bedrock.

4.4 Regional Groundwater Flow

Regional shallow groundwater elevations, provided by the Grand River Conservation Authority (GRCA) (published 2009), indicate that the regional shallow groundwater elevations in the vicinity of the Site are approximately 310 m amsl. In addition, the regional shallow groundwater flow direction is interpreted as westerly towards the Speed River, located approximately 1.3 km west of the Site.

4.5 Water Well Record Search

Hydrogeological data related to private water supply wells within 500 m of the Site were obtained from water well records on-file with the Ministry of the Environment, Conservation and Parks (MECP). A total of 57 water well records were located within 500 m of the Site (**Figure 5**). Of the 57 water well records, the following primary use was listed on the water well record:

- 33 water supply wells;
- 14 monitoring/observation wells or test holes;
- 5 records with no use specified; and
- 4 abandonment records.

MECP water well records are summarized in **Table 2**. Based on the available water well records, there are private water supply wells within the Study Area that are used for Domestic water supply. According to the water well records, these wells are completed into the underlying bedrock.

4.6 Source Water Protection

The closest municipal well to the Site is the University well, located approximately 700 m northeast of the Site. This municipal well is completed into the deep bedrock aquifer and is approximately 80 m deep. The Site is located in Wellhead Protection Area (WHPA) B which is the two to five-year time of travel capture zone (**Figure 6**), with a vulnerability score of 6 to 8. The Site is also located within a mapped Significant Groundwater Recharge Area (SGRA) and an Issue Contributing Area (ICA) for trichloroethylene.

5.0 LOCAL HYDROGEOLOGIC SETTING

5.1 Geological Cross-Section

Boreholes and monitoring wells installed for this investigation were used to interpret local hydrostratigraphic units and generate one geological cross-section. The location of the cross-section is provided on **Figure 2**; the geological cross-section is presented in **Figure 7**.

Geological Cross-Section A-A' (Figure 7):

- Extends approximately 225 m from southwest to northeast.
- Topography slopes from southwest to northeast from approximately 327 to 334 m amsl.
- The Site is underlain by fill materials that range in thickness from approximately 1 to 3 m.

- The fill material is underlain by a sand deposit, consisting of gravelly sand to silty sand, extending to approximately 320 m amsl on the southwest and 331 m amsl on the northeast.
- The sand deposit is underlain by sandy silt deposits extending to the depth of the investigation.

The stratigraphy consists of a surficial layer of shallow fill above sand and sandy silt deposits. Bedrock was not encountered in the boreholes to the depths explored (up to 12 m bgl). The sand and sandy silt deposits are consistent with glaciofluvial outwash deposits.

5.2 Groundwater Elevations and Flow Direction

Hydrographs 1 through 3 (Appendix C) present groundwater elevation information for on-Site monitoring wells. Precipitation data (Environment Canada Guelph Turfgrass Station) has also been presented on the hydrographs to illustrate the relationship between the groundwater elevations in on-Site monitoring wells and precipitation events. The gap in continuous data on **Hydrograph 2** between May 12 and June 7, 2023 is a result of the data logger memory becoming full. As shown on the hydrographs groundwater levels rose in the spring and plateaued in mid-summer before decreasing throughout the fall and early winter. Data logger data from MW101-23 and MW111-23 indicate that beginning in February 2024 groundwater elevations started to increase again.

Groundwater levels in on-Site monitoring wells appear to show minor short-term responses to precipitation events. Overall groundwater levels in on-Site monitoring wells appear to follow a delayed seasonal trend in that groundwater highs on-Site occur in the summer with lows occurring in the late fall/early winter.

Based on manual and continuous groundwater elevation monitoring, the highest groundwater elevation noted on-Site was approximately 321.5m amsl, which occurred at MW108-23.

Groundwater flow mapping was created for the Site using groundwater levels measured on June 7, 2023. Interpreted shallow groundwater elevation contours are illustrated on **Figure 8**. MTE notes that on-Site monitoring wells were only completed on the western half of the Site, as such the groundwater elevation on the eastern half of the Site may differ from that shown on **Figure 8**. Groundwater on the western half of the Site is interpreted to flow from east to west.

5.3 Hydraulic Conductivity

5.3.1 In-Situ Hydraulic Conductivity Testing

MTE conducted single well hydraulic response tests (SWRT) on two monitoring wells (MW101-23 and MW111-23) in March and June 2023. SWRTs typically involve the rapid introduction and/or removal of a slug of known displacement to raise and/or lower the water level in a monitoring well. The response of this rapid change is measured over time and used to calculate hydraulic conductivity. In wells with a water level reported within the screened interval, the response to the introduction of a solid slug can be influenced by the sand pack around the well screen. As the water level within MW101-23 on the day of testing was noted to be within the screened interval, MW101-23 was purged dry and the rate of recovery was recorded using a data logger programmed to collect a water level every second.

A representative test from each well was analyzed using the Bouwer and Rice methodology using AquiferTest© Pro Software (Waterloo Hydrogeologic Inc., 2020). A copy of the AquiferTest© data sheets are located in **Appendix D**.

5.3.2 Grain Size

Selected soil samples obtained during drilling activities were submitted for gradation and hydrometer analysis, as part of the geotechnical investigation. Particle size distribution reports are provided in **Appendix E**.

5.3.3 Hydraulic Conductivity Results

Based on review of the borehole logs and grain size analyses, sediment types generally range from silt to gravelly silty sand, trace clay. Altogether, five samples were analyzed with the results summarized in **Table 3**. The hydraulic conductivities of the tested soils (silt to gravelly silty sand) across the Site ranges from 1.2×10^{-8} m/sec to 1.5×10^{-9} m/sec. These results are consistent with average published values for silt and till soils (Freeze and Cherry, 1979).

The hydraulic conductivity results from the in-situ hydraulic response tests completed at MW101-23 and MW111-23 were 9.9×10^{-7} m/sec and 8.4×10^{-7} m/sec, respectively, with the estimated geometric hydraulic conductivity value of 9.1×10^{-7} m/sec.

5.4 Average Linear Groundwater Velocity

The horizontal hydraulic gradient, based on the June 7, 2023 groundwater elevations (**Figure 8**), is calculated to be 0.02 m/m.

The average linear groundwater velocity can be calculated using Darcy's Law, as follows:

$$q = (Ki)/n_e$$

Where:

q = average linear groundwater velocity (m/sec)

K = hydraulic conductivity (9.1×10^{-7} m/sec (SWRT geometric mean))

i = horizontal hydraulic gradient (0.02 m/m)

n_e = effective sediment porosity (0.26 based on the calculations in **Appendix E**)

Using the above values, the average linear groundwater velocity at the Site is estimated to be approximately 2.4 m/year.

5.5 Groundwater Quality

Groundwater samples were analyzed for the City of Guelph Storm and Sanitary Sewer Use By-Law (1996)-15202 criterion. Analytical results have been compared to the City of Guelph Sewer Use By-Law criterion and are presented in the appended **Table 4**. Unabbreviated laboratory certificates of analysis are presented in **Appendix F**.

Tables 5.5.1 and **5.5.2** below indicate which parameters exceeded either the City of Guelph's Storm and/or Sanitary Sewer Use By-Law.

Table 5.5.1 – City of Guelph Storm Sewer Exceedances for Total Suspended Solids (TSS) and Total Metals

Parameter	Storm Sewer Limit (mg/L)	MW101-23 (mg/L)	MW108-23 (mg/L)
TSS	15	738	12500
Copper	0.01	0.0122	0.118
Lead	0.05	0.00826	0.0731
Nickel	0.05	0.00749	0.111
Zinc	0.05	0.0836	0.368

Table 5.5.2 – City of Guelph Sanitary Sewer Exceedances for Total Suspended Solids (TSS) and Total Metals

Parameter	Sanitary Sewer Limit (mg/L)	MW101-23 (mg/L)	MW108-23 (mg/L)
TSS	350	738	12500
Iron	50	4.58	94.4

6.0 PRELIMINARY DESIGN CONSIDERATIONS

6.1 Dewatering

The shallowest groundwater elevation measured by MTE in on-Site monitoring wells to date is approximately 321.5m amsl. To account for potential changes to the shallow groundwater level, a 0.5m safety factor was included for dewatering considerations. The current concept plan for the Site includes one level of underground parking with a proposed finished floor elevation (FFE) of 325.6m amsl. The current separation between the shallowest water level measured with 0.5m safety factor and the proposed FFE is approximately 3.6 metres (325.6m amsl – 322m amsl). Based on the estimated separation, it is not anticipated that dewatering of groundwater will be required. MTE recommends continuous groundwater monitoring occur during the Site plan approval process, as well as during final design to track seasonal changes in groundwater elevations on-Site.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this hydrogeological investigation, MTE offers the following findings:

- The stratigraphy consists of a surficial layer of shallow fill above sand and sandy silt deposits. Bedrock was not encountered in the boreholes to the depths explored.
- The shallow groundwater flow direction beneath the Site is interpreted to be westerly.
- The horizontal hydraulic gradient of the groundwater table beneath the Site was estimated at 0.02 based on the June 7, 2023 groundwater contours (**Figure 8**).
- Hydraulic conductivity of the underlying materials on-Site is estimated to range from 9.9×10^{-7} m/sec to 8.4×10^{-7} m/sec with a geometric mean of 9.1×10^{-7} m/sec.
- Based on a review of on-Site groundwater elevations and the proposed FFE there is approximately four metres of separation, as such at this time dewatering is not anticipated to be required at the Site.

Recommendations

- During the development application process, existing on-Site groundwater monitoring wells should be maintained.
- Should on-Site infiltration be considered, MTE recommends completing on-Site in-situ infiltration testing prior to final Site design.
- Upon monitoring well decommissioning, monitoring wells are to be decommissioned in accordance with Ontario Regulation 903 (as amended).
- If, upon final confirmation of building and servicing design, it is anticipated that the water table may be intercepted during construction activities, a dewatering assessment should be completed.

8.0 LIMITATIONS

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and the Client. The assignment was carried out in accordance with the Scope of Work described in Section 1.1 as reviewed with and agreed to by the Client. MTE makes no representation that the present report has dealt with all of the important environmental issues, except as provided in the Scope of Work. This report is not intended to be exhaustive in scope or to imply a risk-free facility. As such, this report may not deal with all issues potentially applicable to the Site and may omit aspects which are or may be of interest to the reader.


In addition, it should be recognized that a soil sample or groundwater level measurement represents one discrete portion of the Site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the Site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change, along with regulatory requirements. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

All of which is respectfully submitted,

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9.0 REFERENCES

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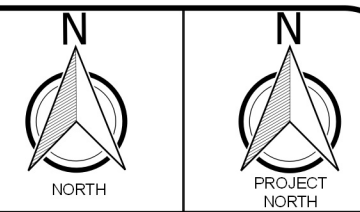
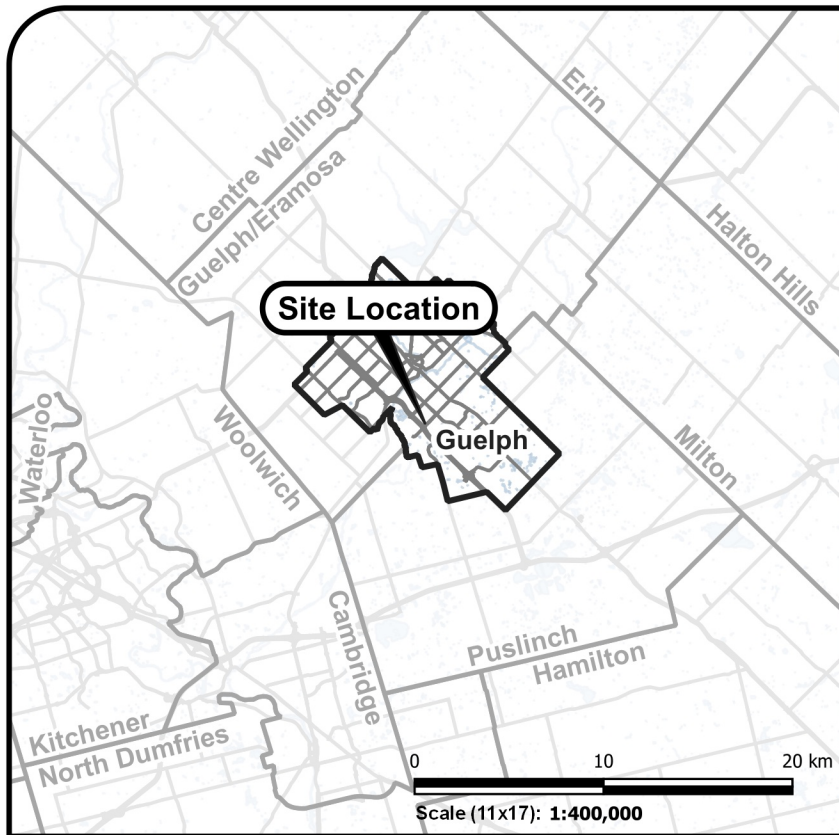
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Figures





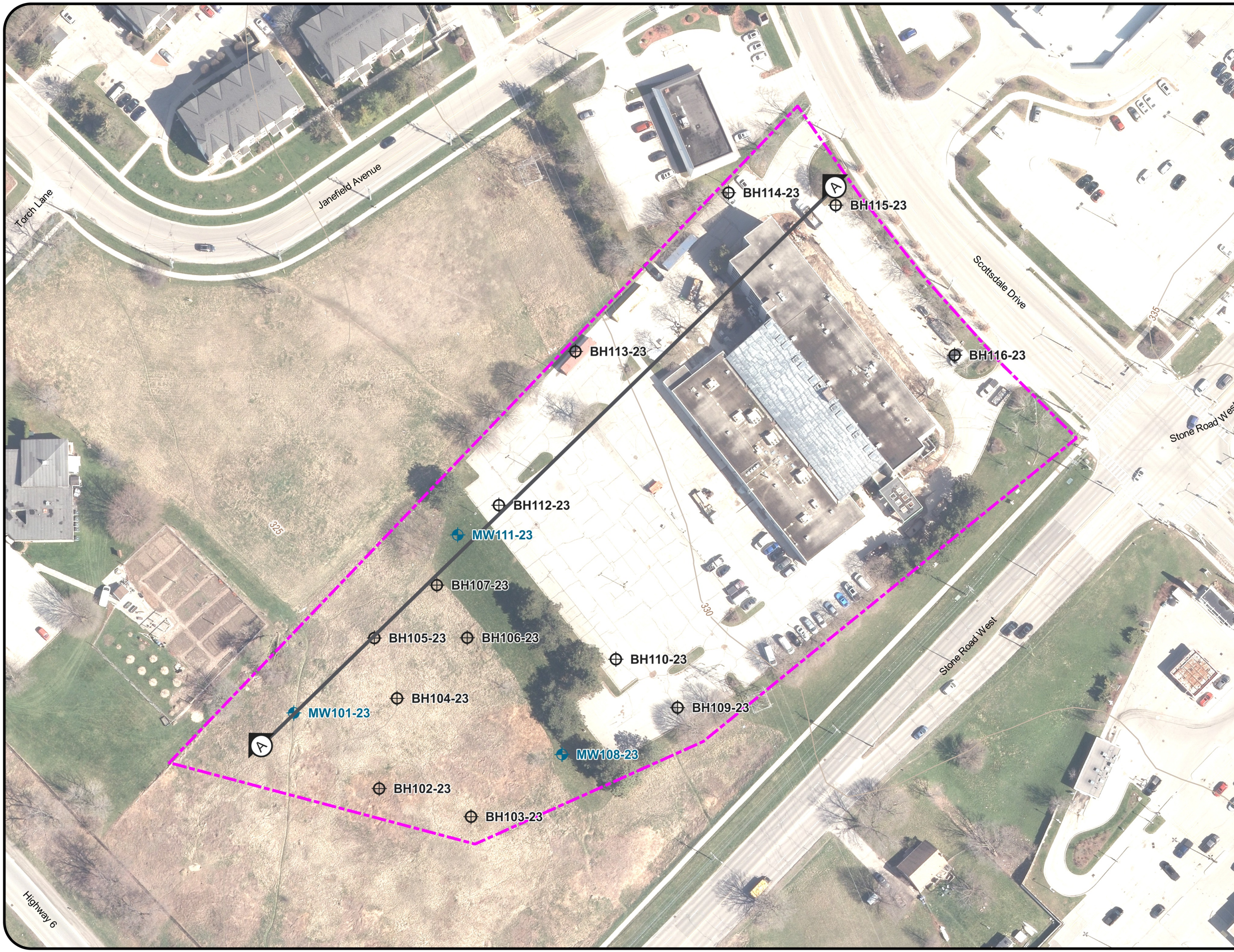
Legend

-  Site Boundary
-  500m Study Area
-  5m Contours
-  Provincially Significant Wetland
-  Waterbody
-  Watercourses

Data Sources:
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 Project CRS: NAD83 / UTM zone 17N



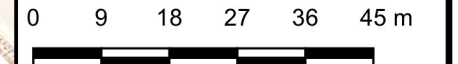
Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	Site Location Map	
Reviewed By	TFC	Project No. 49791-101
Prepared By	KNR	Figure No.
Drawn By	SGL	1
Date	September 2023	



Legend

- Site Boundary
- Monitoring Well
- Borehole
- Geological Cross Section Location
- 5m Contours
- Waterbody
- Watercourses

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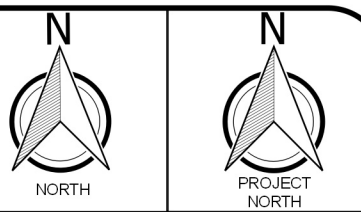
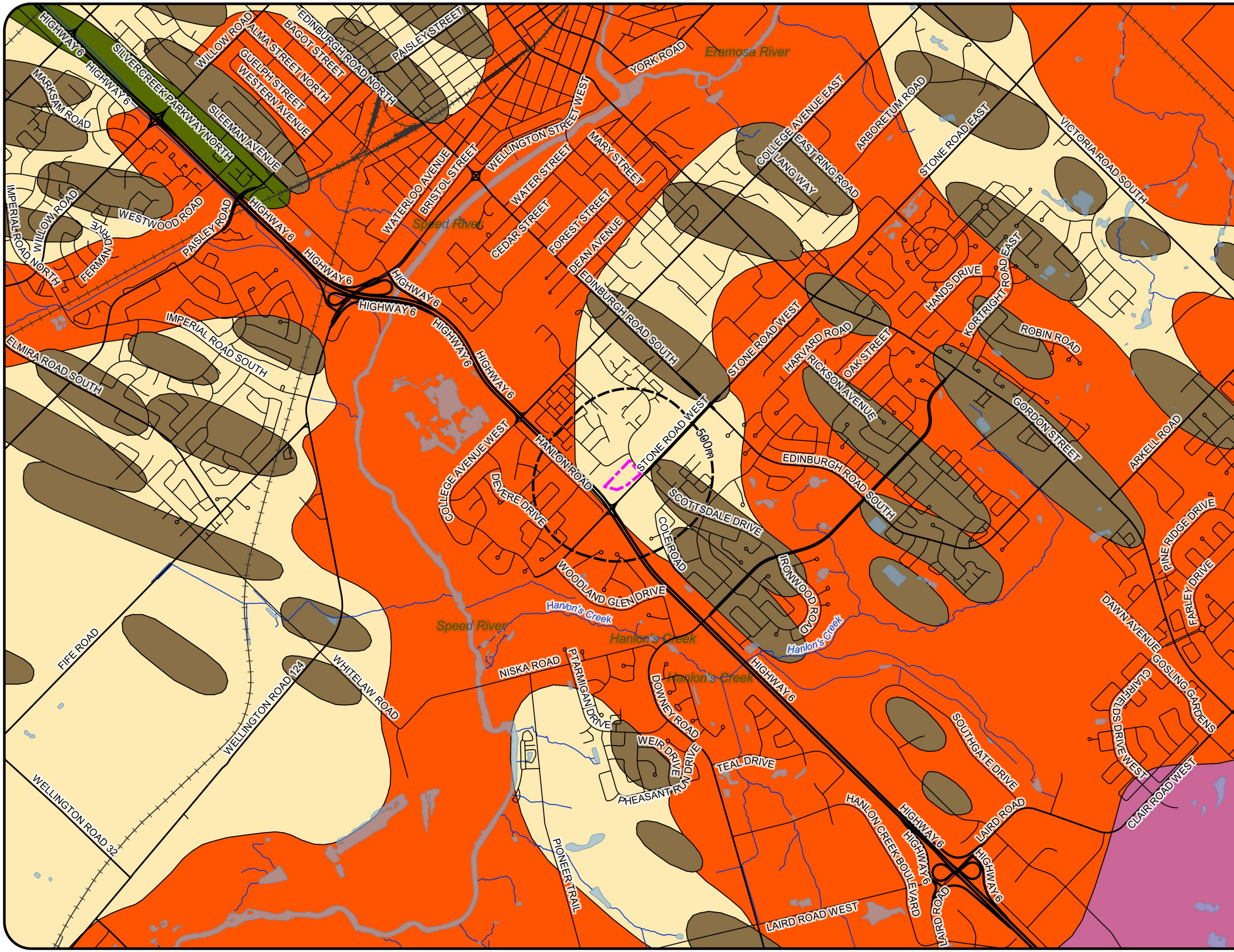


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Project CRS: NAD83 / UTM zone 17N



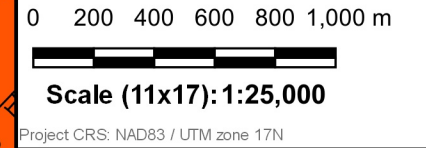
Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	Existing Features	
Reviewed By	TFC	
Prepared By	KNR	Project No 49791-101
Drawn By	SGL	Figure No 2
Date	September 2023	



Legend

- Site Boundary
 - 500m Study Area
 - Railroad
 - Waterbody
 - Watercourses
- Physiographic Landforms**
- 2. Till Moraines
 - 3. Spillways
 - 6. Till Plains (Drumlinized)
 - 7. Drumlins
 - 13. Eskers

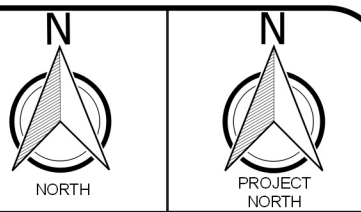
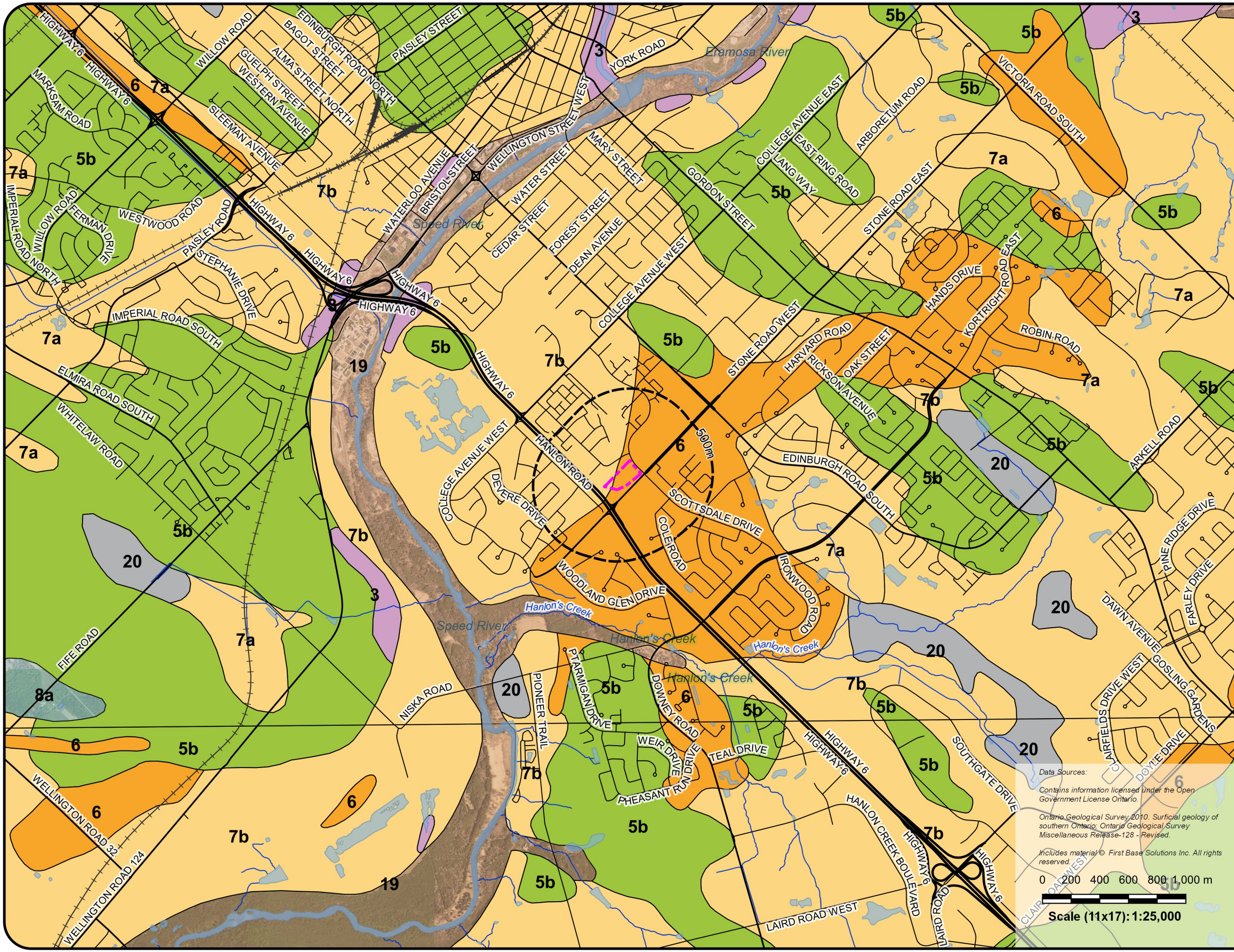
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Project CRS: NAD83 / UTM zone 17N



Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	Physiographic Landforms	
Reviewed By	TFC	
Prepared By	KNR	Project No. 49791-101
Drawn By	SGL	Figure No. 3
Date	September 2023	



Legend

- Site Boundary
- 500m Study Area
- Railroad
- Waterbody
- Watercourses
- Quaternary Geology**
- 20. Organic Deposits: peat, muck, marl
- 19. Modern alluvial deposits: clay, silt, sand, gravel, may contain organic remains
- 8. Fine-textured glaciolacustrine deposits: silt and clay, minor sand and gravel
- 8a. Massive to well laminated
- 7. Glaciofluvial deposits: river deposits and delta topset facies
- 7a. Sandy deposits
- 7b. Gravelly deposits
- 6. Ice-contact stratified deposit: sand and gravel, minor silt, clay and till
- 5. Till:
- 5b. Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain
- 3. Paleozoic bedrock

Project CRS: NAD83 / UTM zone 17N



Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	Quaternary Geology	
Reviewed By	TFC	Project No. 49791-101
Prepared By	KNR	Figure No. 4
Drawn By	SGL	
Date	September 2023	

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 Ontario Geological Survey 2010. Surficial geology of southern Ontario. Ontario Geological Survey Miscellaneous Release-128 - Revised.

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0 200 400 600 800 1,000 m

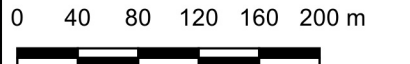
Scale (11x17): 1:25,000



Legend

- Site Boundary
- 500m Study Area
- MECP Well Record**
- Water Supply
- Observation Wells
- +
 Test Hole
- Unknown

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 MOECP WWIS2 September 2020
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Scale (11x17): 1:5,000

Project CRS: NAD83 / UTM zone 17N

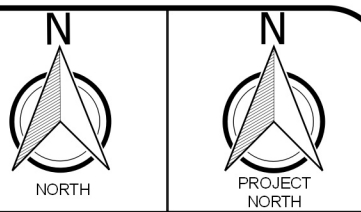
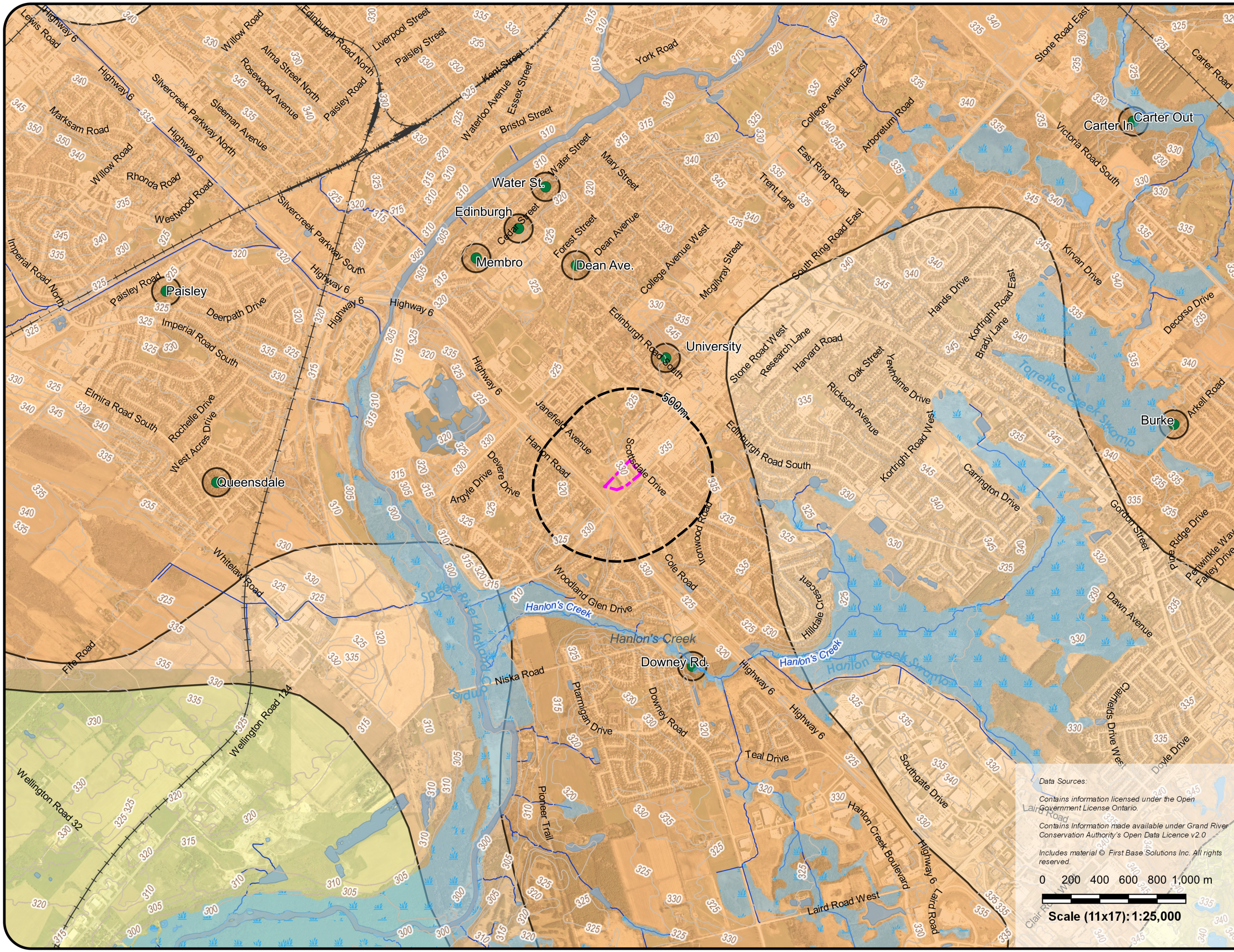


Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	MECP Water Well Location	
Reviewed By	TFC	
Prepared By	KNR	Project No. 49791-101
Drawn By	SGL	Figure No. 5
Date	September 2023	

Project No. 49791-101 P:\P\49791\101\49791.qgz

GWR2.6

September 20, 2023 - 16:22 - Plotted By: SReidner



Legend

- Site Boundary
 - 500m Study Area
 - 5m Contours
 - Railroad
 - Provincially Significant Wetland
 - Waterbody
 - Watercourses
 - Municipal Well (GRCA)
- Wellhead Protection Area Zones**
- A - 100m radius exclusion zone
 - B - 2 Year Travel Time
 - C - 5 Year Travel Time
 - D - 25 Year Travel Time

