Prepared By:

GM BluePlan
ENGINEERING

Industrial Equities Guelph

Hydrogeological Study: 384 Crawley Road, Guelph

GMBP File: 121123

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1. INTRODUCTION

Industrial Equities Guelph (the Client) has retained GM BluePlan Engineering Limited (GMBP) to conduct a Hydrogeological Study to support the applications of a Site Plan of Subdivision for a property located at the civic address 384 Crawley Road, Guelph, Ontario (hereafter referred to as the "Site"). The Site is approximately 82 hectares in size and is located near the southern limits of the City of Guelph (see Figure 1).

The proposed Site Plan (see Appendix A) is for Phase 1 of an industrial development, which comprises a warehouse facility for cold storage of food products and ancillary works such as parking areas, stormwater management facilities, an extension of Southgate Drive, and area grading for future phases.

The Site is proposed to be serviced with both municipal water and sanitary which will include an on-Site sewage pumping station; and stormwater will be managed by on-Site facilities (i.e., stormwater management ponds, engineered infiltration galleries etc.).

The following report presents the findings of the hydrogeological study, which gathered data from existing reports and project-specific site investigation to assess the potential for impacts that the proposed development may have on the local hydrogeological system and nearby receptors.

1.1 PURPOSE AND SCOPE

The purpose of this study is to support the development process by providing hydrogeological information and assessments to support other aspects of the site plan application, such as the stormwater management plan and the environmental impact study.

Objectives of this study are as follows:

- Gather relevant hydrogeological, regulatory, and physical information about the Site
- Develop a hydrogeological conceptual model for the Site
- Provide a hydrogeological impact assessment relevant to the proposed land use in the context of the regulatory setting and hydrogeological system.

The following is a brief outline of the scope of work that was undertaken to meet the objectives.

- Desktop study including review of geological, topographic, and physiographic maps; sourcewater protection documentation; and site-specific geotechnical investigations.

- Field investigation, including
  - Inspection of Site to visually assess drainage and surface water features.
  - The drilling and installation of 11 new monitoring wells, including the logging of stratigraphy and well installations by GMBP staff.
  - Manual installations of 8 piezometers, 6 of which were installed as nests in the various wetlands on-Site
  - Installation of dataloggers in 11 new monitoring wells, 5 existing monitoring wells, and 8 new piezometers to monitor long-term fluctuations in groundwater level.
  - Quarterly monitoring visits to attend to the Site to download groundwater level data from the dataloggers.
  - Collection and analysis of groundwater and surface water samples.
  - Complete a door-to-door well survey at nearby residences and complete baseline water quality sampling
- Hydrogeological assessment, including
  - Drafting of hydrogeological cross-sections
  - Preparation of a water balance (based on a catchment plan as developed by AECOM, the civil engineer for this project)
  - Identification of potential water quality or water quantity impacts that the project may have on nearby receptors such as domestic wells and surface water features or ecological features
  - Potential requirements for construction dewatering
  - Recommendations to minimize potential hydrogeological impacts to identified receptors.

A more detailed description of particular investigative activities is provided in Section 3.1 (Methodology) of this report.

2. BACKGROUND

For the purposes of this report, the term “north” shall be taken to mean the direction parallel with Southgate Drive and Crawley Road toward Clair Road.

The term “wetland corridor” as used in this report refers the zone running roughly north-south through the easterly portion of the Site and which is occupied by wetlands WET-03, WET-05, WET-06, WET-07, WET-12, and their ecological buffer areas.

2.1 SITE LOCATION AND SETTING

The Site is situated near the southern city limits of the City of Guelph and is described by the civic address 384 Crawley Road, Guelph, Ontario. The Site location is further described as Parts of Lot 13, 14 and 15, Concession 7 of the Geographic Township of Puslinch.

At the time of writing, the Site is currently used for agricultural purposes. Land uses to the east and south are agricultural and rural residential. To the immediate west of the Site is the Crawley Road right-of-way and further beyond that is the Ontario Provincial Highway 6. To the north of the Site exists the Southgate Business Park which consists of numerous industrial properties along Southgate Drive. To the immediate northwest of the Site exists a stormwater management pond that manages flows from the uplands along Southgate Drive.

Figure 2 provides an aerial view of the Site and adjacent lands.

2.2 PROPOSED DEVELOPMENT

A copy of the proposed Site Plan for Phase 1 of the development is provided in Appendix A.

Phase 1 is proposed to involve construction and/or pre-grading activities over an area approximately 24.0 ha in size, including the following:

- construction of a warehouse cold storage facility with office building
    - approximate area 22,900 m^2;
- parking areas
    - approximate area 4.9 ha;
- stormwater management infrastructure (i.e., infiltration galleries);
- roadway extension of Southgate Drive with associated stormwater infiltration gallery
    - approximate area 2.1 ha; and
- pre-grading of other areas in preparation for the construction of future phases
    - approximate area 14.8 ha.

The development will involve the removal of an existing tree plantation which currently lies within the area to be developed: compensation woodland plantings will be undertaken in an area of approximately 5.49 ha in the easterly portion of the Site.

The Site is proposed to be serviced with municipal water and sewer, an on-site sewage pumping station, stormwater management facilities and engineered infiltration galleries.

2.3 GEOLOGY AND PHYSIOGRAPHY

The Site is situated within the physiographic region known as the Horseshoe Moraines (Chapman and Putnam, 1984). The Horseshoe Moraines (see Figure 3a) are described as series of broad, horseshoe-shaped glacial moraines which flank the uplands that lie to west of the Niagara Escarpment. The northmost moraine within the Horseshoe Moraine complex (in which the Site is situated in) is the Paris Moraine, which is described as steeply sloped to very hilly, hummocky landscapes with numerous kettle depressions that may vary in size (e.g. 10s of meters to 100s of meters).

In terms of physiographic landforms, mapping from the Ontario Geological Survey (Chapman and Putnam) indicates that the Site is situated within a Till Moraine (see Figure 3b). The available surficial geological mapping (Ontario Geological Survey, 2010) further corroborates this by illustrating that the Wentworth till is the predominant surficial soil type across the Site, with some ice-contact gravel near the center of the Site that extends to the south and west, and a peat and muck layer at the southeast corner of the Site that extends southeast (see Figure 4). The Wentworth till can be described as a thin layer of stony, sand to silty sand till (Karrow, 1968) that can be found near the surface of the Paris Moraine functioning as a cap for the underlying sand and gravel. Notably, it is reported that the Wentworth till atop the Paris Moraine typically has lower silt content, making it harder to distinguish from the underlying sand and gravel.

A review of nearby water well records corroborate the predominance of a surficial layer of till described as clay, gravel and stones generally extending approximately 12 to 13 m below ground surface (mbgs). Underlying the till, interbedded layers of sand and gravel (ranging from fine sand to gravel and boulders) was encountered generally extending to depths of 18 mbgs to 25 mbgs. Below this sand and gravel deposit, the well records are inferred to indicate older till materials (e.g. “gravel sand clay”, “clay gravel”, “gray clay and boulders”) extending to the subcrop of bedrock at around 27 to 42 mbgs

Bedrock in the vicinity of the Site is Silurian dolomite rock of the Guelph/Amabel Formation. This formation is characterized by limestone and dolostone.

2.4 LOCAL RELIEF AND DRAINAGE

Topographically, the Site can be described as hummocky with numerous rolling hills and low-lying closed depressions areas. The topography ranges from elevations of about 345 masl to lows of about 330 to 331 masl within the various kettle depressions.

Due to the lack of watercourses at the Site, it is not readily evident whether the Site lies within the Hanlon Creek, Mill Creek, or Irish Creek watersheds in terms of surface water flows. According to catchment mapping available from the Grand River Conservation Authority (GRCA Web-Map), the Site is located at a watershed divide, where the eastern part of the Site is located within the Hanlon Creek sub-watershed and the western portion is predominately in the Mill Creek sub-watershed. A small portion at the northwest of the property is also designated as the Irish Creek sub-watershed. However, the Clair Maltby Secondary Plan indicates that the Site is within the Mill Creek subwatershed (Wood Canada Limited, 2018).

Surface water drainage on-Site is primarily internal: runoff collects within the numerous “closed” kettle depressions on-Site. Runoff that accumulates at the kettle depressions is controlled by either evapotranspiration or infiltration into the ground, with the latter process ultimately providing recharge to the regional groundwater table.

Though several of the kettle depressions do not retain standing water (i.e., collected runoff dissipates rapidly via evapotranspiration and/or infiltration), some of them do and wetland communities have developed within them. A set of 13 wetland areas have been identified on-Site (named WET-01 through WET-13, see Figure 5 for wetland locations). For those kettle depressions that have developed wetland communities, the water levels fluctuate seasonally and most of these have been observed to go dry for at least part of the year. The larger, deeper depressions located at the northeast quadrant of the Site do maintain water for longer periods but are also known to go dry during times of drought (Anderson, 2010).

The wetlands WET-01 through WET-09 and WET-11 through WET-13 at the Site have been classified as Provincially Significant Wetlands (PSWs) by the Ministry of Natural Resources and Forestry (MNRF). This has significant implications to the project as Section 2.1 of the Provincial Policy Statement (2005), prohibits any development or site alterations from occurring within said PSWs.

2.5 LOCAL USE OF GROUNDWATER

Due to the location of the Site adjacent to the Guelph city limits, there may be some residences or properties in the nearby rural areas that rely on water wells for water supply.

A search of the provincial water well records database was conducted to identify water wells within 500 m of the Site and determine their uses (as per the information available on the record). Figure 6 provides a map showing the water well records attributed to the locations within the search area. Table 1 (see end matter) provides a listing of some of the characteristics of each of the well records. The following is a summary of the findings of that search:

- 54 well records in total, of which the reported uses were:
    - Domestic: 16 records (two attributed to the Site)
    - Commercial: 1 record (attributed to the Site; however, it is mis-plotted and should be located at the address 519 Maltby Road according to record)
    - Industrial: 1 record
    - Livestock: 3 records
    - Municipal: 1 record (well record was for a test hole and not used for water supply)
    - Monitoring: 22 records (three attributed to the Site)
    - Abandoned: 3 records (one belongs to the Site)
    - Not Used: 5 records
    - Not Listed / Unknown: 2 records
- Of the reported off-Site wells for supply uses, six were reported to be overburden wells, and the remainder were bedrock wells.
- Bedrock was generally encountered at 30 to 40 mbgs

Among the water well records, some appear to be attributed to locations on-Site based on MECP mapping. These well records are provided in Appendix B and summary information is provided here as follows:

- Well ID 6702499: 20.4 m deep (overburden), with static water level of 15.3 mbgs. Reported use is domestic.
- Well ID 6703865: 50.3 m deep (bedrock), static water level of 21.4 mbgs. Reported use is domestic.
- Well ID 6708738: 22.9 m deep (overburden), static water level 15.6 mbgs. Reported use is commercial.
    - Upon closer inspection of the well record, it appears that the MECP mapping is in error and that this well is located at 519 Maltby Road rather than on-Site.

2.6 SOURCEWATER PROTECTION

According to the Source Protection Information Atlas (MECP, 2021), the Site overlaps the following types of vulnerable areas:

- Wellhead Protection Area: Yes
    - WHPA-D with a vulnerability score of 2
- Groundwater Under Direct Influence (GUDI): No
- Issus Contributing Area: No
- Significant Groundwater Recharge Area: Yes
- Highly Vulnerable Aquifer: No
- Intake Protection Zone: Yes,
    - IPZ-3 with a vulnerability score of 1

    - Located along the wetland corridor and along south of Site
- Event Based Area: No

These designations under the Sourcewater Protection Plans will be used to assess the proposed development for significant threats to drinking water and to determine, if required, suitable monitoring and/or mitigation activities for the protection of drinking water resources

2.7 RELEVANT LOCAL AND SITE-SPECIFIC REPORTS

2.7.1 2006 GEOTECHNICAL INVESTIGATION BY PETO MACCALLUM LTD.

A geotechnical investigation was previously conducted on the Site by Peto MacCallum Ltd. (PML) in 2006. The geotechnical investigation was conducted to support a previous Draft Plan of Subdivsion application for the development of an industrial subdivision (similar to what is being proposed currently).

The field investigation involved the drilling of fifteen (15) boreholes, ten of which were installed with standpipes to monitor groundwater levels, as well as the excavation of 41 test pits. The boreholes were advanced to depths between 3.65 and 9.60 mbgs; and the test pits were excavated to depths between 1.50 and 4.30 mbgs. The investigative locations were selected to explore the roadway extension of Southgate Drive right-of-way, potential storm water management ponds in low-lying areas, and the slope alongside the south edge of Site. Select soil samples were also collected for grain size analyses to investigate the suitably of soils for storm water and roof water infiltration systems (i.e., storm water retention ponds and infiltration galleries).

As reported by PML, the soils encountered on-Site did not exhibit a discernible stratigraphic pattern but generally these were the soil types encountered:

- <u>Topsoil</u> described as low organic sandy silt, ranging in thickness of 200mm to 400mm and thicker at the low-lying areas 600mm to 800mm; overlying,
- <u>Silt</u> frequently found in the low-lying areas believed to have been deposited as washed-in sediment. The silt was also observed at several isolated locations in the table land areas. The texture ranged from sandy to clayey silt and extended to depths of 0.6 to greater than 2.6 mbgs; overlying,
- <u>Sand</u> varying in texture from silty fine sand to coarse gravelly sand. The sand was prevalent across the site but was more predominant in the north half and east and west ends of the Site.
- <u>Sand and Gravel</u>, grading from gravelly sand to sandy gravel with cobbles and boulders. Encountered primarily through the central and southern half of the Site, as well as the northwest quadrant, and other random occurrences at several isolated test pit locations.
- <u>Sand and Silt Till</u> was encountered at the southeast quadrant of the Site.

The geotechnical investigation concluded that the Site is generally well-suited for stormwater management systems relying on infiltration but noted that the fine-textured soils (e.g. silty clay) may not be suitable for infiltration galleries: alternative locations should be considered, or the soil should be excavated and replaced with sand and gravel from cut areas during grading.

2.7.2 2010 HYDROGEOLOGICAL ASSESSMENT REPORT BY ANDERSON GEOLOGIC LIMITED

It is noted that Anderson Geologic referred to the wetland areas on-Site by a letter-name (e.g. Wetland “B”) convention. For consistency with the rest of this report, the following summary of the Anderson Geologic report will refer to the wetland areas using the numbered wetland names (WET-01 through WET-13) which have been developed for the purpose of the present study.

A hydrogeological assessment was previously conducted by Anderson Geologic Limited (Anderson) in 2010, to satisfy the following specific conditions of a draft plan approval received for the Site in 2007:

- *To provide a confirmatory assessment of the shallow hydrogeological setting using new data collected in 2009 and 2010, with particular emphasis on confirming the inter-relationship between the shallow groundwater regime and the surface water regime (i.e., wetlands and area water courses).*
- *To provide detailed water-balance and groundwater recharge evaluation to support an effective strategy for post-development stormwater management, one that maintains groundwater contributions to important groundwater and surface water receptors*.

Excerpts of select information from Anderson (2010) are provided in Appendix C, including borehole logs, hydrographs, catchment plans, cross-sections, and interpreted groundwater contour plans.

In order to satisfy these conditions, Banks Groundwater Engineering Limited completed the drilling of three additional boreholes (MW1-09 to MW3-09) adjacent to three of the wetland features on-Site (i.e., WET-02, -03 and -07). The boreholes were advanced to depths of 8 to 10 mbgs and each were equipped with a monitoring well. The field program also included the installation of 10 nests of shallow drive-point piezometers at various wetland features (i.e., WET-01 - WET-04, WET-06, WET-07, and WET-10).

The groundwater and surface water levels were then monitored during the period of June 2009 to April 2010 at six (6) monitoring wells (3 new and 3 from the prior 1997 Gartner Lee Limited (GLL) investigation), and the 10 nested piezometers, using dataloggers and manual measurements. This monitoring data in addition to historical monitoring data from the GLL monitoring wells, the Golder Associates monitoring well MW06-07, and the Puslinch Township Well MW5 was used to generate groundwater level contours for the Site during high and low seasonal water levels.

The groundwater levels reported by Anderson GeoLogic (2010) seldom rose to levels shallower than 4 m below ground surface, except in the immediate vicinity of the wetland corridor. The deepest groundwater levels were observed on the western half of the property (i.e., between the woodlot area and Crawley Road). The groundwater contours interpreted by Anderson GeoLogic indicated that the groundwater flow direction across the Site was towards the west-southwest in both low and high-water table conditions. The data also provided insight on the relationship between the regional groundwater table and surface water within the wetlands. The following inferences were made:

- Wetlands WET-06, WET-07 and WET-12
    - Behave as “flow-through” wetlands: based on local groundwater levels and interpreted seepage directions, these wetlands appear to receive seasonal

  groundwater discharge from the upgradient lands to the east during high-water table conditions, while simultaneously recharge occurs on the downgradient (i.e., west) side.
  - During low water-table seasonal periods, these wetlands function as depression-focused recharge features (i.e., are disconnected from the groundwater table).
  - Surface runoff and direct precipitation are still strong contributors to sustaining surface water levels in these wetlands.
- Wetlands WET-01, WET-02, WET-03, WET-04, WET-05, WET-08, WET-09
  - These wetlands are perennially disconnected from the groundwater table and are sustained strictly by surface runoff and direct precipitation
  - Mounding of the regional groundwater table may occur in the vicinity of Wetlands WET-03, WET-04, WET-05, WET-08, and WET-09 due to the recharge that occurs at those locations.

Anderson GeoLogic (2010) also reported the results of a detailed pre-development and post-development feature-based water balance assessment. The assessment provided target quantities of run-off and/or recharge that should be directed to each individual wetland whose catchment areas intersected the proposed development blocks (i.e., post-development).

2.7.3 CLAIR-MALTBY SECONDARY PLAN

The City of Guelph commissioned the preparation of the Clair-Maltby Secondary Plan (CMSP) and approved the resulting report in May 2022. The CMSP included a variety of technical studies in a Comprehensive Environmental Impact Study Report (Wood Canada Limited, 2018), including a hydrological study (by Wood.) and a hydrogeological study (by Matrix Solutions Inc.).

Monitoring data and interpreted groundwater level contours included in the CMSP report indicate that Hall’s Pond (located about 1.6 km east of the Site) and other ponded areas east of Gordon Street are dominant sources of recharge: groundwater level observations indicate substantial groundwater mounding in those areas (see “Water Table Map Observed Data” and “Conceptual Groundwater Flow System” plots in Appendix D).

These significant recharge features (e.g. Hall’s Pond) appear to dominate the groundwater flow patterns across much of the City’s area south of Clair Road: groundwater flow is generally in a radial direction away from this cluster of recharge features.

According to the interpreted groundwater level contours provided in the CMSP, the lateral direction of groundwater flow at the Site is expected to generally be toward the west or southwest.

The CMSP study also included extensive hydrogeological and hydrological modeling, including the determination of groundwater levels and annual recharge rates by simulation.

The output of this model indicates that groundwater levels across most of the western portion of the Site are expected to be deeper than 7 m below ground surface. Near the wetland corridor (i.e., the zone running roughly north-south through the easterly portion of the Site and which is occupied by wetlands WET-03, WET-05, WET-06, WET-07, WET-12) the simulation predicts depth to groundwater ranging from 0 m (i.e., water table coincides with ground surface) to 5 mbgs. See Appendix D for a copy of the simulation results (“Simulated Average Depth to Water Table”).

The model also indicated that for much of the Site, the annual recharge rate is in the range of 250 to 350 mm/year. Along Crawley and Maltby, the recharge rate is toward the upper end of that range, whereas in the interior of the Site and on the east side of the wetland corridor it is toward the lower end of the range. In the western portion of the Site, some areas lying near the bottoms of closed depressions are noted to achieve higher annual recharge rates, up to 400 mm/year. See Appendix D for a copy of the results of the groundwater recharge model ("Simulated Groundwater Recharge").

2.7.4 INFILTRATION TESTING (AECOM)

The present hydrogeological study is being undertaken concurrently with a stormwater management (SWM) design by civil engineering consultant AECOM.

As part of the SWM design work, AECOM undertook a series of test pits and infiltration tests at select locations on-Site. The details of these tests are provided under separate cover by AECOM (2023, *Phase 1 Stormwater Management Plan Report, Parts of Lots 13, 14 and 15, Concession 7, Guelph Ontario*).

A total of five tests were conducted using a Guelph Permeameter in the surficial soils of the Site mainly in areas where infiltration galleries and stormwater management facilities are anticipated to be constructed as part of the proposed development.

Three tests were completed in soils described as loose fine sand with trace gravel and silt. These test results indicated hydraulic conductivity in the range of $4.7x10^{-6}$ to $7.6x10^{-6}$ m/s.

One test (IFT1-4) was completed in the vicinity of WET-02 at an elevation of approximately 332.7 masl. The soil at this location was described as being loose fine-to-coarse sand with trace gravel and silt. This test indicated a hydraulic conductivity of $5.4x10^{-6}$ m/s.

The fifth test was conducted in soils described as loose fine-to-medium sand with trace silt and indicated a hydraulic conductivity of $1.7x10^{-5}$ m/s.

The soils tested were of very similar descriptions, varying mainly by the presence of trace gravel and the gradation of the sand. Across the five tests, the range in hydraulic conductivity varied within less than one order of magnitude, indicating very consistent soil conditions among the locations tested.

2.7.5 ENVIRONMENTAL IMPACT STUDY (NRSI)

In support of the site plan application for the proposed development, Natural Resource Solutions Inc. (NRSI) is concurrently preparing an Environmental Impact Study Report (EIS) to assess the feasibility of the proposed development in relation to the natural features located on-Site.

NSRI identified 13 wetlands features on-Site (i.e., WET-01 to WET-13). Figure 5 shows the locations of these wetlands.

Each of these wetland areas was assigned an ecological land classification (ELC): these are summarized in Table 2 .

Generally, the Ecological Land Classifications indicate that most of the wetland areas experience seasonal flooding in spring, with flooding subsiding and soils drying through the summer.

Exceptions are the portions of WET-06 and WET-07 which are classified as “Organic Shallow Marsh”-type ecosites (MAS3-10 and MAS3-2): these areas are typically characterized (Lee, et al., 1998) as having shallow pools (<2 m deep) of standing water for most or all of the growing season.

2.7.6 WETLAND REMOVAL POLICY ASSESSMENT (NRSI)

NRSI also completed an assessment of wetland WET-10 with respect to section 8.4.4 of GRCA policy (Natural Resource Solutions Inc., 2023). This assessment was conducted to review the ecological and hydrogeological significance of WET-10 and whether or not it may be considered eligible for removal or encroachment by the proposed development.

The conclusion of that assessment was that “WET-10 adequately meets the criteria within Section 8.4.4 of GRCA policy to permit removal of the wetland” (Natural Resource Solutions Inc., 2023).

Correspondence received from the GRCA (Grand River Conservation Authority, 2023) indicates that the GRCA has accepted this conclusion.

Though the GRCA has recognized WET-10 as being eligible for removal, throughout this report (i.e., the hydrogeological study), the term “WET-10” will continue to be used to refer to that area of the Site, such as with respect to catchment identification in the water balance (see Section 5).