Project CRS: NAD83 / UTM zone 17N

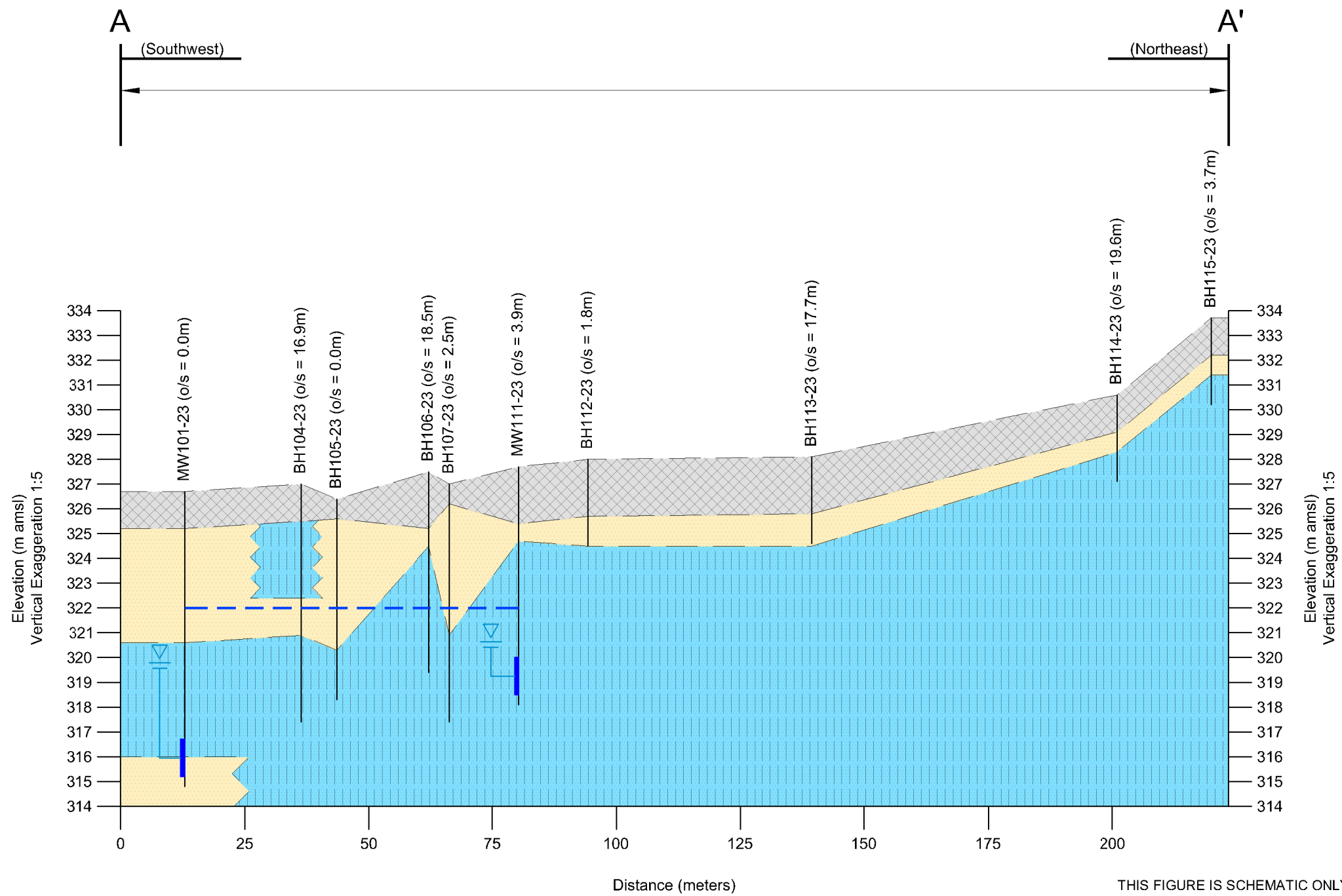


Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	Wellhead Protection Areas	
Reviewed By	TFC	Project No. 49791-101
Prepared By	KNR	Figure No. 6
Drawn By	SGL	
Date	September 2023	

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0 200 400 600 800 1,000 m

Scale (11x17): 1:25,000



LEGEND

- Fill (Grey hatched)
- Sand (Yellow)
- Sandy Silt (Blue hatched)
- Interpreted Seasonal High Water Table 322m amsl (Dashed blue line)

WELL ID: MW4-11 o/s 23m

WELL

INFERRED WATER LEVEL June 7, 2023

SCREENED INTERVAL

0 10 20 30 40 50m

Scale(11x17): 1:1000

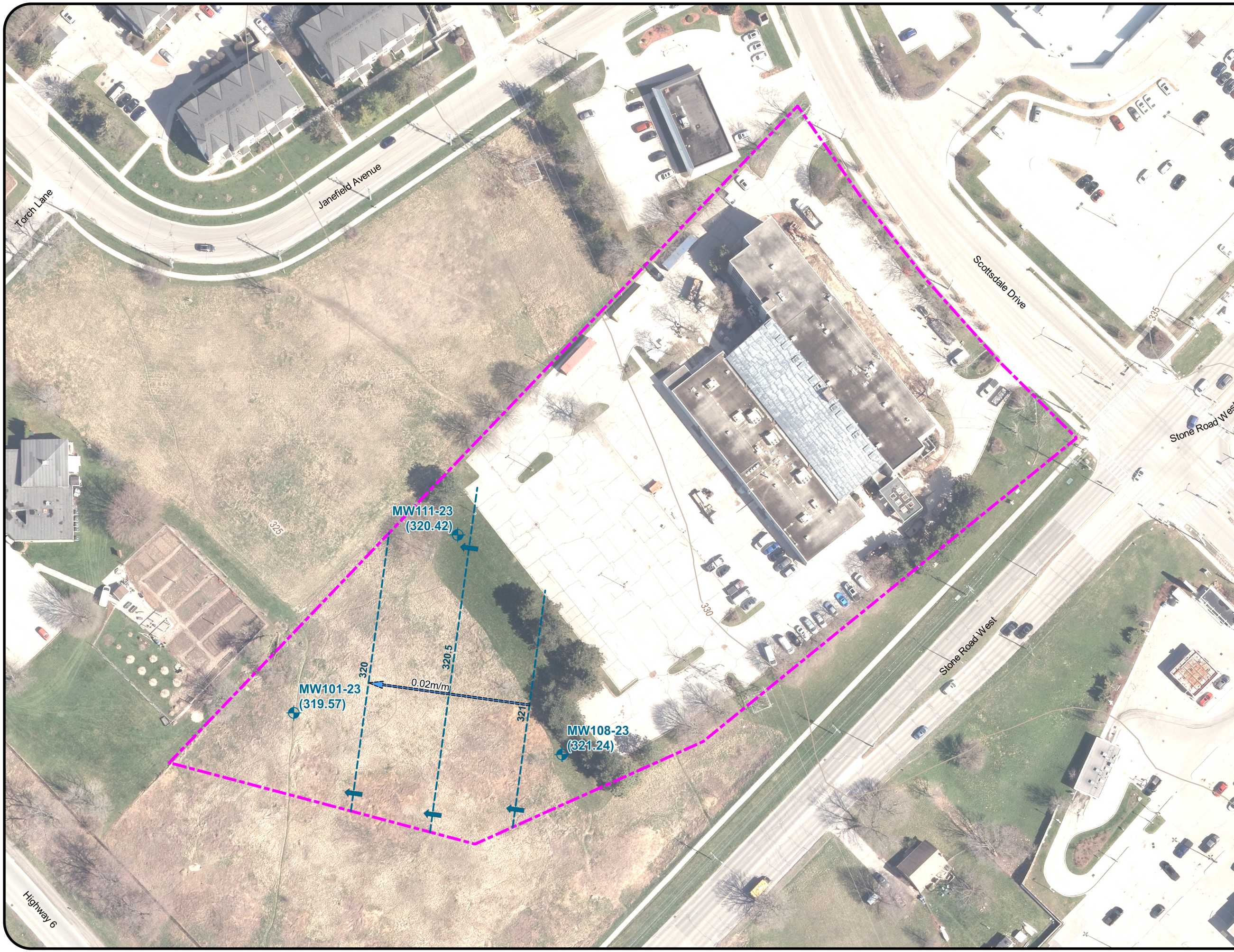


CLIENT	Forum Investment and Development Corporation	
PROJECT	Preliminary Hydrogeologic Investigation	
SITE	601 Scottsdale Drive, Guelph, ON	
TITLE	Geological Cross-Section A-A'	
Reviewed By	TFC	
Prepared By	KNR	Project No. 49791-101
Drawn By	SGL	Figure No. 7
Date	March 2024	

THIS FIGURE IS SCHEMATIC ONLY AND TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

WIDTH OF BOREHOLES FOR ILLUSTRATION PURPOSES ONLY AND DO NOT CORRESPOND TO ACTUAL SPATIAL EXTENT.

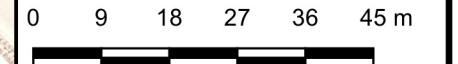
THE SIMPLIFIED STRATIGRAPHY PRESENTED HEREIN IS BASED ON PROFESSIONAL INTERPRETATION FROM THE OVERBURDEN SEDIMENTS RECORDED DURING DRILLING, ACTUAL STRATIGRAPHY CONDITIONS MAY VARY BETWEEN AND BEYOND LOCATIONS. ALL LOCATIONS ARE APPROXIMATE.



Legend

- - - Site Boundary
- Monitoring Well (Groundwater Elevation (mAMSL))
- - - Groundwater Contours (0.5m Interval)
- Groundwater Flow Direction (Inferred)
- Horizontal Gradient (m/m)
- 5m Contours

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Scale (11x17): 1:1,000

Project CRS: NAD83 / UTM zone 17N



Client	Forum 601 Scottsdale LP	
Project	ALMA Guelph Phase 2	
Site	601 Scottsdale Drive, Guelph	
Title	Interpreted Groundwater Flow Map (June 7, 2023)	
Reviewed By	TFC	
Prepared By	KNR	Project No. 49791-101
Drawn By	SGL	Figure No. 8
Date	September 2023	

Tables

Table 1: Manual Groundwater Elevations (m amsl)

Date	MW101-23	MW108-23	MW111-23
TOC Elevation	327.75	329.10	328.53
2023-03-22	317.91	319.48	dry
2023-03-23	317.90	319.54	dry
2023-06-07	319.57	321.24	320.42
2023-06-29	319.67	321.32	320.50
2023-06-30	319.69	321.33	320.54
2023-09-14	319.68	321.23	320.49
2023-12-19	319.05	320.50	319.98
2024-03-20	319.08	320.68	320.01

Notes: *m amsl = metres above sea level*
TOC = top of casing

Table 2: MECP Water Well Record Summary



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
6700935	561096.3	4818426	1967	101.6	56.7	Cable Tool	Water Supply	Domestic	Fresh	51.8	56.69	13.7	68.2	1.8		Gravel	Clay	
														9.1		Medium Sand	Stones	
														24.4		Medium Sand		
														33.8	Grey	Clay		
														47.5		Clay	Medium Sand	
														50.3	Blue	Limestone		
														51.8	Black	Limestone		
														56.7	Grey	Limestone		
6701469	561596.3	4818522	1955	127	47.2	Cable Tool	Water Supply	Domestic	Fresh	38.1	47.24	10.7	31.8	0.6		Topsoil		
														4.9		Medium Sand		
														10.7		Gravel	Medium Sand	
														13.7		Clay	Medium Sand	
														15.5		Medium Sand		
														16.5		Hardpan		
														17.4		Coarse Sand		
														21.6		Hardpan	Medium Sand	
														24.4		Clay	Stones	
														33.5	Brown	Limestone		
														38.1	Grey	Limestone		
47.2	Black	Limestone																
6701470	560954.3	4818359	1955	101.6	47.2	Cable Tool	Water Supply	Domestic	Fresh	21.3	47.24	9.1	36.4	0.3		Topsoil		
														4.9		Medium Sand		
														10.7		Medium Sand	Gravel	
														13.7		Medium Sand	Clay	
														16.2		Medium Sand		
														18.3		Hardpan		
														19.5		Fine Sand		
														28.7	Brown	Limestone		
														32	Grey	Limestone		
														39.6	Black	Limestone		
														45.7	Grey	Limestone		
47.2	Brown	Limestone																
6701471	561152.3	4818359	1956	101.6	54.3	Cable Tool	Water Supply	Domestic	Sulphur	45.1	54.25	12.8	68.2	0.6		Topsoil		
														12.2		Gravel	Medium Sand	
														24.7		Medium Sand	Gravel	Clay
														29.6		Gravel		
														33.2		Clay	Gravel	
														34.1		Medium Sand		
														42.4		Clay		
														45.1	Brown	Limestone		
54.3	Grey	Limestone																
6701472	560936.3	4818404	1957	101.6	30.2	Cable Tool	Water Supply	Domestic	Fresh	30.2	30.18	3.7	45.5	9.8		Fine Sand		
														30.2	Grey	Limestone		

Table 2: MECP Water Well Record Summary



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
6701473	560878.3	4818439	1957	101.6	33.5	Cable Tool	Water Supply	Domestic	Fresh	33.5	33.53	4	27.3	10.4		Fine Sand		
														33.5	Grey	Limestone		
														0.6		Topsoil		
														5.2		Medium Sand	Gravel	
														9.1		Gravel		
														16.5		Medium Sand	Clay	
														18.3		Gravel	Medium Sand	
														29.3	Grey	Clay	Gravel	
														32	Brown	Clay	Gravel	
														37.8	Grey	Clay		
														39.3		Coarse Sand		
														42.7		Gravel		
														44.5		Limestone		
														51.2	Grey	Limestone		
6701474	561166.3	4818484	1958	101.6	51.2	Cable Tool	Water Supply	Domestic	Fresh	43.3	51.21	13.7	68.2	12.2		Fine Sand		
														12.8		Gravel		
														15.5		Fine Sand		
														24.4	Brown	Limestone		
														41.5	Black	Limestone		
6701478	561136.3	4818437	1964	101.6	41.5	Cable Tool	Water Supply	Domestic	Fresh	24.4	41.45	9.1	45.5	12.8		Gravel	Medium Sand	
														29	Grey	Limestone		
														31.1	Brown	Limestone		
6701486	560711.3	4818379	1964	101.6	31.1	Cable Tool	Water Supply	Domestic	Fresh	31.1	31.09	9.1	18.2	12.8		Gravel		
														29.6	Grey	Limestone		
6701490	560712.3	4818364	1964	101.6	29.6	Cable Tool	Water Supply	Domestic	Fresh	29.6	29.57	9.1	27.3	8.8		Gravel		
														27.7	Grey	Limestone		
6701491	560709.3	4818379	1958	101.6	27.7	Cable Tool	Water Supply	Domestic	Fresh	27.7	27.74	8.2	45.5	11.3		Gravel		
														29.3	Brown	Limestone		
6701492	560751.3	4818410	1963	101.6	29.3	Cable Tool	Water Supply	Domestic	Fresh	29.3	29.26	9.1	18.2	1.2		Topsoil		
														6.4		Medium Sand	Gravel	
														8.5		Clay	Medium Sand	
														10.1		Fine Sand		
														14.3	Brown	Limestone		
														23.8	Grey	Limestone		
														25.9	White	Limestone		
														9.8		Medium Sand	Gravel	
6701505	560744.3	4818409	1956	127	25.9	Cable Tool	Water Supply	Domestic	Fresh	24.4	25.91	4.9	45.5	13.7	White	Limestone		
														28	Brown	Limestone		
6701506	561120.3	4818108	1958	101.6	28	Cable Tool	Water Supply	Domestic	Fresh	24.4	28.04	6.1	45.5	9.1		Gravel		
														28.7	Grey	Limestone		
6701507	560787.3	4818312	1958	101.6	28.7	Cable Tool	Water Supply	Domestic	Fresh	28.7	28.65	7.6	45.5	12.2		Gravel		
														30.8	Grey	Limestone		
6701509	560712.3	4818361	1961	101.6	30.8	Cable Tool	Water Supply	Domestic	Fresh	30.8	30.78	7.6	45.5					

Table 2: MECP Water Well Record Summary



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
6701510	560712.3	4818309	1961	101.6	29	Cable Tool	Water Supply	Domestic	Fresh	29	28.96	7.9	36.4	10.7		Gravel		
														12.5		Medium Sand		
														24.4	Grey	Limestone		
														29	Brown	Limestone		
6701511	560783.3	4818447	1959	101.6	28.7	Cable Tool	Water Supply	Domestic	Fresh	28.7	28.65	9.1	31.8	6.7		Gravel		
														9.4		Fine Sand		
														28.7	Brown	Limestone		
6701513	560781.3	4818450	1965	101.6	29.6	Cable Tool	Water Supply	Domestic	Fresh	29.6	29.57	7	45.5	12.2		Gravel	Stones	
														29.6	Brown	Limestone		
6701515	561024.3	4818195	1953	101.6	25.6	Cable Tool	Water Supply	Domestic	Fresh	22.3	25.6	4.3	18.2	0.6		Topsoil		
														2.4		Gravel		
														4.3		Medium Sand	Gravel	
														8.5		Clay		
														9.1		Gravel		
														17.7	White	Limestone		
														22.3	Yellow	Medium Sand	Limestone	
25.6	Grey	Limestone																
6701516	560963.3	4818259	1953	101.6	27.4	Cable Tool	Water Supply	Domestic	Fresh	19.5	27.43	5.2	22.7	0.6		Topsoil		
														2.7		Gravel		
														4.3		Medium Sand	Gravel	
														8.8		Clay		
														9.8		Gravel	Medium Sand	
														19.5	White	Limestone		
														23.2	Yellow	Limestone		
27.4	Grey	Limestone																
6701517	560864.3	4818391	1956	101.6	51.2	Cable Tool	Water Supply	Domestic	Fresh	51.2	51.21	11	45.5	22.9		Medium Sand		
														38.1	Grey	Clay		
														38.7		Gravel		
														49.1	Black	Limestone		
6701519	561088.3	4818053	1953	101.6	61.6	Cable Tool	Water Supply	Domestic	Sulphur	54.9	61.57	14.3	22.7	0.9		Topsoil		
														3.4		Gravel	Stones	
														7.3		Clay		
														8.8		Medium Sand	Gravel	
														21.9		Clay	Hardpan	
														25.6		Medium Sand	Gravel	
														27.7		Gravel		
														36		Clay	Medium Sand	
														47.9		Clay		
														50.3		Fine Sand		
														51.2		Hardpan		
61.6	Black	Limestone																

Table 2: MECP Water Well Record Summary



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
6701520	561079.3	4818168	1955	101.6	39.6	Cable Tool	Water Supply	Domestic	Fresh	39.6	39.62	8.5	31.8	1.2		Fill		
														5.5		Gravel		
														16.8		Clay	Medium Sand	
														25.9		Gravel		
														38.7		Clay	Stones	
														39.6		Gravel		
6701521	561082.3	4817965	1957	101.6	61.6	Cable Tool	Water Supply	Domestic	Fresh	57.9	61.57	11.3	54.6	2.7		Fill	Stones	
														7.6		Clay	Stones	
														9.1		Hardpan		
														24.4		Silt		
														30.5		Gravel		
														31.7		Medium Sand		
														46.9		Hardpan		
														59.4	Black	Limestone		
61.6	Brown	Limestone																
6701522	561159.3	4818192	1958	101.6	41.8	Cable Tool	Water Supply	Domestic	Fresh	41.8	41.76	11.6	45.5	0.9		Topsoil		
														6.7		Medium Sand	Gravel	
														8.2		Gravel		
														15.8		Silt		
														22.9		Clay	Gravel	
														24.4		Medium Sand		
														41.1		Clay	Stones	
41.8		Medium Sand	Gravel															
6701523	560967.3	4818167	1962	101.6	44.5	Cable Tool	Water Supply	Domestic	Fresh	44.2	44.5	11	45.5	2.1		Previously Dug		
														3.7		Gravel		
														16.5		Clay	Medium Sand	
														17.1		Boulders		
														21.3		Clay	Gravel	
														24.4		Gravel		
														30.5	Brown	Limestone		
44.5	Black	Limestone																
6702405	561327.3	4818192	1960	101.6	42.4	Cable Tool	Water Supply	Domestic	Fresh	38.1	42.37	8.5	45.5	0.6		Fill		
														2.4		Stones		
														4.9		Fine Sand		
														6.7		Clay	Gravel	
														20.4		Gravel		
														24.4	Grey	Clay		
														40.2	Brown	Limestone		
42.4	Black	Limestone																

Table 2: MECP Water Well Record Summary



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
6702406	561355.3	4818216	1962	101.6	43.6	Cable Tool	Water Supply	Domestic	Fresh	43	43.59	7.6	22.7	0.3		Topsoil		
														6.1		Medium Sand	Gravel	
														13.7	Grey	Clay	Gravel	
														18.3	Grey	Clay	Stones	
														20.7		Gravel	Stones	
														22.9		Medium Sand		
														41.1	Brown	Limestone		
														43.3	Grey	Limestone		
6702407	561413.3	4818236	1962	101.6	42.7	Cable Tool	Water Supply	Domestic	Fresh	42.7	42.67	6.1	31.8	13.7		Gravel	Medium Sand	
														18.3	Grey	Clay	Stones	
														41.1	Brown	Limestone		
														42.7	Black	Limestone		
6702408	561299.3	4818069	1962	152.4	31.4	Cable Tool	Water Supply	Domestic	Fresh	29	31.39	9.8	90.9	6.1		Previously Dug		
														21.3		Clay	Medium Sand	
														31.4		Limestone		
6703289	560694.3	4818313	1968	101.6	22.9	Cable Tool	Water Supply	Domestic	Fresh	15.2	22.86	8.2	68.2	6.1		Gravel		
														10.7		Medium Sand		
														22.9	Brown	Limestone		
6703584	560704.3	4818373	1969	101.6	15.2	Cable Tool	Water Supply	Domestic	Fresh	17.1	17.07	7.9	45.5	9.8		Gravel	Medium Sand	
														17.1		Limestone		
6715151	560932	4818353	2004	50.8	76.2	Other Method	Observation Wells	-	-	-	79.25	-	-	10.7	Brown	Silt	Clay	Till
														79.2	Red	Rock		
6715259	561360	4818047	2004	1500	20	Rotary (Convent.)	-	Not Used	-	-	19.5	-	-	0.2	Black	Topsoil		
														1.8	Brown	Gravel	Clay	
														5.5	Brown	Sand	Clay	Gravel
														6.7	Brown	Clay		
														7.9	Brown	Gravel		
														8.2	Red	Clay	Gravel	
														10.7	Grey	Clay	Gravel	Boulders
														15.5	Grey	Clay	Stones	
19.5	Grey	Silt	Clay	Gravel														
6715306	561461	4818271	2005	50	7.6	Boring	Observation Wells	-	-	10.6	13.6	-	-	0.2	Black			
														4.5	Brown	Sand		
														13.6	Brown	Sand		
6715372	561437	4818306	2005	51	7.5	Boring	Observation Wells	-	-	10.5	13.68	-	-	8	Brown	Silt	Gravel	
														10.1	Brown	Silt	Coarse Gravel	
														13.7	Brown	Silt	Coarse Gravel	
6715793	561492	4818334	2006	51	6.1	Boring	Observation Wells	-	Fresh	9.7	12.1	-	-	4.5	Brown	Sand	Gravel	
														9.7	Brown	Silt	Sand	Gravel
														12.1	Grey	Silt	Sand	Gravel
7118617	561453	4818292	2008	51	9.1	Boring	Observation Wells	Monitoring	-	8	13.5	-	-	0.5	Brown	Sand	Gravel	
														10	Brown	Sand		
														13.5	Grey	Sand	Silt	

Table 2: MECP Water Well Record Summary



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
7118618	561451	4818261	2008	51	8.2	Boring	Observation Wells	Monitoring	-	9	13.6	-	-	1.5	Brown	Sand	Gravel	Fill
														6	Brown	Sand		
														13.6	Brown	Sand	Silt	
7118619	561431	4818290	2008	51	7.6	Boring	Observation Wells	Monitoring	-	8	12	-	-	1.5	Brown	Sand	Gravel	
														7.6	Brown	Sand		
														12	Brown	Sand	Silt	
7118620	561388	4818232	2008	-	-	Boring	Abandoned-Supply	-	-	-	-	-	-					
7118621	561422	4818226	2008	-	-	Boring	Abandoned-Supply	-	-	-	-	-	-					
7118622	561459	4818221	2008	51	15.1	Boring	Observation Wells	Monitoring	-	14	16.1	-	-	0.5	Brown	Sand	Gravel	
														12	Brown	Sand		
														16.1	Grey	Sand	Silt	
7118623	561454	4818261	2008	51	13.2	Boring	Observation Wells	Test Hole	-	7.5	13.2	-	-	1.5	Brown	Sand	Gravel	
														6	Brown	Sand		
														10	Brown	Sand	Gravel	
														13.2	Grey	Sand	Silt	
7118624	561360	4818320	2008	51	6	Boring	Observation Wells	Monitoring	-	-	12	-	-	1.5	Brown	Sand	Gravel	
														6	Brown	Sand		
														7.6	Brown	Sand	Gravel	
7118625	561402	4818258	2008	51	6	Boring	Observation Wells	Monitoring	Untested	8	12	-	-	1.5	Brown	Sand	Gravel	Fill
														3	Brown	Sand		
														7.6	Brown	Sand	Gravel	
														12	Brown	Sand	Silt	
7223568	561486	4818211	2014	-	-	-	-	-	-	-	-	-	-					
7232304	561203	4818347	2014	50.8	7.6	Rotary (Reverse)	Observation Wells	Monitoring	-	5.5	9.14	-	-	4.6	Brown	Sand	Gravel	Dense
														9.1	Grey	Silt	Gravel	Dense
7244083	561470	4818148	2015	51	4.5	Boring	Test Hole	Test Hole	Untested	6.9	7.6	-	-	3	Brown	Clay	Silt	Soft
														5.4	Brown	Silt	Sand	Packed
														6.9	Brown	Sand	Silt	
														7.6	Brown	Sand		Dense
7249783	561474	4818312	2015	-	-	-	Abandoned-Other	-	-	-	-	-	-					
7249852	561466	4818503	2015	-	-	-	-	-	-	-	-	-	-					
7249891	561489	4818292	2015	-	-	-	-	-	-	-	-	-	-					
7251638	561488	4818300	2015	-	-	-	-	-	-	-	-	-	-					
7269451	561203	4818347	2016	-	-	-	Abandoned-Other	Monitoring	-	-	-	-	-					
7328109	561626	4818819	2018	50.8	4.3	Auger	Observation Wells	Monitoring	-	-	6.1	-	-	6.1	Brown	Sand	Gravel	
7404590	561526	4818469	2021	-	-	-	-	-	-	-	-	-	-					
7405425	561512	4818610	2021	-	-	-	-	-	-	-	-	-	-					

Table 3: Hydraulic Conductivity Summary (m/sec)



In-Situ Hydraulic Conductivity						
Monitoring Well	Ground Surface Elevation	Screened Interval (m bgs/ m amsl)	Soil Description	Hydraulic Conductivity (m/sec)	Method	Calculation
MW101-23	326.70	9.9 - 11.4 316.8 - 315.3	Gravelly Silty SAND, some Clay	9.9×10^{-7}	Recovery	Bouwer & Rice
MW111-23	327.70	5.7 - 7.2 322.0 - 320.5	SILT, some Clay, trace Sand	8.4×10^{-7}	Rising Head	Bouwer & Rice

Particle Size Distribution						
Monitoring Well / Borehole Name	Ground Surface Elevation	Sample Identification and Depth (m bgs)	Screened Interval (m bgs/ m amsl)	Soil Description	Hydraulic Conductivity Range (m/sec)	Formula
MW101-23	326.70	SS-11 10.7-11.1	9.9 - 11.4 316.8 - 315.3	Gravelly Silty SAND, some Clay	3.0×10^{-9}	Kozeny Carmen
MW108-23	328.50	SS-8 9.1-9.8	9.7 - 11.2 318.8 - 317.3	SILT, some Clay, trace Sand	1.5×10^{-9}	Kozeny Carmen
MW111-23	327.70	SS-5 3.0-3.7	5.7 - 7.2 322.0 - 320.5	SILT, some Clay and Gravel, trace Sand	1.6×10^{-9}	Kozeny Carmen
MW111-23	327.70	SS-9 7.6-8.2	5.7 - 7.2 322.0 - 320.5	SILT, some Clay, trace Sand	3.7×10^{-9}	Kozeny Carmen
BH115-23	333.70	SS-3 1.5-2.1	NA	Gravelly Silty SAND, trace Clay	1.2×10^{-8}	Kozeny Carmen

Notes: In-Situ testing not completed at MW108-23 due to lack of water

**Table 4: Groundwater Quality Summary
City of Guelph Sewer Use By-Law**



Client Sample ID				MW101-23	MW108-23	
Date Sampled				23-Mar-2023	23-Mar-2023	
ALS Sample ID				WT2307174-001	WT2307174-002	
Parameter	Detection Limit	City of Guelph Sewer Use Limit		Units	Water	Water
		Sanitary	Storm			
Physical Tests						
pH	0.10	5.5-9.5	6.0-9.0	pH units	7.78	7.71
Total Suspended Solids	2.0	350	15	mg/L	738	12500
Anions and Nutrients						
Chloride (Cl)	0.50	1500	-	mg/L	193	404
Fluoride (F)	0.020	10	-	mg/L	<0.100	<0.100
Total Kjeldahl Nitrogen	0.15	100	-	mg/L	0.422	0.646
Phosphorus, Total	0.0030	10	-	mg/L	0.141	1.24
Sulfate (SO ₄)	0.30	1500	-	mg/L	16.9	41.6
Bacteriological Tests						
Fecal Coliforms	0	-	200	CFU/100mL	0	0
Cyanides						
Cyanide, Total	0.002	2	-	mg/L	<0.0020	<0.0020
Total Metals						
Aluminum (Al)-Total	0.010	50	-	mg/L	2.93	47.9
Antimony (Sb)-Total	0.00010	5	-	mg/L	<0.0010	<0.0010
Arsenic (As)-Total	0.00010	1	-	mg/L	0.00156	0.0216
Bismuth (Bi)-Total	0.000050	5	-	mg/L	<0.0005	0.000532
Cadmium (Cd)-Total	0.000010	1	0.001	mg/L	0.000208	0.000892
Chromium (Cr)-Total	0.00050	5	0.2	mg/L	0.00567	0.084
Cobalt (Co)-Total	0.00010	5	-	mg/L	0.0022	0.0468
Copper (Cu)-Total	0.0010	3	0.01	mg/L	0.0122	0.118
Iron (Fe)-Total	0.050	50	-	mg/L	4.58	94.4
Lead (Pb)-Total	0.00010	5	0.05	mg/L	0.00826	0.0731
Manganese (Mn)-Total	0.00050	5	-	mg/L	0.159	4.93
Mercury (Hg)- Total	<0.000010	0.1	0.001	mg/L	<0.000005	0.0000061
Molybdenum (Mo)-Total	0.000050	5	-	mg/L	<0.0005	0.00108
Nickel (Ni)-Total	0.00050	3	0.05	mg/L	0.00749	0.111
Selenium (Se)-Total	0.00050	5	-	mg/L	<0.0005	0.000512
Silver (Ag)-Total	0.00050	5	-	mg/L	<0.0010	0.000228
Tin (Sn)-Total	0.00010	5	-	mg/L	0.00298	0.00389
Titanium (Ti)-Total	0.00050	5	-	mg/L	0.107	1.66
Vanadium (V)-Total	0.00050	5	-	mg/L	0.00648	0.109
Zinc (Zn)-Total	0.0030	3	0.05	mg/L	0.0836	0.368
Aggregate Organics						
BOD Carbonaceous	3.0	300	15	mg/L	<3.0	<5.0
Oil and Grease, Total	5.0	-	-	mg/L	<5.0	<5.0
Animal/Veg Oil & Grease	5.0	100	-	mg/L	<5.0	<5.0
Mineral Oil and Grease	2.5	15	-	mg/L	<5.0	<5.0
Phenols (4AAP)	0.0010	1	-	mg/L	<0.0050	<0.0050

Notes:

1. Results highlighted yellow and **bold** exceed City of Guelph Sanitary Sewer Use By-Law (1996)

2. Results highlighted blue and **bold** exceed City of Guelph Storm Sewer Use By-Law (1996)

3. Cells highlighted in grey indicate parameter was not analyzed

Appendix A

Site Concept Plan

ZONING MATRIX

* Denotes existing site-specific provision

Provision	SC.1-10 Zone (1995-1486A)	MUC.2(PA) (Draft CZBL)	Provided	Compliance
Permitted Uses	'Apartment Building' + 'Residential Suites'	'Apartment Building' + 'Residential Suites'	'Apartment Building' + 'Residential Suites'	✓
Minimum Lot Area	N/A	3,500 m ²	2.3 ha	✓
Minimum Lot Frontage	30 m	50 m	122 m	✓
Maximum Density	150 UPH*	150 UPH*	300 UPH	Amendment Requested - both by-law
Front Yard	6 m	3-13 m	24 m	✓
Minimum Interior Side Yard	6 m or 1/3 building height, whichever is greater = 14.5 m	3 m	14 m	Yes for new by-law, Amendment for current by-law
Minimum Exterior Side Yard	6 m	3-13 m	16.27 m	✓
Minimum Rear Yard	1/3 building height but not less than 6 m = 14.5 m	7.5 m	N/A, lot has three street frontages and an interior side yard. Setback to Highway 6 is 15.4 m	N/A
Maximum Building Height	8 storeys*	8 storeys*	7 storeys	✓
Minimum First Storey Height	N/A	4.5 m	6.5 m	✓
First Storey Transparency	N/A	40% of the surface area of the first storey of a building up to 4.5 m from the ground when the building is within 15 m of an arterial or collector road	Not applicable. Building is not located within 15 m of an arterial road	N/A
Angular Plane	N/A	15 degrees from interior and rear lot lines when adjacent to an institutional or medium density zone, measured 10.0 m above the average elevation of the grade at the required setback from the property line	58 degrees	Amendment Requested - new by-law
Maximum Building Length	N/A	75 m for buildings within 15 m of a street	Not applicable, building is not located within 15 m of a street	N/A
Minimum Distance Between Buildings	N/A	1/3 building height to a maximum of 15 m and a minimum of 5 m	15.3 m	✓
Minimum Common Amenity Area	1,300 m ² *	1,300 m ² *	1,300 m ²	✓
Minimum Common Amenity Area Location	N/A	Aggregated into areas not less than 50 m ² with length not exceeding 4x the width	1,300 m ²	✓