3. FIELD INVESTIGATION

In order to collect site specific information about the hydrogeological conditions on-Site, a field investigation was conducted as part of this hydrogeological study. This information was collected with the intention of providing additional detail to the existing geological and hydrogeological information available for the purposes of refining the conceptual model of the Site hydrogeology and facilitating the impact assessment process.

3.1 METHODOLOGY

The hydrogeological study involved the completion of multiple activities, including the following:

- Installation of up to 11 new monitoring wells, including logging of stratigraphy and well installation details by GMBP staff.
- Grain size analyses on select samples of soil.
- Manual installation of eight piezometers (six of which were nests of two piezometers) in the wetland areas within the Site (specifically, wetlands WET-01 – WET-09).
- Installation of electronic dataloggers in 11 new monitoring wells, 5 existing monitoring wells, and 8 new piezometers (6 of which are nested) to monitor long-term fluctuations in groundwater level.
- Monitoring visits to attend the site to download groundwater level data from the dataloggers
- Water quality sampling for general water quality parameters at up to 22 groundwater monitoring locations and 8 surface water monitoring locations.
- One event of follow-up environmental water sampling at the same locations

- Door-to-door water well survey, including an attempt to collect baseline water quality samples from up to 5 residences.

Figures 7a and 7b provide the general layout of the site investigation instruments.

Table 3 provides a summary of the tasks completed by GMBP as part of the field investigation program.

3.1.1 MONITORING WELL INSTALLATION

Boreholes were advanced by a licensed well drilling contractor under the supervision of GMBP staff.

Each borehole was advanced using a hollow stem auger to intersect the apparent groundwater table. Borehole depths ranged from 6.1 m to 15.3mbgs.

During drilling, soil samples were collected using split spoon sampler and were visually assessed to describe the stratigraphy of the soils underlying the Site.

Monitoring wells were installed in all 11 boreholes. At two locations the monitoring wells were installed as a nest, with a deep and shallow well). Each well was constructed with casing of 2” PVC pipe with slotted screens. The annulus around the screen was backfilled with sand pack and bentonite chips were placed in the annulus above the filter pack to seal the well and protect it from surface water intrusion. Each well was provided with a J-plug well cap and a protective steel stickup casing which was secured with a padlock.

A datalogger (Solinst Levelogger) was installed in each monitoring well for the ongoing collection of water level data.

Stratigraphic records and details of monitoring well construction are provided in the borehole logs in Appendix E1.

Select soil samples were submitted for grain size analyses and the results of the testing is also provided in Appendix E2.

3.1.2 PIEZOMETER INSTALLATION

Piezometers were installed manually. Using a hand auger (i.e., “Dutch auger”), GMBP staff advanced a borehole to the target depth. Soils withdrawn by the auger were visually-assessed to describe the stratigraphy of the soils.

Upon completion of the borehole, piezometer construction began by placing a casing assembly into the borehole. The casing assembly was constructed of 1-¼” PVC pipe and fittings and consisted of an end-cap, a short section (approximately 20 cm) of machine-slotted PVC screen, a coupling adapter, a section of 1-¼” PVC riser pipe (up to 1.5 m in length), and capped with a J-plug.

The casing assembly was backfilled with clean filter sand to form a filter pack to protect the screen. Bentonite chips were emplaced to form an annular seal from the top of the filter pack to the surface.

The elevations of each piezometer (top of casing, top of ground) were determined using a level loop (i.e., rod and automatic level) to be able to determine water levels as elevations and to compare water levels between piezometers in a nest for the determination of vertical gradients.

A datalogger (Solinst Levelogger) was installed in each piezometer for the ongoing collection of water level data.

3.1.3 GROUNDWATER SAMPLING – MONITORING WELLS

Groundwater samples were collected according to industry-accepted practices and GMBP's internal standard procedures manual. The procedure began by measuring the water level in the well and determining the volume of the water column in the well. A dedicated Waterra inertial pump (i.e., tube with foot valve) was used to purge the well of at least three well-volumes or until dry. After purging, inertial pump was used to draw groundwater from the well and collect it into laboratory-supplied containers/bottles appropriate for the proposed analyses.

Samples collected for metals analyses were filtered using a new Waterra-brand 0.45 µm filter.

Samples were kept cool (between 0 and 10°C) and submitted under chain of custody protocols to a CALA-SCC accredited environmental laboratory (Bureau Veritas, Mississauga) for analyses.

3.1.4 GROUNDWATER SAMPLING – DOMESTIC WELLS

Domestic water samples (i.e., from nearby residences identified in the door-to-door well survey) were collected by GMBP staff from a pre-treatment tap or faucet identified by the homeowner.

The procedure began with the sterilization of the sampling point using a bleach solution or flame. The water was then turned on to run for approximately 3 to 5 minutes. To prevent sample contamination, technicians donned a new pair of nitrile gloves before opening sample bottles to begin collection, with care being taken not to touch the mouth of the bottle or the underside of the cap. Water was collected into the laboratory-supplied bottles. To prevent contamination during collection of samples for microbial analyses, care was taken not to speak or to breathe toward the bottle during sampling.

Samples were kept cool (between 0 and 10°C) and submitted under chain of custody protocols to a CALA-SCC accredited environmental laboratory (Bureau Veritas, Mississauga) for analyses.

3.1.5 SURFACE WATER SAMPLING

Samples from wetland areas were collected by dipping a laboratory-supplied container directly into the water to be sampled. Care was taken during sampling to avoid disturbing sediment and to avoid overfilling which might result in loss of preservative.

Samples were kept cool (between 0 and 10°C) and submitted under chain of custody protocols to a CALA-SCC accredited environmental laboratory (Bureau Veritas, Mississauga) for analyses.

3.2 SITE RECONNAISSANCE

On April 12, 2022, and on August 2, 2022, GMBP visited the Site to conduct a visual inspection of any drainage and surface water features present with the subject Site.

During the reconnaissance, the Site was observed to consist of a hummocky landscape with numerous closed depressions varying in size and orientation. The bulk of the Site is being used for agricultural purposes (i.e., crop land), and the remaining areas consist of a woodlot near the center of the property, a low-lying area referred to as the "wetland corridor" which extends roughly south-north across the center of the Site from wetland WET-03 to WET-12, and various other low-lying natural areas spread across.

3.2.1 WETLAND FEATURES

GMBP observed the condition of these wetlands on two separate occasions: in mid-spring and late summer. During the reconnaissance, the wetland limit stakes were observed as placed by NSRI in consultation with the Grand River Conservation Authority.

On April 12, 2022, GMBP observed standing water in the following wetlands: WET-01, WET-02, WET-06, WET-07, and WET-12. Of these wetlands, WET-07 and WET-12 contained the largest amount of pooled water. No evidence of groundwater seepage was observed along the banks of the depressions. Wetlands WET-03, and WET-09 were observed to have no standing water but rather a soft, moist surface. All other wetlands on-Site were not observed at this time.

On August 2, 2022, wetlands WET-01 through WET-03, WET-05 through WET-07 and WET-12 were all observed to be dry and most had overgrowth vegetation within them.

3.3 SOIL CONDITIONS

During the drilling event on April 18th through to April 22nd, 2022, GMBP attended the Site to supervise the drilling and log the soil stratigraphy encountered. The borehole logs are provided in Appendix E1 for reference.

From these GMBP boreholes, the stratigraphic sequence generally encountered is described as follows:

- Topsoil
- Silt
  - Only observed at borehole MW22-07 and extends 1.8 mbgs
  - This borehole is located at a topographical low and this stratum is likely the result of sediment accumulation due to erosion following initial deposition of the Paris Moraine.
- Silty Sand to Sandy Silt
  - Observed underlying the topsoil at boreholes MW22-02, MW22-08 and MW22-09 and extends 1.5 to 3.0 mbgs.
  - Also observed at borehole MW22-04 and MW22-06 interbedded between Sand and/or Gravel Layers
- Upper Silty Sand to Sandy Silt Till
  - Observed at boreholes MW22-09 and MW22-10 overlying the Sand and/or Gravel.
  - This upper till layer was encountered at elevations ranging from 335.8 - 332.2 masl.
- Sand and/or Gravel
  - Encountered in all boreholes generally underlying the topsoil or Silty Sand / Sandy Silt, typically 8 to 10 m in thickness.
  - Thinner pockets of Sand and Gravel were observed at the eastern half of the Site, ranging in thickness of 1.2 to 3.8 mbgs underlain by Till.
  - At boreholes MW22-01, MW22-05 to MW22-08, and MW22-10 the Sand and/or Gravel was observed to overlie a lower Silty Sand to Sandy Silt Till, and the

    interface between the two strata was described as wet in moisture content (with the exception of MW22-06 which is located at a topographical high point).
    - A deeper Sand and Gravel layer was observed at MW22-08 underlying the lower Till and extended beyond the depth of borehole (i.e., lower than 327.5 masl) which was not observed at other borehole locations.

- Lower Silty Sand to Sandy Silt Till
    - Observed at boreholes MW22-01, MW22-05 to MW22-08, and MW22-10 underlying the Sand and/or Gravel Layer and extended beyond the depth of boreholes (except at borehole MW22-08 where it extended to 328.3 masl).

3.4 GROUNDWATER LEVELS

3.4.1 MONITORING WELLS

On March 29, 2022 datalogging pressure transducers were installed in five of the previously existing monitoring wells located on-Site in order to record groundwater levels on a frequent basis over an extended period of time (ideally multiple seasons). On May 12, 2022, GMBP again visited the Site to install dataloggers in the newly installed monitoring wells (i.e., MW22-## series).

A topographic survey was also completed on the new and pre-existing monitoring wells to translate the data recorded by the dataloggers into actual elevations.

Figure 7a provides a map of the Site and the locations of the monitoring wells.

Table 4a and 4b provide a summary of groundwater level measurements collected from the monitoring wells (including manual and datalogger measurements). Charts 1 through 16 provide hydrographs of groundwater levels from each of the 11 new monitoring wells and 5 of the pre-existing monitoring wells in which dataloggers were installed.

From the data collected to date, groundwater levels at the Site were generally highest in the late spring (i.e., April and May) and have exhibited a relatively low degree of seasonal fluctuation with water levels in the early winter being only slightly lower (i.e., within 1 to 2 m at most locations).

The shallowest groundwater level on-Site was observed at MW22-10 (333.30 masl) located at the southeast corner of the Site near WET-04. The groundwater table was encountered approximately 1.2 mbgs at this location. Conversely, the deepest groundwater level was observed at MW22-01D (327.47 masl) located at the northwest quadrant of the Site and was 13.1 mbgs.

Generally, the groundwater level in the vicinity of the various wetlands was observed to be lower than the surface water levels in the wetlands, indicating that the surface water accumulating in the wetlands is infiltrating downward and providing recharge to the groundwater table (i.e., “recharge” conditions).

Comparing the groundwater levels between monitoring wells in the same nest provides an indication of vertical groundwater gradients:

- MW22-01S/D (located in the westerly portion of the Site) indicates a difference in which the water level in the shallow well is about 4 m higher than the water level in the deep well (about 332.7 masl versus 328.3 masl, respectively).
    - This is further contrasted with the historical interpretation of “high” groundwater level of about 329.5 masl given by Anderson (2010) for this area.

    - It is noted that there is a till layer intervening between the screen of the shallow well and the deeper well of MW22-01S/D, which is likely responsible for the difference in water level between the two wells.
- MW22-04S/D (located a short distance west of WET-06) indicates that the water in the sand and gravel unit intersected by them is hydrostatic (i.e., under minimal vertical gradient).

3.4.2 PIEZOMETERS IN WETLAND FEATURES

In the Spring and early Fall of 2022, eight (8) piezometers (6 of which were nested) were installed at wetlands WET-01 to WET-08. Piezometers were installed as single piezometers where it was noted that there was an operable monitoring well nearby (e.g., see MW3-09 and PZ-06, or MW97-5 and PZ-01) to provide information about vertical gradients. Each of these piezometers has been installed with a datalogger since May 2022 and monitoring is proposed to continue through the development approvals process.

Figure 7b provides a map showing the location of the piezometers across the Site area.

Table 4c provides a summary of groundwater level measurements collected from the new piezometers. Charts 17 through 22 provide hydrographs of groundwater levels from each of the piezometers.

A summary of the readings at each piezometer is given here:

- PZ-01 (located at WET-04):
    - Groundwater levels were recorded at about 0.5 m below ground surface in spring 2022, but then decreased to levels below the piezometer bottom (i.e., “dry” piezometer) through summer and fall 2022.
    - In late November 2022, groundwater levels rose abruptly and have fluctuated between about 0.2 and 0.6 mbgs over the winter.
    - Compared to groundwater levels at nearby MW97-5, a downward gradient is indicated.
    - See Chart 15.
- PZ-02S/D:
    - Initially installed as a single shallow piezometer in spring 2022, with a deeper piezometer being added in fall 2022.
    - Groundwater levels in PZ-02S were recorded as high as about 0.4 mbgs before declining to levels below the piezometer bottom. The piezometer remained dry for the remainder of the period to Feb 2023.
    - Groundwater levels have not been detected in PZ-02D since its installation (September 2022), indicating groundwater levels are below about 331.8 masl at this location.
    - See Chart 16.
- PZ-03S/D
    - Similar to PZ-02, this was installed as a single shallow piezometer in spring 2022, with a deeper piezometer being added in fall 2022.
    - Groundwater levels were about 0.2 mbgs around the time of first installation and decreased to below the piezometer bottom.
    - Subsequent installation of deep piezometer indicated dry conditions until early January 2023 at which time groundwater levels began to increase, rising to about 332.3 masl, about 1.8 mbgs.

  - See Chart 17.
- PZ-04S/D (in/near WET-01)
  - These piezometers have been dry since the beginning of monitoring (April 2022 for PZ-04S and September 2022 for PZ-04D), indicating groundwater levels deeper than 333.0 masl, approximately 1.5 mbgs at the WET-01 area.
  - See Chart 18.
- PZ-05S/D (north side of WET-06)
  - Groundwater levels at these piezometers were nearly identical in spring 2022, indicating hydrostatic conditions (i.e., no apparent vertical gradient).
  - Beginning about 0.3 mbgs, groundwater levels steadily declined through summer to elevations below the bottom of PZ-05D (i.e., less than 330.3 masl) and have remained dry since then.
  - See Chart 19.
- PZ-06 (near the southwesterly edge of WET-07)
  - In spring 2022 groundwater levels were about 0.5 mbgs, and declined through summer 2022 to about 1 mbgs. Through the fall and winter, groundwater levels have oscillated between just above and just below the bottom of the piezometer (about 329.3 masl).
  - The hydrograph appears more erratic due to suction effects on the levelogger during periods of drying which give the impression of a “measured” groundwater level below the bottom of the piezometer.
  - See Chart 20.
- PZ-07S/D (near the south end of WET-05)
  - These piezometers have been dry since installation in September 2022 (i.e., groundwater levels below 332.1 masl).
  - See Chart 21.
- PZ-08S/D (at WET-08)
  - PZ-08S has been dry since installation (September 2022)
  - PZ-08D was mostly dry since installation (September 2022) with a brief spike in water level in mid-October that quickly subsided, followed by more pronounced increase-decrease cycles beginning in January 2023. The highest level recorded was about 1.3 mbgs.
  - See Chart 22.

Generally, the piezometer data supports the finding that there is some vertical separation between the surface water or ground surface level in the wetlands and the groundwater level, indicating that downward gradients (or “recharge” conditions) have prevailed during this monitoring period. PZ-05S/D (at WET-06) appears to be an exception, in which the groundwater levels in the two piezometers were nearly identical, indicating hydrostatic conditions in that area, potentially due to a deeper aquitard limiting downward seepage and forcing groundwater to flow laterally through the area: compare to MW-04S/D (Chart 3), at which the groundwater levels were identical to each other but slightly lower than at PZ-05S/D, potentially indicating a lateral gradient and westerly flow through this area near WET-06.

3.5 GROUNDWATER QUALITY

Groundwater samples were collected from 14 out of the 16 monitoring wells on-Site (MW22-05 and MW22-06 were dry on the date of sampling) and the samples were submitted for routine groundwater quality analyses ("RCAP"). The results of the quality analyses of the groundwater samples are provided in Table 5a and 5b. The Certificate of Analysis associated with the groundwater quality analyses is also included in Appendix F1.

It is noted that the proposed development will be serviced by municipal water supply. As such, the results from the laboratory analyses have been compared against the *Provincial Water Quality Objectives* (PWQO) criteria (rather than the *Ontario Drinking Water Quality Standards*) because it is more relevant to review in the context of its potential influence on surface water (e.g., such as during construction dewatering and discharge).

Generally, the reported results indicate that the shallow groundwater on-Site is considered to be moderately mineralized as indicated by the elevated concentrations of dissolved calcium and magnesium. This result can be expected due to the Site's geological environment: the local overburden, which is largely derived from regional bedrock materials such as the limestone and dolostone of the Guelph / Amabel Formations.

A single well (i.e., MW3-09) exceeded the PWQO for the metals parameters cobalt and iron. It is inferred that these two metals parameters are naturally occurring and not as a result of anthropogenic activity; and furthermore, appear to be localized to the area in the immediate vicinity of MW3-09 because iron and cobalt were below the laboratory detection limit at all other sampled monitoring wells. As MW3-09 is located within the buffer of WET-07, there is no development proposed to occur at this location. As such, these reported exceedances do not have any implications for groundwater discharge during any potential construction dewatering that may occur during the proposed development.

Ultimately, the results of the analyses indicate that the groundwater on-Site meets the PWQO (with the exception of MW3-09) and would be suitable to be discharged to land in the scenario where construction dewatering is required. Appropriate measures to capture suspended solids from the dewatering discharge should be implemented during construction.

3.6 SURFACE WATER QUALITY – WETLAND FEATURES

Through summer and fall 2022, GM BluePlan made multiple attempts to collect surface water quality samples from the identified wetland features on-Site which were observed to be dry. During the most recent sampling attempt on January 6, 2023, GM BluePlan staff observed surface water in wetlands WET-02 and WET-06 sufficient enough to collect samples.

The samples were collected into laboratory supplied bottles and were submitted to an accredited laboratory for analyses of general water chemistry parameters. Please refer to Appendix F2 for a copy of the Certificate of Analysis as well as Table 6a and 6b for a tabulated summary in which the results of analyses are compared to the Provincial Water Quality Objectives (PWQO) for information purposes.

The samples indicate substantially lower magnesium and calcium concentrations compared to the groundwater quality results, indicating the dominant effect of precipitation on the chemistry of the surface water.

3.7 DOOR-TO-DOOR WATER WELL SURVEY

As part of the scope for this Hydrogeological Study, an invitation letter to participate in a well survey and a groundwater monitoring program hand-delivered to nearby residents. This is of increased importance as nearby water well users may be receptors for any potential environmental impacts that may be contributed by the proposed private sewage systems on-site.

The invitation to participate was hand-delivered to the following 20 properties:

- Crawley Road: 372, 384
- Maltby Road: 72, 80, 88, 99, **104**, **110**,159, 168, 177, 201, 224, 264, 424, **519** and **192**
- Concession Road 4: 7047
- Sideroad 20: **4646**
- Southgate Drive: 995

Five responses were received (indicated by **Bold** text) by residents who wish to participate.

On December 1 and 5, 2022, GM BluePlan staff visited the five residences that responded to the survey to confirm well locations, interview residents, and collect baseline water quality samples to compare to future post-development water quality. It is noted that one respondent owns two properties within the study area (i.e., 519 Maltby Road and 4646 Sideroad 20 N) and thus six properties in total were investigated.

Tables 7a-7f provide a summary of the water quality results compared to the criteria and Appendix F3 provides the laboratory Certificates of Analysis.

The water quality results have been compared to the Ontario Drinking Water Quality Standards (ODWS) and the chemical and physical objectives set forth by the Ontario Regulation 169/03 and the Safe Drinking Water Act (Ministry of Conservation and Parks (MECP), 2002). The ODWS has two sets of criteria: the maximum acceptable concentrations (MAC), and the aesthetic objectives (A/O). The MAC was established for parameters who have known or suspected health effects above a certain concentration. The aesthetic objective was set forth for parameters which may impair the taste, odour, or colour of the water but have no established health effects.

Generally, the water quality at each participant in the monitoring program has been below the MAC for all indicator parameters (i.e., parameters listed above), with the exception of one residence, 192 Maltby Road, at which an exceedance of total coliforms was identified in the sample.

Upon receipt of these results, GM BluePlan contacted the resident (via telephone call) to inform them of the exceedance and to advise that they contact their local public health office immediately for further guidance pertaining to the results. As no construction has begun regarding the proposed development, this exceedance is interpreted to be due to existing conditions at this specific well.

4. HYDROGEOLOGICAL CONCEPTUAL MODEL

A “conceptual model” of a site describes its physical characteristics and provides an interpreted overview of its hydrogeological behaviour. It provides a basis for general understanding of groundwater flows and other hydrogeological phenomena as well as a basis for the assessment of potential impacts. It is noted that additional groundwater level data continues to be collected for the Site.

This conceptual model is subject to change until a data of groundwater level data spanning at least 12 consecutive months has been collected. However, given the data collected thus far as part of the current monitoring program plus the available historical data from prior study by others (e.g., Anderson GeoLogic) we do not expect that the results of additional monitoring will affect the conceptual model of the Site or the results of the assessments made in subsequent sections.

The topography of the Site is hummocky and features numerous closed depressions. As a result, little runoff leaves the Site: the vast majority of it collects in depressions and subsequently infiltrates or is subject to evapotranspiration. In some of these internally-drained catchments on-Site, the amount of runoff is large enough relative to the rate of infiltration that a pool of standing water is allowed to form, thus leading to the development of several wetlands across the Site.

In terms of hydrological function, the hummocky topography leads to retention of precipitation on the Site. The local water budget accordingly consists of evapotranspiration, infiltration and storage, with negligible net outflow by runoff.

The hydrostratigraphy of the Site is complex, featuring a thick overburden with coarse deposits of sand/sand-and-gravel as well as laterally-discontinuous deposits of sand-silt till and other fine-textured deposits. A set of cross-sections have been plotted in Figures 8a-8e showing the available stratigraphic data (i.e., from investigative drilling and historical test pits and boreholes).

The water table on-Site lies at elevations around 331 masl along the wetland corridor and 326 masl near the southwest corner of the Site. The magnitude of fluctuation from periods of high groundwater to periods of low groundwater is approximately 1 to 2 m, with lesser fluctuation being observed near the wetland corridor.

Field observations indicate that the groundwater levels are highest in the vicinity of WET-04/-11 (southeastern portion of the Site) and lowest near Crawley Road in the southwestern portion of the Site. Based on groundwater levels recorded on June 1, 2022, an interpreted groundwater level contour plan has been developed (see Figure 9).

The gradients in the contour plan indicate that the lateral direction of groundwater flow in the western part of the Site is northwesterly while in the eastern part of the Site it is more northerly. The wetland corridor appears to form a minor groundwater divide in that groundwater levels are slightly higher there than points immediately to the east or west: this indicates that the wetlands (e.g. WET-03/-05) are recharge areas causing some mounding of the groundwater table to occur beneath them.

The consistency of groundwater levels (or “smoothness” of the groundwater surface) across Site indicates that the overburden sand/sand-and-gravel aquifer is laterally continuous across the Site and that the till/silt aquitards do not significantly impede or redirect groundwater flow.