Provision	SC.1-10 Zone (1995-1486A)	MUC.2(PA) (Draft CZBL)	Provided	Compliance
Minimum Landscaped Open Space	10% of lot area	10% of lot area	Lot Area: 22,226 m ² Landscaped Open Space: 6,900 m ² Percent: 31%	✓
Parking	1 unit = 0.1 unit visitor* = 654 x 3.1 = 200 parking stalls	Apartment Building First 20 units = 1.5 spaces / unit 21 units = 1.25 spaces / unit 20% for visitors = 20 x 1.5 + 63x 1.25 = 82.3 parking stalls	0.35 spaces / bed, inclusive of visitor parking = 754 * 0.35 = 191 191 spaces provided	Amendment Requested - both by-laws
Accessible Parking	2	1 + 1% of total spaces, equal number of Type A and Type B = 1 + (191/100) = 7 spaces	7 spaces	✓
Parking Space Size	2.25 m x 5.5 m*	2.25 m x 5.5 m (standard) 3.4 m x 5.5 m (Type A accessible) 2.4 x 5.5 m (Type B accessible)	2.25 m x 5.5 m (standard) 3.4 m x 5.5 m (Type A accessible) 2.4 x 5.5 m (Type B accessible)	✓
Parking Aisle Width	N/A	The minimum width of a parking aisle providing two-way access shall be 6.5 metres	6.5 m single-loaded aisle 7.0 m double-loaded aisle	✓

Provision	SC.1-10 Zone (1995-1486A)	MUC.2(PA) (Draft CZBL)	Provided	Compliance
Electric Vehicle Parking	N/A	10% of required parking to have electric vehicle charging stations, with 80% designed to accommodate EV parking in the future = 191 * 0.1 = 19 EV stalls = 40 required to have minimum Level 2 chargers	5 EV parking stalls	Amendment Requested - new by-law
Bicycle Parking	N/A	1 per unit (short term) = 654 * 1 = 66 1 per unit (long term) = 654	25 per bed = 754 * 0.35 = 191	Amendment Requested - new by-law
Buffer Strip	1.5 m	A 3 m buffer strip is required adjacent to interior side and rear lot lines 3 m buffer strip is required around the perimeter of surface parking lots	North: 3.35 m to match existing South: 3 m	Amendment Requested - new by-law, continues existing condition to Phase 2
Active Entrance	N/A	1 active entrance for every 30 m of street line when the building is within 15 m of an arterial or collector road	Not applicable, building is not located within 15 m of a street	N/A

SITE STATISTICS

EXISTING ZONING	SC. 1-10		
SITE AREA	22,226.00 m ²	239,239 ft ²	2.22 ha
FRONTAGE	122.20 m	401 ft	
DEPTH	241.20 m	791 ft	

PROJECT STATISTICS

PHASE 1 (TO REMAIN)	GFA (Above Grade)		UNIT COUNT		BUILDING HEIGHT
		8,641.6 m ²	93,017 ft ²	164 UNITS	STUDIOS = 151 2 BED = 13
PHASE 2 (PROPOSED)	21,936.0 m ²	236,115 ft ²	489 UNITS	STUDIOS = 391 2 BED = 98	7 STOREYS
TOTAL	30,577.6 m ²	329,132 ft ²	653 UNITS	STUDIOS = 542 2 BED = 111	

FSI:	1.37
UNITS / HECTARE:	294 UNITS / HA

AMENITY

PHASE 1 & 2	1,300 + m ²
-------------	------------------------

BICYCLE PARKING

TOTAL BICYCLE PARKING ON SITE:	191
--------------------------------	-----

CAR PARKING

ACCESSIBLE PARKING:	7 (1 + 3%)
TOTAL PARKING ON SITE:	191

LOADING

PHASE 1	1 LOADING SPACE
PHASE 2	2 LOADING SPACES

Proposed Development
237 Janefield Ave
(8 & 10 Storey)



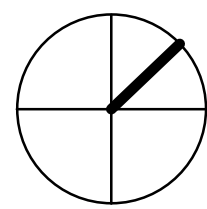
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23-09-15 Issued for OPA & ZBA



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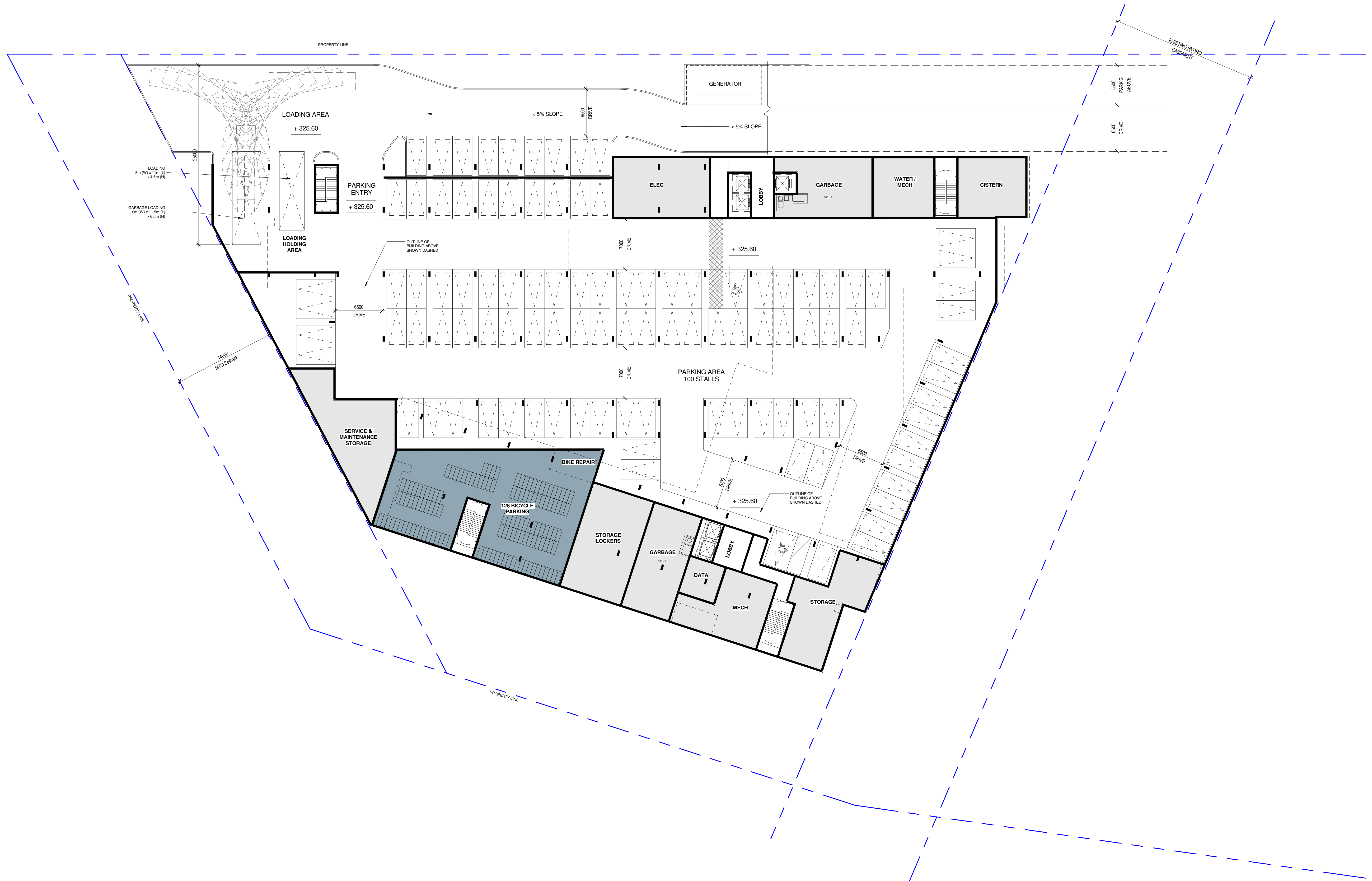
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ALMA GUELPH Phase 2
601 Scottsdale Dr
Guelph, ON

OWNER
Forum

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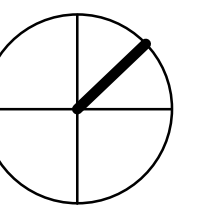
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 Guelph, ON

OWNER
Forum

DWG TITLE
Floor Plans_Level -1 Parking

DATE: 08/24/23
 SCALE: 1 : 250
 DRAWN: BJS
 CHECKED: JG/AJH
 PROJ. No.: 2305

DWG No.

AZ200

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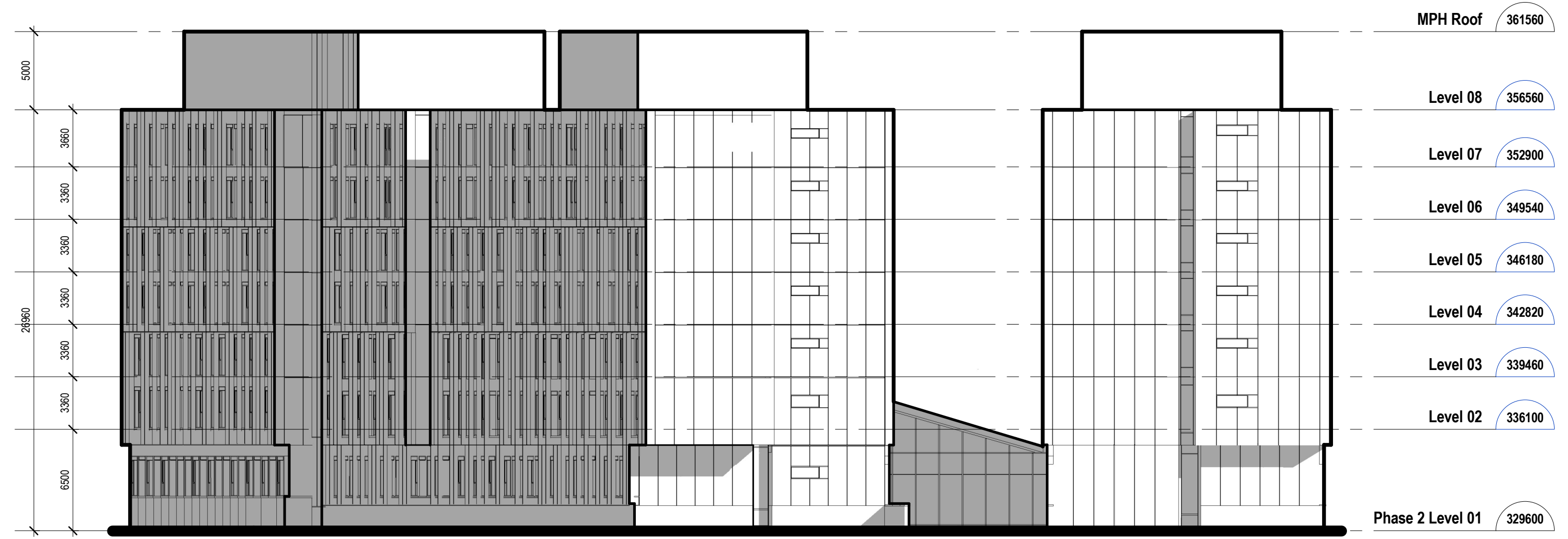
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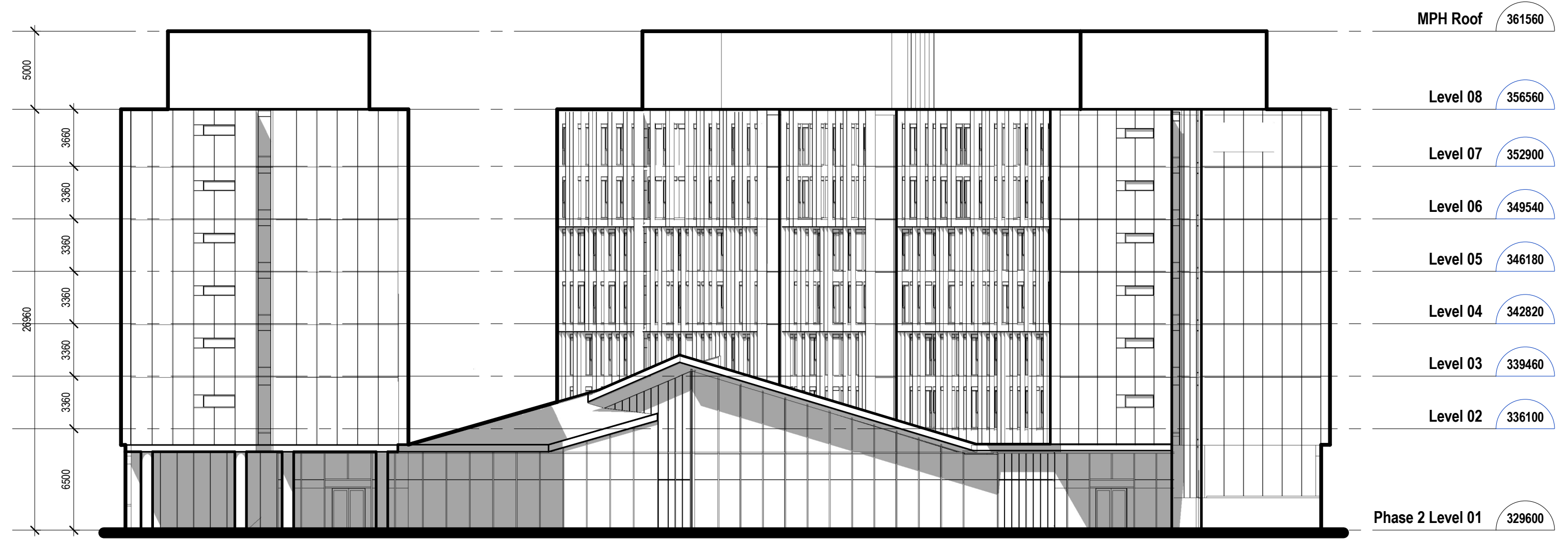
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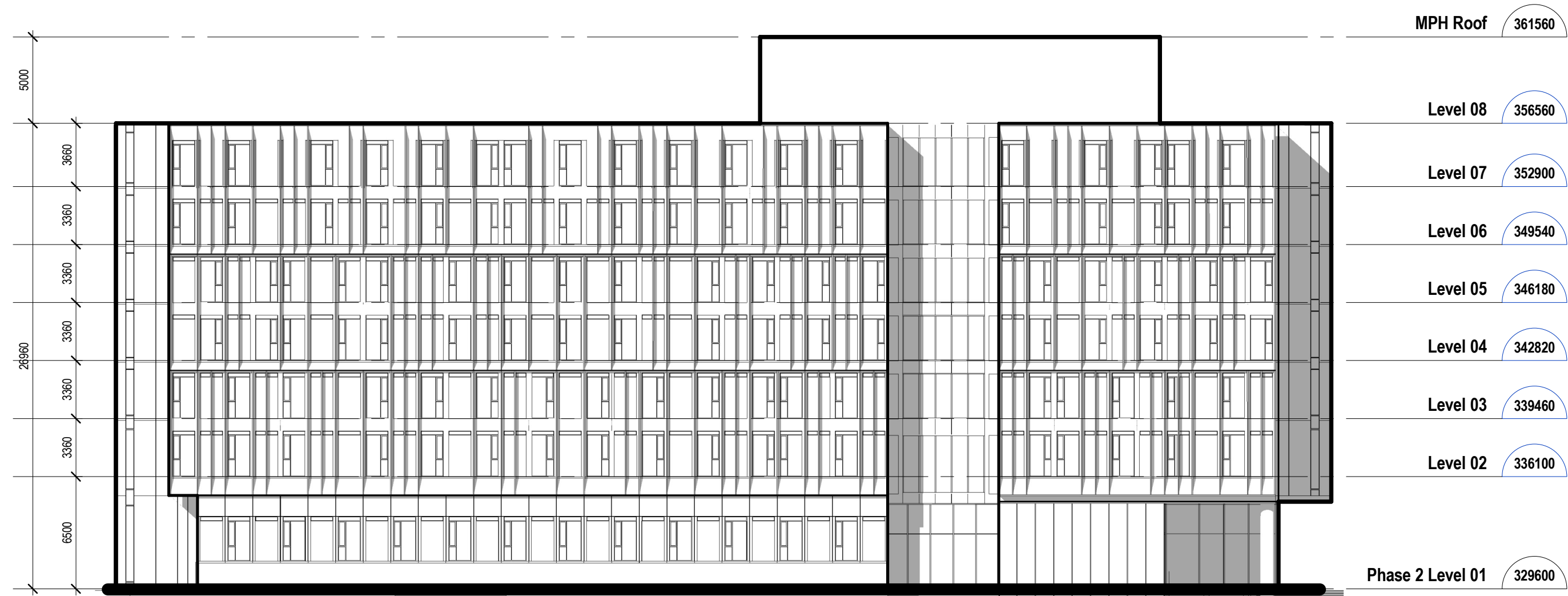
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AZ401 1 : 250



3 Block A - East Elevation
AZ401 1 : 250



2 Block A - South Elevation
AZ401 1 : 250



1 Block A - North Elevation
AZ401 1 : 250

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DWG TITLE
Building Elevations_Block A

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PROJ. No. : 2305

DWG No.

AZ401

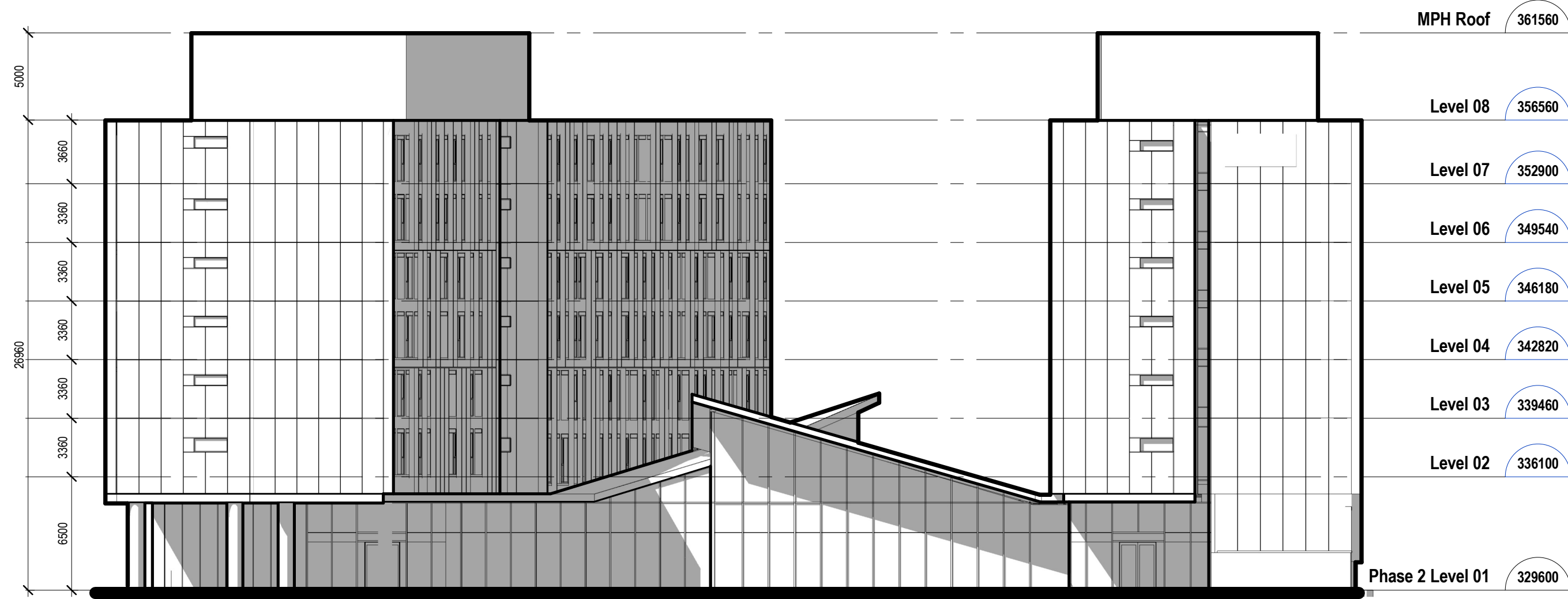
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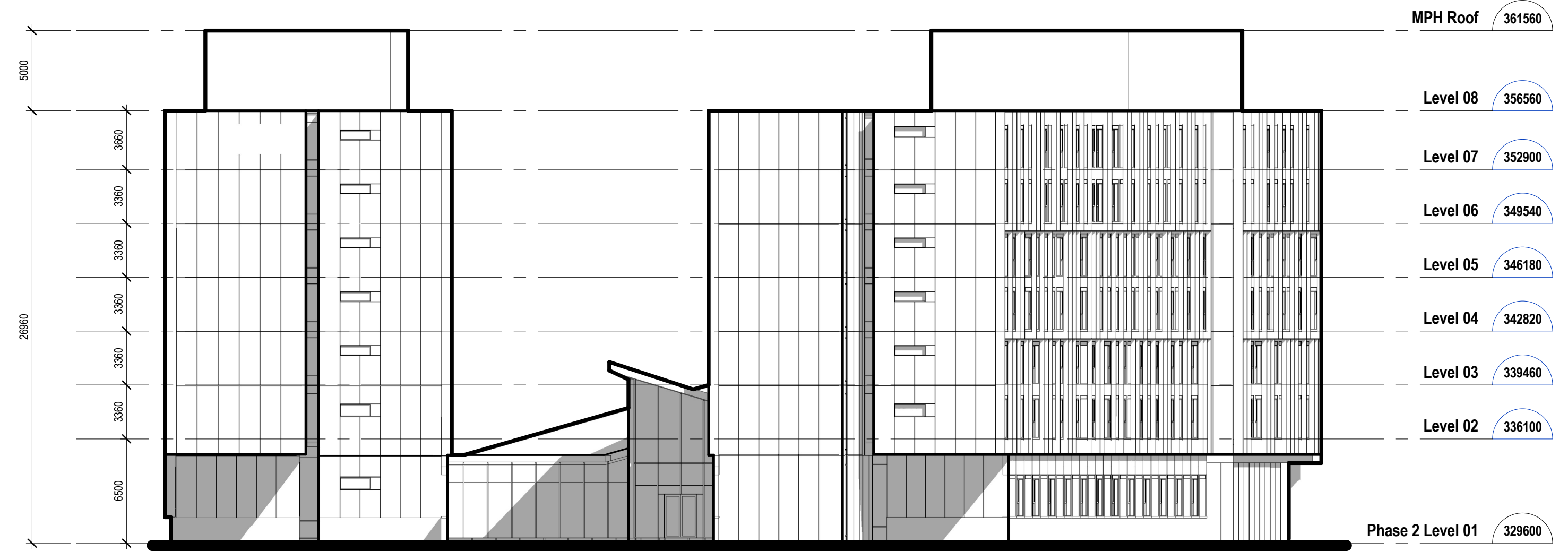
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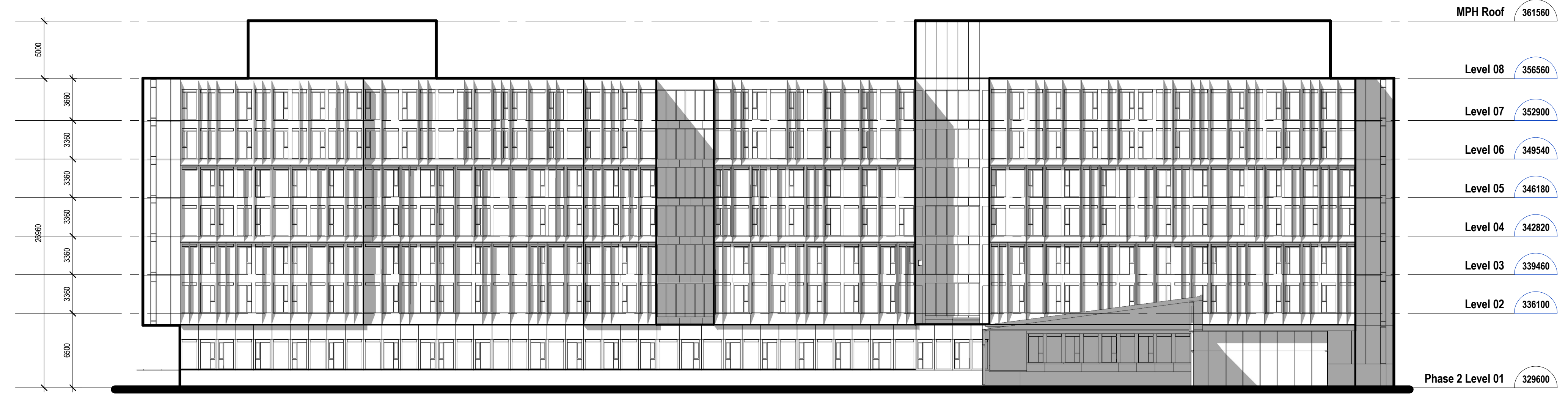
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4 Block B - East Elevation
AZ402 1 : 250



3 Block B - West Elevation
AZ402 1 : 250



2 Block B - South Elevation
AZ402 1 : 250



1 Block B - North Elevation
AZ402 1 : 250

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DWG TITLE
Building Elevations_Block B