However, there are some areas where these fine-textured aquitards do influence the local distribution of groundwater levels, such as at well nest MW22-01S/D, where the groundwater level is approximately 4 m higher in the shallow monitor than in the deep monitor: this occurrence of groundwater mounding appears to be due to the presence of an intervening till aquitard at depth. Due to the consistency of groundwater levels at MW22-01S, the soils above the till appear to be well-drained: the topography of the till surface may be causing retention of water in the overlying sand and gravel (i.e., “perched” groundwater). At MW22-10, the situation is similar, with groundwater levels being elevated due to the prevalence of fine-textured soils at that location and due to proximity to WET-04/-11, which is a local point of recharge.

Groundwater level observations also indicate that the Site typically exhibits “recharge” conditions. That is, the vertical component of groundwater flow is generally downward, allowing the infiltration of precipitation into the subsurface to “recharge” the groundwater table. This condition even persists at most of the wetland areas on-Site as they exhibit surface water levels that are elevated above and separated from the local groundwater table throughout the year: for these “perched” wetland areas, the main supply of water is via precipitation incident on the wetland area itself and runoff from its immediate catchment area.

A few wetland areas (i.e., WET-13 and WET-06/-07/-12) are understood to intersect the groundwater table for at least a part of the year, during which times they may receive some amount of groundwater discharge. Due to the general distribution of groundwater levels and pattern of groundwater flows, discharge conditions are most likely to occur on the east side (i.e., the upgradient side) of the wetland corridor. This means that the catchment areas that control discharge to the wetland areas are those areas that lie to the east of the wetland corridor: this is an important item to consider, because the development area of the Site lies west of the wetland corridor and therefore is not expected to interrupt the existing sources of groundwater discharge to the wetlands.

Due to the physical constraints of the terrain there is no overland flow outlet for runoff from the Site: the stormwater management plan of the Site will therefore rely heavily on the infiltration of stormwater. As such, the proposed stormwater management design must consider the potential for groundwater mounding and whether or not the water balance of the wetlands will be affected.

5. WATER BALANCE

A monthly water balance has been completed for the purpose of evaluating the quantities of recharge and runoff for the pre-development condition and for the post-development condition.

This monthly water balance was calculated using the Thornthwaite and Mather method (Thornthwaite & Mather, 1957) and was calculated as a “feature-based” analysis to identify the effects of development on each of the identified wetlands on-Site.

The calculations were completed using the catchment areas provided by AECOM, the civil engineer for the proposed development. Plots of these catchment areas are provided in Appendix G.

The water balance calculation sheets for the pre-development case are provided in Appendix H1 and for the post-development case in Appendix H2.

Summaries of the water balance calculations are provided in tables (see end matter) as follows:

- Table 8a: Overall Summary of Water Balance by Wetland
- Table 8b: Summary of Runoff Quantities – Pre-, Post- and Change
- Table 8c: Summary of Recharge Quantities – Pre-, Post- and Change.

Due to the complexities of calculating actual recharge and runoff for the wetland area itself (i.e., due to standing water affecting the rate of evapotranspiration and infiltration, and due to variable size of open water area) the wetland catchments include only the area outside of the wetland limits described and surveyed by NRSI. This is considered to be a reasonable approach because the main concern for the analysis is to determine changes in water balance and since development will not be occurring within the wetland limits themselves, it will suffice to quantify the changes that occur in the remainder of the catchment.

Overall, recharge is estimated to increase by approximately 16% and runoff will decrease by approximately 6%.

In the pre-development condition, annual runoff depths in the wetland catchments range from about 116 mm/yr (catchment belonging to WET-06/-07/-12) to 218 mm/yr (WET-09). Recharge quantities range from 155 mm/yr (WET-13) to 272 mm/yr (WET-06/-07/-12). These variations are due mainly to the difference in soil types, topography, and vegetative cover between the different catchment areas. For example, much of the WET-06/-07/-12 catchment area consists of sand/sand-and-gravel soils, which encourage recharge. Evapotranspiration is relatively consistent among the wetland catchments, ranging from about 544 mm/yr to 576 mm/yr.

The water balance calculations (see Table 8a through 8c) also considered “Other Areas” on Site, which are those areas that do not drain to a wetland area and are considered to be internally-drained. As described in the hydrogeological conceptual model (Section 4), the areas to the east of the wetland corridor are interpreted to be potential sources of groundwater discharge to the wetland areas WET-06/-07/-12 due to their location upgradient of those wetland areas. Therefore, the water balance summary distinguishes the areas as follows:

- Other Areas – West of the Wetland Corridor, consisting of catchments
  - Pre-Development: 112
  - Post-Development:
    - 202, 203, and 204 (Phase 1 developed areas)
    - 201, 205, 206 (including areas that will be affected by Phase 1 pre-grading)
    - that part of 109P that will be affected by Phase 1 pre-grading and will have its runoff diverted to a temporary erosion and sediment control pond (i.e., rather than to WET-02)
    - 301, 302 and 303 (Southgate Drive extension areas)
- Other Areas – East of the Wetland Corridor, consisting of catchments
  - Pre-Development: 102 and 104
  - Post-Development: 102P and 104P

By virtue of the internal drainage of these “Other Areas”, it is recognized that the runoff calculated by the water balance will not actually run off because of the lack of external outlets from the Site. In pre-development catchments (and in the Phase 1 pre-grade areas that will divert to erosion and sediment control ponds instead of wetland areas), runoff will collect in low-lying, closed depressions and will be divided between evapotranspiration and infiltration. For these cases, the quantity of “runoff” has therefore been set to zero and the amount of recharge and evapotranspiration have been adjusted accordingly to account for the “runoff” volume. This adjustment procedure is described in the footnotes of Table 8a. In the post-development case, due to engineered drainage to infiltration galleries the vast majority of this would-be runoff water will be infiltrated due to negligible potential for evapotranspiration from these subsurface facilities.

It is noted that WET-10 has been identified as being eligible for removal (Grand River Conservation Authority, 2023). Despite this eligibility, it is expected that the general hydrogeological function of that area will not be changed substantially due to its location adjacent to Maltby Road and the required development setbacks, both of which will limit the possible changes in grading in that area. This in turn will limit the possible changes to the water balance of that catchment. Therefore, though the water balance has been calculated with reference to WET-10, this reference is used for convenience and clarity (i.e., a known location with defined catchment area) and is not to be construed as a recommendation that WET-10 be retained.

5.1 EFFECTS OF DEVELOPMENT ON WETLANDS DUE TO CHANGES IN RUNOFF

Based on the conceptual model, which indicates that the wetland areas are mainly supplied by runoff and direct precipitation, it is important to ensure that the runoff in the post-development condition sufficiently matches the pre-development condition so that it does not disrupt the extant ecological communities.

In the post-development condition, runoff depths for the wetland catchments remain similar (ranging from 115 mm/yr to 215 mm/yr) to pre-development. However, due to the proposed development, some of the wetlands will undergo changes to their catchment areas, thus affecting the overall quantity of runoff that those wetlands receive.

For most of the wetlands, the change in overall runoff quantity will be minor, less than 10% difference between the pre-development condition and post-development condition. Some of the wetland areas are not expected to be affected at all because there is no planned development in their catchments (e.g., WET-03/-05, WET-04/-11, and WET-13). However, there are three wetland catchments for which the change in annual runoff is expected to be substantial and worthy of discussion:

- WET-01
    - Pre-Development Runoff: 1,949 m^3
    - Post-Development Runoff: 2,477 m^3
    - Change: +527.9 m^3
    - % Change: +27.1 %
- WET-02
    - Pre-Development Runoff: 13,394 m^3
    - Post-Development Runoff: 10,248 m^3
    - Change: -3,146 m^3
    - % Change: -23.5 %
- WET-09
    - Pre-Development Runoff: 8,758 m^3
    - Post-Development Runoff: 7,362 m^3
    - Change: -1,397 m^3
    - % Change: -15.9 %

See Appendix H3 for plots of the monthly runoff estimated for the pre-development case and after construction of Phase 1.

With respect to WET-01, the change is roughly consistent throughout the year (i.e., about +27% change in each month). This is because the changes at WET-01 are due to a change in the size of the catchment: area grading will result in a strip of land being added to the WET-01 catchment, increasing its size and therefore increasing the potential runoff contributions to that wetland. The change in volume of runoff, expressed as a depth over the wetland area, will be about +188 mm/year, which is relatively minor given that water levels at this wetland area have tended to be relatively deep below the ground surface (about 1 to 1.5 mbgs). Impacts to the hydroperiod of the wetland are not expected.

With respect to WET-02, the change in runoff is also consistent throughout the year, ranging from about -23.8% through the growing season (April to September) to -20.7% in March. The consistency in this change is because the main change to the catchment area is its size, while its other characteristics (e.g., cover, soil type, topography) will largely be unchanged. Per assessment by NRSI, the ecological communities at WET-02 are hardy and likely to withstand the anticipated changes to runoff quantity received by the wetland area.

With respect to WET-09, the change in runoff is expected to vary over the course of the year from -27.4% in the cooler months to -13.1% in the growing season. This is because the main effect that Phase 1 will have on WET-09 will be due to the proposed compensation plantings, which will change the vegetative cover of its catchment area from cultivated land to predominantly wooded. NRSI has indicated that the water balance during the growing season is most important because it is when plants are most in need of moisture: because the expected change in runoff during the growing season is relatively modest (-13.1%) and the ecological communities at WET-09 are resilient, it is expected that WET-09 will not be substantially affected by the changes to its catchment and runoff quantities.

5.2 EFFECTS OF DEVELOPMENT WETLANDS DUE TO CHANGES IN RECHARGE

Due to the physical constraints of the Site and the requirement to infiltrate all stormwater, an analysis has been undertaken to consider the potential effects of increased recharge, and changes to the distribution of recharge across the Site.

In the post-development condition, recharge depths are also similar to the pre-development condition (ranging from 155 mm/yr to 260 mm/yr). Because the flow paths of recharge are dictated by subsurface conditions and the groundwater table, it is not as important to discuss recharge on the basis of wetland catchment areas.

Overall, on a Site-wide basis the recharge quantities are as follows:

Pre-Development Recharge:	209,540	m^3
Post-Development Recharge:	243,471	m^3
Change:	+33,931	m^3
% Change:	+16.2	%

This equates to an approximate increase in annual recharge depth (Site-wide average, excluding areas within the wetland limits) of approximately 46 mm/year from 287 mm/year pre-development to 333 mm/year following the construction of Phase 1.

The bulk of the change in recharge will occur in the developed catchments (e.g. facilities and parking areas constructed in catchments 202, 203 and 204, and the Southgate Drive extension in catchments 301, 302, and 303). These catchments (captured under the “Other Areas – West of the Wetland Corridor in the summary, Table 8c) will exhibit a nearly 50% increase in recharge due to the necessity to manage stormwater mainly via engineered infiltration facilities.

On a feature-by-feature basis, most of the wetland catchment areas will experience only minor changes to recharge. Exceptions are identified as follows:

- WET-01
    - % Change: +27.7 %
- WET-02
    - % Change: -17.5 %
- WET-09
    - % Change: +14.1 %

It is noted that each of the wetlands identified above are perennial recharge features and are vertically separated from the groundwater table (i.e., they do not receive groundwater discharge).

There are two primary ways by which changes to groundwater recharge can affect the wetland areas on-Site:

1. Increases in recharge may cause the groundwater table to rise, potentially affecting the hydroperiod of the wetland or causing flooding of the wetland area.
2. Reductions of recharge may affect the quantity of groundwater discharge that is received by the wetlands.

The first effect (i.e., flooding due to increases in recharge) is not likely to occur following Phase 1 construction. This is because most of the wetland areas exhibit perennial recharge conditions and substantial separation from the groundwater table. Therefore, increases in recharge would need to be very large to cause mounding of the groundwater table to impact wetland hydroperiods. As a demonstration of this, a groundwater mounding analysis will be completed for WET-02, specifically with respect to the erosion and sediment control pond/ infiltration gallery which is proposed to be built adjacent to its buffer area (see Section 6).

The second effect (i.e., decreases to discharge received by wetlands) is also unlikely to occur following Phase 1 construction. This is because only certain wetlands receive groundwater discharge to begin with (i.e., WET-13 and WET-06/-07/-12) and therefore only those wetlands are susceptible to this effect. However, Phase 1 of the development is not expected to substantially affect the recharge occurring in the catchments of those wetlands (-1.2% at WET-06/-07/-12; 0% at WET-13). Furthermore, the recharge occurring at “Other Areas – East of Wetland Corridor” (i.e., upgradient areas in which groundwater recharge might supply the groundwater discharge that occurs at those wetlands) will also not be affected much (-0.8%) by the development of Phase 1. Therefore, discharge-related impacts are not expected to occur.

6. GROUNDWATER MOUNDING

As previously mentioned, there is no overland flow outlet from the Site. As such, the stormwater management plan for the Site will involve the retention and infiltration of the bulk of the stormwater received by the Site. The proposed development will involve a substantial increase in impervious land area and so the proposed development will result in a corresponding increase in groundwater recharge, which has the potential to cause groundwater mounding at the proposed enhanced recharge facilities.

For much of the Site area, this is not expected to be of concern due to the distance between the proposed recharge facilities and local wetland receptors, as well as the depth of the groundwater table below surface.

However, due to the proximity of a proposed erosion and sediment control (E&SC) pond to WET-02 (see catchment 109P, Appendix H2), a groundwater mounding analysis was conducted to determine whether enhanced recharge at those locations might influence that wetland.

The water balance for the catchments that supply the E&SC Pond are provided in Appendix H2 (see Catchments "109P (E&SC Pond) Upland" and "109P (E&SC Pond) Forest"). The calculations indicate a maximum combined monthly runoff of 639 m^3 (in May), or about 18 mm/day when expressed as a depth of runoff distributed over an assumed E&SC Pond area (about 1,200 m^2).

Based on this average infiltration rate, groundwater mounding calculations were conducted according to the Hantush method (Hantush, 1967). The calculations were completed in spreadsheet format and copies of the output calculation sheet is provided in Appendix I.

The groundwater mounding was computed for assuming a hydraulic conductivity of underlying soil of $5x10^{-6}$ m/s (per an infiltration test conducted by AECOM at 332.7 masl near WET-02).

For the E&SC Pond under consideration, the increase in groundwater level at the adjacent wetland boundary was estimated to be as follows:

Estimated Groundwater Level (Pre-Development):	331.20 m
Estimated Rise in Groundwater Table at WET-02 Boundary (Δh):	0.1 m
Estimated Groundwater Level (Phase 1 stage):	331.30 m

Compared to the ground surface level at the wetland in question (approximately 334 masl at PZ-03 adjacent to WET-02), it is expected that, post-development, the mounding effect of the E&SC pond will not cause groundwater levels to rise to ground surface at the wetlands. This is an important finding because it means that the prevailing "recharge" conditions will not be disrupted and that the proposed E&SC Pond will not cause flooding of the wetland or changes to its hydroperiod.

7. CONSTRUCTION DEWATERING

Groundwater control is a key factor to consider when entering the construction phase of any project, as it can result in unforeseen project delays and substantial costs if not adequately addressed. The construction of the proposed development will include the excavation for municipal services, an on-Site sewage pumping station, storm sewers, infiltration galleries, storm water management ponds, and building foundations.

Generally, the groundwater levels on-Site seldom rise above 4 mbgs and lie even deeper along the western half the Site (e.g., west of the woodlot area, 6 to 10 mbgs) where the bulk of the industrial development is proposed to occur. The shallowest groundwater levels were observed at MW22-10 and MW22-07, both of which are located at low-lying areas.

Based on the nature of the proposed development (i.e., large industrial buildings and parking lots) and the hummocky terrain of the Site, a considerable amount of cut and fill grading work will need to be completed to flatten the existing topography. As such, there is some uncertainty as to whether excavations will encounter groundwater but due to the significant depth to groundwater it is considered to be a low likelihood.

Based on the characteristics and prevalence of relatively coarse soils on-Site, where excavations do extend below groundwater it is likely that dewatering in excess of 50,000 L/d will be required. Dewatering rates may even exceed 400,000 L/d depending on the types of materials encountered (e.g., sand and gravel will require greater dewatering rates for groundwater control) and the depth of excavation below groundwater.

A more definitive statement regarding approval requirements will be provided during detailed design when the grading, servicing, and foundation elevations are near completion and when more seasonal groundwater level data has been collected (i.e., via the installed dataloggers). The construction dewatering considerations will be reassessed at that time to determine the appropriate approval required (i.e., EASR or PTTW) and to develop appropriate monitoring and mitigation plans as required by the approval.

For the time being, it is expected that construction dewatering and discharge management can be achieved through common means (e.g. sump pumping, erosion and sediment control best practices) and will not be a cause of significant technical difficulty for the project.

8. IMPACT ASSESSMENT

8.1 RECEPTOR IDENTIFICATION AND SCREENING OF IMPACTS

The first step in impact assessment is to identify the receptors, which are those parts of the environment which may be affected by a development. Following that, a screening assessment can be undertaken to determine whether each receptor may be affected by the proposed development, whether due to changes in the quantity or quality of water available to that receptor.

For the Site and proposed development, five receptors have been identified and the screening exercise is summarized in the table below:

Receptor	Potential Impacts Related to		Rationale
	Water Quantity	Water Quality	
On-Site Wetland Areas	■	■	Mapping from the GRCA indicates the presence of multiple Provincially Significant Wetlands on the Site. There is potential that the proposed development might negatively impact the amount of surface runoff entering into these low-lying areas which in turn will affect the amount of groundwater recharge available for the regional groundwater table
Municipal Water Resources/ Source Water Protection	■	■	The Site lies within a WHPA-D (2) area as well as an IPZ-3 (1). The Site is also considered a significant groundwater recharge area. The proposed development and potential dewatering activities should be reviewed in light of the source protection context and policies.
Private Water Wells	■	■	Numerous domestic water well records within the Study Area and GMBP is aware of a history of local construction projects affecting overburden wells during dewatering. Some local well users are using overburden wells for their primary water supply and so the integrity of the shallow groundwater is important to maintain during construction.
Construction Dewatering Activities	■	■	Construction dewatering may be required to complete servicing activities. The approval and operation of groundwater control systems will be considered a potential water quantity impact to the project. The dewatering discharge may result in impacts to surface water quality for which the construction project is responsible to mitigate.

8.2 WETLANDS

8.2.1 IMPACTS RELATED TO QUANTITY

As discussed in Section 5 (“Water Balance”), the proposed development is generally expected to

a) increase the overall amount of recharge on-Site
b) significantly affect the runoff that is contributed to three of the wetland areas
    i. WET-01,
    ii. WET-02 and
    iii. WET-09.
c) Significantly affect the amount of recharge that occurs in the catchments of three wetland areas:
    i. WET-01,
    ii. WET-02 and
    iii. WET-09.

With respect to the overall increase in recharge, it has been explained (Section 5) that because most of the wetland areas are not groundwater-fed, the change in recharge on-Site is not expected to have a deleterious effect on the wetland areas. It has been noted that some wetlands on-Site (WET-06/-07/-12 and WET-13) are, at certain times of the year, connected to the groundwater table and therefore do occasionally receive some groundwater discharge. However, in the hydrogeological context, the catchment area that supplies discharge to these wetlands is the area east of the wetland corridor. The water balance for those areas (i.e., see Table 8a, "Other Areas – East of Wetland Corridor") will not be substantially affected by the construction of Phase 1 and so the general increase in recharge on-Site is not expected to impact the wetland areas.

With respect to runoff, it has been identified that the proposed development will result in alterations to the existing catchments of WET-01, WET-02 and WET-09, with the former two being affected by changes to the size of their runoff-contributing catchments and WET-09 being affected by a change in ground cover (i.e., existing cultivated land being used as compensation tree planting area). Discussion in Section 5.1 indicates that the changes to runoff are minor in the context of the specific ecological communities (e.g., tolerant species) and hydrogeological conditions (i.e., existing groundwater levels at significant depths below wetland surface, so reductions in runoff are not likely to substantially affect the hydroperiod of the wetlands).

With respect to changes in the distribution of runoff in specific wetland catchment areas, it has been identified that because most of the wetlands do not intersect the groundwater table (i.e., recharge features with perennial separation from groundwater) that local changes to recharge are not expected to affect their water balance because recharged water would not ultimately be available to the wetlands (i.e., no groundwater discharge). However, because of the proximity of an E&SC Pond adjacent to the buffer area of WET-02, a groundwater mounding analysis was conducted to determine whether the infiltration occurring at those facilities will affect the water balance of the nearby wetlands. The mounding analysis (described in Section 6) indicates that the E&SC Pond will not cause a rise in groundwater level large enough to affect the water quantity at their respective nearby wetland (WET-02).

Therefore, it is expected that Phase 1 of the proposed development will not impact the wetlands in terms of water quantity.

8.2.2 IMPACTS RELATED TO QUALITY

With respect to water quality, it is not expected that the wetlands will be impacted by the proposed development.

This is because the proposed stormwater management design will ensure that the wetlands only receive runoff from vegetated, non-paved surfaces. Therefore, the runoff received by the wetlands will not have been affected by contact with paved surfaces, which would have caused the transport of some contaminants (e.g. salt) to the wetland areas.

Stormwater from paved areas will be infiltrated on-Site in a series of infiltration galleries located in the proposed developed area (e.g., in Catchment 302 to manage runoff from the Southgate Drive extension; in Catchment 202 to manage runoff from the proposed parking areas and warehouse facility). Prior to infiltration a level of control on runoff quality will be provided by catchbasin shields. Infiltration galleries will also include "isolator rows" which will provide added quality control (e.g., removal of TSS). It is recognized that these systems cannot effectively remove salt but even so this is not expected to impact the wetlands on-Site because the infiltration activities will mainly be occurring downgradient of and a significant distance away from the wetland areas.

It is noted that a portion of Catchment 109P will be graded so that it drains runoff toward WET-02. Potential impacts to WET-02 will be mitigated by means such as seeding of the pre-graded area to stabilize soil and minimize entrainment of sediment, check dams and other sediment capture structures will be installed in the collector swale, construction of a spreader structure at the outlet to dissipate energy and minimize erosion.

Therefore, no impacts to water quality in the wetlands are anticipated as a result of Phase 1 of the proposed development.

8.3 MUNICIPAL WATER RESOURCES / SOURCE WATER PROTECTION

The City of Guelph provides water services to its residents via a network of bedrock water supply wells, the nearest of which are located approximately 4.5 km northeast (i.e., Burke Well) and northwest (i.e., Downey Well) of the subject Site.

Upon review of the available mapping from the MECP’s Source Protection Information Atlas, the Site was identified to be within a designated Wellhead Protection Area D (WHPA-D) with a vulnerability score of 2, an Intake Protection Zone 3 (IPZ-3) with a vulnerability score of 1, and a Significant Groundwater Recharge Area.

8.3.1 IMPACTS RELATED TO QUANTITY

The Site is proposed to be developed with municipal water service and therefore impacts related to the ongoing taking of water need not be assessed.

However, the numerous closed kettle depressions on-Site are understood to be significant groundwater recharge areas that provide recharge to the regional overburden groundwater table, which in turn provides recharge to the underlying bedrock aquifer (as determined by the deep borehole data and well records from GLL 1997 and Golder 2007). Therefore, it is noted that the proposed development must avoid reduction of recharge.

The water balance analysis completed indicates that the construction of Phase 1 of the development will result in an increase in overall recharge by about 16%. As such, the proposed development is not expected to reduce the quantity of groundwater available for municipal resources.

8.3.2 IMPACTS RELATED TO QUALITY

Upon review of the *Tables of Drinking Water Threats (Clean Water Act, 2006)*, there are no listed “Significant” drinking water threat activities associated with the above-mentioned vulnerable zones and scores.

As such, it is not expected that the Site will require a Risk Management Plan. In any event, the City of Guelph will require a Section 59 Policy Applicability Review Form to be completed and submitted with any application concerning the proposed development. A copy of the Section 59 Policy Applicability Review Form will be sent under separate cover.

As a matter of general practice and means of protecting groundwater supplies, it is recommended that once the groundwater monitoring wells on-Site are determined to have served their purpose, all such wells shall be decommissioned by a licensed well drilling contractor (as per O.Reg.903).

8.4 PRIVATE WATER WELLS

The well records search summarized in Table 1 identified 14 records of domestic water supply wells at neighboring properties within 500 m of the subject Site, 6 of which were reported to be installed within the overburden.

8.4.1 IMPACTS RELATED TO QUANTITY

The Site is proposed to be developed with municipal water service and therefore well interference need not be assessed.

As discussed in Section 8.3.1, stormwater management designs are being proposed to ensure that surface water runoff and groundwater infiltration are being maintained post-development. As such, groundwater recharge occurring on the Site will continue providing recharge to the groundwater table, thus maintaining the quantity of groundwater available for nearby water well users, especially those residences that are supplied by overburden wells.

The construction of Phase 1 of the proposed development is not expected to cause groundwater quantity-related impacts to the water supply available to private wells on other nearby properties.

8.4.2 IMPACTS RELATED TO QUALITY

Based on the nature of proposed land use (industrial), potential exists for groundwater quality to be impacted by on-Site activities.

However, of the 6 identified overburden water supply wells, 5 of those records are located along Maltby road, east of the Site (i.e., MECP Well IDs: 6703150, 6703384, 6703848, 6707995, 6711246). Based on the observed regional groundwater flow direction, these locations are considered to be located hydraulically upgradient of the Site; and thus, the risk for potential groundwater quality impacts from on-Site activities to affect these water supply wells is considered low.

The sixth overburden water supply well record (MECP Well ID: 6708329) is plotted just northwest of the Site, where a temporary stormwater management pond exists at the current terminus of Southgate Drive. It is likely this well is no longer in use and is likely to have been decommissioned with the development of other industrial properties along Southgate Drive.

For other nearby private water well users whose wells are installed within the limestone bedrock, the risk for water quality to be impacted by on-Site activities is considered low due to the separation provided by the thickness of the overburden (i.e., bedrock subcrops around 27 to 42 mbgs). Furthermore, various well records indicated an older till layer overlying the bedrock which provides further protection from potential impacts entering into the bedrock aquifer.

Therefore, the construction of Phase 1 of the proposed development is not expected to cause impacts to the groundwater quality available to known private water well users.

8.5 CONSTRUCTION OF DEVELOPMENT

This section addresses the potential for groundwater and hydrogeological phenomena to impact the construction of the project. Specifically, this relates to requirements for construction dewatering.

8.5.1 IMPACTS RELATED TO QUANTITY

Generally, the taking of water during construction dewatering activities may result in the lowering of the water table at nearby residential water wells. It can also potentially have a deleterious effect at nearby ecological receptors where groundwater discharge contributes to these environments.

As, discussed in Section 8.4.2, well records for domestic water supply wells finished within the overburden have been identified to be located approximately 250 m east of the Site. Based on the observed groundwater levels at the Site, these well records are considered to be located hydraulically upgradient. As such, based on the separation distance and the direction of groundwater flow, these domestic water supply wells are not likely to be affected by the temporary construction dewatering.

Furthermore, most of the wetland features on Site have been identified to be groundwater recharge areas. As such, the groundwater taking during dewatering is not expected to have affect the water balance of those features as the main contributor of water to these features is surface runoff.

For those wetland features that are at times subject to groundwater discharge (i.e., WET-13, WET-06/-07/-12), construction dewatering for Phase 1 is not expected to impact them because of the significant distance between the Phase 1 area and those wetlands.

8.5.2 IMPACTS RELATED TO QUALITY

The analytical results for the groundwater samples collected indicate the groundwater on-Site meets the PWQO, with the exception of MW3-09 which exceeded for iron and cobalt. These exceeding metal parameters appear to be localized to the area in which MW3-09 is located and are inferred to be naturally occurring. As MW3-09 is located within the wetland WET-07, there is no development proposed to occur at this location.

As such, these reported exceedances do not have implications for groundwater discharge during construction dewatering. In the areas where construction is proposed, the groundwater on-Site is suitable for discharge to land provided that sediment control measures are implemented.

9. SUMMARY

A Hydrogeological Study has been completed with respect to a site plan approval application for Phase 1 of a proposed industrial development at 384 Crawley Road, Guelph.

The study comprised of several aspects, including a desktop study of available geological and hydrogeological information; field activities such as a subsurface investigation, overburden monitoring well sampling and water level surveying, installation of shallow nested piezometers and water level surveying, and a site reconnaissance to assess on-Site drainage features.

The collected information was used to complete a hydrogeological impact assessment concerning Source Water Protection policies, nearby sensitive/ecological areas and groundwater users.

The findings of the study are as follows:

- The Site is located near the southern city limit of Guelph at the address 384 Crawley Road, Guelph, Ontario. The Site occupies an area of approximately 82 hectares.
- Phase 1 of the proposed development is proposed to involve construction of a warehouse, parking areas, roadways, and pre-graded areas within an area of approximately 24.0 ha in the western portion of the Site.
- Topographically, the Site can be described as hummocky with numerous rolling hills and low-lying closed depressions areas. Through the center of the Site, a low-lying area extending north-south exists described as the wetland corridor.
- Ecological consultant NRSI identified 13 wetland features present at the Site: for the purposes of the project these have been named WET-01 through WET-13.
    - An assessment according to Grand River Conservation Authority policies was conducted in respect of wetland WET-10 and it as found that WET-10 meets the policy criteria for wetland removal or encroachment. At this time, however, no permits for removal have been issued.
- The stratigraphy of soil encountered varied but generally followed the following sequence:
    - Topsoil
    - Silt
    - Sandy Silt to Silty Sand
    - Upper Sandy Silt to Silty Sand Till
    - Sand and Gravel
    - Lower Sandy Silt to Silty Sand Till
- A total of 16 domestic wells (6 of which were screened within the overburden) were identified within the study area, two of which are located on-Site. The reported overburden monitoring wells are all located about 250 m east (upgradient) of the Site and are not expected to be affected by the proposed development. Nearby bedrock water supply wells are also at low risk due to the thickness of the overburden.
- The Site is proposed to be serviced by municipal water supply and sanitary sewers.
- With respect to Source Water Protection, the Site overlap a Wellhead Protection Area WHPA-D vulnerability score 2, Intake Protection Zone IPZ-3 vulnerability score 1, and a significant groundwater recharge area. No “Significant” drinking water threats have been identified with respect to the proposed development. It is anticipated that a Risk Management Plan for Source Water Protection will not be required for the proposed development.
- Groundwater quality within the area of proposed construction generally meets the Provincial Water Quality Objectives. Construction dewatering is expected to be suitable for discharge to the surface, provided that sediment control measures are implemented.
- Baseline surface water quality samples were collected from two wetlands (WET-02 and WET-06) to be compared to future post-development surface water quality. Analytical results indicated a lesser degree of mineralization compared to groundwater samples, demonstrating the influence of precipitation on the wetland water balance.
- A door-to-door well survey program was initiated with five residents who agreed to participate. Baseline water quality samples have been collected from each of the residents’ wells.

- The wetland features on-Site exhibit a “recharge” condition and are primarily driven by surface water runoff. Groundwater was observed to be consistently lower than the surface at the wetlands; however, previous reports on the subject Site had reported groundwater levels near the surface at WET-06/-07/-12/ and WET-13 during high water table conditions, indicating occasional groundwater discharge conditions at those wetlands.
- A water balance assessment was completed according to the Thornthwaite and Mather method for pre-development conditions and for Phase 1 of the proposed development. This included a feature-based assessment of the catchments belonging to each of the on-Site wetlands.
- The results of the water balance assessment indicate that the construction of Phase 1 will result in the following changes relative to pre-development conditions:
    - Overall, recharge will increase by approximately 16% and runoff will decrease by approximately 6%.
    - Three wetlands are expected to have notable changes to their water balances as a result of Phase 1 of the development: WET-01, WET-02, WET-09. However, due to the hydrogeological conditions (recharge conditions, separation from groundwater table) and/or the tolerance of the ecological communities (i.e., insensitivity to changes in hydroperiod), no impacts are expected to occur.
    - The water balance for the remaining wetland features is not expected to be affected by Phase 1 of the development.
- A groundwater mounding analysis has indicated that the construction of a temporary erosion and sediment control pond within the pre-graded area near WET-02 will not result in flooding or changes to the hydroperiod at WET-02.
- Construction dewatering for servicing trenches and excavations have the potential to exceed 50,000 L/d if the groundwater table is encountered and may even exceed 400,000 L/d depending on the depth of excavation below the water table. However, due to the depth of groundwater across much of the Site, groundwater may not be encountered during excavation. Once a grading and functional servicing plan is developed for the project, the construction dewatering considerations should be revisited to determine the appropriate approval required (i.e., EASR or PTTW).

10. CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of information collected during this investigation, the following conclusions are made with respect to the proposed development:

1. The assessments indicate that Phase 1 of the proposed development is feasible to construct without negatively impacting the local wetland areas.
2. The proposed development is not expected to create a “significant” drinking water threat under the local Source Protection Plan.
3. Preliminary groundwater data and site servicing information indicate that construction dewatering will likely be minimal because excavation will generally occur above groundwater. Groundwater quality on-Site is suitable for discharge to land, provided that appropriate erosion and sediment controls are implemented.
4. Due to there being no overland flow outlet from the Site, the stormwater management design will be required to be managed stormwater via retention and infiltration.

In proceeding with the project, we provide the following recommendations:

1. The pre-grade design for catchment 109P shall include a diversion swale with outlet to WET-02 to mitigate potential loss of runoff that might otherwise have been caused by extensive area grading of the existing WET-02 catchment.
2. The diversion swale mentioned above shall include necessary erosion and sediment control facilities to prevent the discharge of sediment to and to mitigate the potential for erosion at WET-02.
3. Groundwater level monitoring is recommended to continue until site plan approval is issued. Future monitoring programs (i.e., through construction and post-construction periods) will be developed in conjunction with the Environmental Implementation Report.
4. As the details of the engineering design (e.g., grading, servicing, and foundations) are confirmed, the construction dewatering assessment shall be revisited (i.e., during detailed design) to provide greater certainty about the need for construction dewatering approvals (e.g., EASR or PTTW). If an approval is then determined to be necessary, then that approval shall be obtained from the Ministry of the Environment, Conservation and Parks, and the dewatering shall be carried out in accordance with the plans associated with the approval (e.g., monitoring and mitigation plan or water-taking and discharge plan).
5. As the details of future phases are confirmed, the hydrogeological impact assessment (including water balance calculations) shall be updated to confirm avoidance of impacts or that potential impacts will be sufficiently mitigated by the proposed development plan and/or stormwater management design.
6. When it is determined that the monitoring wells have served their purpose and are no longer needed, it is recommended that they be decommissioned by a licensed well driller in accordance with Ontario Regulation 903.

11. STATEMENT OF LIMITATIONS

The information in this report is intended for the sole use of Industrial Equities Guelph and its assignees. GM BluePlan Engineering Limited accepts no liability for use of this information by third parties. Any decisions made by third parties on the basis of information provided in this report are made at the sole risk of the third parties.

GM BluePlan Engineering Limited cannot guarantee the accuracy or reliability of information provided by others. GM BluePlan Engineering Limited does not accept liability for unknown, unidentified, undisclosed, or unforeseen surface or sub-surface conditions that may be later identified.

The conclusions pertaining to the condition of soils and/or groundwater identified at the Site are based on the visual observations at the locations of the investigative boreholes/monitoring wells and on the reported laboratory results for the selected soil and/or groundwater samples. GM BluePlan Engineering Limited cannot guarantee the condition of soil and/or groundwater that may be encountered at the site in locations that were not specifically investigated as part of this investigation.

This report is believed to reflect the condition of the Site as of February 2, 2023.

All of which is respectfully submitted,

GM BLUEPLAN ENGINEERING LIMITED

Per:

[redacted]

[redacted]

Abdi Faarah, Hons B.Sc., P.Geo.

Matthew Long, M.Eng., P.Eng.

21 Apr 2023

PROVINCE OF ONTARIO

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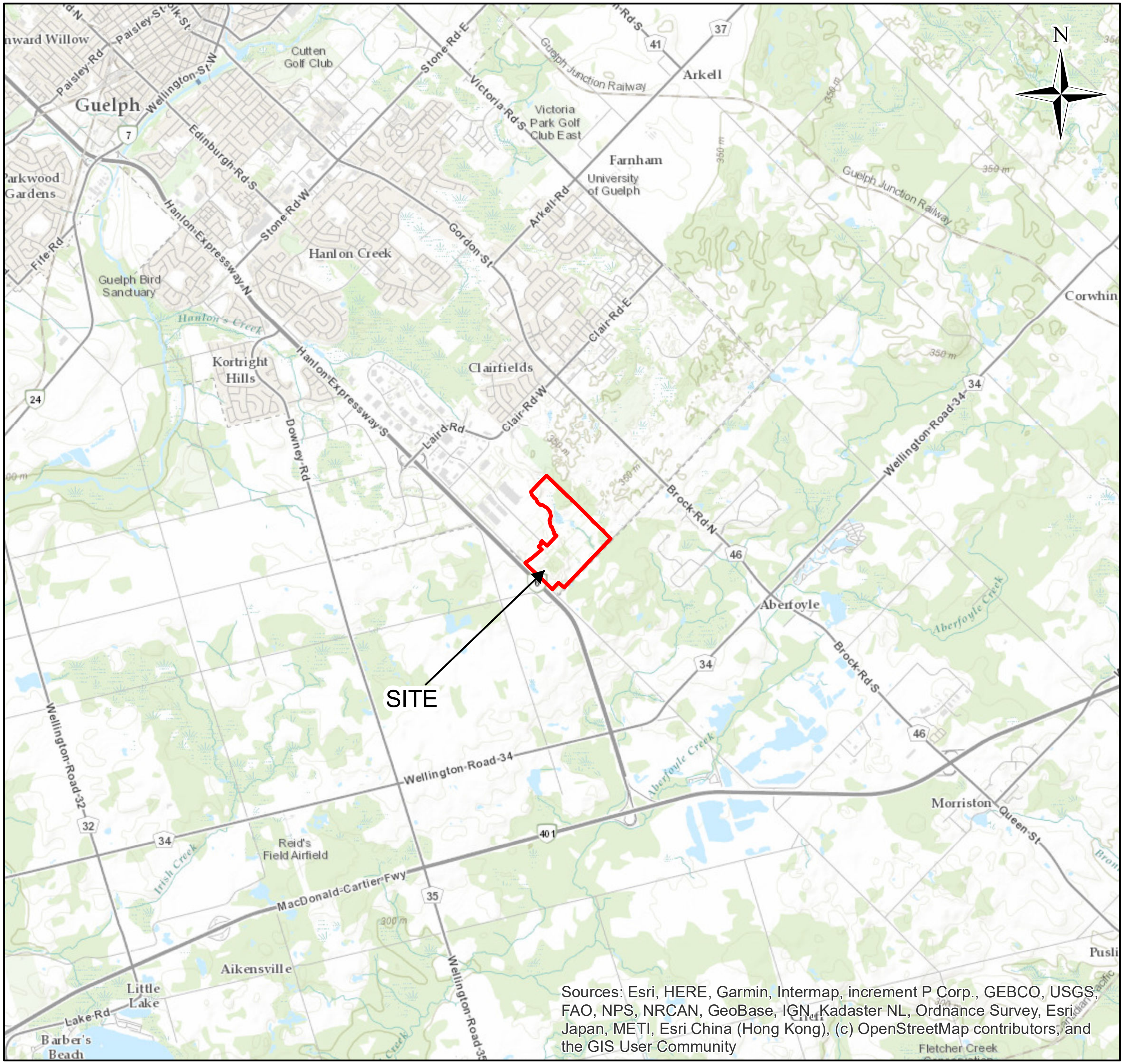
FIGURES



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Project: 121123
Hydrogeological Study
Southgate Business Park
Guelph, Ontario

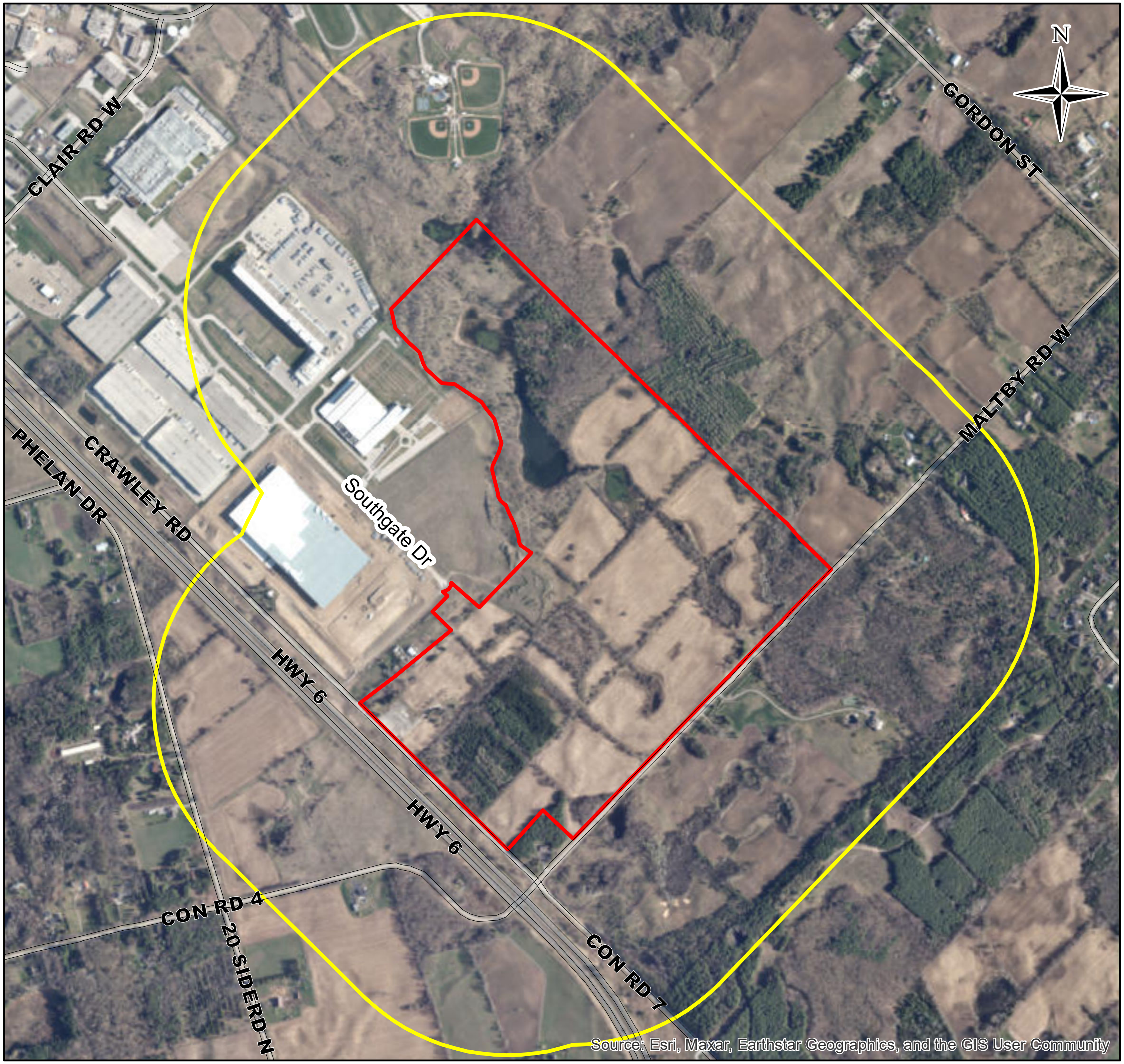
Parts of Lot 14 & 15,
Concession 7
Geo. Twp. of Puslinch

🟥 Site Boundary

Scale: 1: 75,000
September 2022

Figure 1:
Site Location

GM BluePlan ENGINEERING



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Project: 121123
Hydrogeological Study
Southgate Business Park
Guelph, Ontario

Parts of Lot 13,14,& 15
Concession 7
Geo. Twp. of Puslinch

═ Roads

🟨 Study Area (500m)

🟥 Site Boundary

Scale: 1: 13,600
September 2022

Figure 2:
Study Area Layout

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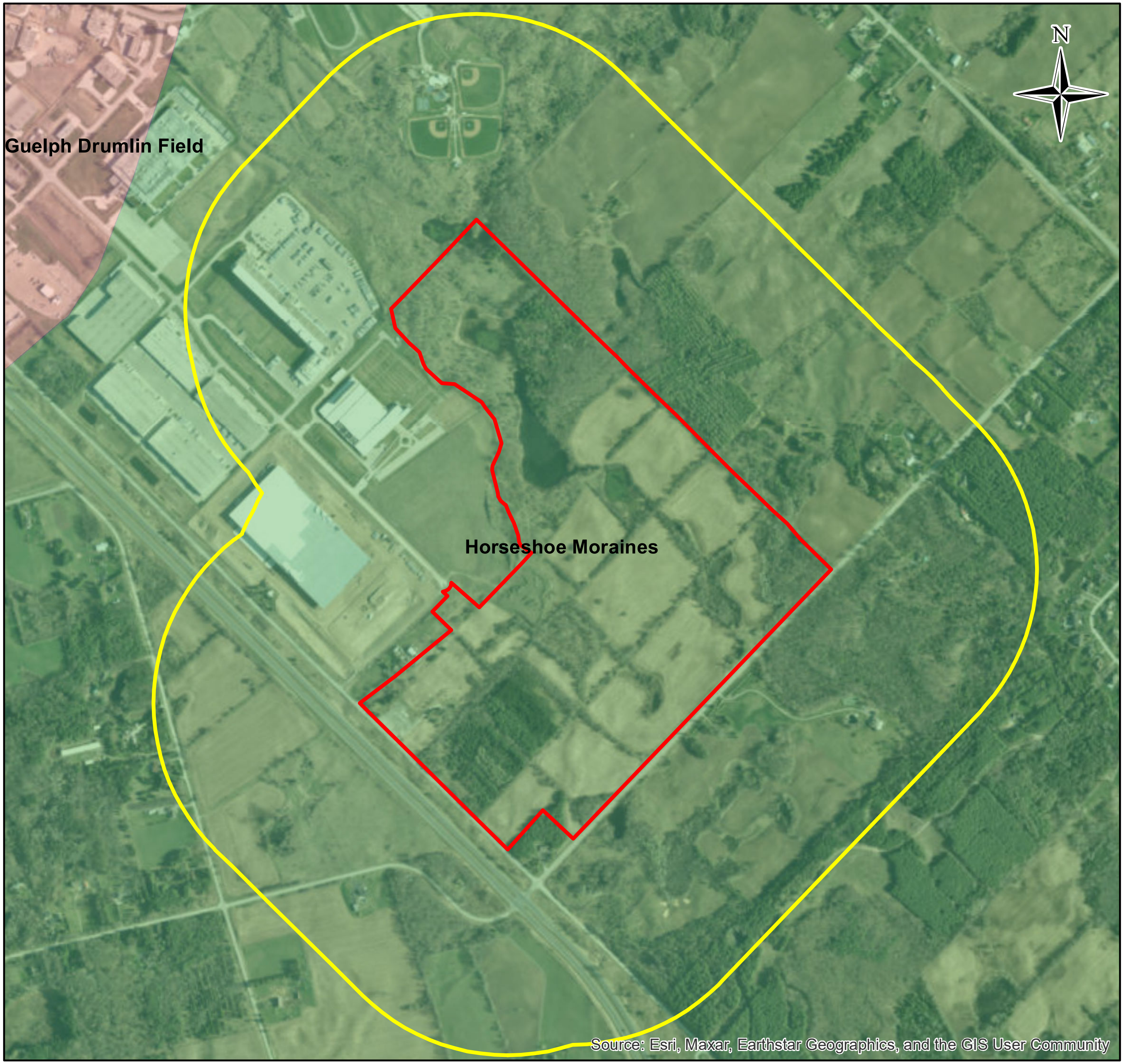