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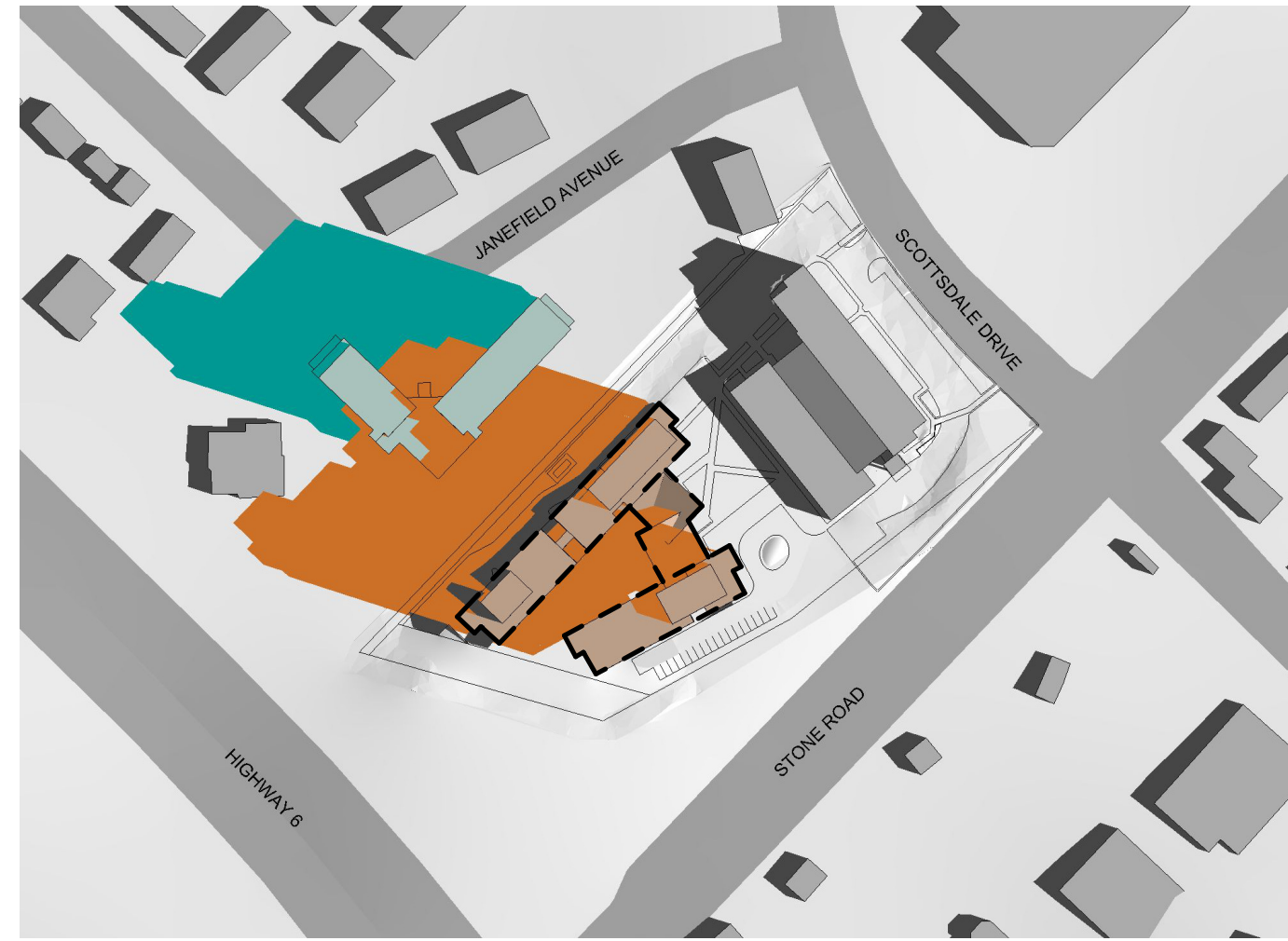
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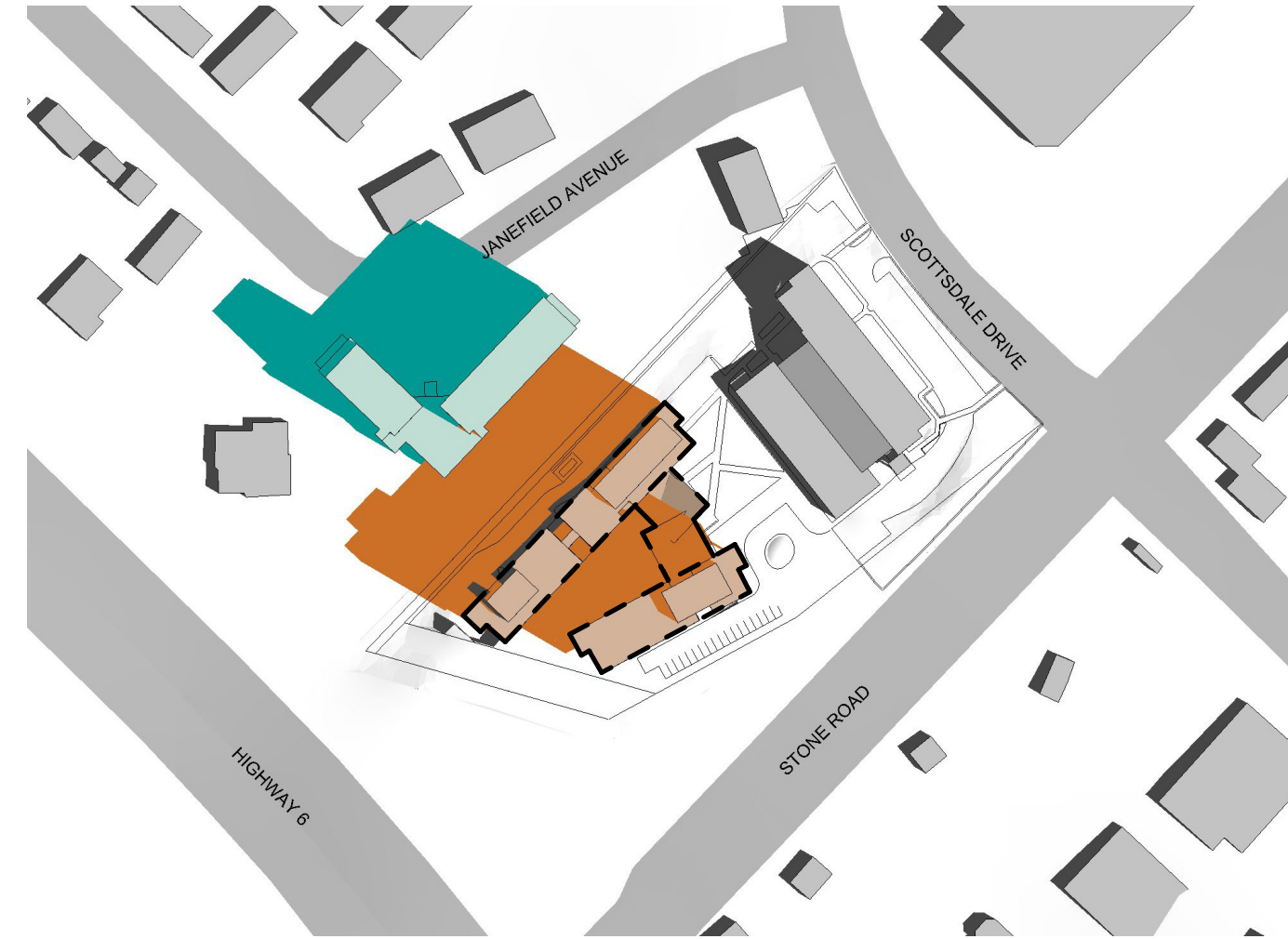
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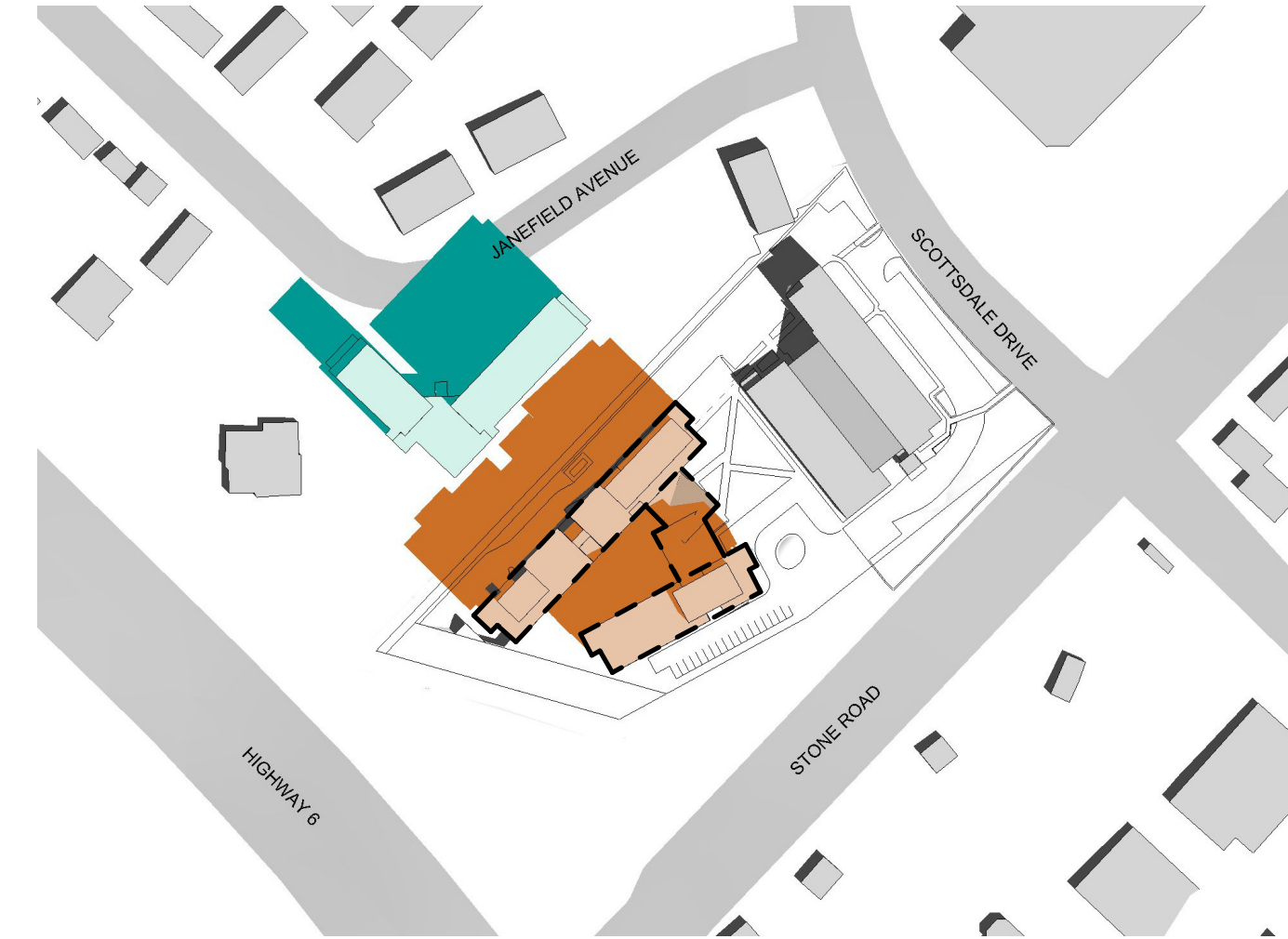
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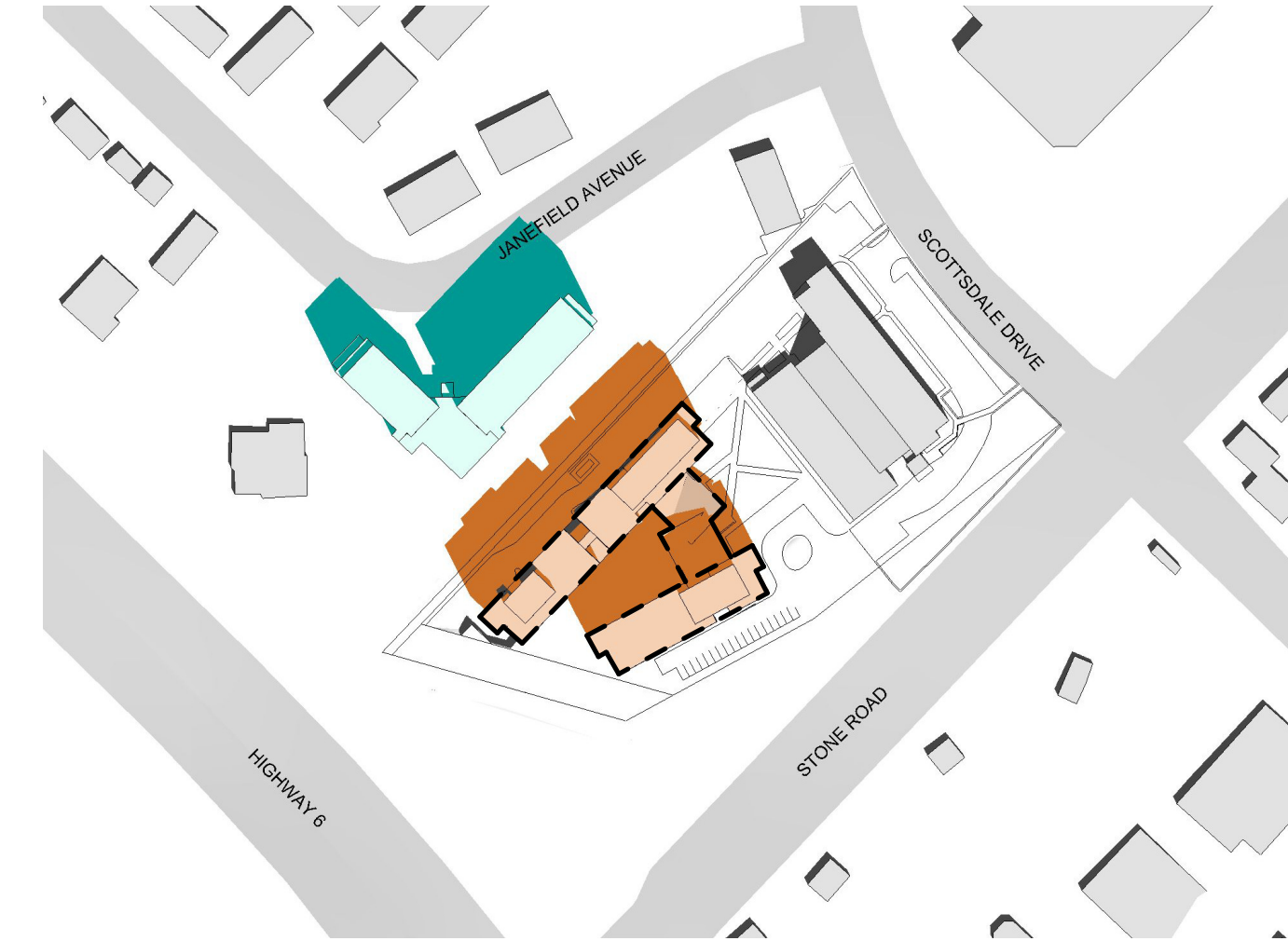
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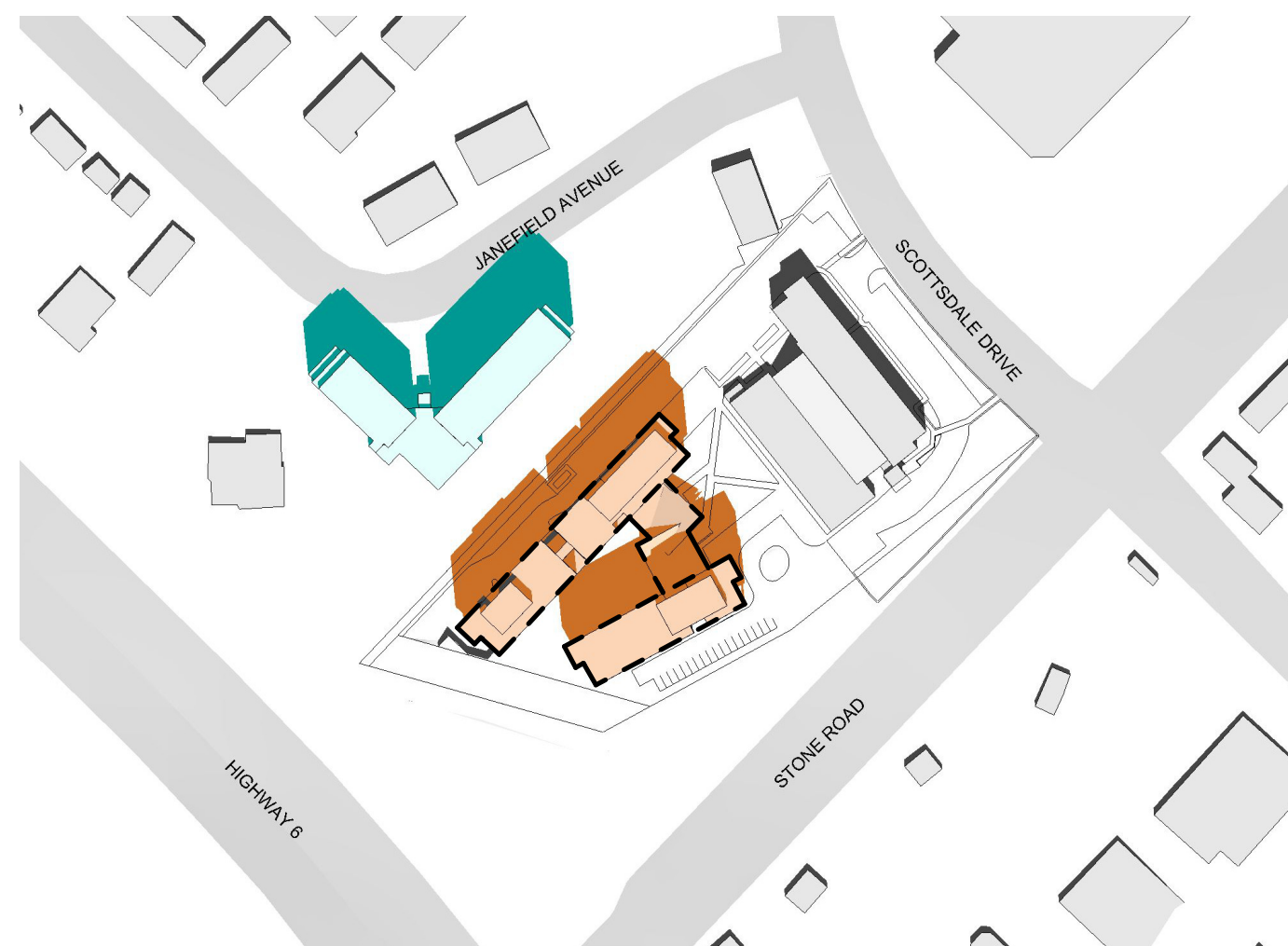
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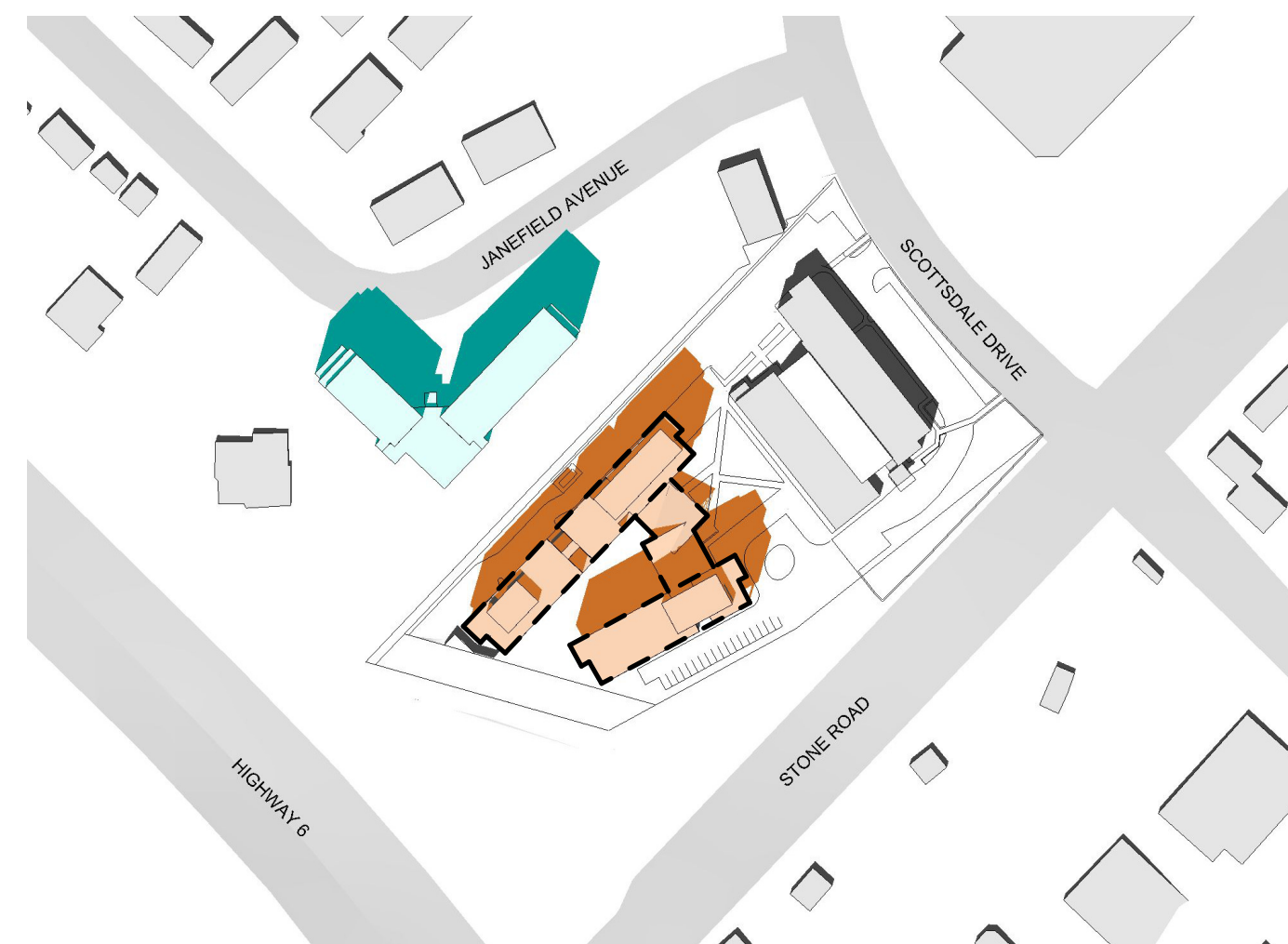
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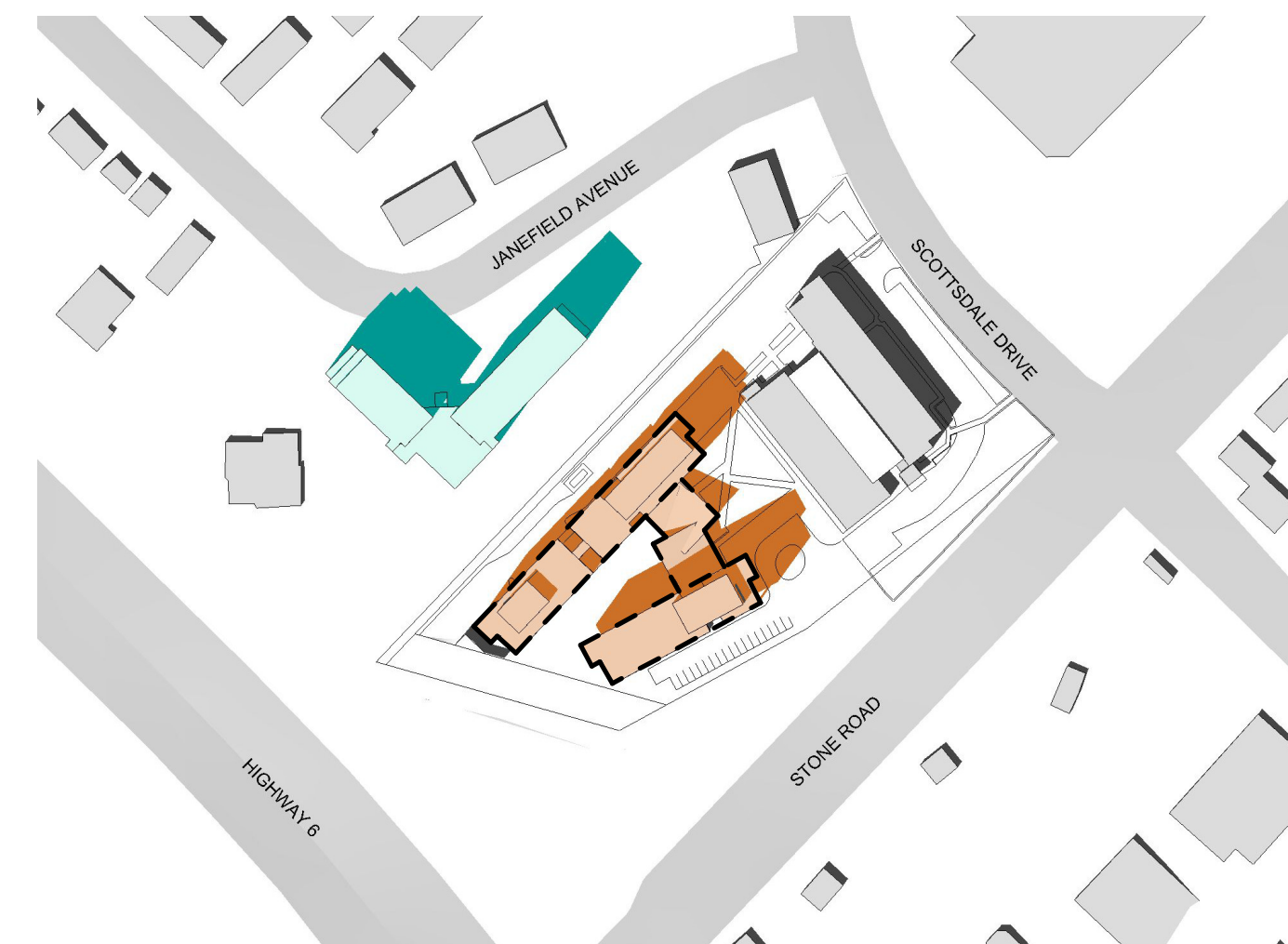
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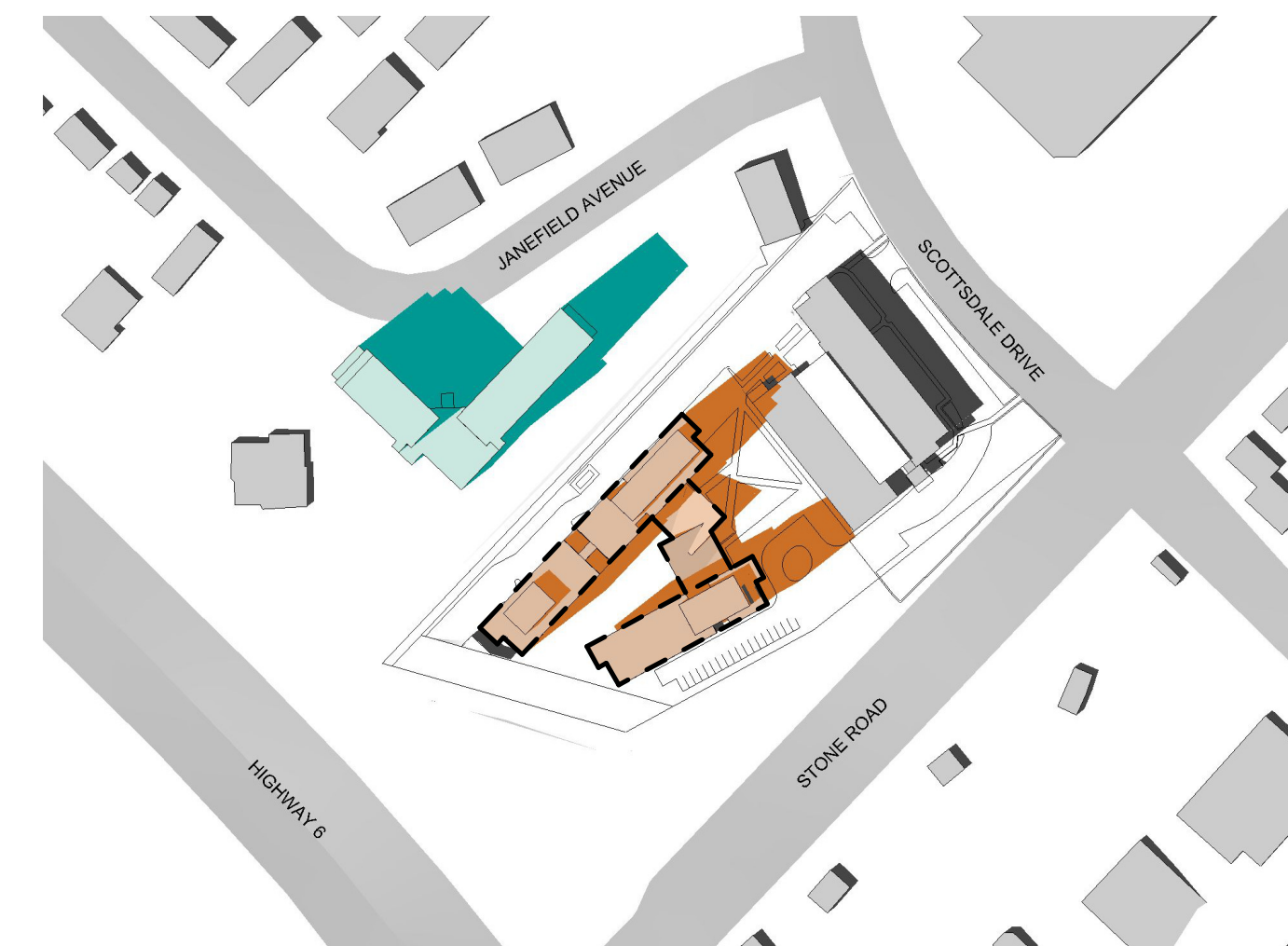
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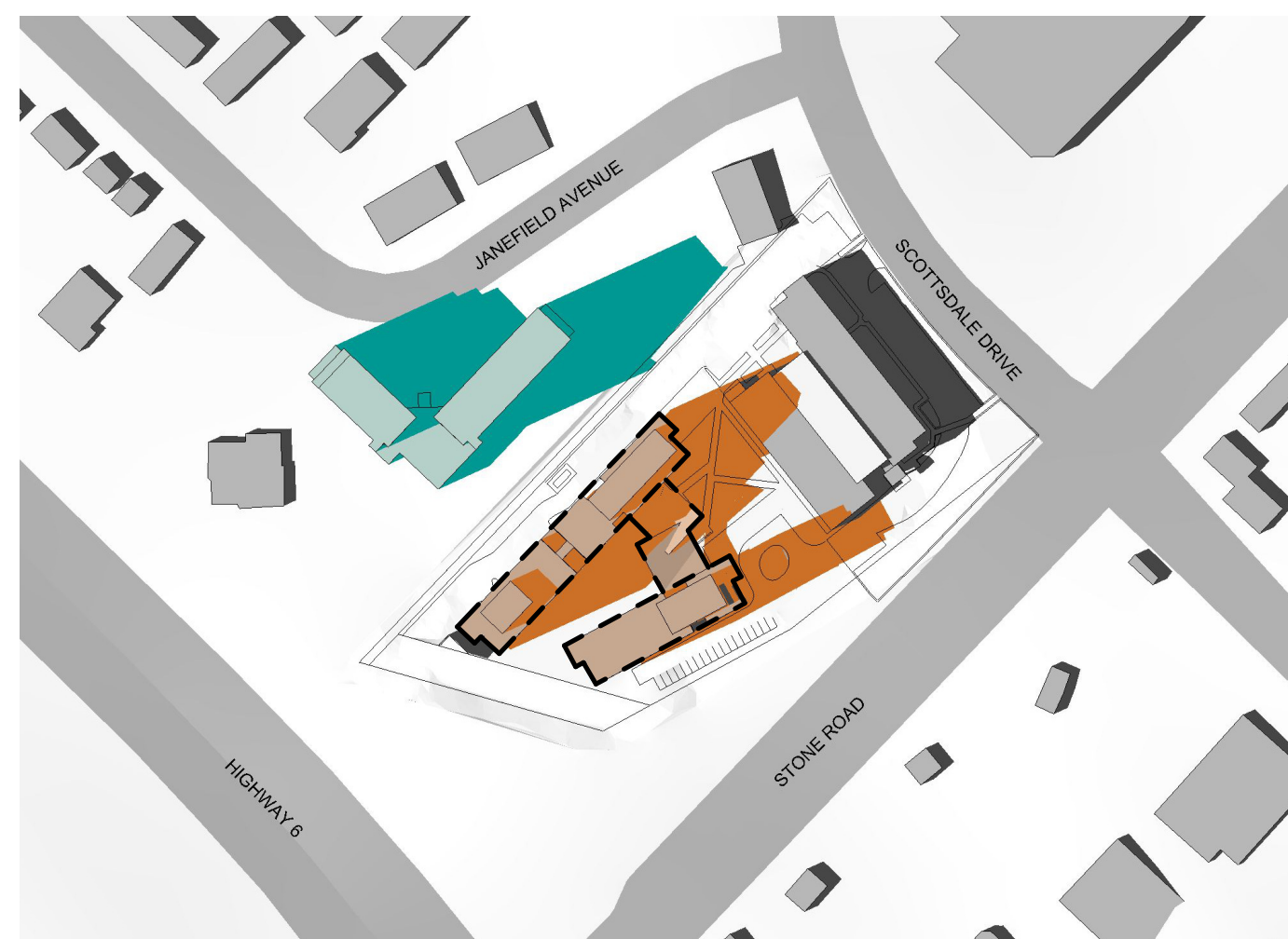
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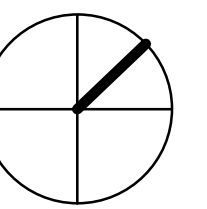
SEPTEMBER 21 - 3:00 PM EDT