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Project: 121123
Hydrogeological Study
Southgate Business Park
Guelph, Ontario

Parts of Lot 13,14,& 15
Concession 7
Geo. Twp. of Puslinch

🟨 Study Area (500m)

🟥 Site Boundary

Physiographic Regions

UNIT, REGION

🟩 5, Horseshoe Moraines

🟥 11, Guelph Drumlin Field

Scale: 1: 13,600
September 2022

Figure 3a: Physiographic Regions

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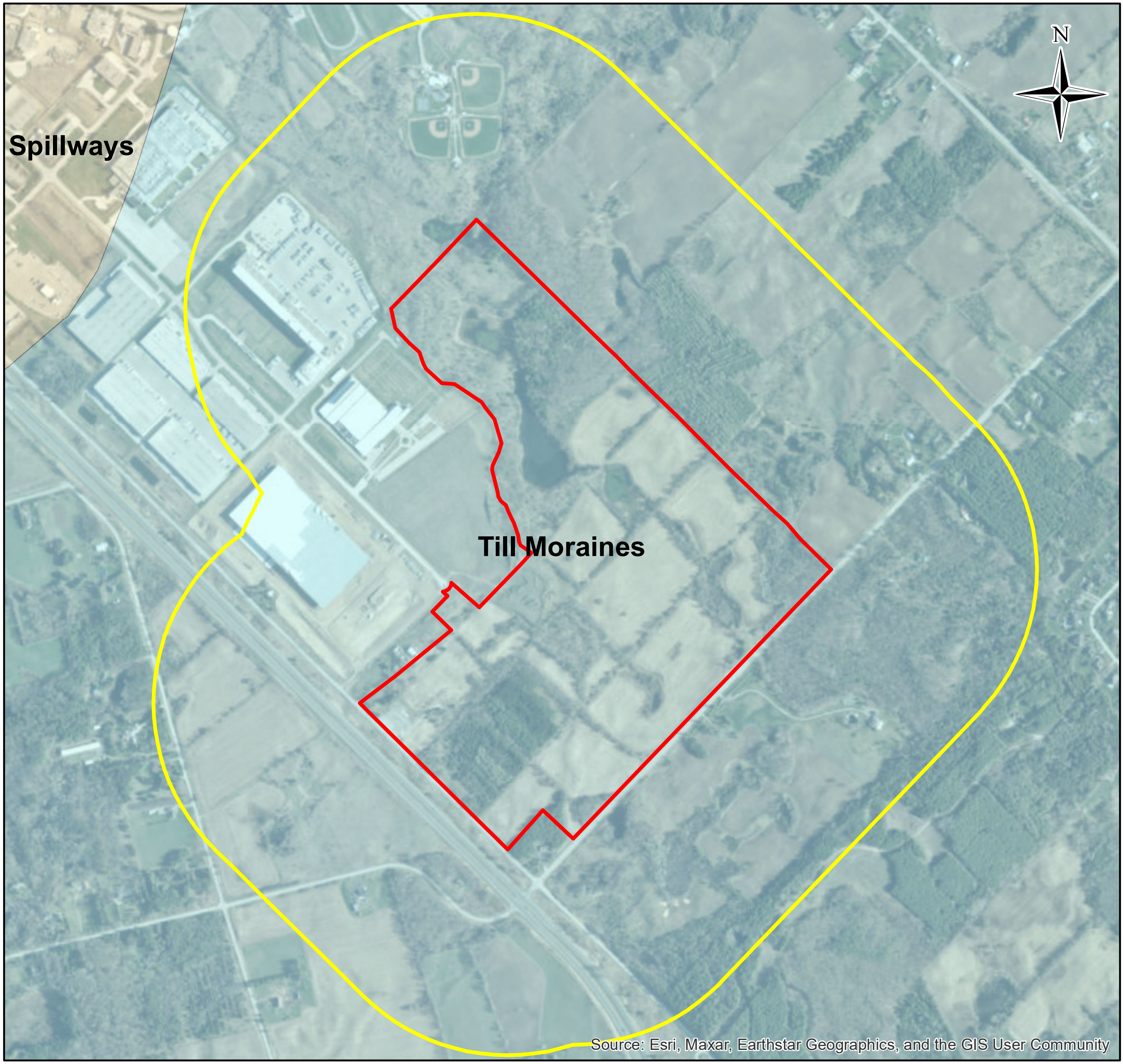


Project: 121123
Hydrogeological Study
Southgate Business Park
Guelph, Ontario

Parts of Lot 13,14 & 15
Concession 7
Geo. Twp. of Puslinch

🟨 Study Area (500m)
🟥 Site Boundary

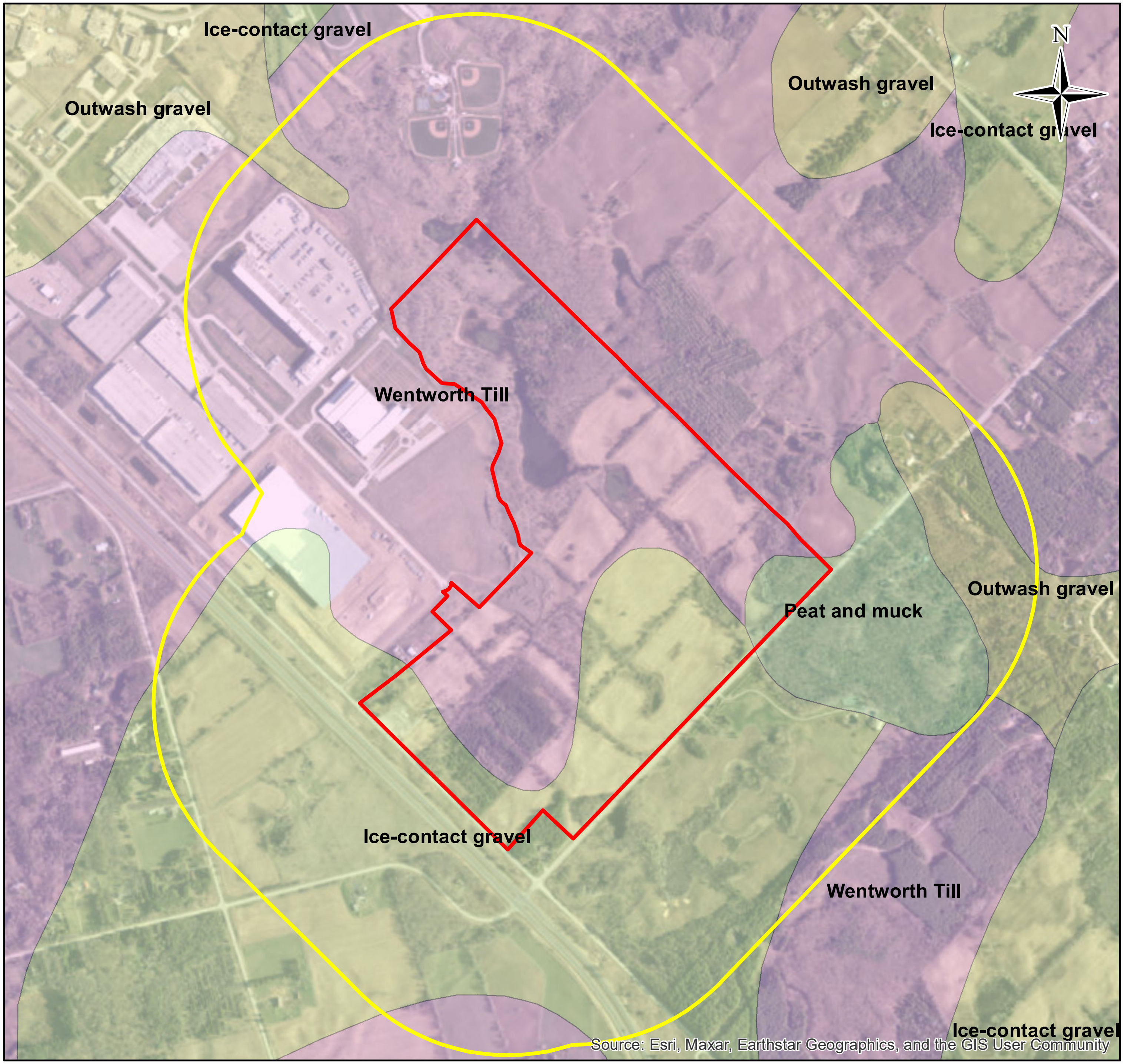
Physiography of Southern Ontario

▢ Spillways
▢ Till Moraines

Scale: 1: 13,600
September 2022

Figure 3b:
Physiographic Landforms

GM BluePlan ENGINEERING



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Parts of Lot 13,14,& 15
Concession 7
Geo. Twp. of Puslinch

🟨 Study Area (500m)

🟥 Site Boundary

Surficial Geology of Ontario

- 🟩 Ice-contact gravel
- 🟨 Outwash gravel
- 🟩 Peat and muck
- 🟪 Wentworth Till

Scale: 1: 13,600
September 2022

Figure 4:
Surficial Geology

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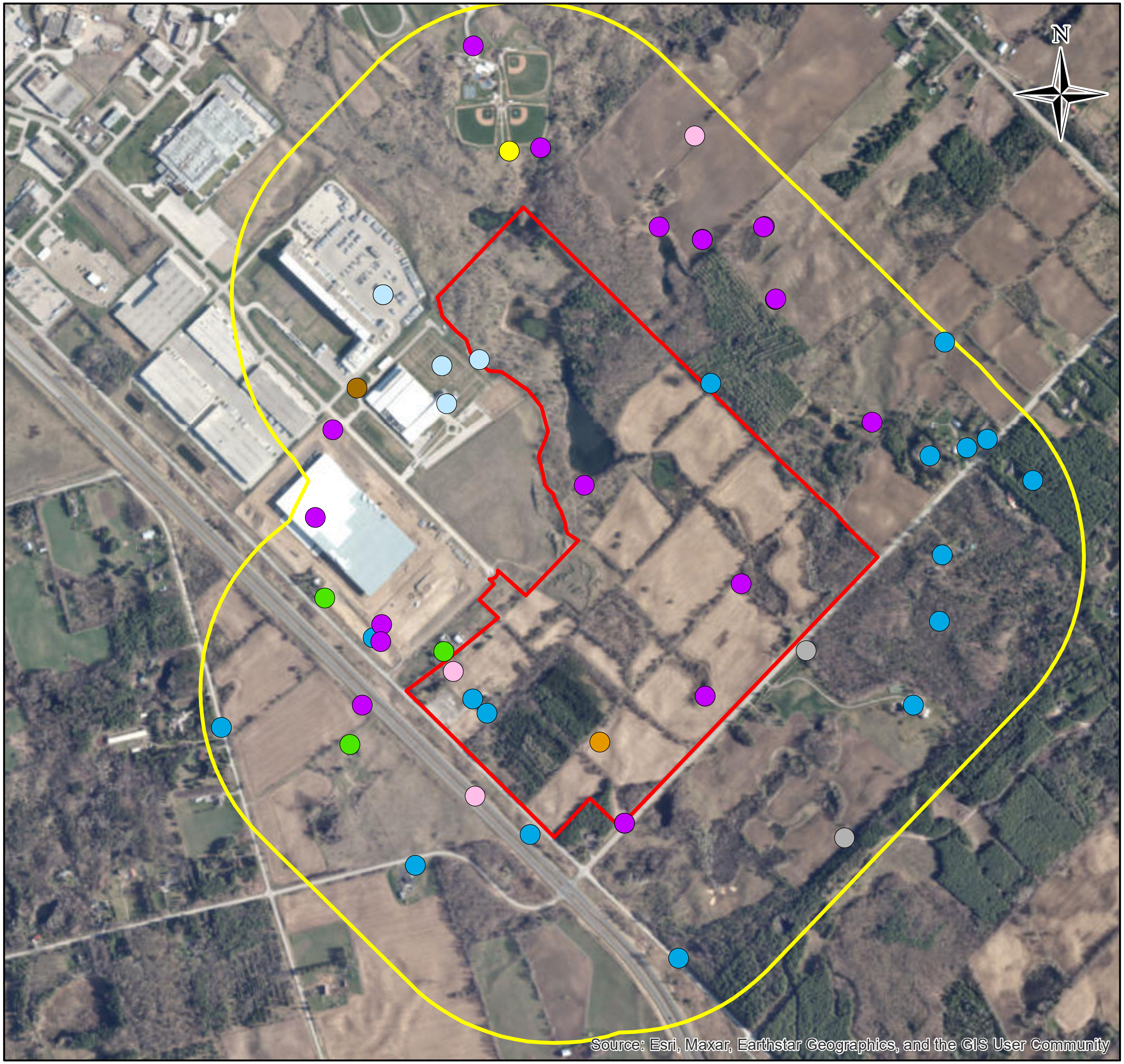
Guelph, Ontario

Parts of Lot 13,14 & 15,
Concession 7
Geo. Twp. of Puslinch



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Water Well Records (500m): Well Use

- ● Abandoned
- ● Commerical
- ● Domestic
- ● Industrial
- ● Livestock
- ● Monitoring
- ● Municipal
- ● Not Used
- ● Unknown
- ▭ Study Area (500m)
- ▭ Site Boundary

Scale: 1: 13,600
October 2022

Figure 5:
MECP Water Well Records

GM BluePlan ENGINEERING

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Parts of Lot 13,14 & 15,
Concession 7
Geo. Twp. of Puslinch

⊕ Historical Investigation Points (Existing)

◉ Monitoring Wells (2022)

▭ Site Boundary

Scale: 1: 9,000
October 2022

Figure 6a:
Monitoring Well Locations

GM BluePlan
ENGINEERING

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Southgate Business Park
Guelph, Ontario

Parts of Lot 13,14 & 15,
Concession 7
Geo. Twp. of Puslinch

● Piezometers (approx.)
□ Site Boundary

Scale: 1: 9,000
October 2022

Figure 6b:
Piezometer Locations

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Hydrogeological Study
Southgate Business Park
Guelph, Ontario

Parts of Lot 13,14 & 15,
Concession 7
Geo. Twp. of Puslinch

▨ Wetland Boundaries (NRSI)

🟥 Site Boundary

Scale: 1: 9,000
October 2022

Figure 7:
Wetland Boudaries
(NRSI)

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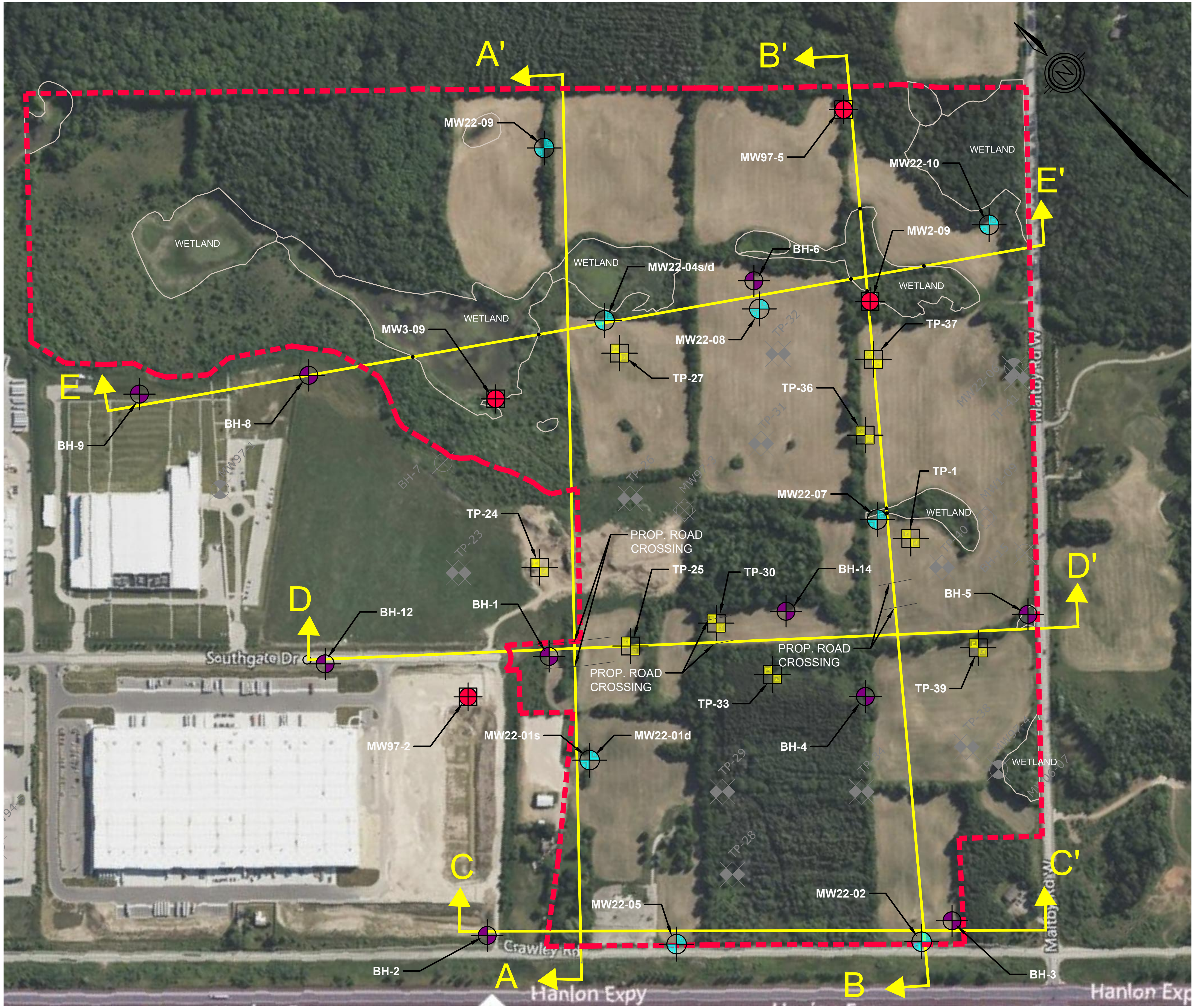

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HYDROGEOLOGICAL STUDY

CITY OF GUELPH

LEGEND

⊕	BOREHOLES (2006)
⊞	TEST PITS (2006-2007)
⊞	HISTORICAL INVESTIGATION POINTS (EXIST. WELLS)
⊕	MONITORING WELLS (2022)
- - -	SITE BOUNDARY (BNDY_V2)

75 0 50 100 200
1:5000 (m)

HYDROGEOLOGICAL CROSS-SECTIONS PLAN VIEW FIGURE No. 8

GM BluePlan ENGINEERING

121123
REVISED SEPTEMBER 2022
Scale: 1:5000 | NAD 1983 UTM Zone 17N

FILE:W:\Guelph\121-2021\121123 South Gate Business Park\5 Work In Progress\Drafting\Sheets\121123 South Gate Business Park.dwg LAYOUT:Location Plan
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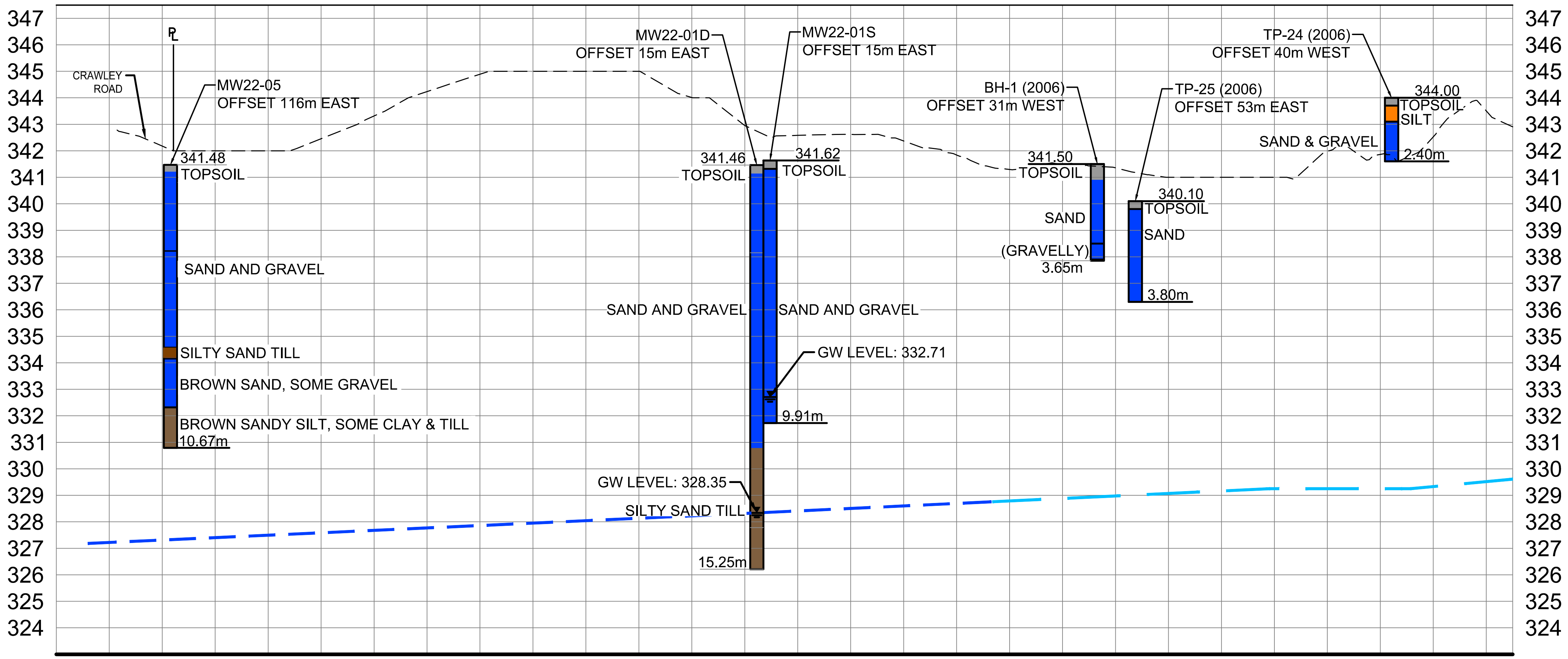
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

A

SECTION A - A' (1 OF 2)



LEGEND:

GW TABLE (INTERPOLATED)

GW TABLE (GIS DATA)

▨ TOPSOIL

🟦 SAND AND GRAVEL
SILTY SAND AND GRAVEL
SAND
LAYERED SILTS/ SANDS AND GRAVEL

🟨 SANDY SILT
SILTY SAND

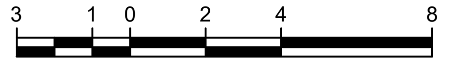
🟧 SILT
SILTY CLAY

🟫 TILL
SANDY SILT TILL
SILTY SAND TILL

HORIZONTAL

1:2000 (m)

VERTICAL



1:200 (m)

HYDROGEOLOGICAL
CROSS-SECTION
A-A'

Figure No. 8a

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ENGINEERING

117021
REVISED AUGUST 2019
NAD 1983 UTM Zone 17N

FILE:W:\Guelph\121-2021\121123 South Gate Business Park\5 Work In Progress\Drafting\Sheets\121123 South Gate Business Park.dwg LAYOUT:X-SEC A-A'
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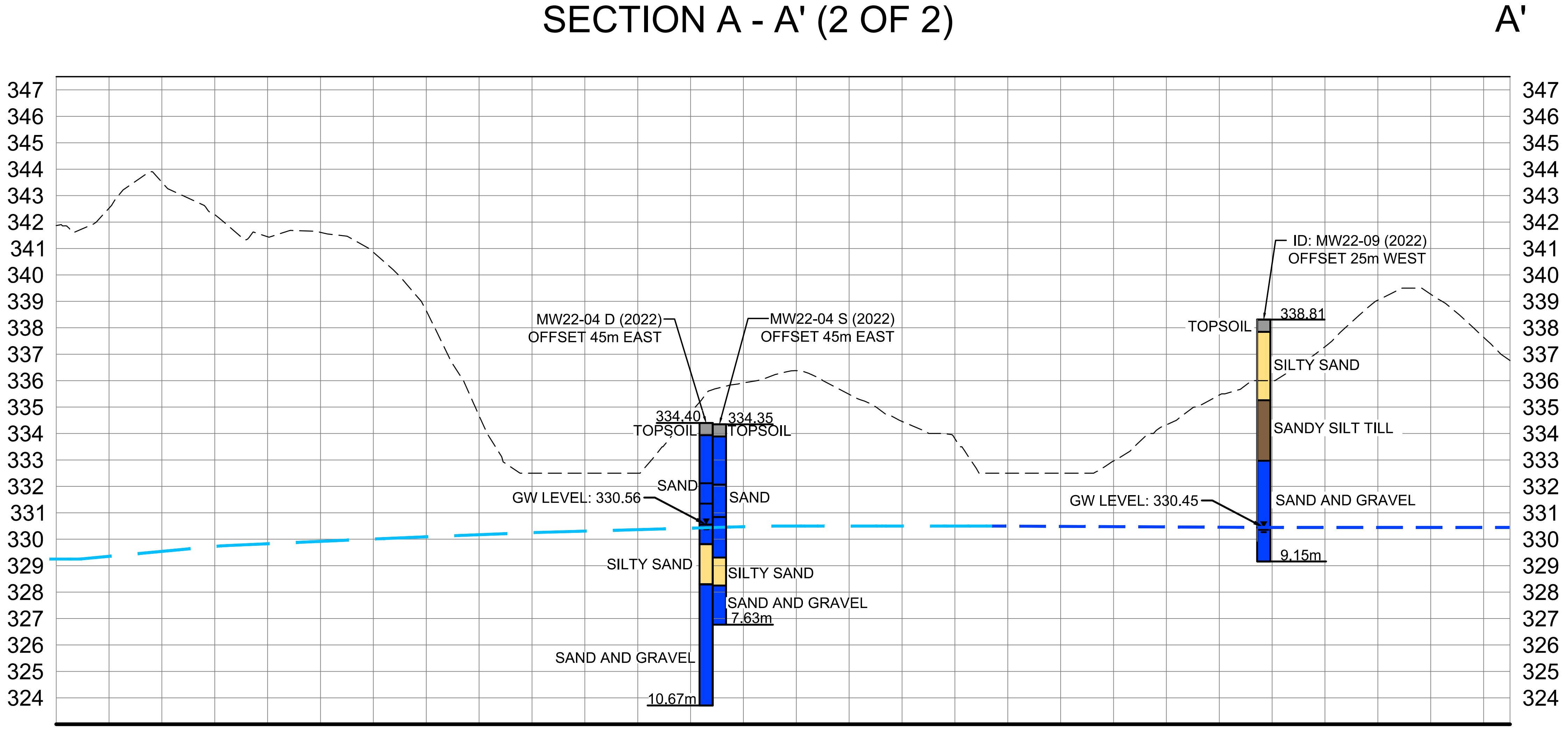
PROJECT: 121123
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

SECTION A - A' (2 OF 2)



LEGEND:

▼ GW TABLE (INTERPOLATED)

▼ GW TABLE (GIS DATA)

▨ TOPSOIL

■ SAND AND GRAVEL
SILTY SAND AND GRAVEL
SAND
LAYERED SILTS/ SANDS AND GRAVEL

■ SANDY SILT
SILTY SAND

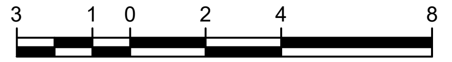
■ SILT
SILTY CLAY

■ TILL
SANDY SILT TILL
SILTY SAND TILL

HORIZONTAL

1:2000 (m)

VERTICAL



1:200 (m)

HYDROGEOLOGICAL CROSS-SECTION A-A'

Figure No. 8a

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NAD 1983 UTM Zone 17N

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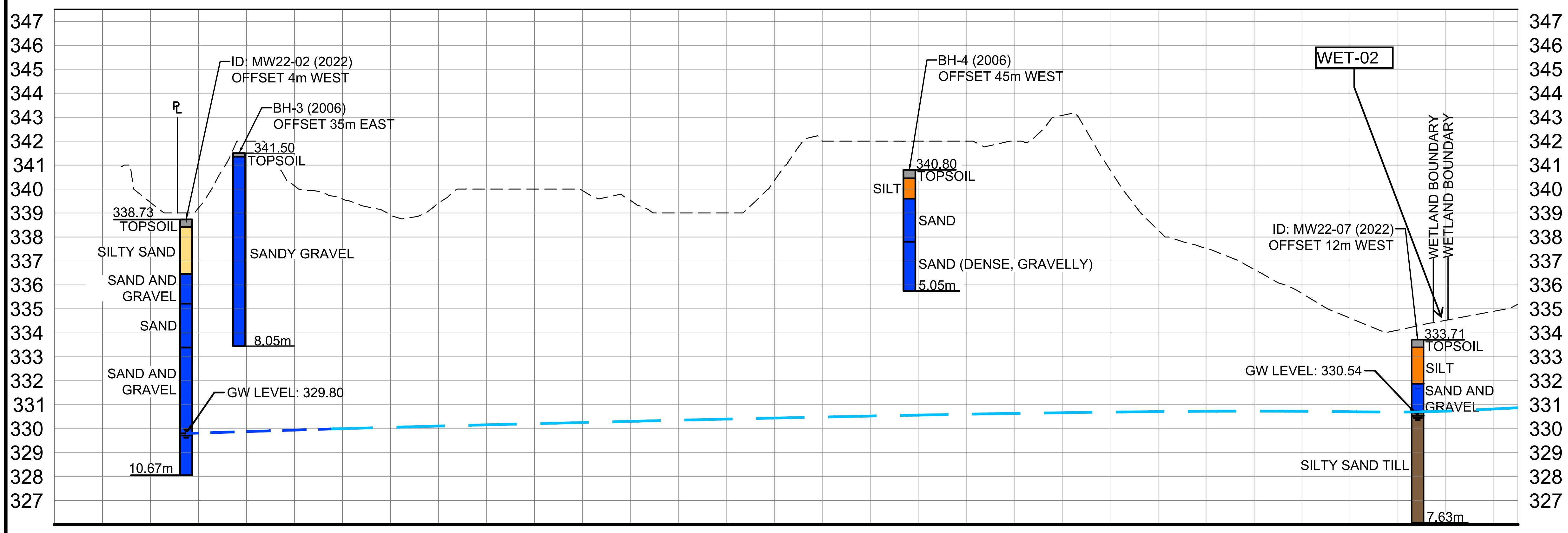
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

B

SECTION B - B' (1 OF 2)



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GW TABLE (INTERPOLATED)

GW TABLE (GIS DATA)

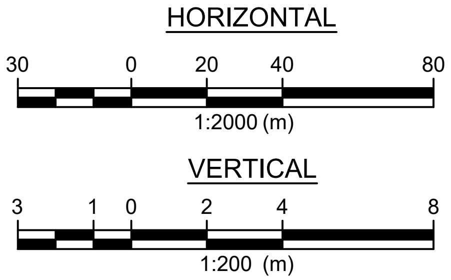
▨ TOPSOIL

▨ SAND AND GRAVEL
SILTY SAND AND GRAVEL
SAND
LAYERED SILTS/ SANDS AND GRAVEL

▨ SANDY SILT
SILTY SAND

▨ SILT
SILTY CLAY

▨ TILL
SANDY SILT TILL
SILTY SAND TILL



HYDROGEOLOGICAL
CROSS-SECTION
B-B'

Figure No. 8b

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NAD 1983 UTM Zone 17N

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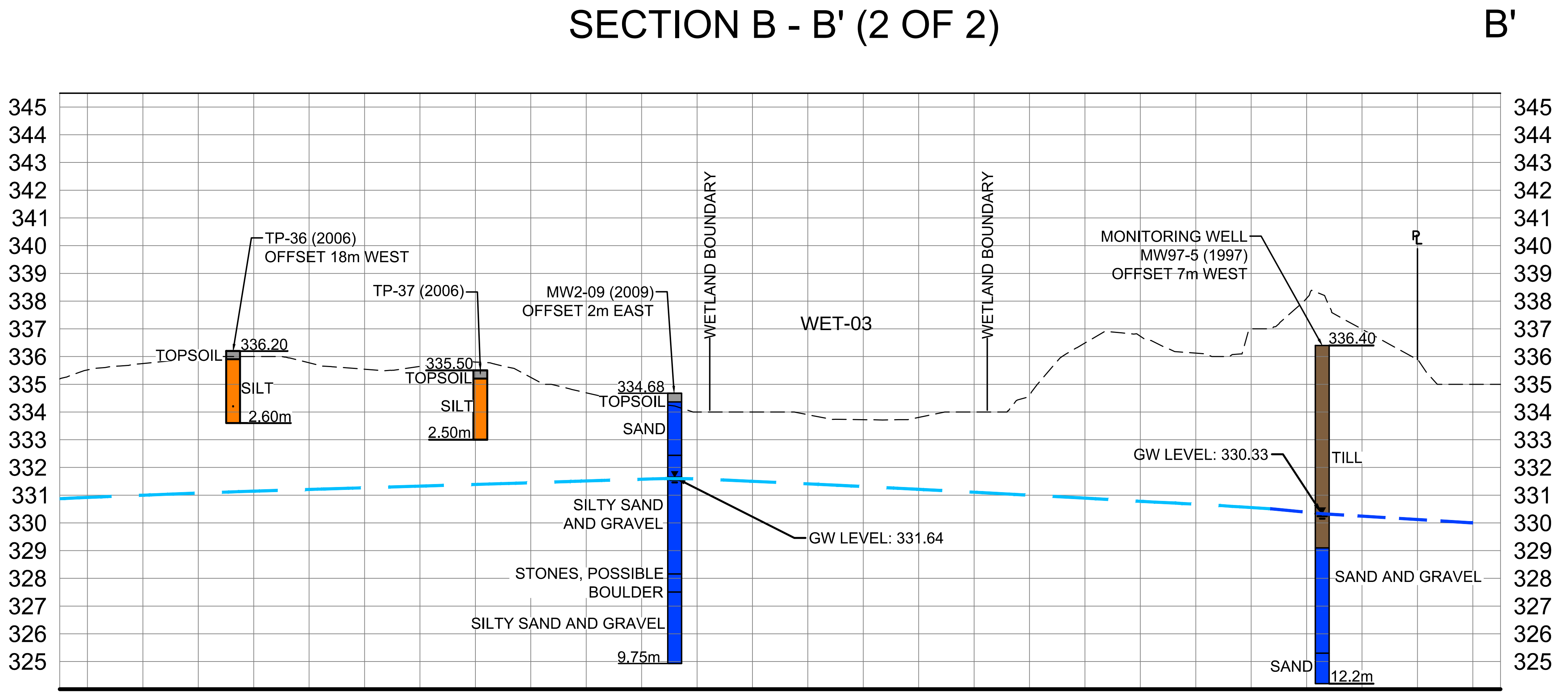
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

SECTION B - B' (2 OF 2)



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- GW TABLE (INTERPOLATED)
- GW TABLE (GIS DATA)

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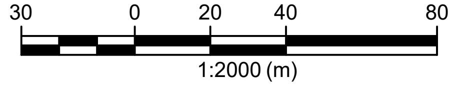
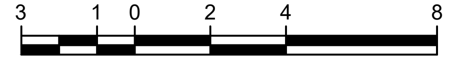
🟨	SANDY SILT SILTY SAND
🟧	SILT SILTY CLAY
🟫	TILL SANDY SILT TILL SILTY SAND TILL

HORIZONTAL



1:2000 (m)

VERTICAL



1:200 (m)

HYDROGEOLOGICAL CROSS-SECTION B-B'

Figure No. 8b

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NAD 1983 UTM Zone 17N

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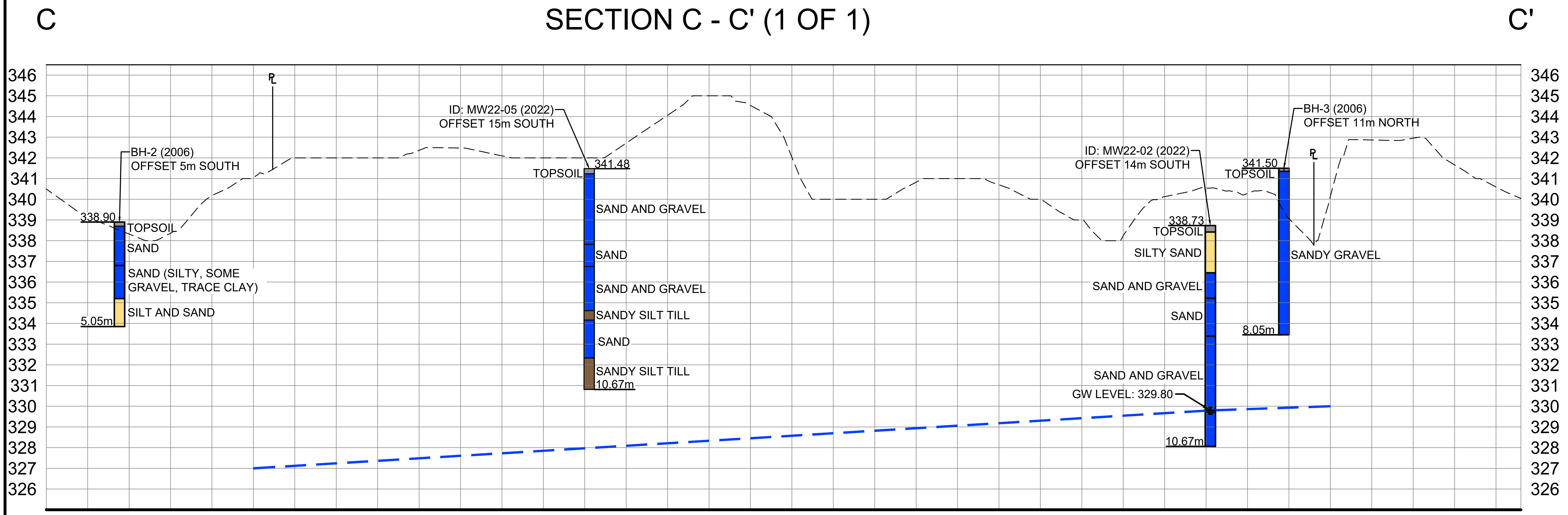
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

SECTION C - C' (1 OF 1)



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▼ - - - - - GW TABLE (GIS DATA)

▩ TOPSOIL

🟦 SAND AND GRAVEL
SILTY SAND AND GRAVEL
SAND
LAYERED SILTS/ SANDS AND GRAVEL

🟨 SANDY SILT
SILTY SAND

🟧 SILT
SILTY CLAY

🟫 TILL
SANDY SILT TILL
SILTY SAND TILL

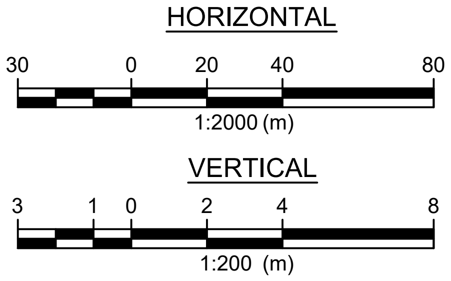

Figure No. 8c

HYDROGEOLOGICAL CROSS-SECTION C-C'

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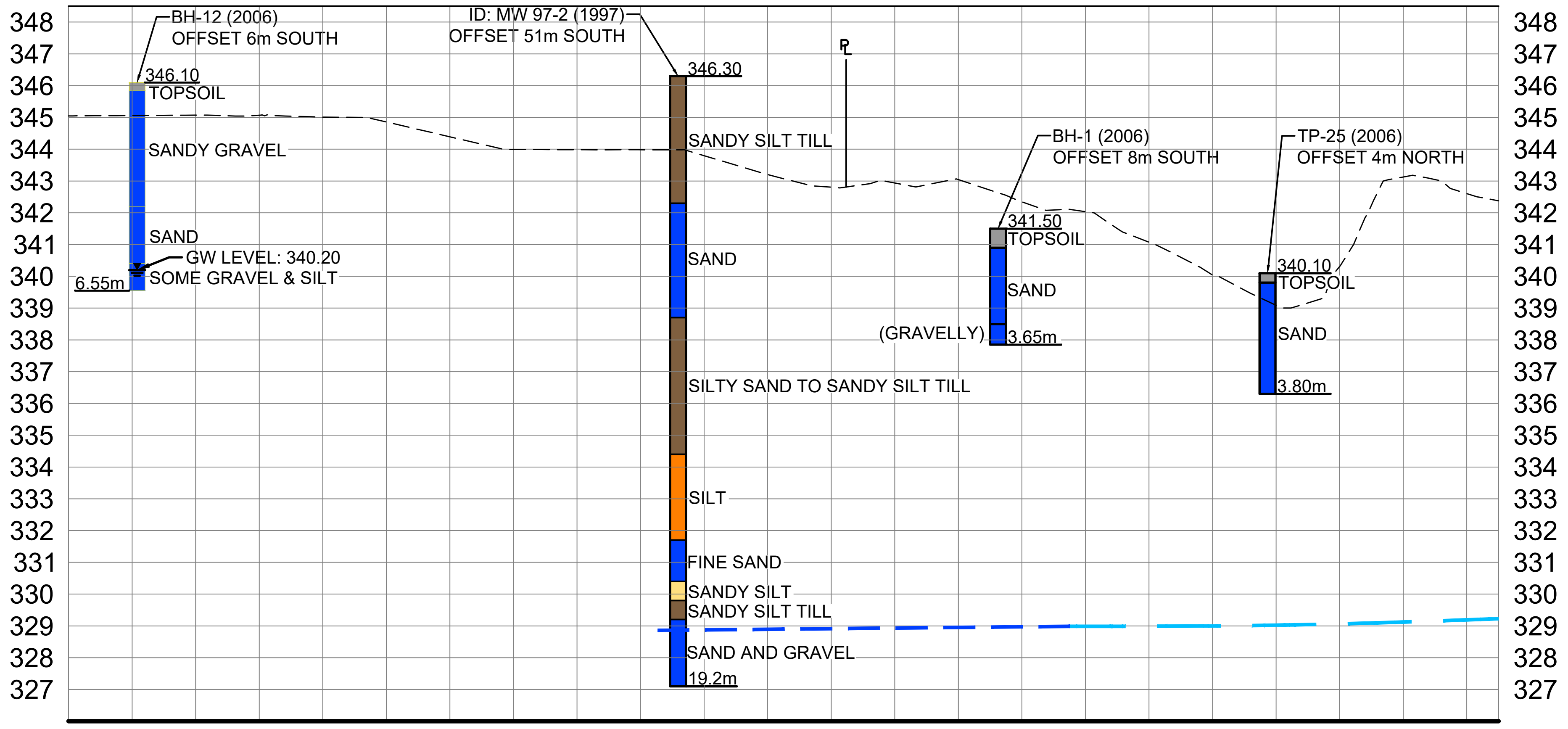
PROJECT: 121123
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

D

SECTION D - D' (1 OF 2)



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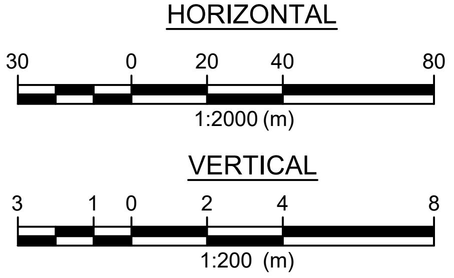
- ▼ — — — GW TABLE (GIS DATA)
- ■ TOPSOIL
- 🟦 SAND AND GRAVEL
SILTY SAND AND GRAVEL
SAND
LAYERED SILTS/ SANDS AND GRAVEL
- 🟨 SANDY SILT
SILTY SAND
- 🟧 SILT
SILTY CLAY
- 🟫 TILL
SANDY SILT TILL
SILTY SAND TILL



HYDROGEOLOGICAL
CROSS-SECTION
D-D'

Figure No. 8d

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117021
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NAD 1983 UTM Zone 17N