SEPTEMBER 21 - 4:00 PM EDT



SEPTEMBER 21 - 5:00 PM EDT



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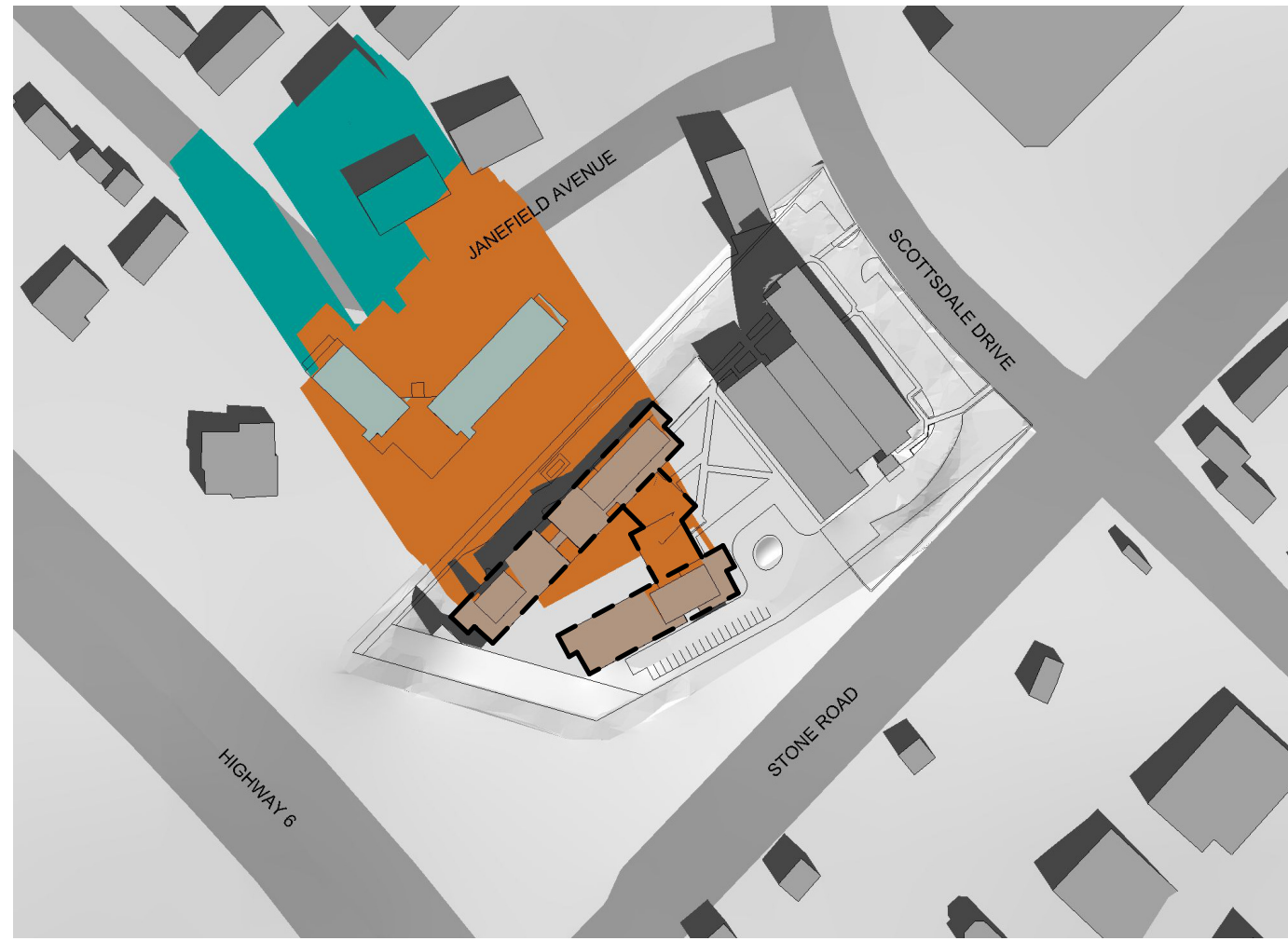
PROJ. NAME
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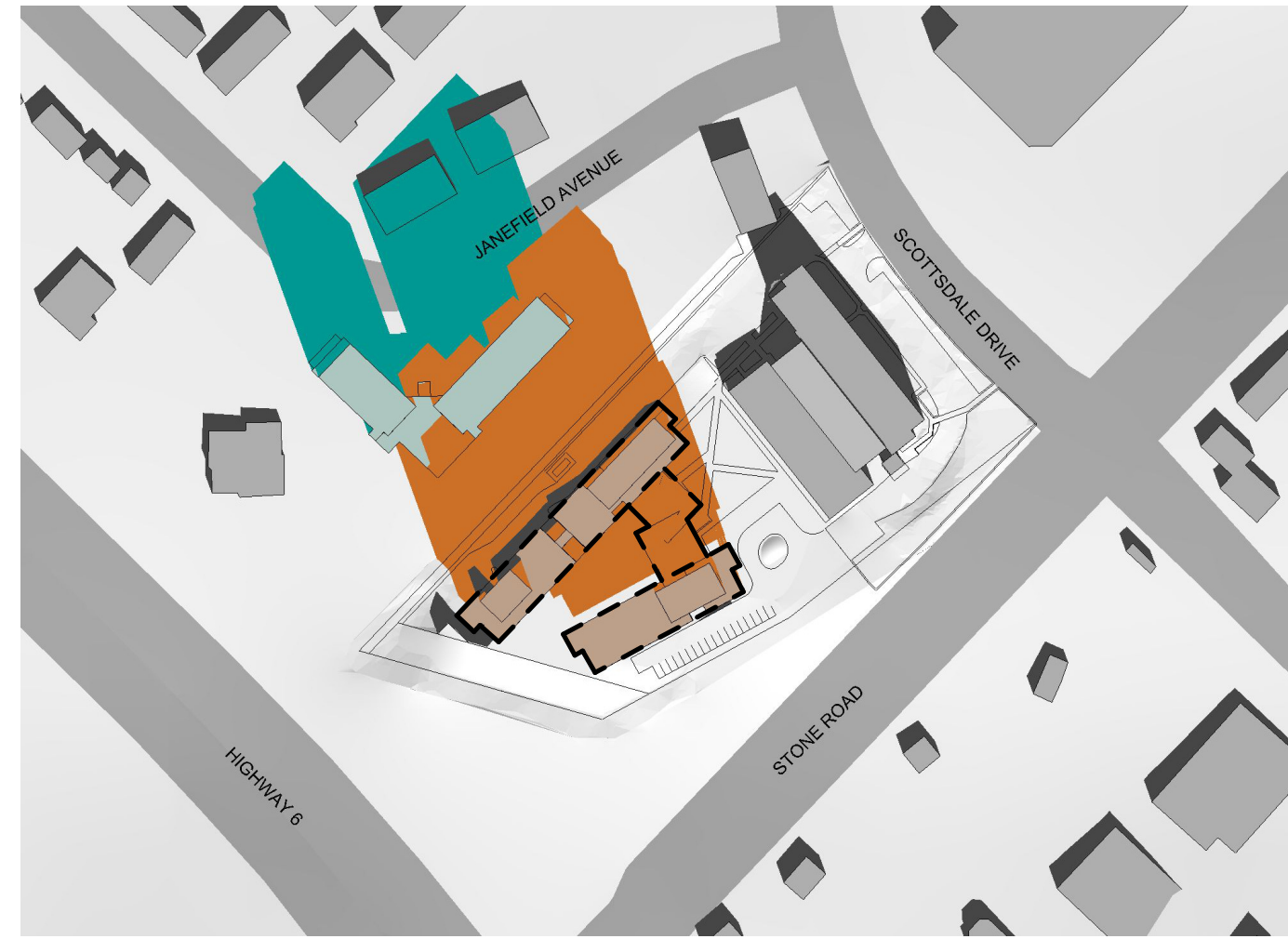
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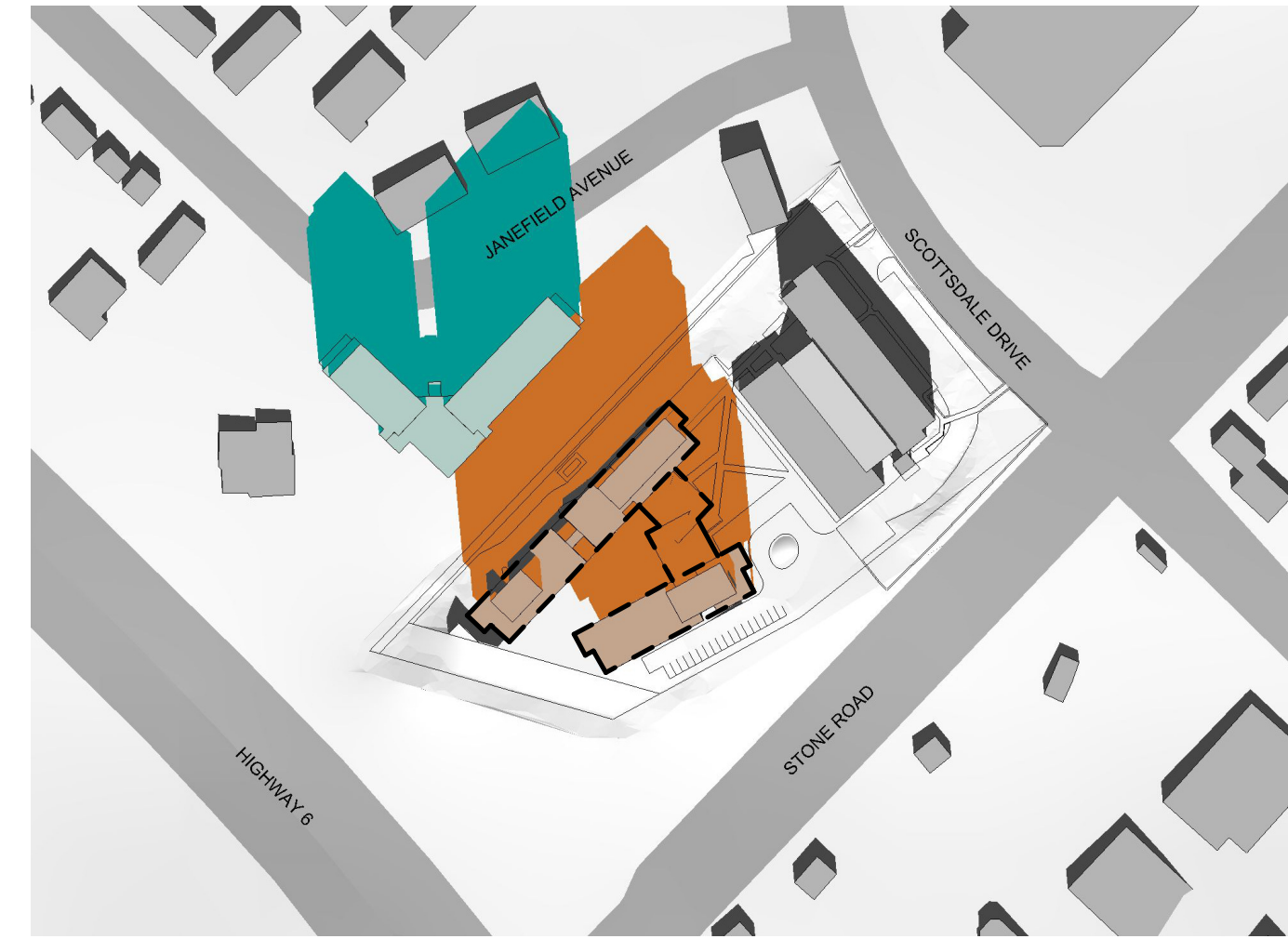
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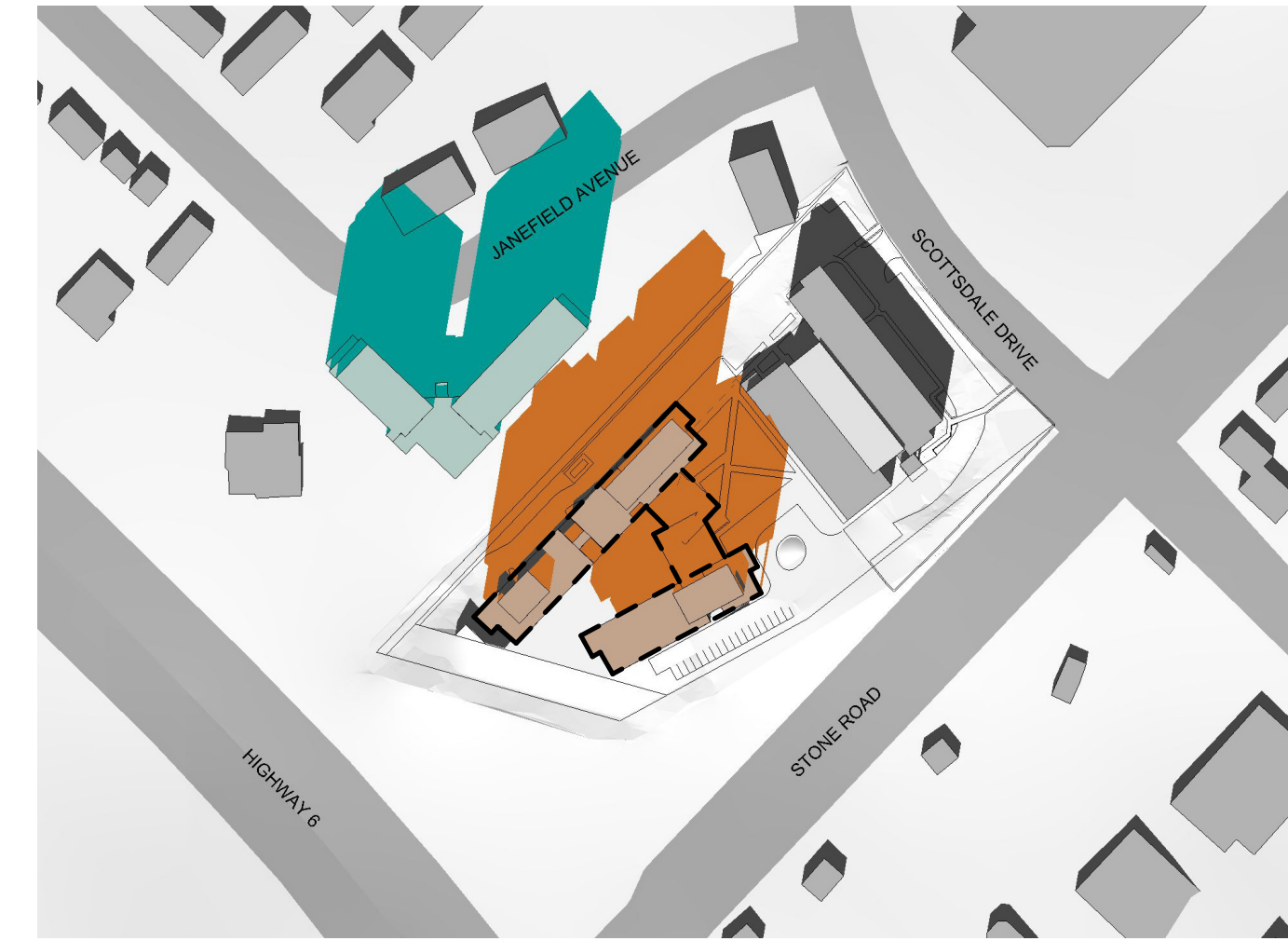
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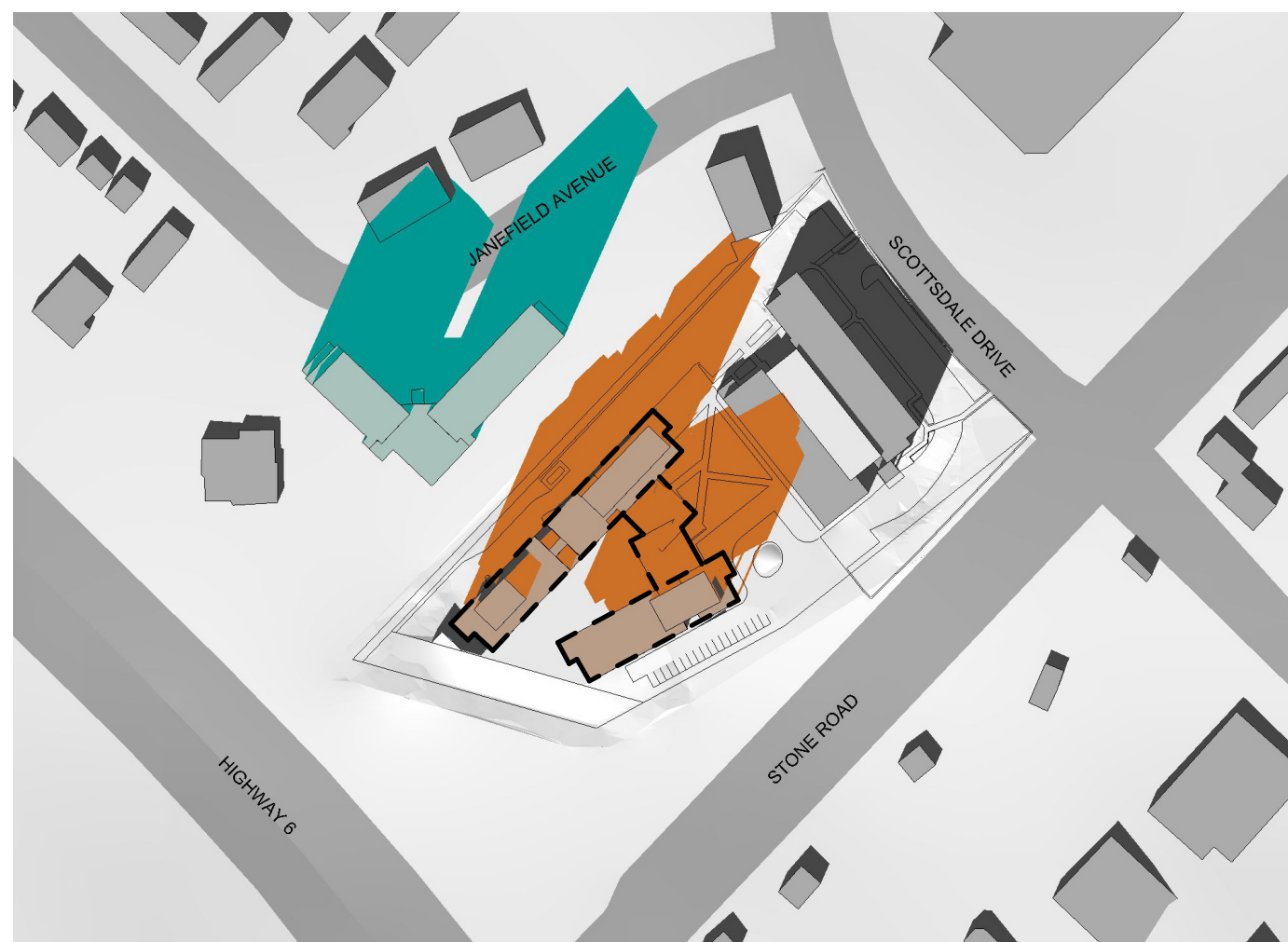
DECEMBER 21 - 11:00 AM EST



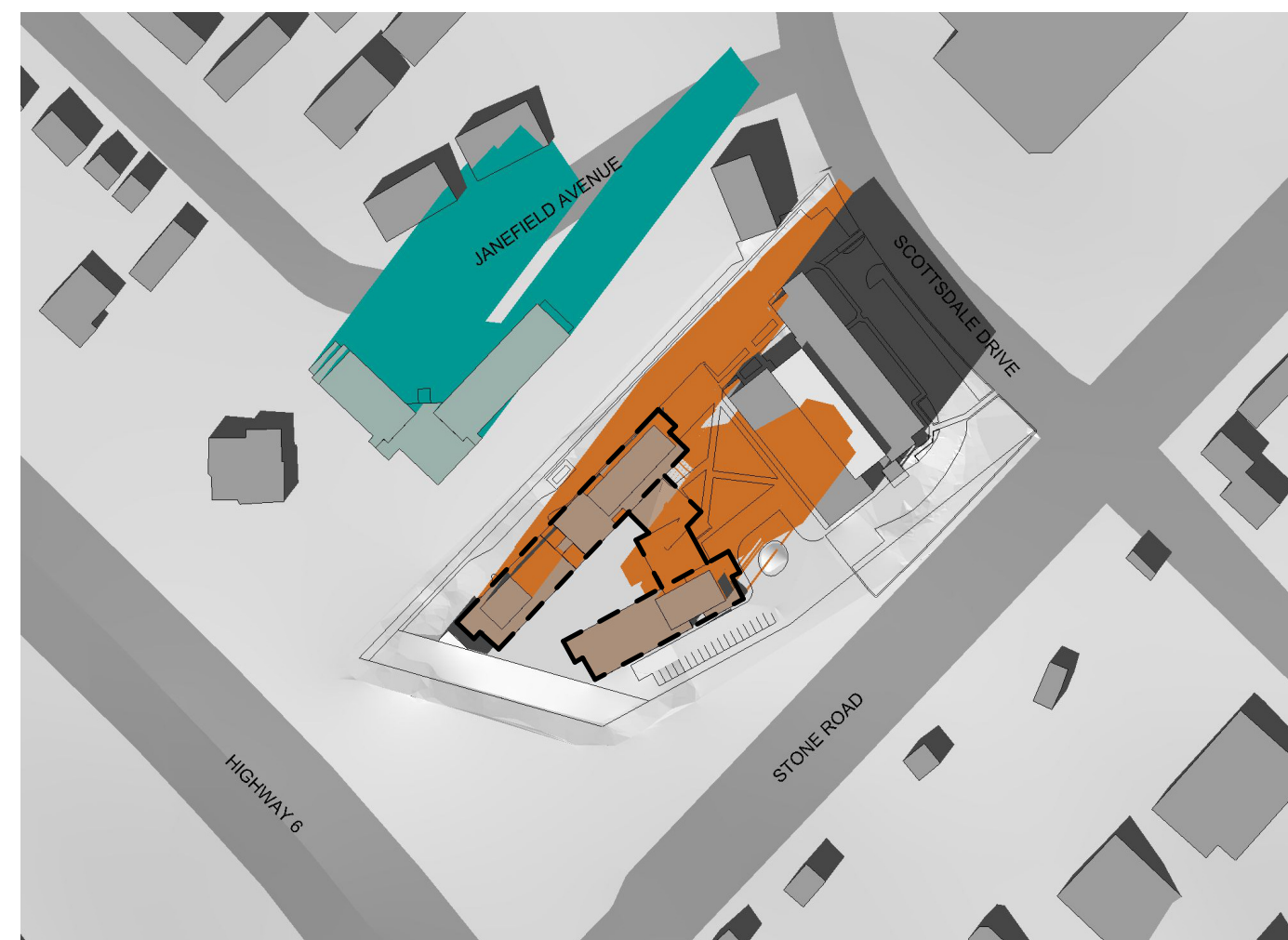
DECEMBER 21 - 12:00 PM EST



DECEMBER 21 - 1:00 PM EST



DECEMBER 21 - 2:00 PM EST



DECEMBER 21 - 3:00 PM EST

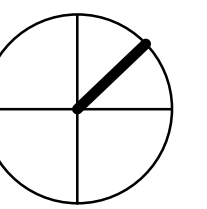
DRAWING NOT TO BE SCALED

Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work.

This drawing shall not be used for construction purposes until signed by the consultant responsible. This drawing, as an instrument of service, is provided by and is the property of Sweeney & Co. Architects.

ISSUED

23-09-15 Issued for OPA & ZBA



**Sweeney&Co
Architects**

134 PETER STREET | SUITE 1601
TORONTO, ONTARIO | M5V 2H2 | CANADA
P: 416-971-6252 | F: 416-971-5420
E: info@sweeneyandco.com | www.sweeneyandco.com

PROJ. NAME
ALMA GUELPH Phase 2
601 Scottsdale Dr
Guelph, ON

OWNER
Forum

DWG TITLE
Shadow Studies December

DATE: 07/28/23
SCALE:
DRAWN: Author
CHECKED: Checker
PROJ. No.: 2305 DWG No.

AZ1104

Appendix B

Borehole Logs

ID No.: MW101-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

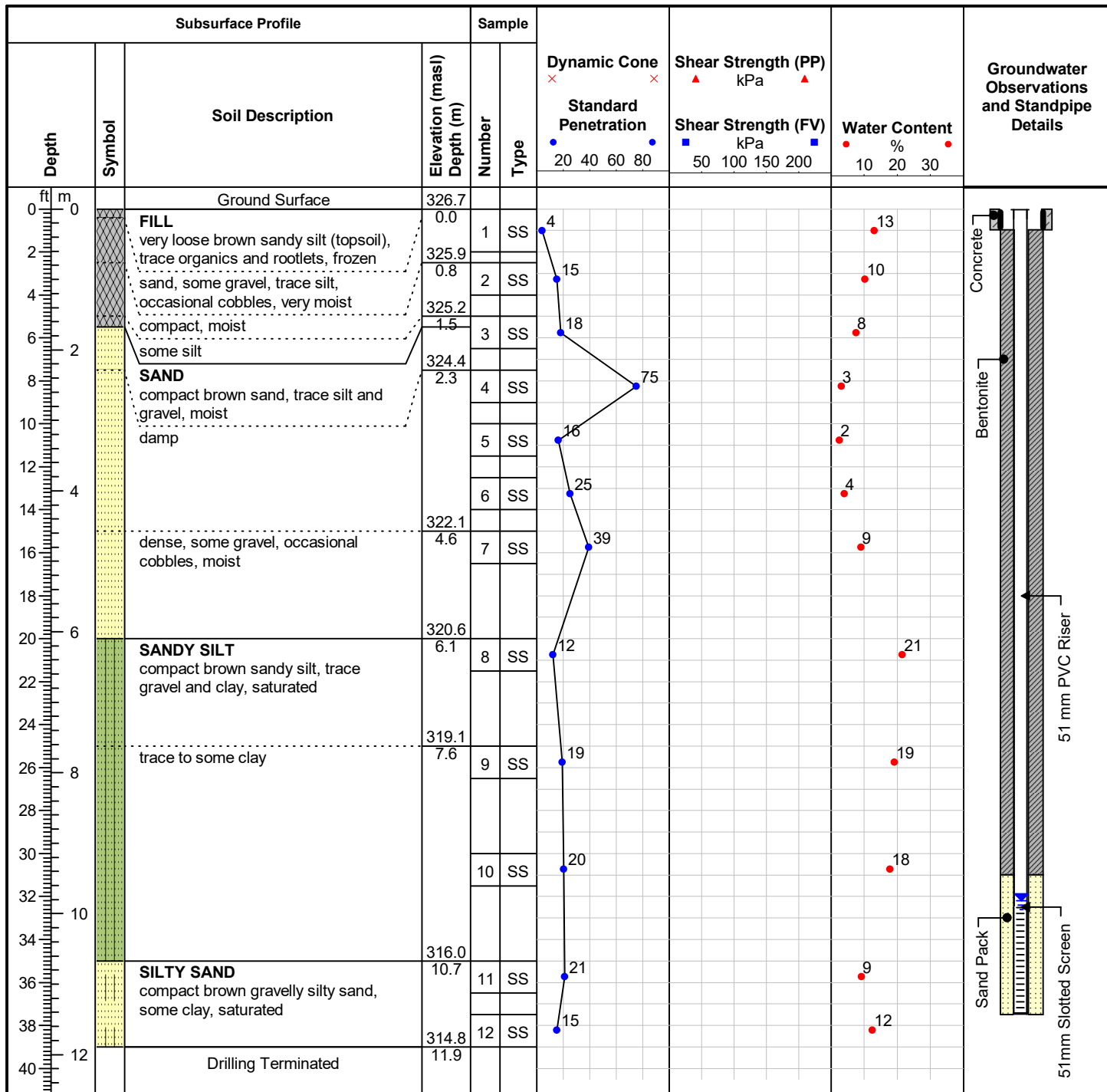
Date Completed: 3/8/2023

Drilling Contractor: Direct Environmental Drilling

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 320.6 masl) during drilling. Water measured at 9.8 mbgs (Elevation 316.9 masl) on March 22, 2023

ID No.: BH102-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

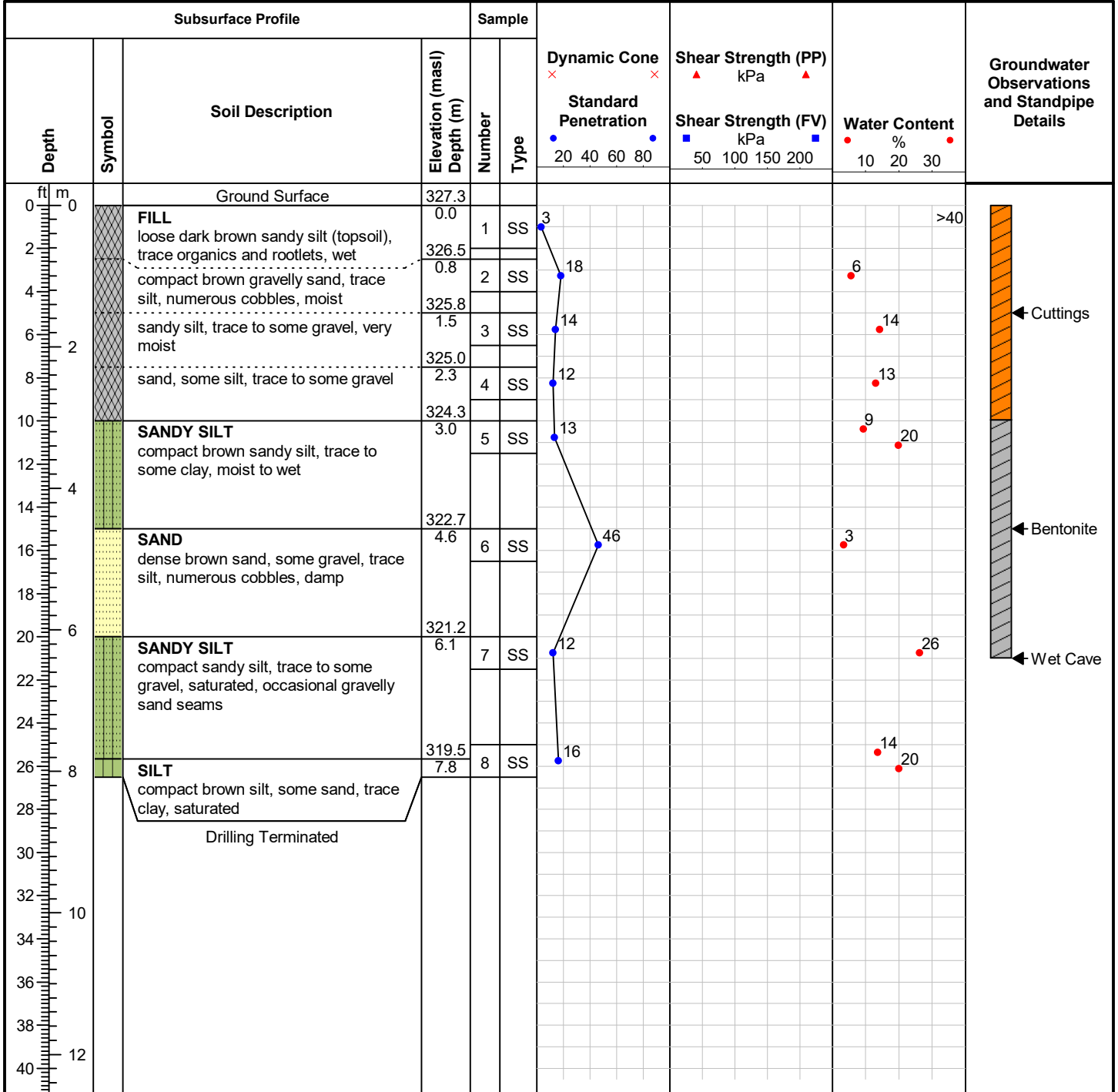
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KR D

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.2 masl) during drilling.

ID No.: BH103-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

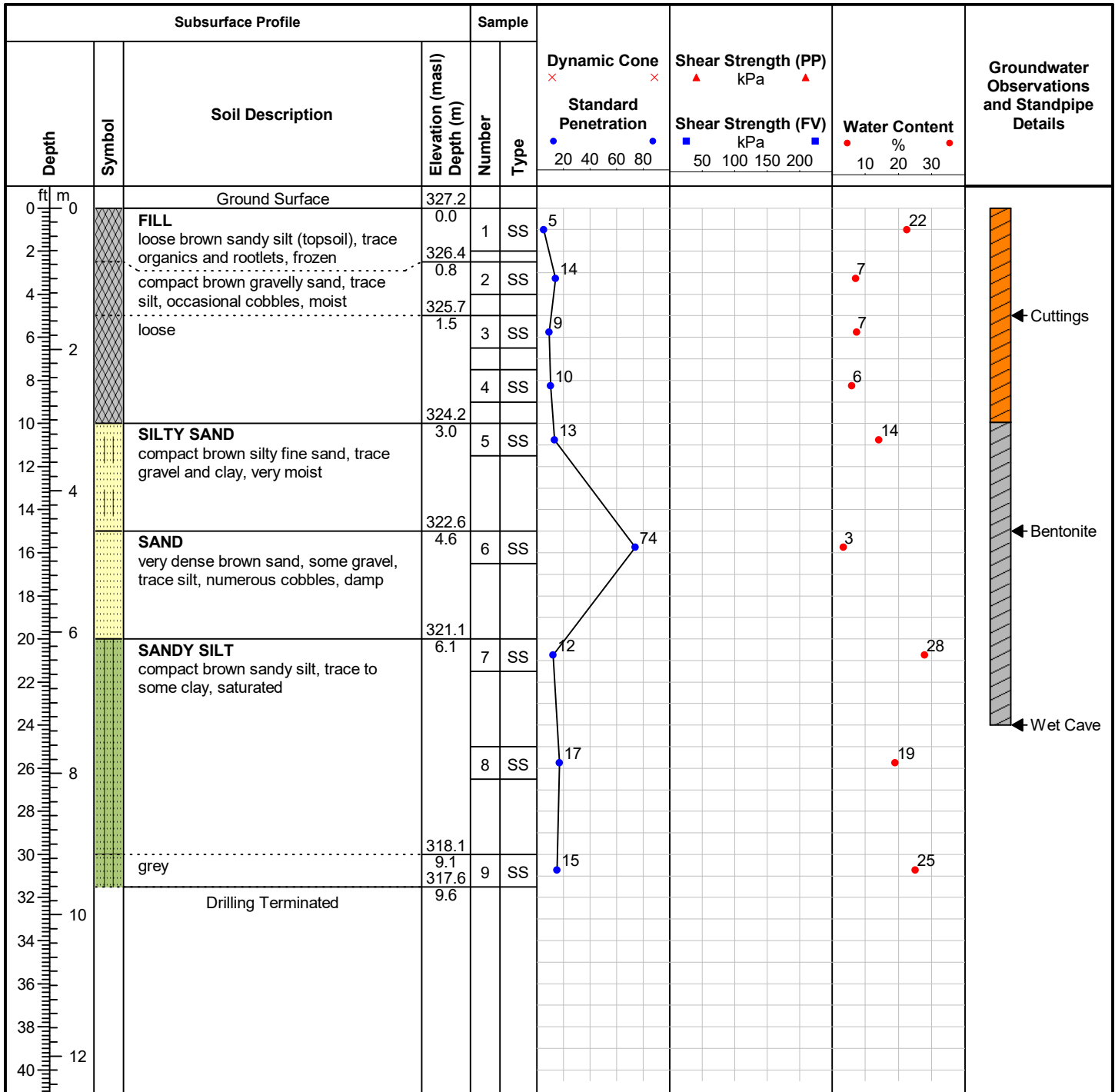
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KR D

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.1 masl) during drilling.

ID No.: BH104-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

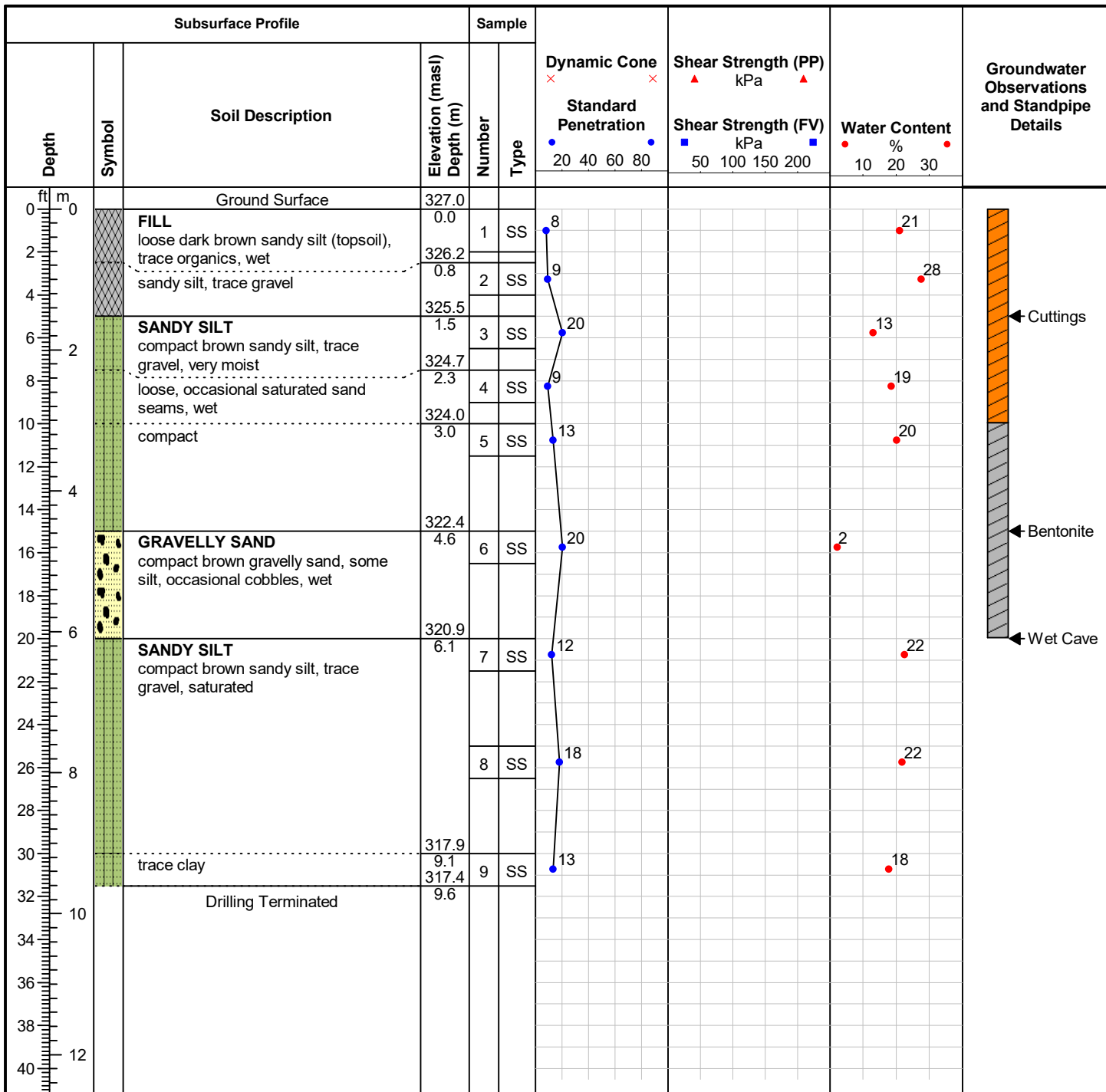
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 320.9 masl) during drilling.

ID No.: BH105-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

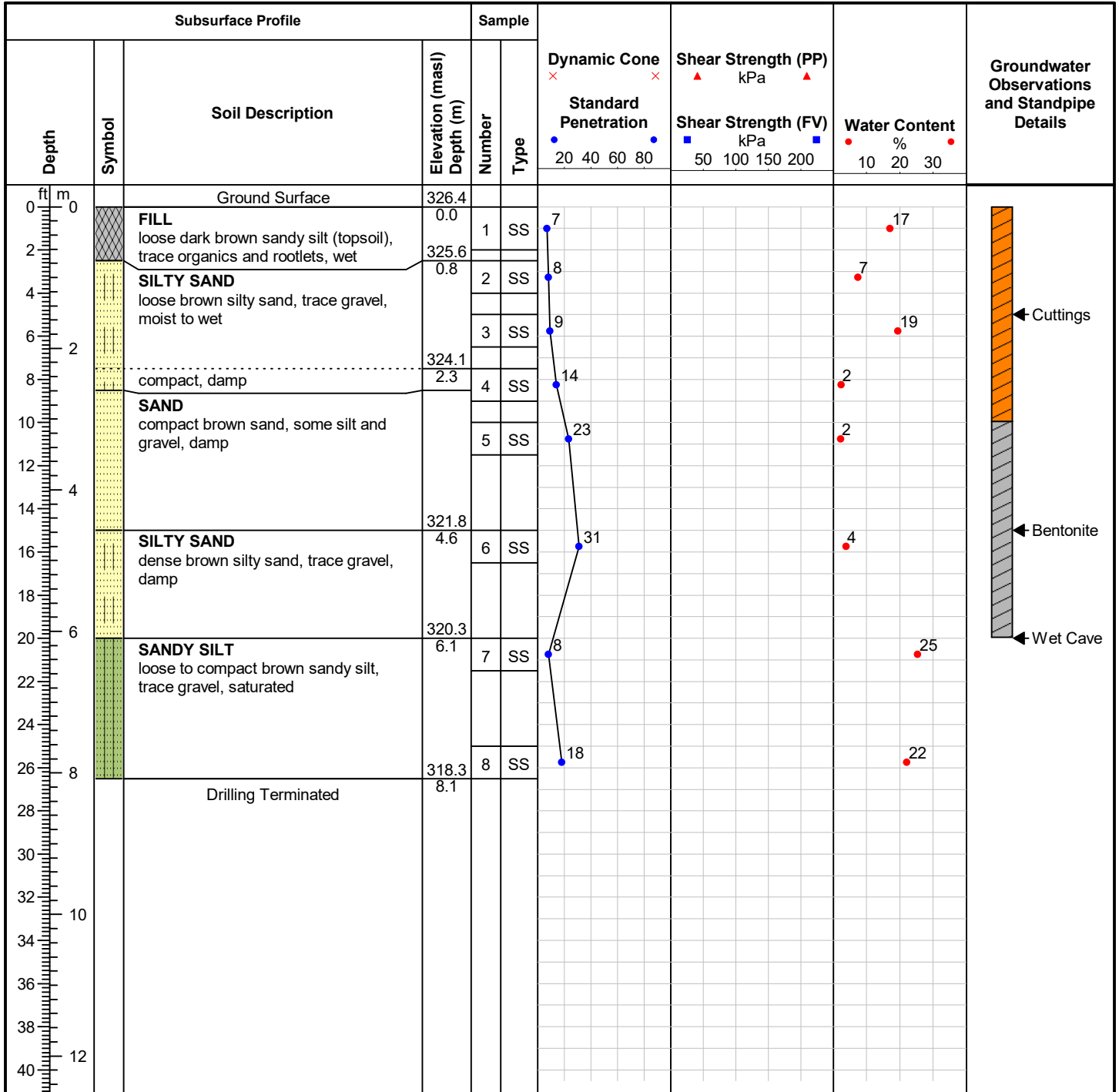
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs
(Elevation 320.3 masl) during drilling.