FILE:W:\Guelph\121-2021\121123 South Gate Business Park\5 Work In Progress\Drafting\Sheets\121123 South Gate Business Park.dwg LAYOUT:X-SEC D-D'
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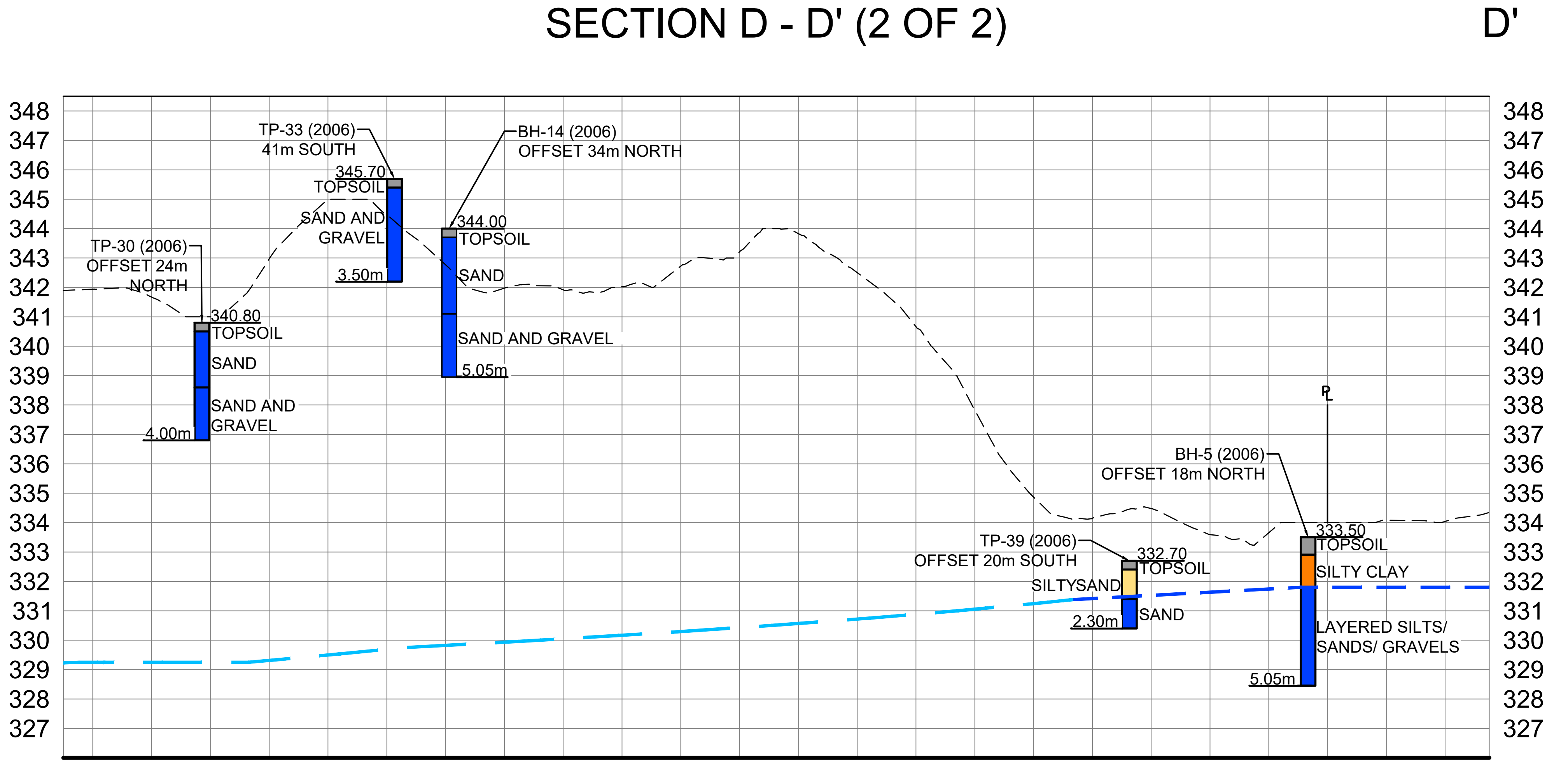
PROJECT: 121123
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

SECTION D - D' (2 OF 2)



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GW TABLE (INTERPOLATED)
GW TABLE (GIS DATA)

⬛	TOPSOIL
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🟨	SANDY SILT SILTY SAND
🟧	SILT SILTY CLAY
🟫	TILL SANDY SILT TILL SILTY SAND TILL

HORIZONTAL
30 0 20 40 80
1:2000 (m)

VERTICAL
3 1 0 2 4 8
1:200 (m)

HYDROGEOLOGICAL CROSS-SECTION D-D'

Figure No. 8d

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FILE:W:\Guelph\121-2021\121123 South Gate Business Park\5 Work In Progress\Drafting\Sheets\121123 South Gate Business Park.dwg LAYOUT:X-SEC D-D' (2)
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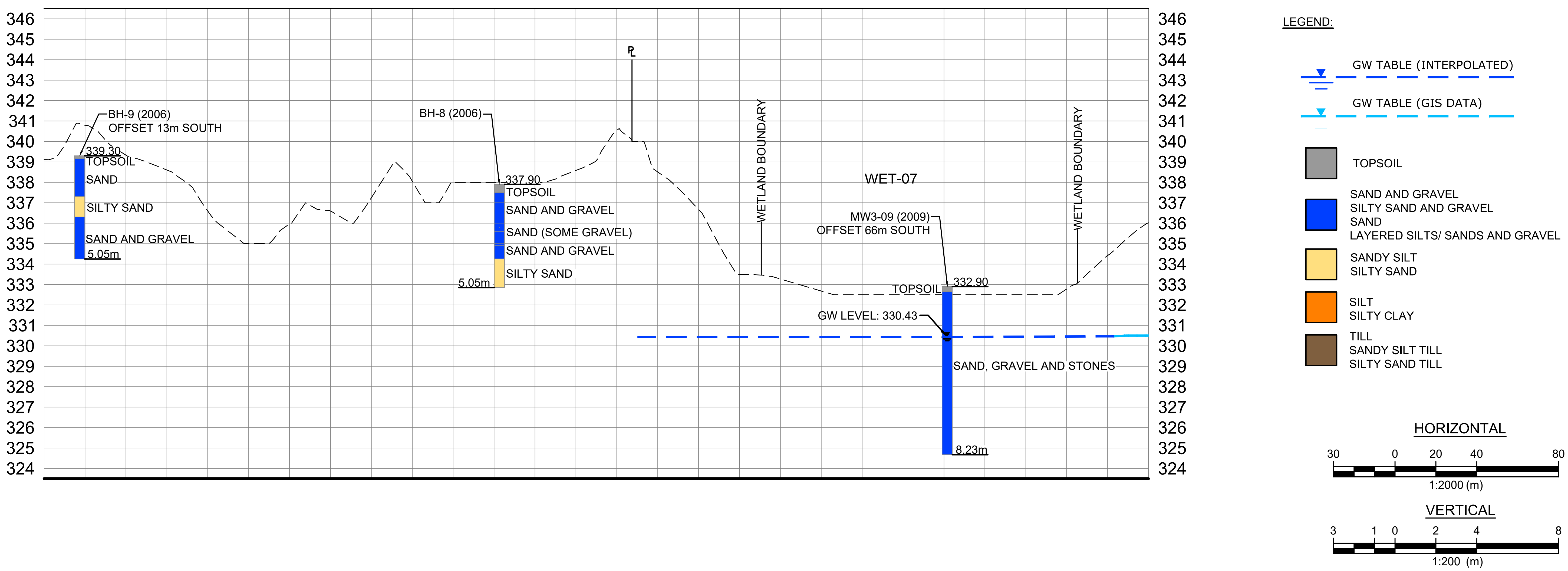
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

E

SECTION E - E' (1 OF 2)



HYDROGEOLOGICAL
CROSS-SECTION
E-E'

Figure No. 8e

GM BluePlan ENGINEERING

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REVISED AUGUST 2019
NAD 1983 UTM Zone 17N

FILE:W:\Guelph\121-2021\121123 South Gate Business Park\5 Work In Progress\Drafting\Sheets\121123 South Gate Business Park.dwg LAYOUT:X-SEC E-E'
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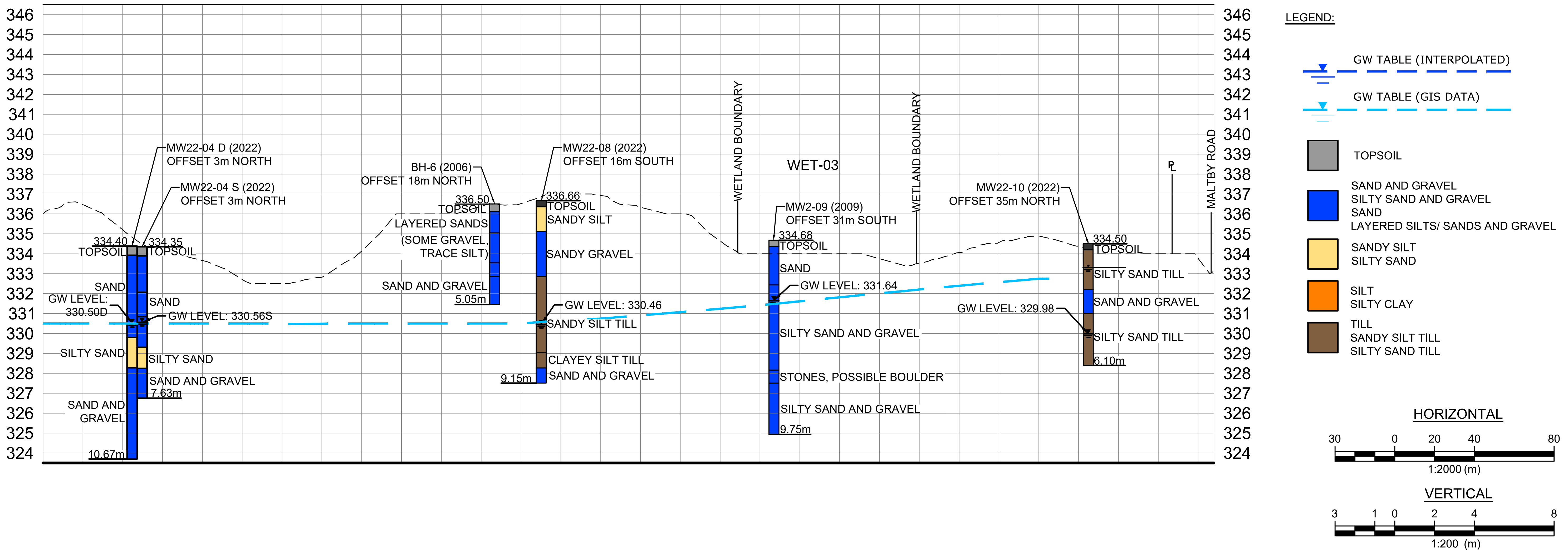
PROJECT: 121123
SOUTH GATE BUSINESS PARK
HYDROGEOLOGICAL STUDY

CITY OF GUELPH

SECTION E - E' (2 OF 2)

E'



HYDROGEOLOGICAL
CROSS-SECTION
E-E'

Figure No. 8e

117021
REVISED AUGUST 2019
NAD 1983 UTM Zone 17N

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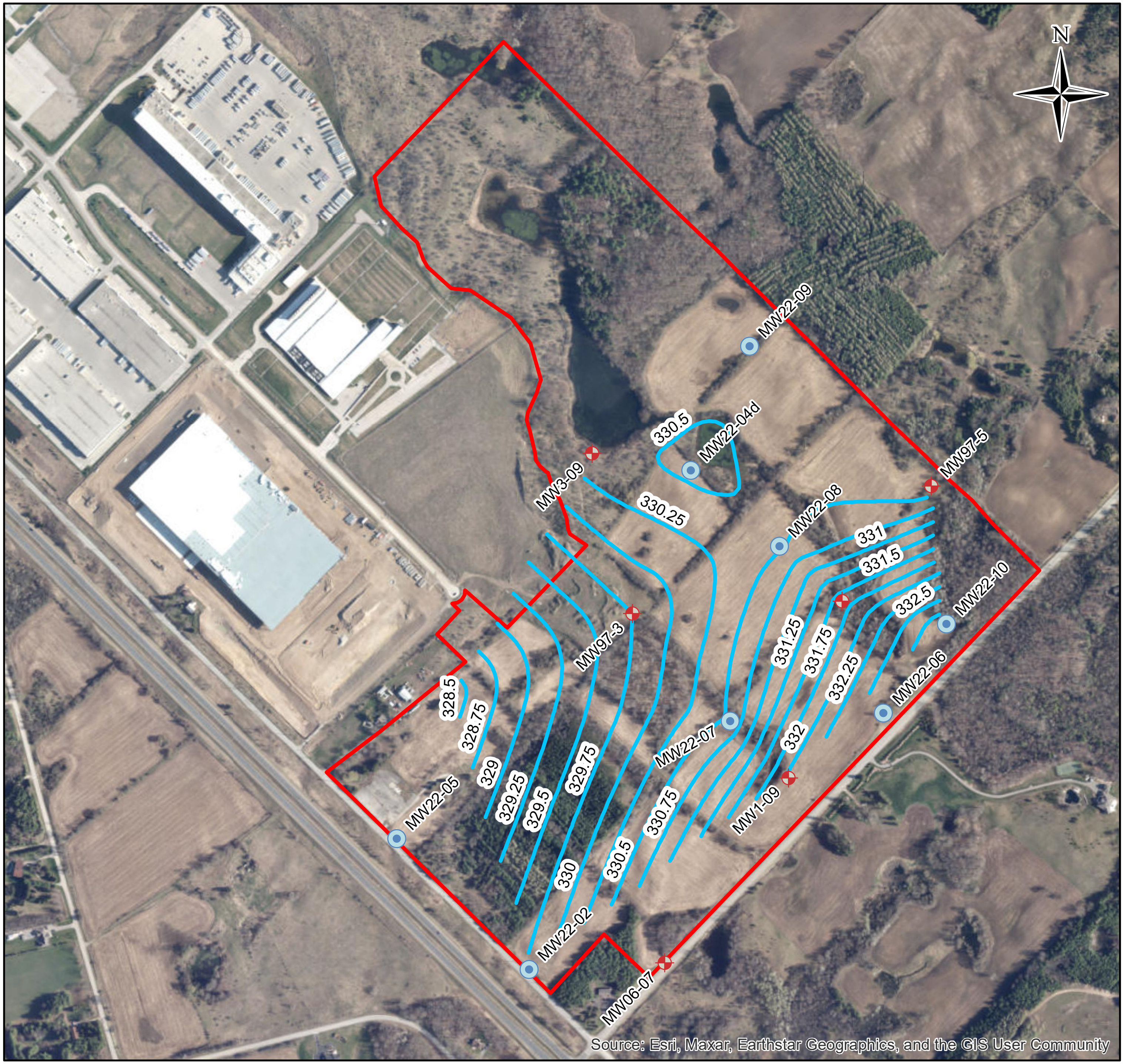


Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Project: 121123
Hydrogeological Study
Southgate Business Park
Guelph, Ontario

Parts of Lot 13,14 & 15,
Concession 7
Geo. Twp. of Puslinch

Well ID	GWL (masl)	Well ID	GWL (masl)
MW1-09	332.06	MW22-04D	330.5
MW2-09	331.64	MW22-04S	330.56
MW3-09	330.43	MW22-05	<330.814
MW97-3	329.75	MW22-06	<330.752
MW97-5	330.33	MW22-07	330.54
MW22-01D	328.35	MW22-08	330.46
MW22-01S	332.71	MW22-09	330.45
MW22-02	329.8	MW22-10	332.99

- ⊕ Historical Investigation Points (Existing)
- ◉ Monitoring Wells (2022)
- — GW Contours (2022-06-01)
- ▭ Site Boundary

Scale: 1: 9,000
October 2022

Figure 9:
Interpreted Groundwater Level Contours

BluePlan ENGINEERING

TABLES

Table 1: Summary of Water Well Records

MECP Well ID	Lot	Conc.	Easting	Northing	Township	Well Use	Bedrock/ Overburden	Depth to Bedrock (m)	Total Depth of Well (m)	Static Water Level (m)	Year Drilled	Notes
Wells Within Site												
6702499	14	7	565349	4814138	PUSLINCH TOWNSHIP	Domestic	Overburden	~	20.4	15.3	1967-09-01	
6703865	14	7	565314	4814173	PUSLINCH TOWNSHIP	Domestic	Bedrock	42.7	50.3	21.4	1970-10-28	Appears to be abandoned as per MECP Well Record ID: 7149057
6708738	15	7	565623	4814068	PUSLINCH TOWNSHIP	Commerical	Overburden	~	22.9	15.6	1986-11-18	The well is acutally located on the property 519 Maltyby Road according to record
7127705	15	7	565879	4814180	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	9.0	~	2009-07-13	Monitoring well installed by Banks Groundwater Engineering Limited
7127705	15	7	565967	4814452	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	9.0	~	2009-07-13	Monitoring well installed by Banks Groundwater Engineering Limited
7127705	15	7	565585	4814692	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	9.0	~	2009-07-13	Monitoring well installed by Banks Groundwater Engineering Limited
7149057	14	7	565268	4814239	PUSLINCH TOWNSHIP	Abandoned	Bedrock	~	51.9	~	2010-06-15	Well has been abandoned according to record
Wells Within 500 m of Site												
6702371	21	4	565016	4814062	PUSLINCH TOWNSHIP	Livestock	Bedrock	38.1	70.1	18.3	1962-02-06	
6702496	13	7	564955	4814418	PUSLINCH TOWNSHIP	Livestock	Bedrock	38.1	39.0	15.3	1957-10-22	
6702498	14	7	565244	4814288	PUSLINCH TOWNSHIP	Livestock	Bedrock	41.8	46.3	21.4	1959-01-26	
6703150	15	7	566514	4814783	PUSLINCH TOWNSHIP	Domestic	Overburden	~	19.8	9.2	1968-04-27	
6703187	20	4	564704	4814103	PUSLINCH TOWNSHIP	Domestic	Bedrock	42.7	57.9	21.0	1968-07-31	
6703384	15	7	566564	4814803	PUSLINCH TOWNSHIP	Domestic	Overburden	~	41.1	18.3	1969-06-07	
6703848	15	7	566424	4814763	PUSLINCH TOWNSHIP	Domestic	Overburden	~	16.2	7.6	1970-07-25	
6704466	16	7	566674	4814703	PUSLINCH TOWNSHIP	Domestic	Bedrock	34.2	35.1	11.6	1972-09-14	
6706156	16	7	565814	4813543	PUSLINCH TOWNSHIP	Domestic	Bedrock	35.7	51.8	11.3	1976-08-09	
6707737	22	3	565454	4813843	PUSLINCH TOWNSHIP	Domestic	Bedrock	38.7	47.9	22.3	1982-11-13	
6707995	16	7	566454	4814523	PUSLINCH TOWNSHIP	Domestic	Overburden	~	18.3	9.2	1984-11-15	
6708329	14	7	565073	4814321	PUSLINCH TOWNSHIP	Domestic	Overburden	~	35.4	16.8	1985-09-18	
6711246	16	7	566460	4815039	PUSLINCH TOWNSHIP	Domestic	Overburden	~	19.2	5.2	1993-06-30	
6713164	14	7	565893	4814939	PUSLINCH TOWNSHIP	Domestic	Bedrock	29	61.9	25.0	1999-10-07	
6713680	21	3	565175	4813768	PUSLINCH TOWNSHIP	Domestic	Bedrock	36.9	42.7	14.9	2001-05-16	
6714518	16	7	566448	4814361	PUSLINCH TOWNSHIP	Domestic	Bedrock	33.6	47.2	18.9	2003-07-10	
6715030	12	7	565097	4815155	PUSLINCH TOWNSHIP	Not Used	Bedrock	27.4	27.9	~	2007-02-09	
6715032	12	7	565097	4815155	PUSLINCH TOWNSHIP	Not Used	~	~	~	~	2004-08-13	
7041087	~	~	565683	4813871	GUELPH CITY	Monitoring	Bedrock	34.5	99.9	~	2007-03-27	Monitoring Well MW06-07 (BH-A)
7041088	~	~	565683	4813871	GUELPH CITY	Monitoring	Bedrock	34.8	64.0	~	2007-03-27	Monitoring Well MW06-07 (BH - B)
7041089	~	~	565683	4813871	GUELPH CITY	Monitoring	Bedrock	34.8	39.6	~	2007-03-27	Monitoring Well MW06-07 (BH-C)
7041090	~	~	565683	4813871	GUELPH CITY	Monitoring	Overburden	~	19.8	~	2007-03-27	Monitoring Well MW06-07 (BH-D)
7043036	~	~	565240	4814982	GUELPH CITY	Not Used	Bedrock	27.4	27.9	~	2007-02-09	
7044324	13	7	565252	4814890	PUSLINCH TOWNSHIP	Not Used	Bedrock	28.3	28.6	~	2007-05-17	
7044325	13	7	565331	4814997	PUSLINCH TOWNSHIP	Not Used	Bedrock	26.8	28.6	~	2007-05-17	
7118829	13	7	564932	4814614	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	9.4	~	2008-02-20	
7118829	13	7	564812	4814728	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	7.8	~	2008-02-18	
7118829	13	7	564812	4814728	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	9.7	~	2008-02-18	
7118829	13	7	564812	4814728	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	10.0	~	2008-02-18	
7120997	~	~	565034	4814928	GUELPH CITY	Industrial	Bedrock	34.2	88.7	~	2008-08-01	
7121100	~	~	564406	4815503	GUELPH CITY	Municipal	Bedrock	37.8	102.1	~	2008-06-16	Record indicates that this was a test hole and not used for water supply.
7191239	~	~	565321	4813936	PUSLINCH TOWNSHIP	Abandoned	~		16.2	~	2012-10-25	
7198975	~	~	566124	4814290	PUSLINCH TOWNSHIP	Unknown	~	~	~	~	2013-02-15	
7274660	16	7	566218	4813835	PUSLINCH TOWNSHIP	Unknown	~	~	~	~	2016-08-31	
7278485	~	7	565479	4815512	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	35.4	17.2	2016-08-24	
7285179	~	~	565767	4815319	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	12.2	~	2017-03-28	
7285182	~	~	566050	4815143	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	17.4	~	2017-03-29	
7287747	16	7	566385	4814157	PUSLINCH TOWNSHIP	Domestic	Bedrock	38.4	39.6	9.8	2016-05-24	Screen/Open hole within bedrock
7297875	15	7	566284	4814845	GUELPH CITY	Monitoring	Overburden	~	10.7	~	2017-03-20	
7316404	~	~	565091	4814312	GUELPH CITY	Monitoring	Overburden	~	10.7	9.5	2018-07-19	
7323504	~	~	565872	4815289	GUELPH CITY	Monitoring	Overburden	~	14.6	12.8	2018-10-09	
7323505	~	~	565872	4815288	GUELPH CITY	Monitoring	Overburden	~	4.6	~	2018-10-09	
7323506	~	~	565872	4815288	GUELPH CITY	Monitoring	Overburden	~	4.6	~	2018-10-09	
7323508	~	~	566023	4815321	GUELPH CITY	Monitoring	Overburden	~	15.3	~	2018-10-10	
7323509	~	~	566021	4815319	GUELPH CITY	Monitoring	Overburden	~	6.1	~	2018-10-10	
7331308	13	7	565854	4815540	PUSLINCH TOWNSHIP	Abandoned	~	~	61	~	2019-04-29	
7359713	~	~	565316	4815759	PUSLINCH TOWNSHIP	Monitoring	Overburden	~	16.5	15.3	2020-04-27	

~ - indicates data not included on record.

Table 2 - Summary of Identified On-Site Wetlands by Ecological Land Classification (ELC) and Typical Hydrological Characteristics as Noted in the Literature.

WETLAND	ELC	**Hydrological Characteristics** (Lee, et al., 1998)
WET-01	SWD3-2	-seasonal flooding duration is short, substrate aeration by early to mid-summer
WET-02	SWT2-5	-seasonal flooding duration is short, substrate aerated by early to mid-summer
	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
WET-03	SWD4-1	-commonly found on floodplains; flooding duration is short, substrate aerated by early to mid-summer
WET-04	SWD3-3	-seasonal flooding duration is short, substrate aerated by early to mid-summer
WET-05	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
WET-06	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
	SWT2-5	-seasonal flooding duration is short, substrate aerated by early to mid-summer
	MAS3-10	-water up to 2 m deep, standing or flowing water for much or all of growing season.
WET-07	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
	SWT2-2	-seasonal flooding duration is short, substrate aerated by early to mid-summer
	MAS3-2	-water up to 2 m deep, standing or flowing water for much or all of growing season.
WET-08	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
WET-09	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
WET-10*	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
WET-11	SWT2-4	-flooding duration is short, substrate aeration by early to mid-summer
WET-12	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.
WET-13	MAM2-2	-variable flooding regimes, water depth <2 m; soils flooded in spring, moist to dry by summer.