ID No.: BH106-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

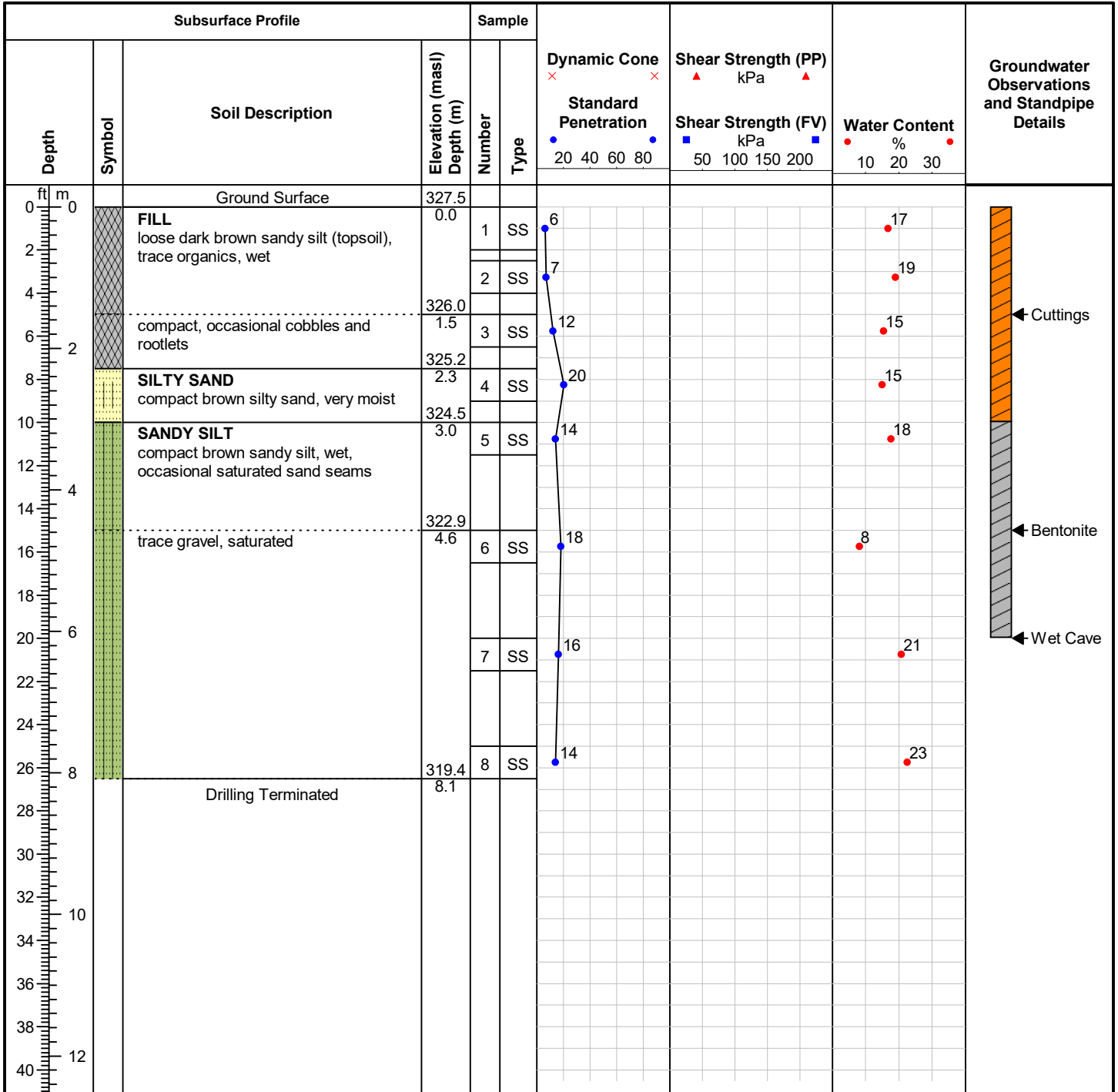
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 4.6 mbgs (Elevation 322.9 masl) during drilling.

ID No.: BH107-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

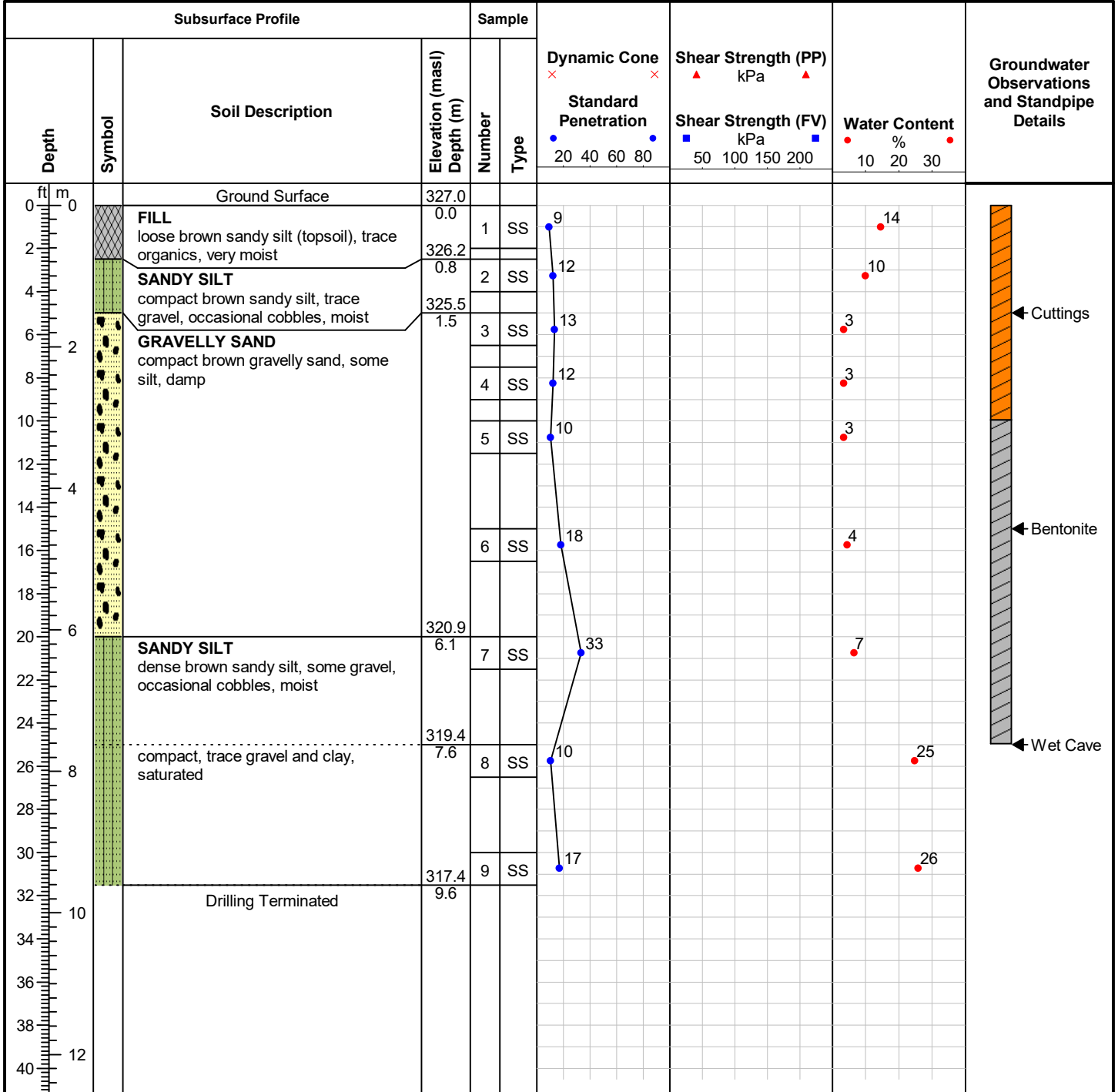
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KR D

Reviewed by: DG



Groundwater encountered at 7.6 mbgs (Elevation 319.4 masl) during drilling.

ID No.: MW108-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

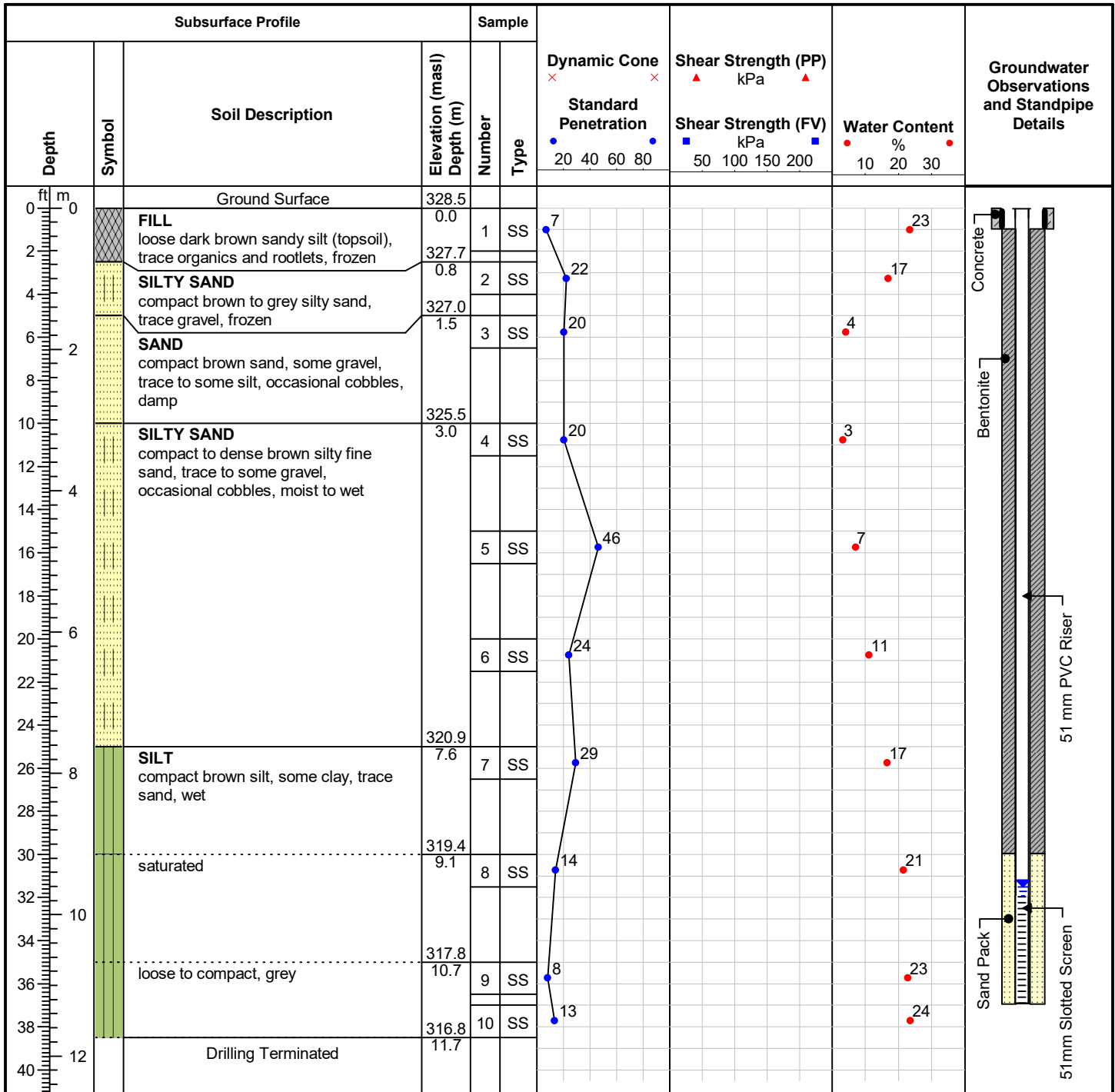
Date Completed: 3/8/2023

Drilling Contractor: London Soil Test

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup



Field Technician: HXS

Drafted by: KR D

Reviewed by: DG



Groundwater encountered at 9.1 mbgs (Elevation 319.4 masl) during drilling. Water measured at 9.6 mbgs (Elevation 318.9 masl) on March 22, 2023

ID No.: BH109-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

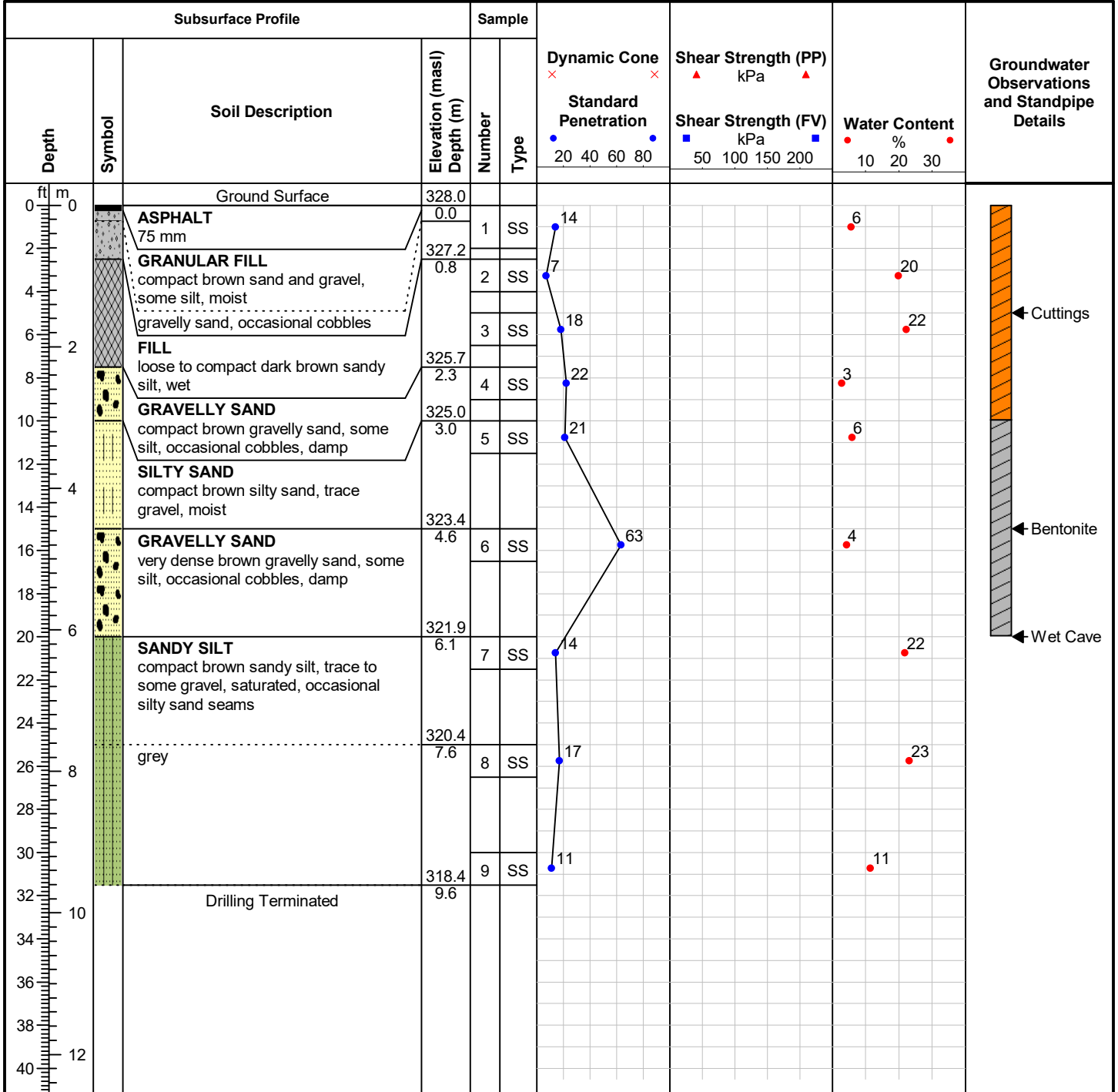
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KR D

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.9 masl) during drilling.

ID No.: BH110-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

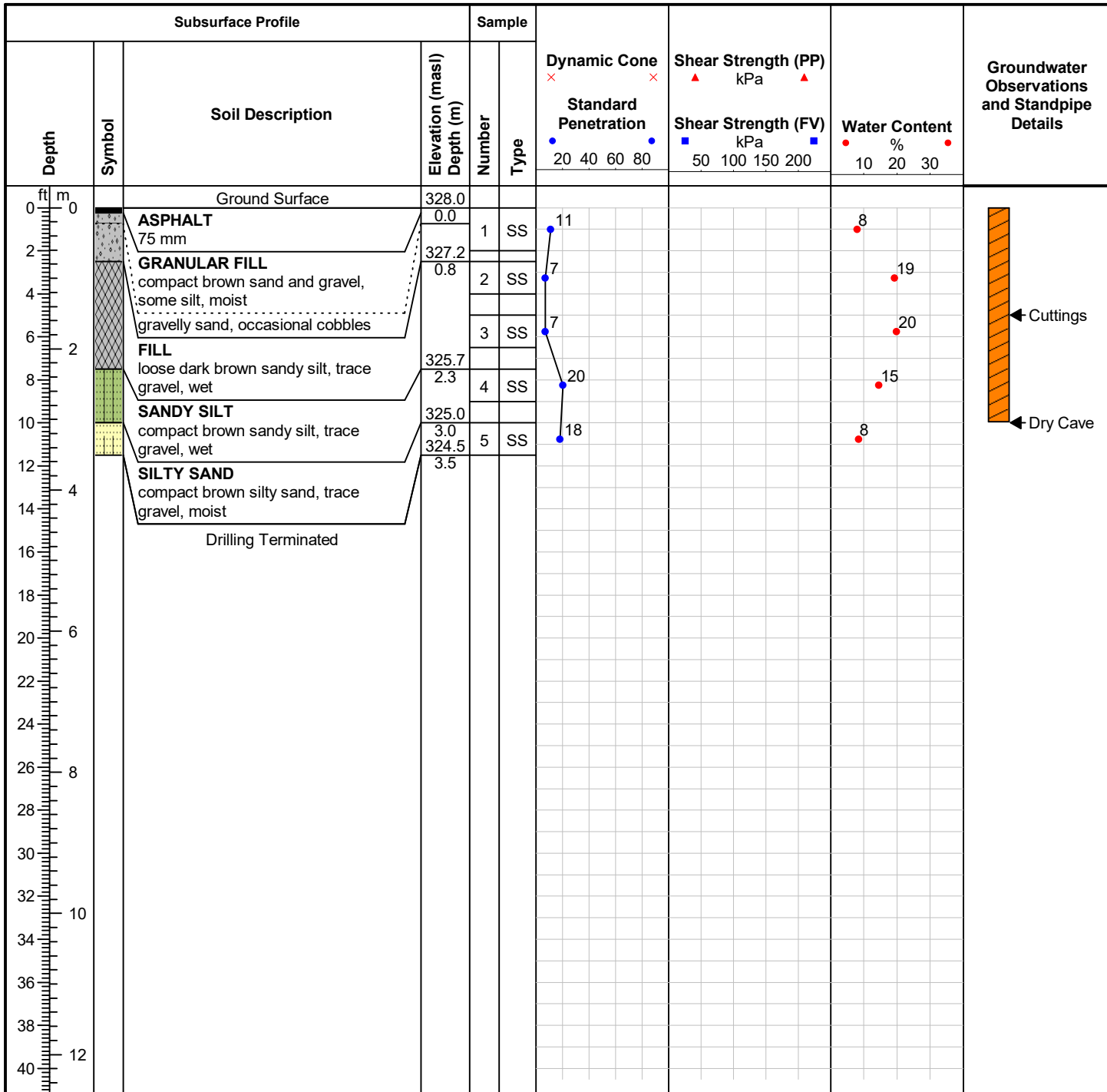
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



ID No.: MW111-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

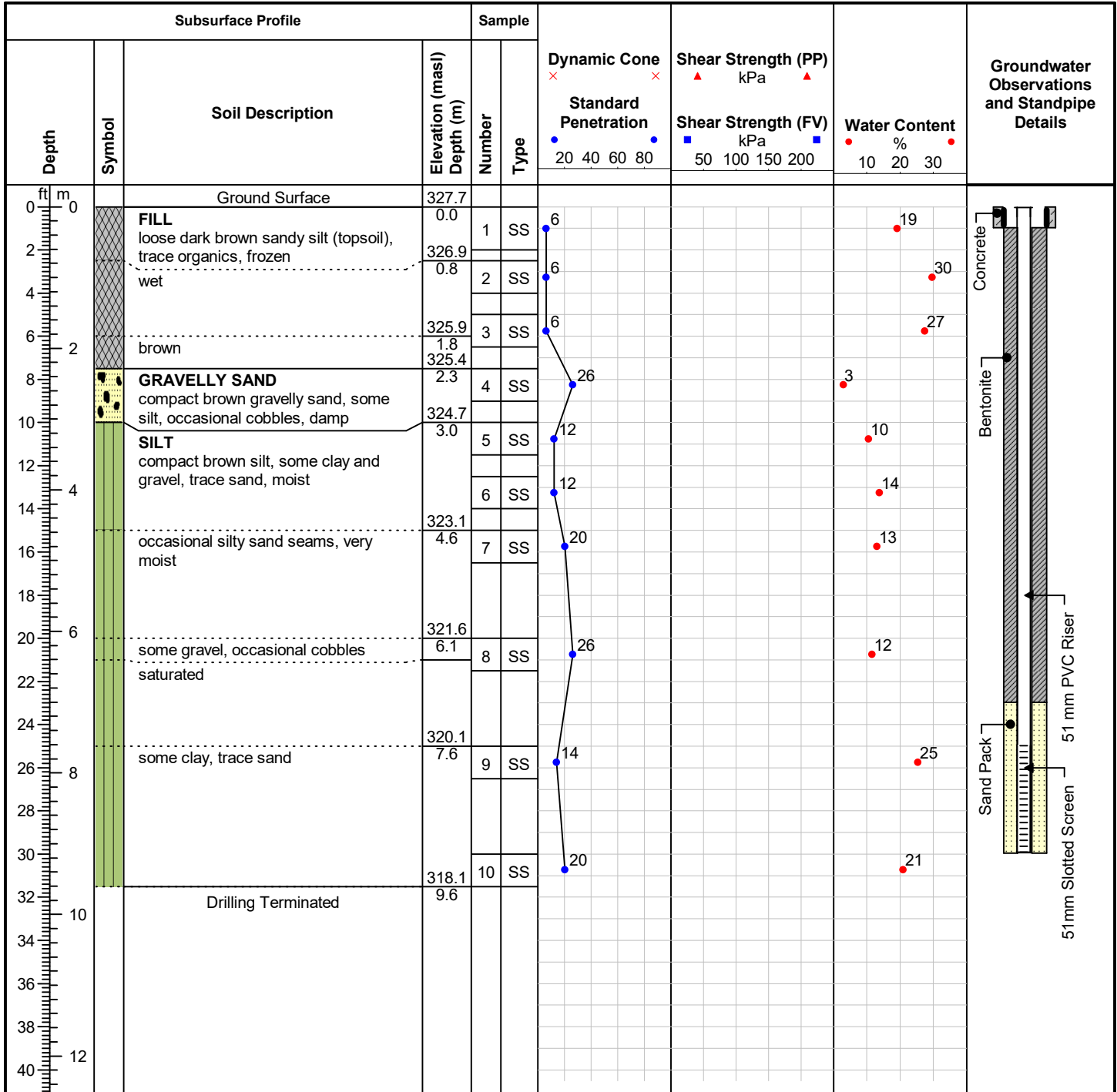
Date Completed: 3/8/2023

Drilling Contractor: Direct Environmental Drilling

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup



Field Technician: HXS

Drafted by: KR D

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.6 masl) during drilling. Dry conditions measured on March 22, 2023

ID No.: BH112-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

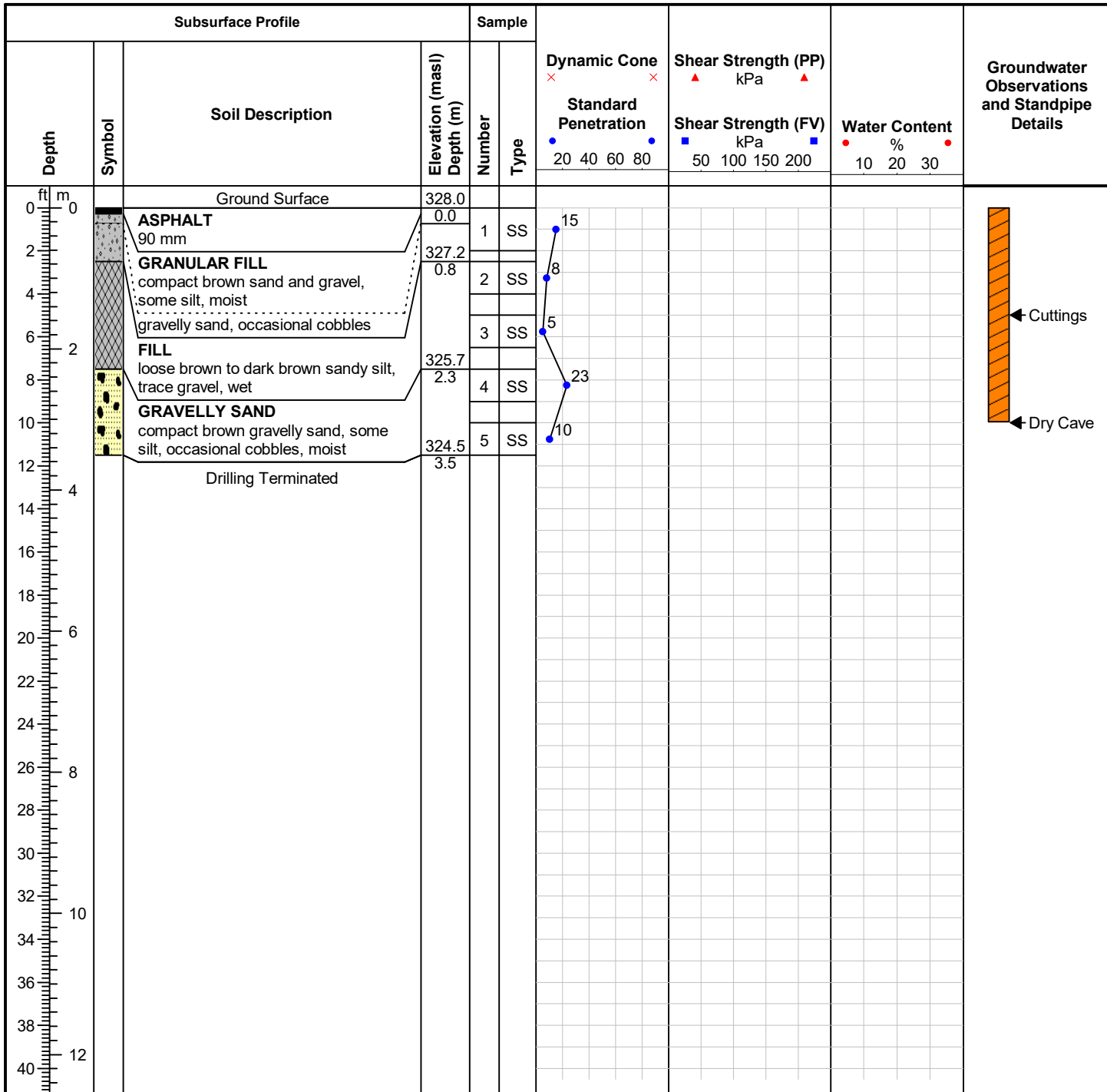
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



ID No.: BH113-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

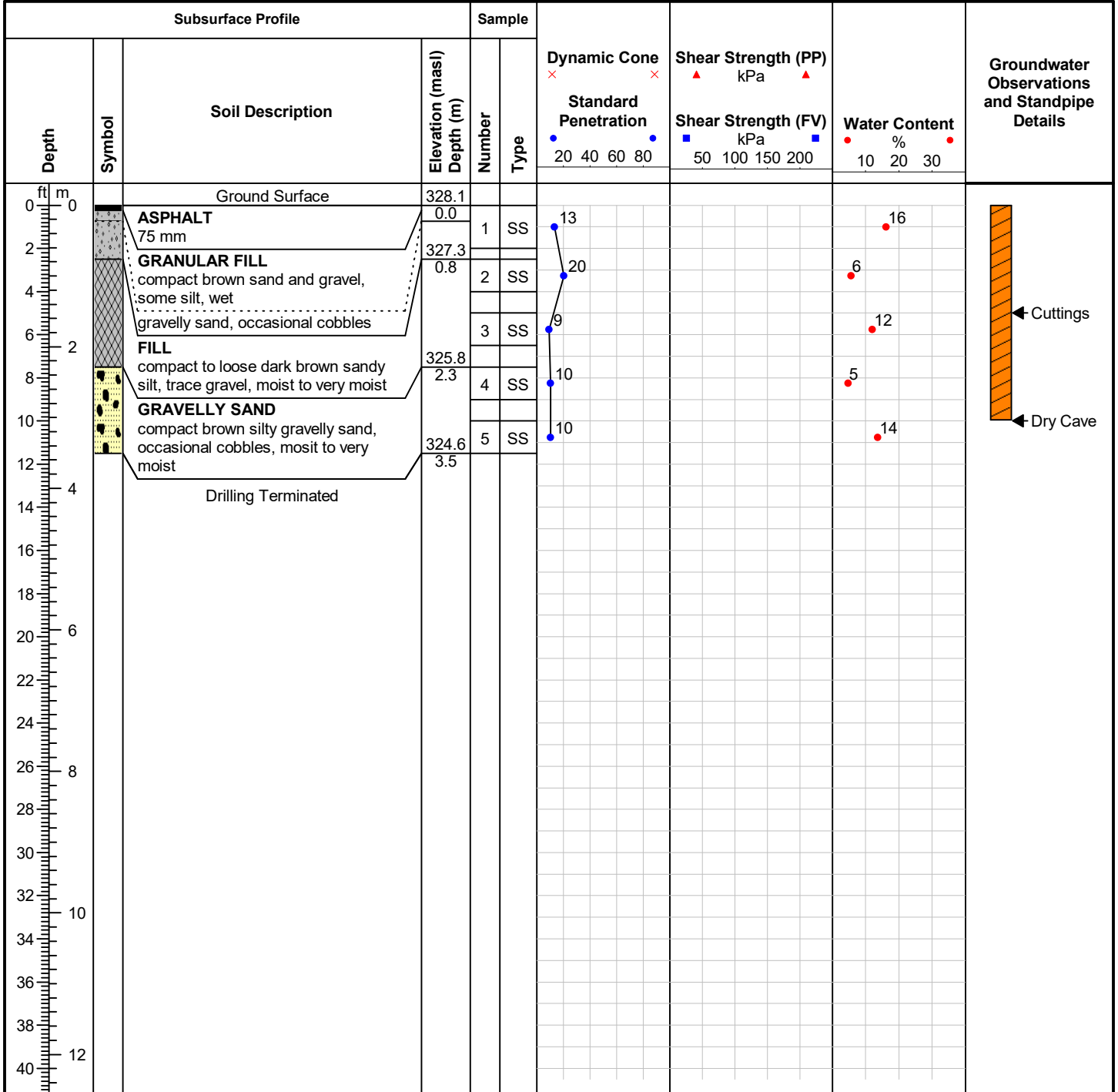
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



ID No.: BH114-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

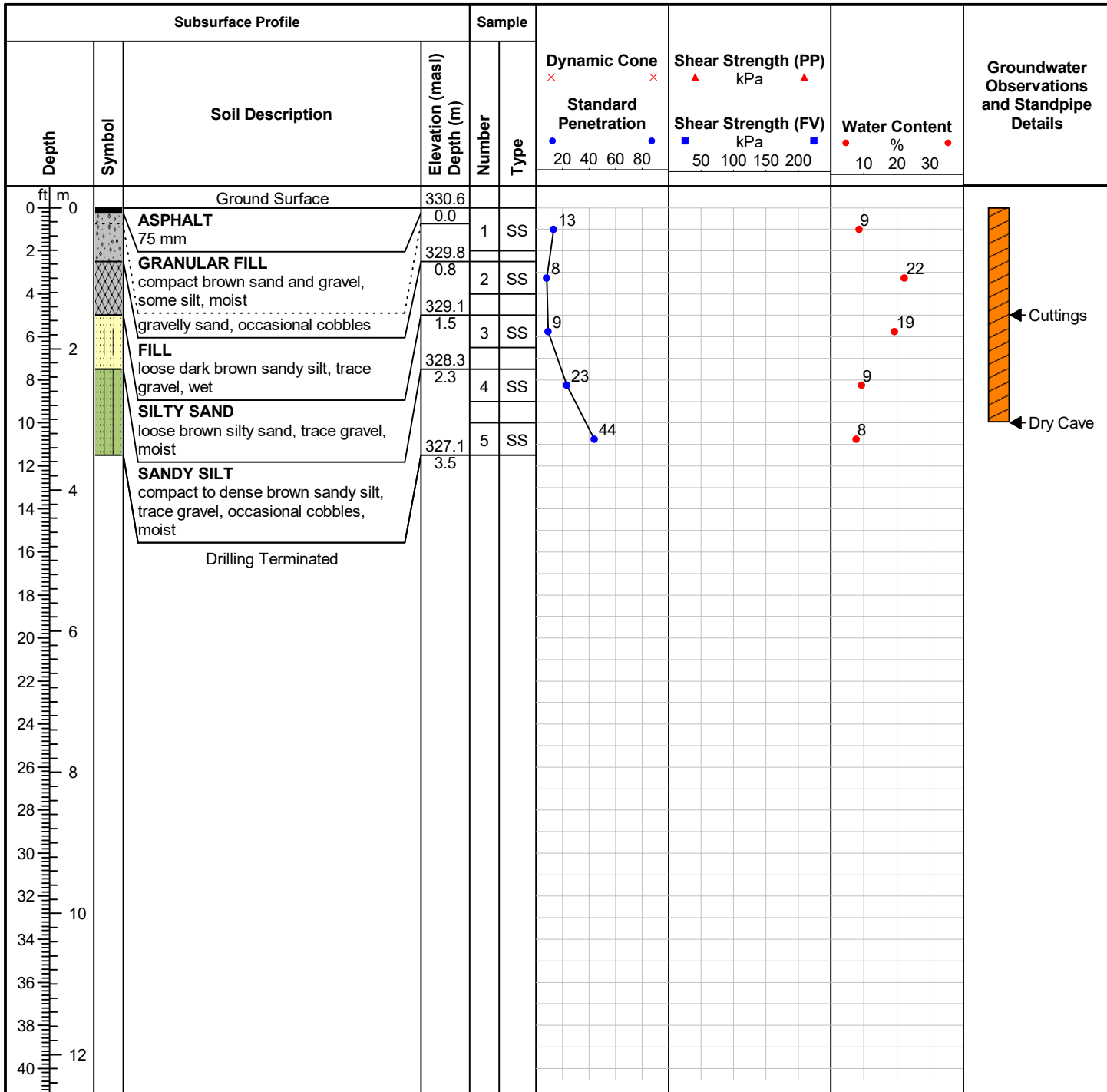
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



ID No.: BH115-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

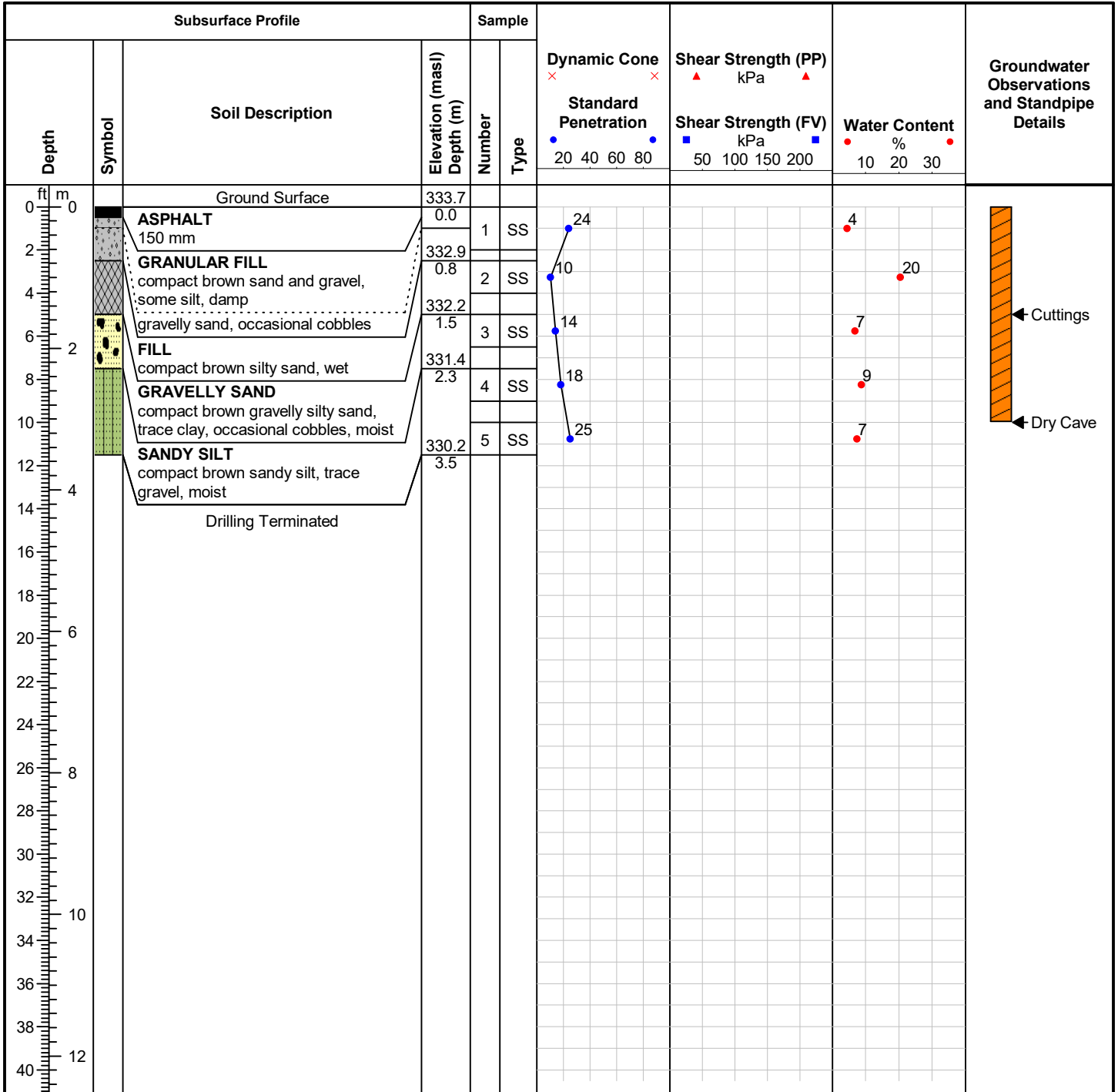
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



ID No.: BH116-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

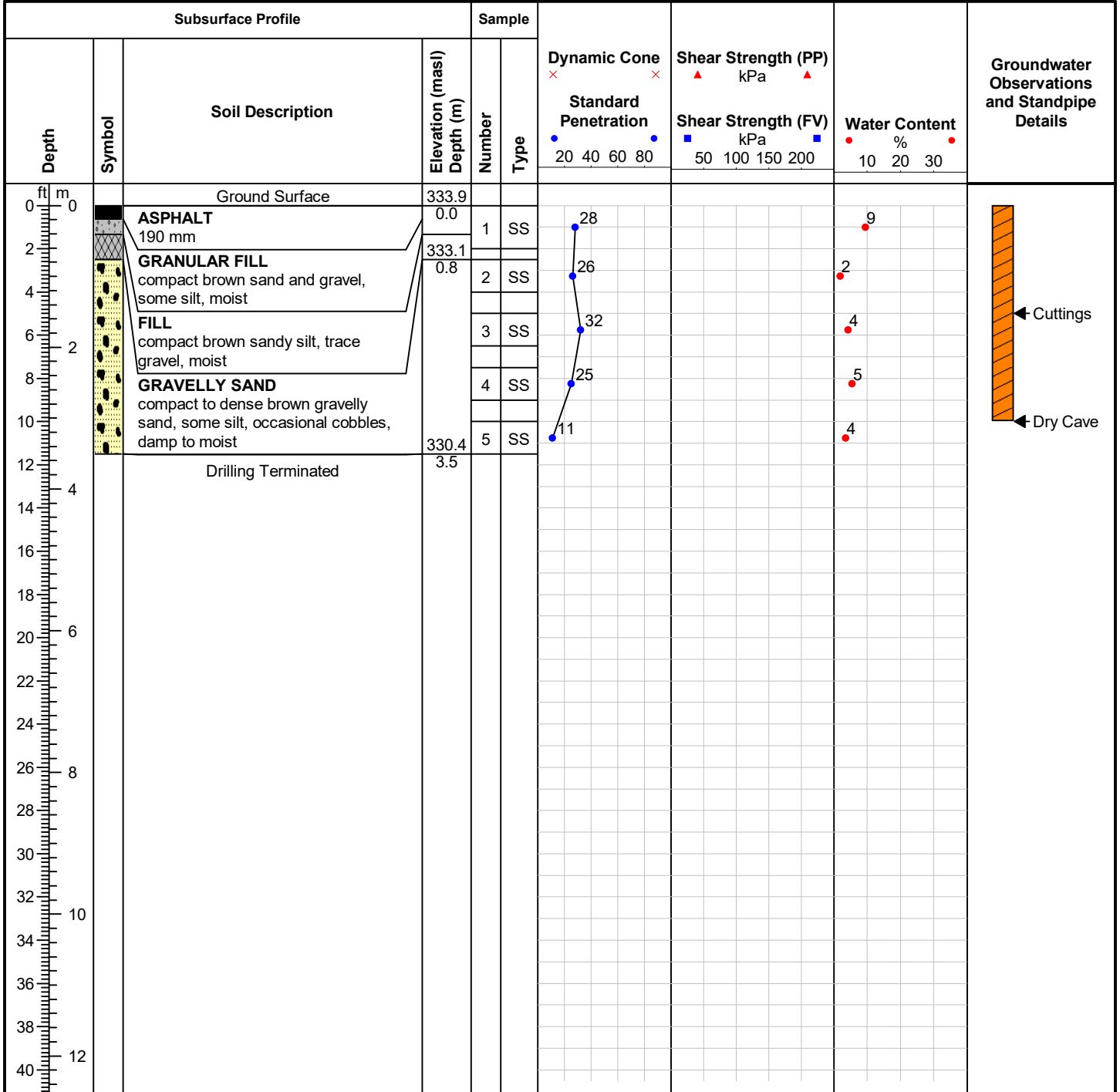
Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD

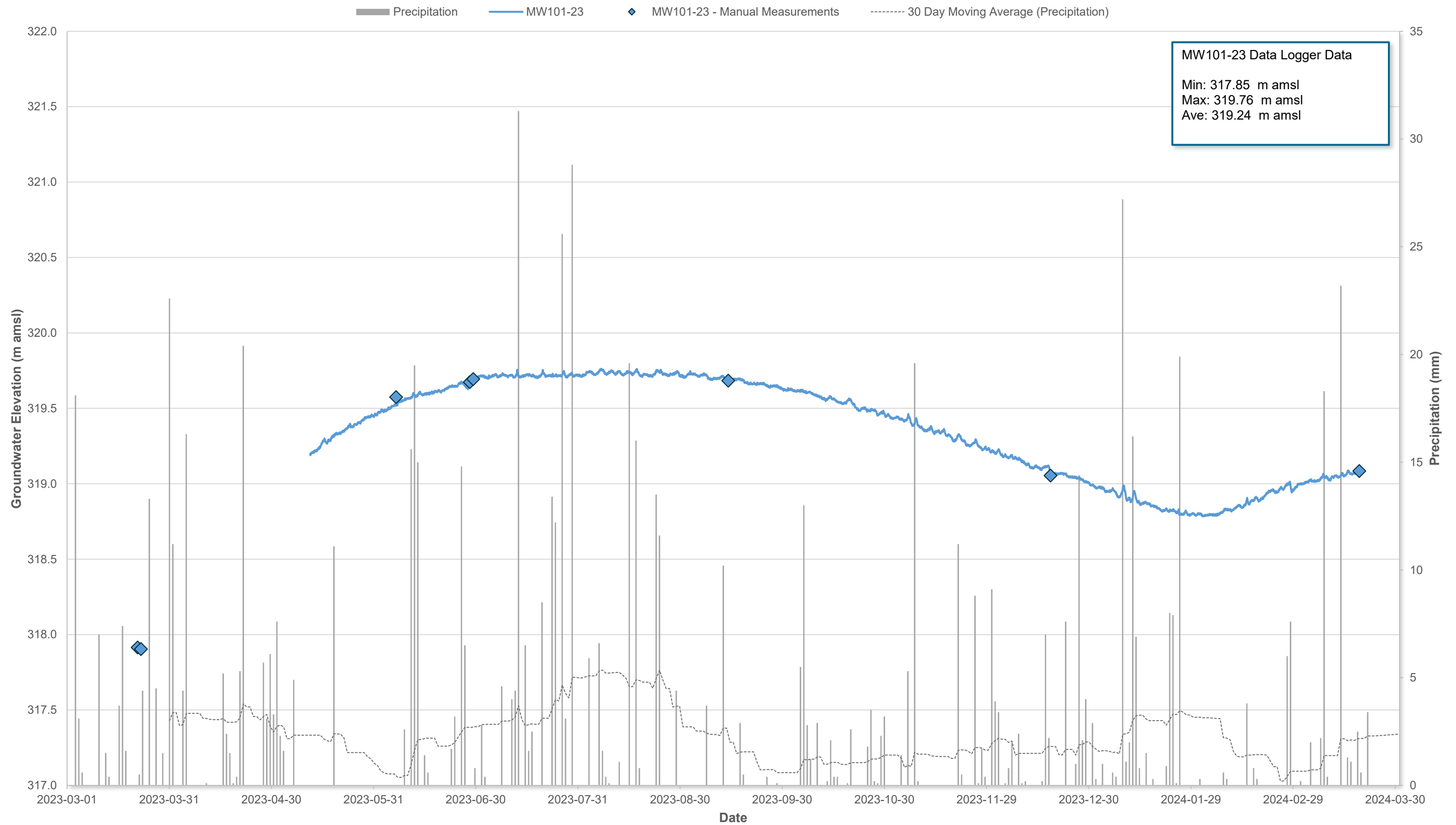
Reviewed by: DG



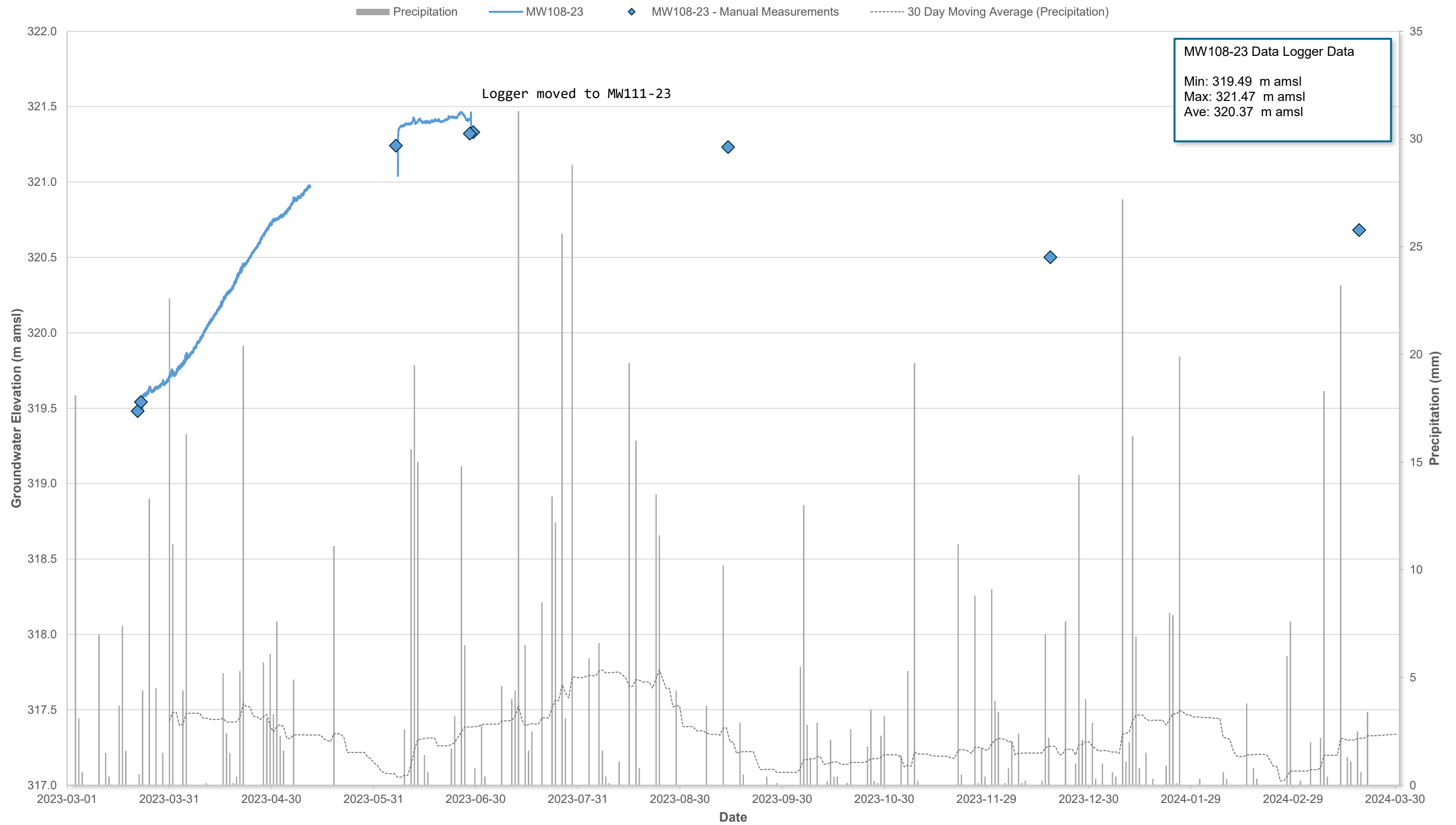
Appendix C

Hydrographs

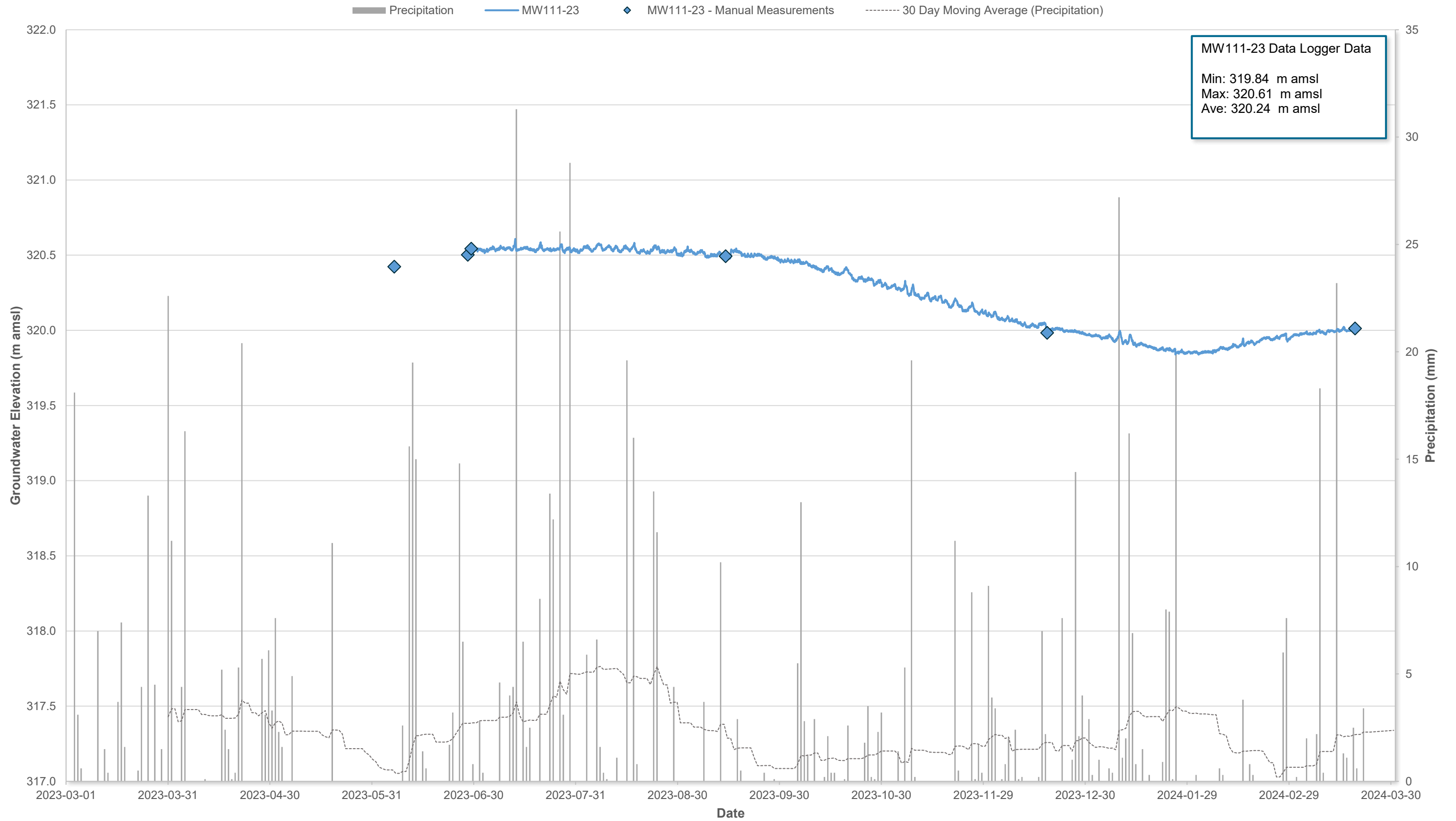
Hydrograph 1: Groundwater Elevations (m amsl) - MW101-23



Hydrograph 2: Groundwater Elevations (m amsl) - MW108-23



Hydrograph 3: Groundwater Elevations (m amsl) - MW111-23



Appendix D

AquiferTest Results



MTE Consultants Inc.
 520 Bingham Centre Drive
 Kitchener, ON
 N2B 3X9

Slug Test Analysis Report

Project: Hydrogeological Investigation

Number: 49791-101

Client: Forum 601 Scottsdale LP

Location: 601 Scottsdale Drive, Guelph

Slug Test: MW101-23 Recovery

Test Well: MW101-23

Test Conducted by: ALC

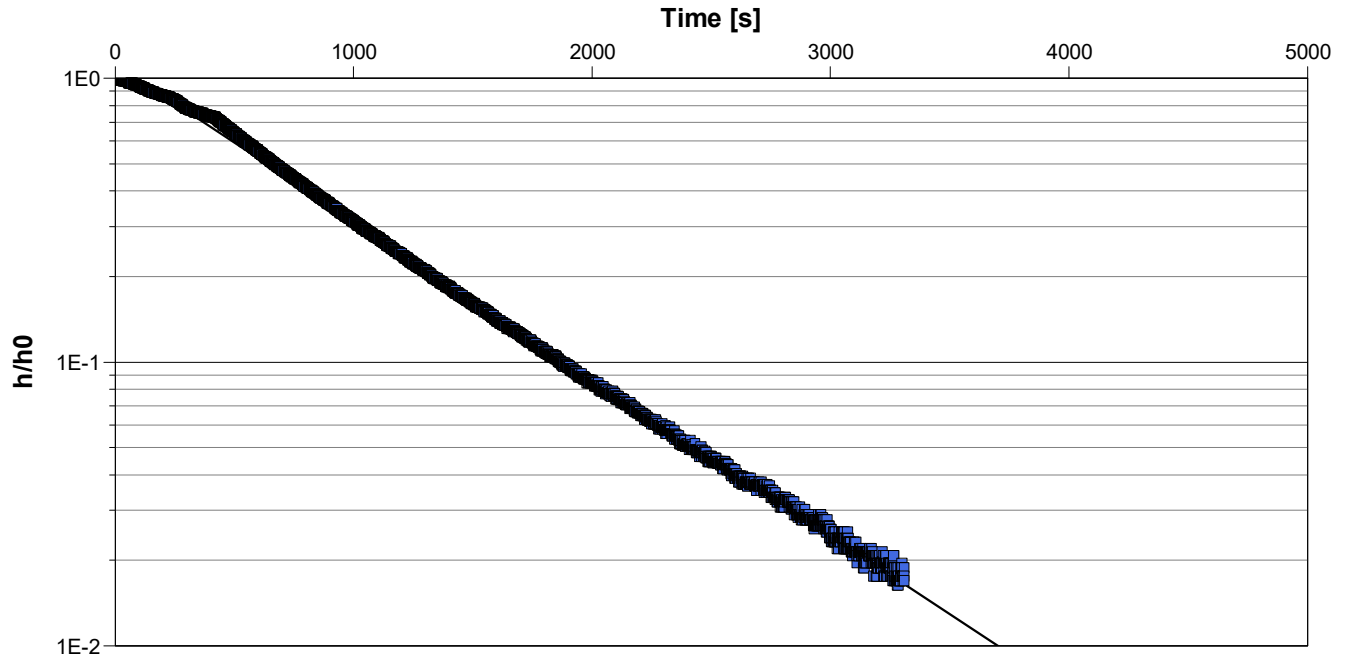
Test Date: 3/23/2023

Analysis Performed by: KNR

Bouwer & Rice

Analysis Date: 4/10/2023

Aquifer Thickness: 10.20 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]
MW101-23	9.90×10^{-7}



MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON
N2B 3X9

Slug Test Analysis Report

Project: Hydrogeological Investigation

Number: 49791-101

Client: Forum 601 Scottsdale LP

Location: 601 Scottsdale Drive, Guelph

Slug Test: MW111-23_RH3

Test Well: MW111-23

Test Conducted by: JDH

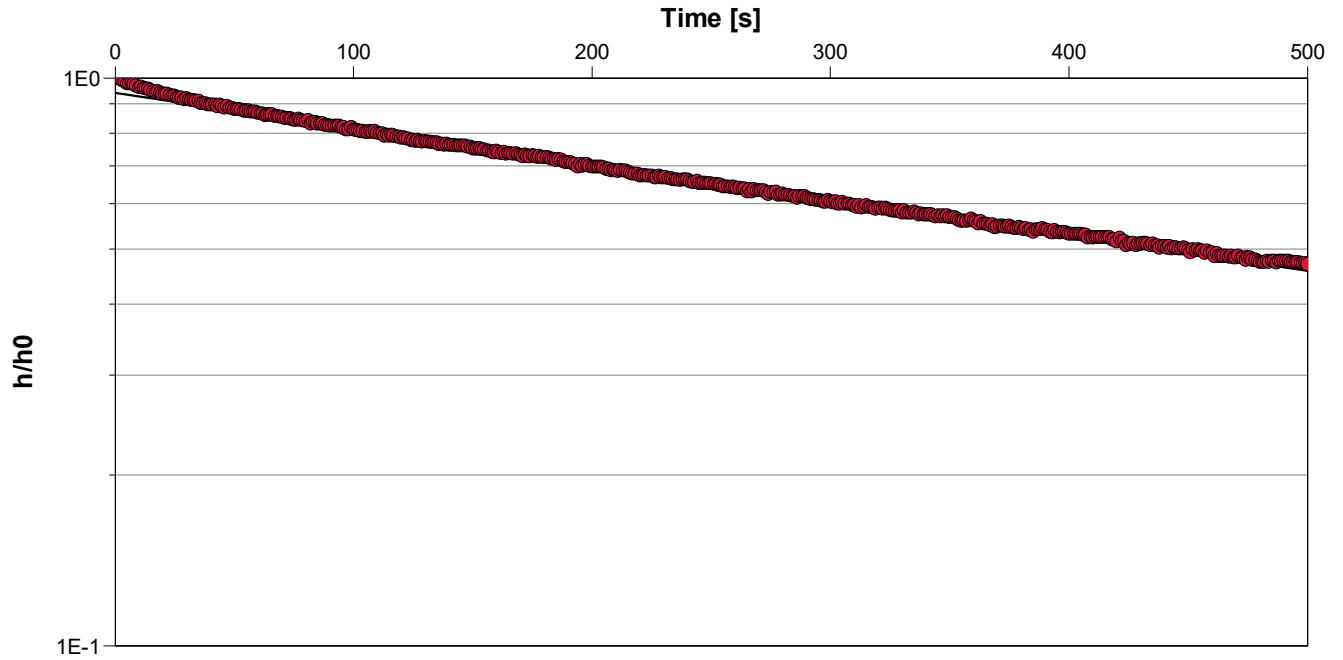
Test Date: 6/30/2023

Analysis Performed by: JDH

Bouwer & Rice

Analysis Date: 7/6/2023

Aquifer Thickness: 10.20 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW111-23	8.43×10^{-7}	

Appendix E

Particle Size Distribution and Hydraulic Conductivity Estimates



Particle Size Distribution Analysis Test Results

Project Name: Geotechnical Investigation

Date Sampled: Feb. 21 to Mar. 8, 2023

MTE File No.: 49791-200

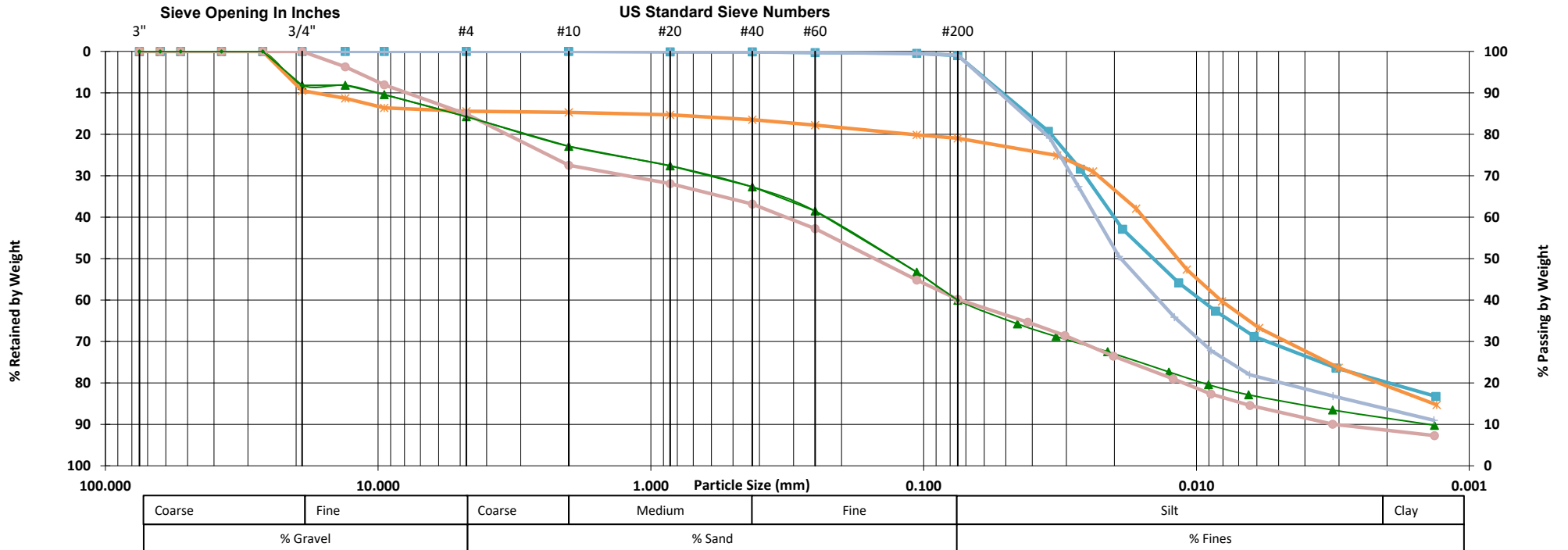
Client: Forum Asset Management

Date Tested: March 20 to 22, 2023

Table No: 101

Project Location: 601 Scottsdale Drive, Guelph, Ontario

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	MW101-23	SS-11	10.7 - 11.1 mbgs	Gravelly Silty SAND, some Clay
■	MW108-23	SS-8	9.1 - 9.8 mbgs	SILT, some Clay, trace Sand
✱	MW111-23	SS-5	3.0 - 3.7 mbgs	SILT, some Clay and Gravel, trace Sand
◆	MW111-23	SS-9	7.6 - 8.2 mbgs	SILT, some Clay, trace Sand
●	BH115-23	SS-3	1.5 - 2.1 mbgs	Gravelly Silty SAND, trace Clay



NOTES:

Hydraulic Conductivity, Porosity, and Infiltration Rate Estimated from Particle Distribution Analysis



Well ID	Depth Top (m)	Depth Bottom (m)	Dominant Soil Type	Grain Size at which 10% is finer (mm) d ₁₀	Grain Size at which 60% is finer (mm) d ₆₀	% passing .02mm sieve % P ₁	% passing .06mm sieve % P ₂	Hazen Coefficient (-) C	Uniformity Index ¹ (-) C _u = d ₆₀ /d ₁₀	Porosity ² (-) n=0.255(1+0.83 ^{Cu})	Hydraulic Conductivity ³ (m/sec)					Infiltration Rate ⁵ (mm/hr)	
											Hazen ³	Beyer ³	Kozeny-Carmen ³	Wang ³	Kaubisch ⁴		Geometric Mean
MW101-23	10.7	11.1	Gravelly Silty SAND, some Clay	0.0015	0.24	27	37	-	160.0	0.255	N/A	N/A	3.0E-09	N/A	4.5E-08	1.2E-08	0
MW108-23	9.1	9.8	SILT, some Clay, trace Sand	0.001	0.02	60	95	-	20.0	0.261	N/A	N/A	1.5E-09	N/A	N/A	1.5E-09	0
MW111-23	3.0	3.7	SILT, some Clay and Gravel, trace Sand	0.001	0.017	67	78	-	17.0	0.266	N/A	N/A	1.6E-09	N/A	N/A	1.6E-09	0
MW111-23	7.6	8.2	SILT, some Clay, trace Sand	0.0015	0.024	51	95	-	16.0	0.268	N/A	N/A	3.7E-09	N/A	N/A	3.7E-09	0
BH115-23	1.5	2.1	Gravelly Silty SAND, trace Clay	0.003	0.31	27	38	-	103.3	0.255	N/A	N/A	1.2E-08	N/A	3.7E-08	2.1E-08	0

N/A The entry is not appropriate to use for grain size distribution of the sample

Hazen Formula:

$$K = Cd_{10}^2$$

Where:

- K Hydraulic conductivity (cm/sec)
- d₁₀ Grain size at which 10% is finer (cm)
- C Coefficient as follows:

Very fine sand, poorly sorted	40-80
Fine sand with appreciable fines	40-80
Medium sand, well sorted	80-120
Coarse sand, poorly sorted	80-120
Coarse sand, well sorted	120-150

Applicability: where 0.1 < d₁₀ < 3.0 mm

Beyer Formula:

$$K = 6 \times 10^{-4} \frac{g}{v} \ln \left(\frac{500}{Cu} \right) d_{10}^2$$

Where:

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s²)
- v Kinematic viscosity of water (1.2 x 10⁻⁶ m²/s)
- d₁₀ Grain size at which 10% is finer (m)

Applicability: where 0.06 < d₁₀ < 0.6 mm AND C_u <= 20

Kozeny-Carmen Formula:

$$K = \frac{1}{180} \frac{g}{v} \left(\frac{n^3}{(1-n)^2} \right) d_{10}^2$$

Where:

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s²)
- v Kinematic viscosity of water (1.2 x 10⁻⁶ m²/s)
- d₁₀ Grain size at which 10% is finer (m)

Applicability: silts, sands, gravelly sands

Wang Et Al. Formula:

$$K = 2.9 \times 10^{-3} \frac{g}{v} \left(\log \frac{gd_{60}^3}{v^2} \right)^{-1} d_{10}^2$$

Where:

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s²)
- v Kinematic viscosity of water (1.2 x 10⁻⁶ m²/s)
- d₁₀ Grain size at which 10% is finer (m)
- d₆₀ Grain size at which 60% is finer (m)

Applicability: where 0.05 < d₁₀ < 0.83 mm, 0.09 < d₆₀ < 4.29 mm, AND 1.3 < CU < 18.3%

Kaubisch Formula:

$$K = 10^{0.0005P_2^2 - 0.12P_2 - 3.59}$$

Where:

- K Hydraulic conductivity (m/sec)
- P₂ percent passing .06mm sieve

Applicability: where 5 < C_u < 400 AND 10% < P₂ < 60%

¹ Craig, R.F. 1992. "Soil Mechanics, Fifth Edition". Chapman and Hill.

² Vukovic, M., and Soro, A. 1992. "Determination of Hydraulic Conductivity of Porous Media from Grain-Size Composition"

³ Duffield, G.M. "Representative Values of Hydraulic Properties" http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm

⁴ Cai, Jialiang, Taute, Thomas, Hamann, Enrico, and Schneider, Michael. 2013. "An Integrated Laboratory Method to Measure and Verify Directional Hydraulic conductivity in Fine-to-Medium Sandy Sediments". Groundwater.

⁵ Sustainable Technologies Evaluation Program (STEP), 2020.

Appendix F

Laboratory Certificates of Analysis



CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

<p>Work Order : WT2307174</p> <p>Client : MTE Consultants Inc.</p> <p>Contact : Fraser Cummings</p> <p>Address : 520 Bingham Centre Drive Kitchener ON Canada N2B 3X9</p> <p>Telephone : 519 743 6500</p> <p>Project : 49791-200</p> <p>PO : ----</p> <p>C-O-C number : 20-1048805</p> <p>Sampler : ----</p> <p>Site : ----</p> <p>Quote number : Standing Offer 2023</p> <p>No. of samples received : 2</p> <p>No. of samples analysed : 2</p>	<p>Page : 1 of 6</p> <p>Laboratory : Waterloo - Environmental</p> <p>Account Manager : Emily Hansen</p> <p>Address : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p>Telephone : +1 519 886 6910</p> <p>Date Samples Received : 23-Mar-2023 12:35</p> <p>Date Analysis Commenced : 23-Mar-2023</p> <p>Issue Date : 03-Apr-2023 13:41</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Cynthia Bauer	Organic Supervisor	Organics, Calgary, Alberta
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Marsha Calero	Laboratory Assistant	Organics, Calgary, Alberta
Nguyen Tran	Laboratory Analyst	Organics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
CFU/100mL	colony forming units per hundred millilitres
mg/L	milligrams per litre
pH units	pH units

>: greater than.

<: less than.

Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.

For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Qualifiers

<i>Qualifier</i>	<i>Description</i>
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
SP	Sample was preserved at the laboratory.



Analytical Results

Analyte	Method	LOR	Unit	Client sample ID						
				MW101-23						
Sub-Matrix: Water (Matrix: Water)				Sampling date/time						
				WT2307174-001	GUESUB SAN	GUESUB STM				
Physical Tests										
pH	E108	0.10	pH units	7.78	5.5 - 9.5 pH units	6 - 9 pH units	--	--	--	--
Solids, total suspended [TSS]	E160	3.0	mg/L	738 DLHC	350 mg/L	15 mg/L	--	--	--	--
Anions and Nutrients										
Chloride	E235.Cl	0.50	mg/L	193 DLDS	1500 mg/L	--	--	--	--	--
Fluoride	E235.F	0.020	mg/L	<0.100 DLDS	10 mg/L	--	--	--	--	--
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	0.422	100 mg/L	--	--	--	--	--
Phosphorus, total	E372-U	0.0020	mg/L	0.141 DLM	10 mg/L	--	--	--	--	--
Sulfate (as SO4)	E235.SO4	0.30	mg/L	16.9 DLDS	1500 mg/L	--	--	--	--	--
Cyanides										
Cyanide, strong acid dissociable (Total)	E333	0.0020	mg/L	<0.0020	2 mg/L	--	--	--	--	--
Microbiological Tests										
Coliforms, thermotolerant [fecal]	E012.FC	1	CFU/100mL	Not Detected	--	200 CFU/100mL	--	--	--	--
Total Metals										
Aluminum, total	E420	0.0030	mg/L	2.93 DLHC	50 mg/L	--	--	--	--	--
Antimony, total	E420	0.00010	mg/L	<0.00100 DLHC	5 mg/L	--	--	--	--	--
Arsenic, total	E420	0.00010	mg/L	0.00156 DLHC	1 mg/L	--	--	--	--	--
Bismuth, total	E420	0.000050	mg/L	<0.000500 DLHC	5 mg/L	--	--	--	--	--
Cadmium, total	E420	0.0000050	mg/L	0.000208 DLHC	1 mg/L	0.001 mg/L	--	--	--	--
Chromium, total	E420	0.00050	mg/L	0.00567 DLHC	5 mg/L	0.2 mg/L	--	--	--	--
Cobalt, total	E420	0.00010	mg/L	0.00220 DLHC	5 mg/L	--	--	--	--	--
Copper, total	E420	0.00050	mg/L	0.0122 DLHC	3 mg/L	0.01 mg/L	--	--	--	--
Iron, total	E420	0.010	mg/L	4.58 DLHC	50 mg/L	--	--	--	--	--
Lead, total	E420	0.000050	mg/L	0.00826 DLHC	5 mg/L	0.05 mg/L	--	--	--	--
Manganese, total	E420	0.00010	mg/L	0.159 DLHC	5 mg/L	--	--	--	--	--
Mercury, total	E508	0.0000050	mg/L	<0.0000050	0.1 mg/L	0.001 mg/L	--	--	--	--
Molybdenum, total	E420	0.000050	mg/L	<0.000500 DLHC	5 mg/L	--	--	--	--	--
Nickel, total	E420	0.00050	mg/L	0.00749 DLHC	3 mg/L	0.05 mg/L	--	--	--	--
Selenium, total	E420	0.000050	mg/L	<0.000500 DLHC	5 mg/L	--	--	--	--	--
Silver, total	E420	0.000010	mg/L	<0.000100 DLHC	5 mg/L	--	--	--	--	--



Analyte	Method	LOR	Unit	WT2307174-001 (Continued)		GUESUB SAN	GUESUB STM				
Total Metals - Continued											
Tin, total	E420	0.00010	mg/L	0.00298	DLHC	5 mg/L	--	--	--	--	--
Titanium, total	E420	0.00030	mg/L	0.107	DLHC	5 mg/L	--	--	--	--	--
Vanadium, total	E420	0.00050	mg/L	0.00648	DLHC	5 mg/L	--	--	--	--	--
Zinc, total	E420	0.0030	mg/L	0.0836	DLHC	3 mg/L	0.05 mg/L	--	--	--	--
Aggregate Organics											
Carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0	BODL	300 mg/L	15 mg/L	--	--	--	--
Oil & grease (gravimetric)	E567	5.0	mg/L	<5.0		--	--	--	--	--	--
Oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0		100 mg/L	--	--	--	--	--
Oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0		15 mg/L	--	--	--	--	--
Phenols, total (4AAP)	E562	0.0010	mg/L	<0.0050	DLM	1 mg/L	--	--	--	--	--

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

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
MW101-23	Water	Solids, total suspended [TSS]		GUESUB	SAN	738 mg/L	350 mg/L
	Water	Solids, total suspended [TSS]		GUESUB	STM	738 mg/L	15 mg/L
	Water	Copper, total		GUESUB	STM	0.0122 mg/L	0.01 mg/L
	Water	Zinc, total		GUESUB	STM	0.0836 mg/L	0.05 mg/L

Key:

- GUESUB Ontario Guelph Sanitary and Storm Sewer By-Law 15202 (1996)
- SAN Ontario City of Guelph Sanitary Sewer Use By-Law 15202
- STM Ontario City of Guelph Storm Sewer Use By-Law 15202



Analytical Results

Analyte	Method	LOR	Unit	Client sample ID						
				MW108-23						
Sub-Matrix: Water (Matrix: Water)				Sampling date/time						
				WT2307174-002	GUESUB SAN	GUESUB STM				
Physical Tests										
pH	E108	0.10	pH units	7.71		5.5 - 9.5 pH units	6 - 9 pH units	--	--	--
Solids, total suspended [TSS]	E160	3.0	mg/L	12500	DLHC	350 mg/L	15 mg/L	--	--	--
Anions and Nutrients										
Chloride	E235.Cl	0.50	mg/L	404	DLDS	1500 mg/L	--	--	--	--
Fluoride	E235.F	0.020	mg/L	<0.100	DLDS	10 mg/L	--	--	--	--
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	0.646		100 mg/L	--	--	--	--
Phosphorus, total	E372-U	0.0020	mg/L	1.24	DLM	10 mg/L	--	--	--	--
Sulfate (as SO4)	E235.SO4	0.30	mg/L	41.6	DLDS	1500 mg/L	--	--	--	--
Cyanides										
Cyanide, strong acid dissociable (Total)	E333	0.0020	mg/L	<0.0020		2 mg/L	--	--	--	--
Microbiological Tests										
Coliforms, thermotolerant [fecal]	E012.FC	1	CFU/100mL	Not Detected	DLM	--	200 CFU/100mL	--	--	--
Total Metals										
Aluminum, total	E420	0.0030	mg/L	47.9	DLHC	50 mg/L	--	--	--	--
Antimony, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L	--	--	--	--
Arsenic, total	E420	0.00010	mg/L	0.0216	DLHC	1 mg/L	--	--	--	--
Bismuth, total	E420	0.000050	mg/L	0.000532	DLHC	5 mg/L	--	--	--	--
Cadmium, total	E420	0.0000050	mg/L	0.000892	DLHC	1 mg/L	0.001 mg/L	--	--	--
Chromium, total	E420	0.00050	mg/L	0.0840	DLHC	5 mg/L	0.2 mg/L	--	--	--
Cobalt, total	E420	0.00010	mg/L	0.0468	DLHC	5 mg/L	--	--	--	--
Copper, total	E420	0.00050	mg/L	0.118	DLHC	3 mg/L	0.01 mg/L	--	--	--
Iron, total	E420	0.010	mg/L	94.4	DLHC	50 mg/L	--	--	--	--
Lead, total	E420	0.000050	mg/L	0.0731	DLHC	5 mg/L	0.05 mg/L	--	--	--
Manganese, total	E420	0.00010	mg/L	4.93	DLHC	5 mg/L	--	--	--	--
Mercury, total	E508	0.0000050	mg/L	0.0000061		0.1 mg/L	0.001 mg/L	--	--	--
Molybdenum, total	E420	0.000050	mg/L	0.00108	DLHC	5 mg/L	--	--	--	--
Nickel, total	E420	0.00050	mg/L	0.111	DLHC	3 mg/L	0.05 mg/L	--	--	--
Selenium, total	E420	0.000050	mg/L	0.000512	DLHC	5 mg/L	--	--	--	--
Silver, total	E420	0.000010	mg/L	0.000228	DLHC	5 mg/L	--	--	--	--



Analyte	Method	LOR	Unit	WT2307174-002 (Continued)		GUESUB SAN	GUESUB STM				
Total Metals - Continued											
Tin, total	E420	0.00010	mg/L	0.00389	DLHC	5 mg/L	--	--	--	--	--
Titanium, total	E420	0.00030	mg/L	1.66	DLHC	5 mg/L	--	--	--	--	--
Vanadium, total	E420	0.00050	mg/L	0.109	DLHC	5 mg/L	--	--	--	--	--
Zinc, total	E420	0.0030	mg/L	0.368	DLHC	3 mg/L	0.05 mg/L	--	--	--	--
Aggregate Organics											
Carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0	BODL	300 mg/L	15 mg/L	--	--	--	--
Oil & grease (gravimetric)	E567	5.0	mg/L	<5.0		--	--	--	--	--	--
Oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0		100 mg/L	--	--	--	--	--
Oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0		15 mg/L	--	--	--	--	--
Phenols, total (4AAP)	E562	0.0010	mg/L	<0.0050	DLM SP	1 mg/L	--	--	--	--	--

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

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
MW108-23	Water	Solids, total suspended [TSS]		GUESUB	SAN	12500 mg/L	350 mg/L
	Water	Iron, total		GUESUB	SAN	94.4 mg/L	50 mg/L
	Water	Solids, total suspended [TSS]		GUESUB	STM	12500 mg/L	15 mg/L
	Water	Copper, total		GUESUB	STM	0.118 mg/L	0.01 mg/L
	Water	Lead, total		GUESUB	STM	0.0731 mg/L	0.05 mg/L
	Water	Nickel, total		GUESUB	STM	0.111 mg/L	0.05 mg/L
	Water	Zinc, total		GUESUB	STM	0.368 mg/L	0.05 mg/L

Key:

- GUESUB Ontario Guelph Sanitary and Storm Sewer By-Law 15202 (1996)
- SAN Ontario City of Guelph Sanitary Sewer Use By-Law 15202
- STM Ontario City of Guelph Storm Sewer Use By-Law 15202



QUALITY CONTROL INTERPRETIVE REPORT

<p>Work Order : WT2307174</p> <p>Client : MTE Consultants Inc.</p> <p>Contact : Fraser Cummings</p> <p>Address : 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9</p> <p>Telephone : 519 743 6500</p> <p>Project : 49791-200</p> <p>PO : ----</p> <p>C-O-C number : 20-1048805</p> <p>Sampler : ----</p> <p>Site : ----</p> <p>Quote number : Standing Offer 2023</p> <p>No. of samples received : 2</p> <p>No. of samples analysed : 2</p>	<p>Page : 1 of 11</p> <p>Laboratory : Waterloo - Environmental</p> <p>Account Manager : Emily Hansen</p> <p>Address : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p>Telephone : +1 519 886 6910</p> <p>Date Samples Received : 23-Mar-2023 12:35</p> <p>Issue Date : 03-Apr-2023 13:41</p>
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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 Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Total Metals	QC-874409-002	----	Nickel, total	7440-02-0	E420	123 % ^{MES}	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day										
HDPE [BOD HT-4d] MW108-23	E555	23-Mar-2023	----	----	----		24-Mar-2023	4 days	1 days	✓
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day										
HDPE [BOD HT-4d] MW101-23	E555	23-Mar-2023	----	----	----		27-Mar-2023	4 days	4 days	✓
Aggregate Organics : Mineral Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid) MW101-23	E567SG	23-Mar-2023	27-Mar-2023	28 days	4 days	✓	28-Mar-2023	40 days	1 days	✓
Aggregate Organics : Mineral Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid) MW108-23	E567SG	23-Mar-2023	27-Mar-2023	28 days	4 days	✓	28-Mar-2023	40 days	1 days	✓
Aggregate Organics : Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid) MW101-23	E567	23-Mar-2023	27-Mar-2023	28 days	4 days	✓	27-Mar-2023	40 days	0 days	✓
Aggregate Organics : Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid) MW108-23	E567	23-Mar-2023	27-Mar-2023	28 days	4 days	✓	27-Mar-2023	40 days	0 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) MW101-23	E562	23-Mar-2023	24-Mar-2023	----	----		24-Mar-2023	28 days	1 days	✓



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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) MW108-23	E562	23-Mar-2023	24-Mar-2023	----	----		24-Mar-2023	28 days	1 days	✔
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] MW101-23	E235.Cl	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] MW108-23	E235.Cl	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] MW101-23	E235.F	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] MW108-23	E235.F	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] MW101-23	E235.SO4	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] MW108-23	E235.SO4	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW101-23	E318	23-Mar-2023	27-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW108-23	E318	23-Mar-2023	27-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔



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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) MW101-23	E372-U	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) MW108-23	E372-U	23-Mar-2023	24-Mar-2023	----	----		27-Mar-2023	28 days	4 days	✔
Cyanides : Total Cyanide										
HDPE - total (sodium hydroxide) MW101-23	E333	23-Mar-2023	30-Mar-2023	----	----		30-Mar-2023	14 days	7 days	✔
Cyanides : Total Cyanide										
HDPE - total (sodium hydroxide) MW108-23	E333	23-Mar-2023	30-Mar-2023	----	----		30-Mar-2023	14 days	7 days	✔
Microbiological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] MW101-23	E012.FC	23-Mar-2023	----	----	----		24-Mar-2023	48 hrs	24 hrs	✔
Microbiological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] MW108-23	E012.FC	23-Mar-2023	----	----	----		24-Mar-2023	48 hrs	24 hrs	✔
Physical Tests : pH by Meter										
HDPE [ON MECP] MW101-23	E108	23-Mar-2023	24-Mar-2023	----	----		26-Mar-2023	14 days	3 days	✔
Physical Tests : pH by Meter										
HDPE [ON MECP] MW108-23	E108	23-Mar-2023	24-Mar-2023	----	----		26-Mar-2023	14 days	3 days	✔
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP] MW101-23	E160	23-Mar-2023	----	----	----		24-Mar-2023	7 days	1 days	✔



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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP] MW108-23	E160	23-Mar-2023	----	----	----		24-Mar-2023	7 days	1 days	✔
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MW101-23	E508	23-Mar-2023	24-Mar-2023	----	----		24-Mar-2023	28 days	1 days	✔
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MW108-23	E508	23-Mar-2023	24-Mar-2023	----	----		24-Mar-2023	28 days	1 days	✔
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW101-23	E420	23-Mar-2023	23-Mar-2023	----	----		24-Mar-2023	180 days	2 days	✔
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW108-23	E420	23-Mar-2023	23-Mar-2023	----	----		24-Mar-2023	180 days	2 days	✔

Legend & Qualifier Definitions

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 (%)		Evaluation
			QC	Regular	Actual	Expected	
Analytical Methods							
Laboratory Duplicates (DUP)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	874985	2	34	5.8	5.0	✔
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✔
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✔
pH by Meter	E108	875263	1	16	6.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✔
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✔
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	874957	0	2	0.0	5.0	✖
Total Cyanide	E333	881027	1	11	9.0	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✔
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✔
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	✔
TSS by Gravimetry	E160	875240	1	19	5.2	4.7	✔
Laboratory Control Samples (LCS)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	874985	2	34	5.8	5.0	✔
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✔
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✔
Mineral Oil & Grease by Gravimetry	E567SG	877188	1	18	5.5	5.0	✔
Oil & Grease by Gravimetry	E567	877187	1	18	5.5	5.0	✔
pH by Meter	E108	875263	1	16	6.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✔
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✔
Total Cyanide	E333	881027	1	11	9.0	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✔
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✔
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	✔
TSS by Gravimetry	E160	875240	1	19	5.2	4.7	✔
Method Blanks (MB)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	874985	2	34	5.8	5.0	✔
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✔
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✔
Mineral Oil & Grease by Gravimetry	E567SG	877188	1	18	5.5	5.0	✔
Oil & Grease by Gravimetry	E567	877187	1	18	5.5	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✔



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							
Method Blanks (MB) - Continued							
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✔
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	874957	1	2	50.0	5.0	✔
Total Cyanide	E333	881027	1	11	9.0	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✔
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✔
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	✔
TSS by Gravimetry	E160	875240	1	19	5.2	4.7	✔
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✔
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✔
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✔
Total Cyanide	E333	881027	1	11	9.0	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✔
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✔
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	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
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC Waterloo - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 44.5 ± 0.2°C for 22-26 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Waterloo - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Waterloo - Environmental	Water	Method Fialab 100, 2018	TKN 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).
Total Cyanide	E333 Waterloo - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourimetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Waterloo - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Waterloo - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Nitrification inhibitor is added to samples to prevent nitrogenous compounds from consuming oxygen resulting in only carbonaceous oxygen demand being reported by this method. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Phenols (4AAP) in Water by Colorimetry	E562 Waterloo - Environmental	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide (K ₃ Fe(CN) ₆) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Calgary - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG Calgary - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Mineral Oil and Grease.
Animal & Vegetable Oil & Grease by Gravimetry	EC567A.SG Calgary - Environmental	Water	APHA 5520 (mod)	Animal & vegetable oil and grease is calculated as follows: Oil & Grease (gravimetric) minus Mineral Oil & Grease (gravimetric)

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for Total Phosphorus in water	EP372 Waterloo - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Oil & Grease Extraction for Gravimetry	EP567 Calgary - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane by liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: WT2307174	Page	: 1 of 10
Client	: MTE Consultants Inc.	Laboratory	: Waterloo - Environmental
Contact	: Fraser Cummings	Account Manager	: Emily Hansen
Address	: 520 Bingham Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 49791-200	Date Samples Received	: 23-Mar-2023 12:35
PO	: ----	Date Analysis Commenced	: 23-Mar-2023
C-O-C number	: 20-1048805	Issue Date	: 03-Apr-2023 13:41
Sampler	: ---- 519 743 6500		
Site	: ----		
Quote number	: Standing Offer 2023		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Cynthia Bauer	Organic Supervisor	Calgary Organics, Calgary, Alberta
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Marsha Calero	Laboratory Assistant	Calgary Organics, Calgary, Alberta
Nguyen Tran	Laboratory Analyst	Calgary Organics, Calgary, Alberta

Page : 2 of 10
Work Order : WT2307174
Client : MTE Consultants Inc.
Project : 49791-200



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: 875240)											
WT2307157-001	Anonymous	Solids, total suspended [TSS]	----	E160	3.0	mg/L	30.5	30.7	0.654%	20%	----
Physical Tests (QC Lot: 875263)											
HA2300093-001	Anonymous	pH	----	E108	0.10	pH units	6.03	6.07	0.661%	4%	----
Anions and Nutrients (QC Lot: 874757)											
WT2306672-002	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0200	mg/L	6.87	6.83	0.617%	20%	----
Anions and Nutrients (QC Lot: 874759)											
WT2306908-027	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.863	0.909	5.19%	20%	----
Anions and Nutrients (QC Lot: 875264)											
WT2307133-001	Anonymous	Fluoride	16984-48-8	E235.F	0.100	mg/L	1.59	1.61	0.793%	20%	----
Anions and Nutrients (QC Lot: 875267)											
WT2307133-001	Anonymous	Chloride	16887-00-6	E235.Cl	2.50	mg/L	5.98	5.80	0.17	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 875268)											
WT2307133-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1490	1500	0.439%	20%	----
Cyanides (QC Lot: 881027)											
WT2307170-001	Anonymous	Cyanide, strong acid dissociable (Total)	----	E333	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Total Metals (QC Lot: 874409)											
WT2307055-001	Anonymous	Aluminum, total	7429-90-5	E420	0.0300	mg/L	4.97	4.94	0.556%	20%	----
		Antimony, total	7440-36-0	E420	0.00100	mg/L	0.00126	0.00126	0.000003	Diff <2x LOR	----
		Arsenic, total	7440-38-2	E420	0.00100	mg/L	0.00360	0.00378	0.00018	Diff <2x LOR	----
		Bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		Cadmium, total	7440-43-9	E420	0.0000500	mg/L	0.000108	0.000110	0.0000021	Diff <2x LOR	----
		Chromium, total	7440-47-3	E420	0.00500	mg/L	0.0873	0.0868	0.615%	20%	----
		Cobalt, total	7440-48-4	E420	0.00100	mg/L	0.00436	0.00442	0.00006	Diff <2x LOR	----
		Copper, total	7440-50-8	E420	0.00500	mg/L	0.0304	0.0302	0.00013	Diff <2x LOR	----
		Iron, total	7439-89-6	E420	0.100	mg/L	7.16	7.19	0.492%	20%	----
		Lead, total	7439-92-1	E420	0.000500	mg/L	9.38 µg/L	0.00936	0.182%	20%	----
		Manganese, total	7439-96-5	E420	0.00100	mg/L	0.255	0.256	0.466%	20%	----
		Molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.0145	0.0146	0.629%	20%	----
		Nickel, total	7440-02-0	E420	0.00500	mg/L	0.0135	0.0137	0.00017	Diff <2x LOR	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 874409) - continued											
WT2307055-001	Anonymous	Selenium, total	7782-49-2	E420	0.000500	mg/L	0.000821	0.000709	0.000112	Diff <2x LOR	----
		Silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		Tin, total	7440-31-5	E420	0.00100	mg/L	0.00177	0.00182	0.00005	Diff <2x LOR	----
		Titanium, total	7440-32-6	E420	0.00300	mg/L	0.209	0.210	0.632%	20%	----
		Vanadium, total	7440-62-2	E420	0.00500	mg/L	0.0176	0.0173	0.00030	Diff <2x LOR	----
		Zinc, total	7440-66-6	E420	0.0300	mg/L	0.0509	0.0527	0.0018	Diff <2x LOR	----
Total Metals (QC Lot: 874693)											
TY2302290-001	Anonymous	Mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 874756)											
TY2302280-001	Anonymous	Phenols, total (4AAP)	----	E562	0.0500	mg/L	1.44	1.51	4.64%	20%	----
Aggregate Organics (QC Lot: 874985)											
WT2307173-003	Anonymous	Carbonaceous biochemical oxygen demand [CBOD]	----	E555	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
Aggregate Organics (QC Lot: 877034)											
WT2307174-001	MW101-23	Carbonaceous biochemical oxygen demand [CBOD]	----	E555	3.0	mg/L	<3.0	<3.0	0.0%	30%	----



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: 875240)						
Solids, total suspended [TSS]	---	E160	3	mg/L	<3.0	---
Anions and Nutrients (QCLot: 874757)						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	---
Anions and Nutrients (QCLot: 874759)						
Kjeldahl nitrogen, total [TKN]	---	E318	0.05	mg/L	<0.050	---
Anions and Nutrients (QCLot: 875264)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	---
Anions and Nutrients (QCLot: 875267)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	---
Anions and Nutrients (QCLot: 875268)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	---
Cyanides (QCLot: 881027)						
Cyanide, strong acid dissociable (Total)	---	E333	0.002	mg/L	<0.0020	---
Microbiological Tests (QCLot: 874957)						
Coliforms, thermotolerant [fecal]	---	E012.FC	1	CFU/100mL	<1	---
Total Metals (QCLot: 874409)						
Aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	---
Antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	---
Arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	---
Bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	---
Cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	---
Chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	---
Cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	---
Copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	---
Iron, total	7439-89-6	E420	0.01	mg/L	<0.010	---
Lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	---
Manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	---
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	---
Nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	---
Selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	---
Silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	---
Tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	---



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 874409) - continued						
Titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
Zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 874693)						
Mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Aggregate Organics (QCLot: 874756)						
Phenols, total (4AAP)	----	E562	0.001	mg/L	<0.0010	----
Aggregate Organics (QCLot: 874985)						
Carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 877034)						
Carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 877187)						
Oil & grease (gravimetric)	----	E567	5	mg/L	<5.0	----
Aggregate Organics (QCLot: 877188)						
Oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	<5.0	----



Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 875240)									
Solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	110	85.0	115	----
Physical Tests (QCLot: 875263)									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
Anions and Nutrients (QCLot: 874757)									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.845 mg/L	98.9	80.0	120	----
Anions and Nutrients (QCLot: 874759)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 875264)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 875267)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 875268)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Cyanides (QCLot: 881027)									
Cyanide, strong acid dissociable (Total)	----	E333	0.002	mg/L	0.25 mg/L	93.6	80.0	120	----
Total Metals (QCLot: 874409)									
Aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	104	80.0	120	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	106	80.0	120	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	111	80.0	120	----
Bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	106	80.0	120	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	108	80.0	120	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	106	80.0	120	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	108	80.0	120	----
Copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	106	80.0	120	----
Iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	109	80.0	120	----
Lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	108	80.0	120	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	108	80.0	120	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	106	80.0	120	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	# 123	80.0	120	MES
Selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	105	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 874409) - continued									
Silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	103	80.0	120	----
Tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	106	80.0	120	----
Titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	105	80.0	120	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	108	80.0	120	----
Zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	107	80.0	120	----
Total Metals (QCLot: 874693)									
Mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	94.7	80.0	120	----
Aggregate Organics (QCLot: 874756)									
Phenols, total (4AAP)	----	E562	0.001	mg/L	0.02 mg/L	105	85.0	115	----
Aggregate Organics (QCLot: 874985)									
Carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	198 mg/L	96.3	85.0	115	----
Aggregate Organics (QCLot: 877034)									
Carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	198 mg/L	100	85.0	115	----
Aggregate Organics (QCLot: 877187)									
Oil & grease (gravimetric)	----	E567	5	mg/L	100 mg/L	84.1	70.0	130	----
Aggregate Organics (QCLot: 877188)									
Oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	50 mg/L	85.5	70.0	130	----

Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



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: 874757)										
WT2306672-002	Anonymous	Phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 874759)										
WT2306908-027	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.78 mg/L	2.5 mg/L	111	70.0	130	----
Anions and Nutrients (QCLot: 875264)										
WT2307133-001	Anonymous	Fluoride	16984-48-8	E235.F	5.08 mg/L	5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 875267)										
WT2307133-001	Anonymous	Chloride	16887-00-6	E235.Cl	506 mg/L	500 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 875268)										
WT2307133-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	500 mg/L	ND	75.0	125	----
Cyanides (QCLot: 881027)										
WT2307170-001	Anonymous	Cyanide, strong acid dissociable (Total)	----	E333	0.242 mg/L	0.25 mg/L	96.8	75.0	125	----
Total Metals (QCLot: 874409)										
WT2307055-002	Anonymous	Aluminum, total	7429-90-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		Antimony, total	7440-36-0	E420	0.0535 mg/L	0.05 mg/L	107	70.0	130	----
		Arsenic, total	7440-38-2	E420	0.0547 mg/L	0.05 mg/L	109	70.0	130	----
		Bismuth, total	7440-69-9	E420	0.0508 mg/L	0.05 mg/L	102	70.0	130	----
		Cadmium, total	7440-43-9	E420	0.00519 mg/L	0.005 mg/L	104	70.0	130	----
		Chromium, total	7440-47-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Cobalt, total	7440-48-4	E420	0.0131 mg/L	0.0125 mg/L	105	70.0	130	----
		Copper, total	7440-50-8	E420	0.0126 mg/L	0.0125 mg/L	100	70.0	130	----
		Iron, total	7439-89-6	E420	0.052 mg/L	0.05 mg/L	103	70.0	130	----
		Lead, total	7439-92-1	E420	0.0257 mg/L	0.025 mg/L	103	70.0	130	----
		Manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Molybdenum, total	7439-98-7	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		Nickel, total	7440-02-0	E420	0.0256 mg/L	0.025 mg/L	102	70.0	130	----
		Selenium, total	7782-49-2	E420	0.0515 mg/L	0.05 mg/L	103	70.0	130	----
		Silver, total	7440-22-4	E420	0.00478 mg/L	0.005 mg/L	95.6	70.0	130	----
		Tin, total	7440-31-5	E420	0.0259 mg/L	0.025 mg/L	104	70.0	130	----
		Titanium, total	7440-32-6	E420	0.0122 mg/L	0.0125 mg/L	97.7	70.0	130	----
		Vanadium, total	7440-62-2	E420	0.0269 mg/L	0.025 mg/L	107	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
Total Metals (QCLot: 874409) - continued										
WT2307055-002	Anonymous	Zinc, total	7440-66-6	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
Total Metals (QCLot: 874693)										
TY2302290-002	Anonymous	Mercury, total	7439-97-6	E508	0.0000982 mg/L	0.0001 mg/L	98.2	70.0	130	----
Aggregate Organics (QCLot: 874756)										
TY2302280-001	Anonymous	Phenols, total (4AAP)	----	E562	ND mg/L	0.02 mg/L	ND	75.0	125	----