* Indicates wetland has been identified as being eligible for removal. See discussion in Section 2.7.6.

Table 3 - Summary of Investigation Activities

Date	Investigative Activities Completed
29-Mar-22	Located existing monitoring wells: MW1-09, MW2-09, MW3-09, MW97-3, and MW97-5. Collected manual groundwater level measurements.
6-Apr-22	Installed dataloggers, collected manual water levels, and collected water quality samples at existing monitoring wells.
12-Apr-22	Installed six piezometers (PZ-1 to PZ-06) in wetlands WET-01 to WET-04, WET-06 and WET-07. Piezometers at WET-01 and WET-06 were installed as nests.
18-Apr-22	Collected manual measurements at all piezometers.
18-Apr-22	Began the drilling of 11 new monitoring wells as described in Section 3.1.
12-May-22	Installed dataloggers and collected manual water measurements at all the new monitoring wells and piezometers.
21-Jun-22	Hand-delivered well survey and groundwater monitoring program invitation letters to nearby residences within 500 m of Site.
2-Aug-22	Collected manual water level measurements and downloaded logger data at all investigative locations.
5-Sep-22	Installed new piezometer nests at wetlands WET-05 and WET-08. Installed deep piezometers to create a nest at wetlands WET-02, WET-03. Installed a deep piezometer at lower elevation within WET-01.
22-Nov-22	Collected manual water level measurements and downloaded logger data at all investigative locations.
	Attempted to collect surface water samples from wetlands on-site, but wetlands were dry at the time of visit
1-Dec-22	Visited residences 4646 Sideroad 20, 519 Maltby Road, and 192 Maltby Road to collect baseline water quality samples.
5-Dec-22	Visited residences 104 and 110 Maltby Road to collect baseline water quality samples.
	Attempted to collect surface water samples from wetlands on-site, but wetlands were dry at the time of visit
6-Jan-23	Collection of baseline samples from surface water features (WET-02, WET-06)
2-Feb-23	Collected manual water level measurements and downloaded logger data at all investigative locations (i.e., piezometers and monitoring wells).

Table 4a: Monitoring Well Details and Water Level Observations
2022 Monitoring Wells

				DATE:	2022-05-12		2022-06-01		2022-08-02		2022-11-22		2023-02-02	
			Screen		Water Level		Water Level		Water Level		Water Level		Water Level	
Well ID	Ground Elev.	TOC Elev.	Top Elev.	Length	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
(--)	(masl)	(masl)	(masl)	(m)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)
MW22-01D	341.461	342.504	329.261	3.05	14.16	328.344	14.154	328.35	14.444	328.06	15.035	327.469	15.265	327.239
MW22-01S	341.623	342.561	334.763	3.05	9.836	332.725	9.851	332.71	9.9	332.661	10.023	332.538	9.798	332.763
MW22-02	338.73	339.644	331.110	3.05	9.766	329.878	9.844	329.8	10.255	329.389	10.816	328.828	11.071	328.573
MW22-04D	334.395	335.271	326.775	3.05	4.775	330.496	4.771	330.5	5.337	329.934	6.187	329.084	6.488	328.783
MW22-04S	334.348	335.258	329.768	3.05	4.701	330.557	4.698	330.56	5.175	330.083	6.025	329.233	6.237	329.021
MW22-05	341.484	342.397	333.864	3.05	DRY	<330.814	DRY	<330.814	DRY	<330.814	DRY	<330.815	DRY	<330.815
MW22-06	344.482	345.292	333.802	3.05	DRY	<330.752	DRY	<330.752	DRY	<330.752	DRY	<330.753	DRY	<330.753
MW22-07	333.713	334.711	329.133	3.05	4.031	330.68	4.171	330.54	5.003	329.708	5.827	328.884	6.073	328.638
MW22-08	336.659	337.659	330.559	3.05	7.21	330.449	7.199	330.46	7.841	329.818	8.695	328.964	8.987	328.672
MW22-09	338.807	339.748	332.706	3.05	9.326	330.422	9.298	330.45	9.766	329.982	9.93	329.818	9.93	329.818
MW22-10	334.496	335.41	331.446	3.05	2.110	333.3	2.42	332.99	3.585	331.825	4.92	330.49	3.622	331.788

mbTOC - metres below top of casing of well.
masl - metres above Sea Level
NM - not measured
Elev. - Elevation

Table 4b: Monitoring Well Details and Water Level Observations
Pre-Existing Monitoring Wells

				DATE:	2022-05-30		2022-06-01		2022-08-04		2022-11-22		2023-02-02	
			Screen		Water Level		Water Level		Water Level		Water Level		Water Level	
Well ID	Ground Elev.	TOC Elev.	Top Elev.	Length	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
(--)	(masl)	(masl)	(masl)	(m)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)
MW1-09	334.24	335.23	328.1	3.0	3.16	332.07	3.17	332.06	4.03	331.2	5.07	330.16	4.768	330.462
MW2-09	334.68	335.69	329.2	3.0	4.035	331.655	4.05	331.64	5.001	330.689	5.765	329.925	5.816	329.874
MW3-09	332.9	333.92	328.6	3.0	3.5	330.42	3.49	330.43	3.947	329.973	4.745	329.175	5.005	328.915
MW97-3	340.1	340.89	328.6	3.0	11.21	329.68	11.14	329.75	11.49	329.4	12.29	328.6	12.583	328.307
MW97-5	336.4	337.19	327.4	3.0	6.885	330.305	6.86	330.33	7.344	329.846	8.225	328.965	8.538	328.652

mbTOC - metres below top of casing of well.
masl - metres above Sea Level
NM - not measured
Elev. - Elevation

Table 4c: Piezometer Details and Water Level Observations

				DATE:	2022-04-18		2022-05-12		2022-08-02		2022-11-22		2023-02-02	
			Screen		Water Level		Water Level		Water Level		Water Level		Water Level	
Well ID	Ground Elev.	TOC Elev.	Top Elev.	Length	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
(--)	(masl)	(masl)	(masl)	(m)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)	(mbTOC)	(masl)
PZ-01	333.78	334.904	333.379	0.50	1.61	333.294	1.617	333.287	DRY	<333.08	DRY	<333.09	DRY	<333.09
PZ-02S	333.74	334.964	333.439	0.60	1.62	333.344	1.731	333.233	DRY	<334.54	DRY	<334.55	DRY	<334.55
PZ-02D	333.74	334.795	333.270	0.80	~	~	~	~	~	~	DRY	<331.74	DRY	<331.74
PZ-03S	334.09	335.258	333.733	0.51	1.463	333.795	1.58	333.678	DRY	<333.33	DRY	<333.34	DRY	<333.34
PZ-03D	334.012	335.087	333.562	1.80	~	~	~	~	~	~	3.03	332.06	2.816	332.271
PZ-04S-R	335.93	336.805	335.280	1.40	DRY	<334.28	DRY	<334.28	DRY	<334.28	DRY	<334.29	DRY	<334.29
PZ-04D-R	334.557	335.692	334.167	1.29	~	~	~	~	~	~	DRY	<332.967	DRY	<332.967
PZ-05S	331.518	332.713	331.188	0.43	1.438	331.275	1.509	331.204	DRY	<330.89	DRY	<330.89	DRY	<330.89
PZ-05D	331.539	332.534	331.009	1.08	1.264	331.27	1.35	331.184	2.01	330.524	2.105	330.43	2.8	<329.734
PZ-06	330.917	331.942	330.417	0.70	1.575	330.367	~	~	1.951	329.991	DRY	<329.839	1.99	329.952
PZ-07S	334.041	335.106	333.581	0.71	~	~	~	~	~	~	DRY	<333.081	DRY	<333.081
PZ-07D	334.018	335.168	333.643	1.70	~	~	~	~	~	~	DRY	<332.118	DRY	<332.118
PZ-08S	331.315	332.34	330.815	0.70	~	~	~	~	~	~	DRY	<330.315	DRY	<330.315
PZ-08D	330.972	332.297	330.772	1.75	~	~	~	~	~	~	DRY	<329.022	2.932	329.365

~ indicates not measured at the time

mbTOC - metres below top of casing of well.

masl - metres above Sea Level

NM - not measured

Elev. - Elevation

Table 5a: Results of Groundwater Quality Analyses - General Chemistry and Inorganic Parameters

	Sample ID		MW97-3	MW97-5	MW1-09	MW2-09	MW3-09	MW22-01S	MW22-01D	MW22-02	MW22-04S	MW22-04D	MW22-07	MW22-08	MW22-09	MW22-10
	Sample Description		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampling Date		2022-04-06	2022-04-06	2022-04-06	2022-04-06	2022-04-06	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12
Parameters	**Criteria 1**	**Criteria 3**	**Concentration**													
	PWQO	**O.Reg. 153/04 Table 1: Full Depth Background Site Conditions**														
Bicarb. Alkalinity (calc. as CaCO3) (mg/L)			440	230	240	290	280	280	230	280	270	280	320	240	270	280
Calculated TDS (mg/L)			540	280	330	350	290	400	360	380	330	310	400	330	310	390
Carb. Alkalinity (calc. as CaCO3) (mg/L)			2.3	2.2	2.0	3.1	1.6	3.3	3.4	2.4	3	3.2	2.7	2.3	3.2	2.5
Hardness (CaCO3) (mg/L)			520	270	300	280	290	330	300	300	300	270	360	290	310	350
Conductivity (umho/cm)			870	490	570	590	530	730	670	680	580	550	700	570	580	680
Orthophosphate (P) (mg/L)			<0.050	<0.010	<0.010	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.010	<0.010
pH	**6.5:8.5**		7.73	8.01	7.95	8.05	7.77	8.1	8.19	7.95	8.07	8.08	7.96	8.01	8.11	7.99
Dissolved Sulphate (SO4) (mg/L)			23.0	9.1	15.0	30.0	7.1	9.7	12	8.6	8.4	8.1	9	8.1	5.5	26
Alkalinity (Total as CaCO3) (mg/L)			440	230	250	300	290	280	240	290	270	280	320	240	270	280
Dissolved Chloride (Cl-) (mg/L)		***790***	3.8	6.1	9.7	5.1	1.9	63	69	25	6.7	13	17	12	25	8.9
Nitrite (N) (mg/L)			<0.010	<0.010	<0.010	0.016	<0.010	0.041	0.111	0.02	0.01	0.011	0.063	0.015	<0.010	0.048
Nitrate (N) (mg/L)			10.10	5.13	8.52	<0.10	<0.10	2.49	0.55	8.62	5.96	1.78	8.31	11	0.88	12.5
Nitrate + Nitrite (N) (mg/L)			10.10	5.13	8.52	<0.10	<0.10	2.54	0.66	8.64	5.97	1.79	8.37	11	0.88	12.5
Total Ammonia-N (mg/L)			<0.050	<0.050	<0.050	0.06	0.07	0.19	0.32	0.096	0.15	0.13	0.11	0.13	0.059	0.095
Dissolved Organic Carbon (mg/L)			1.60	0.46	0.93	1.40	1.60	1.5	1.2	0.8	1.2	2.2	1.3	0.73	0.59	1.6

Notes:

1. Criteria are from the Ontario Provincial Water Quality Objectives (Criteria 1), and the O.Reg.153/04: Table 1: Full Depth Background Site Conditions (Criteria 2).
   Criteria are indicated by:
   White Text for Criteria 1, **Underlined** for Criteria 2.
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. ---- represents sample parameters that were not analyzed; ~ = No value specified.
5. BV Labs Job Number: C291734, C2D0995

Table 5b: Results of Groundwater Quality Analyses - Metals Parameters

	Sample ID		MW97-3	MW97-5	MW1-09	MW2-09	MW3-09	MW22-01S	MW22-01D	MW22-02	MW22-04S	MW22-04D	MW22-07	MW22-08	MW22-09	MW22-10
	Sample Description		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampling Date		2022-04-06	2022-04-06	2022-04-06	2022-04-06	2022-04-06	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12	2022-05-12
Parameters	**Criteria 1**	**Criteria 3**	**Concentration**													
	PWQO	**O.Reg. 153/04 Table 1: Full Depth Background Site Conditions**														
Dissolved Aluminum (Al) (ug/L)			6	<4.9	<4.9	<4.9	18	9.8	12	6.6	<4.9	7.7	9.2	9.3	9.2	6.8
Dissolved Antimony (Sb) (ug/L)	20	***1.5***	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Arsenic (As) (ug/L)	100	***13***	<1.0	<1.0	<1.0	<1.0	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved Barium (Ba) (ug/L)		**610**	48	48	14	140	28	53	48	33	11	20	34	38	44	32
Dissolved Beryllium (Be) (ug/L)	11	**0.5**	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dissolved Boron (B) (ug/L)	200	***1700***	13	<10	<10	11	<10	37	72	12	<10	15	18	<10	16	<10
Dissolved Cadmium (Cd) (ug/L)	0.2	**0.5**	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090
Dissolved Calcium (Ca) (ug/L)			140,000	75,000	82,000	73,000	76,000	72000	51000	84000	88000	71000	86000	74000	63000	99000
Dissolved Chromium (Cr) (ug/L)		**11**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dissolved Cobalt (Co) (ug/L)	0.9	**4**	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Copper (Cu) (ug/L)	5	**5**	1.3	<0.90	<0.90	<0.90	<0.90	1.9	1.7	1.4	1.5	1.1	1.5	1.5	2.6	3.1
Dissolved Iron (Fe) (ug/L)	300		<100	<100	<100	<100	4300	<100	<100	<100	<100	<100	<100	<100	<100	<100
Dissolved Lead (Pb) (ug/L)	5	**1.9**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Magnesium (Mg) (ug/L)			39,000	21,000	23,000	24,000	24,000	35000	41000	22000	19000	22000	35000	26000	36000	25000
Dissolved Manganese (Mn) (ug/L)			<2.0	<2.0	<2.0	43	620	86	81	24	<2.0	80	33	21	8.8	87
Dissolved Molybdenum (Mo) (ug/L)	40	**23**	<0.50	<0.50	<0.50	5.4	<0.50	17	15	0.97	<0.50	2.4	3.8	2.7	2.1	0.83
Dissolved Nickel (Ni) (ug/L)	25	**14**	<1.0	<1.0	<1.0	<1.0	<1.0	1.6	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Dissolved Phosphorus (P) (ug/L)			<100	<100	<100	<100	<100	100	<100	<100	<100	<100	<100	<100	100	110
Dissolved Potassium (K) (ug/L)			870	490	510	1,500	1,000	7200	7100	1500	2200	1900	2400	1700	2000	960
Dissolved Selenium (Se) (ug/L)	100	**5**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dissolved Silicon (Si) (ug/L)			5,400	4,500	4,100	8,300	1,600	3400	4400	3500	2700	2800	5600	4300	3900	3000
Dissolved Silver (Ag) (ug/L)	0.1	***0.3***	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090
Dissolved Sodium (Na) (ug/L)		**490,000**	1,900	1,700	2,800	23,000	3,800	22000	22000	25000	7800	14000	13000	6700	4700	1900
Dissolved Strontium (Sr) (ug/L)			140	78	85	110	67	170	140	120	150	120	160	98	120	110
Dissolved Thallium (Tl) (ug/L)	0.3	**0.5**	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.059	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Titanium (Ti) (ug/L)			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dissolved Uranium (U) (ug/L)	5	**8.9**	0.31	0.25	0.36	2.2	<0.10	0.74	0.19	0.23	0.27	0.74	0.53	0.56	0.26	1.6
Dissolved Vanadium (V) (ug/L)	6	**3.9**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.86
Dissolved Zinc (Zn) (ug/L)	30	**160**	7.5	7.5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	6.9	<5.0

Table 6a: Results of Wetland Water Quality Analyses - General Chemistry and Organic Parameters

	Sample ID	WET-02	WET-06
	Sample Description	Surface Water	Surface Water
	Sampling Date	2023-01-06	2023-01-06
Parameters	**Criteria 1** **PWQO**	**Concentration**	
Bicarb. Alkalinity (calc. as CaCO3) (mg/L)		87	30
Calculated TDS (mg/L)		160	110
Carb. Alkalinity (calc. as CaCO3) (mg/L)		<1.0	<1.0
Hardness (CaCO3) (mg/L)		120	73
Conductivity (umho/cm)		260	180
Orthophosphate (P) (mg/L)		1.3	0.13
pH	6.5:8.5	7.38	6.98
Dissolved Sulphate (SO4) (mg/L)		36	38
Alkalinity (Total as CaCO3) (mg/L)		87	30
Dissolved Chloride (Cl-) (mg/L)		5.0	8.3
Nitrite (N) (mg/L)		0.07	0.017
Nitrate (N) (mg/L)		0.59	0.62
Nitrate + Nitrite (N) (mg/L)		0.66	0.64
Total Ammonia-N (mg/L)		0.33	0.34
Dissolved Organic Carbon (mg/L)		13	8.90

Notes:

1. Criteria are from the Ontario Provincial Water Quality Objectives Criteria are indicated by:
   White Text for Criteria 1
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with shaded cells and white text exceed the corresponding criteria.
4. ---- represents sample parameters that were not analyzed; ~ = No value specified.
5. BV Labs Job Number: C307788

Table 6b: Results of Wetland Water Quality Analyses - Metals Parameters

	Sample ID	WET-02	WET-06
	Sample Description	Surface Water	Surface Water
	Sampling Date	2023-01-06	2023-01-06
Parameters	**Criteria 1** **PWQO**	**Concentration**	
Dissolved Aluminum (Al) (ug/L)		10	11
Dissolved Antimony (Sb) (ug/L)	20	<0.50	<0.50
Dissolved Arsenic (As) (ug/L)	100	1.2	<1.0
Dissolved Barium (Ba) (ug/L)		13	11
Dissolved Beryllium (Be) (ug/L)	11	<0.40	<0.40
Dissolved Boron (B) (ug/L)	200	14	30
Dissolved Cadmium (Cd) (ug/L)	0.2	<0.090	<0.090
Dissolved Calcium (Ca) (ug/L)		31,000	18,000
Dissolved Chromium (Cr) (ug/L)		<5.0	<5.0
Dissolved Cobalt (Co) (ug/L)	0.9	<0.50	<0.50
Dissolved Copper (Cu) (ug/L)	5	4.5	2.1
Dissolved Iron (Fe) (ug/L)	300	<100	<100
Dissolved Lead (Pb) (ug/L)	5	<0.50	<0.50
Dissolved Magnesium (Mg) (ug/L)		10,000	6,600
Dissolved Manganese (Mn) (ug/L)		14	12
Dissolved Molybdenum (Mo) (ug/L)	40	2	<0.50
Dissolved Nickel (Ni) (ug/L)	25	<1.0	<1.0
Dissolved Phosphorus (P) (ug/L)		1400	240
Dissolved Potassium (K) (ug/L)		9,300	6,600
Dissolved Selenium (Se) (ug/L)	100	<2.0	<2.0
Dissolved Silicon (Si) (ug/L)		3,400	1,600
Dissolved Silver (Ag) (ug/L)	0.1	<0.090	<0.090
Dissolved Sodium (Na) (ug/L)		1,600	2,400
Dissolved Strontium (Sr) (ug/L)		33	22
Dissolved Thallium (Tl) (ug/L)	0.3	<0.050	<0.050
Dissolved Titanium (Ti) (ug/L)		<5.0	<5.0
Dissolved Uranium (U) (ug/L)	5	<0.10	<0.10
Dissolved Vanadium (V) (ug/L)	6	<0.50	<0.50
Dissolved Zinc (Zn) (ug/L)	30	<5.0	<5.0

1. Criteria are from the Ontario Provincial Water Quality Objectives

Criteria are indicated by:

White Text for Criteria 1

2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with shaded cells and white text exceed the corresponding criteria.
4. ---- represents sample parameters that were not analyzed; ~ = No value specified.
5. BV Labs Job Number: C307788

Table 7a**: Results of Groundwater Quality Analyses**

	Residence		104 Maltby Rd.
	Sample Description/Location		Basement Faucet / Raw Water
	Laboratory Job Number		C2Z6673
	Sampling Date		2022-12-05
Parameters	**Criteria 1**	**Criteria 2**	**Concentration**
	ODWS - MAC	**ODWS - A/O**	
Hardness (CaCO3) (mg/L)			350
Total Ammonia-N (mg/L)			<0.050
Conductivity (µS/cm)			840
Dissolved Organic Cabon (mg/L)			0.81
pH			8
Nitrite (N) (mg/L)	1		<0.010
Nitrate (N) (mg/L)	10		5.9
Nitrate + Nitrite (N) (mg/L)	10		5.9
Total Suspended Solids (mg/L)		***500***	<10
Turbidity (NTU)			<0.1
Alkalinity (Total as CaCO3) (mg/L)			300
Total Calcium (Ca) (µg/L)			94,000
Total Iron (Fe) (µg/L)		***300***	<100
Total Magnesium (Mg) (µg/L)			27,000
Total Manganese (Mn) (µg/L)		***50***	<2.0
Total Sodium (Na) (µg/L)		***200,000***	41,000
Microbiology: Fecal Coliforms (CFU/100 mL)			0
Microbiology: Total Coliforms (CFU/100 mL)	0		0
Escherichia Coli (CFU/100 mL)	0		0

Notes:

1. Criteria are from the *Ontario Drinking Water Standards Maximum Acceptable Concentration* (Criteria 1) and *Aesthetic Objectives* (Criteria 2) . Criteria are indicated by: **White Text** for Criteria 1, ***Bold Italics*** for Criteria 2
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate (where available).
5. ---- represents sample parameters that were not analyzed; ~ = No value specified.
6. CFU = Colony-Forming Units
7. Water sampled on December 5, 2022 collected from basement faucet pre-treatment

Table 7b: Results of Groundwater Quality Analyses

Residence	110 Maltby Rd.
Sample Description/Location	Basement Faucet / Raw Water
Laboratory Job Number	C2Z6673
Sampling Date	2022-12-05

Parameters	Criteria 1	Criteria 2	Concentration
	ODWS - MAC	ODWS - A/O	
Hardness (CaCO3) (mg/L)			250
Total Ammonia-N (mg/L)			0.2
Conductivity (µS/cm)			480
Dissolved Organic Cabon (mg/L)			0.79
pH			8.13
Nitrite (N) (mg/L)	**1**		<0.010
Nitrate (N) (mg/L)	**10**		<0.10
Nitrate + Nitrite (N) (mg/L)	**10**		<0.10
Total Suspended Solids (mg/L)		***500***	<10
Turbidity (NTU)			2.1
Alkalinity (Total as CaCO3) (mg/L)			230
Total Calcium (Ca) (µg/L)			56,000
Total Iron (Fe) (µg/L)		***300***	260
Total Magnesium (Mg) (µg/L)			28,000
Total Manganese (Mn) (µg/L)		***50***	29
Total Sodium (Na) (µg/L)		***200,000***	7,200
Microbiology: Fecal Coliforms (CFU/100 mL)			0
Microbiology: Total Coliforms (CFU/100 mL)	**0**		0
Escherichia Coli (CFU/100 mL)	**0**		0

Notes:

1. Criteria are from the *Ontario Drinking Water Standards Maximum Acceptable Concentration* (Criteria 1) and *Aesthetic Objectives* (Criteria 2) . Criteria are indicated by: **White Text** for Criteria 1, ***Bold Italics*** for Criteria 2
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate (where available).
5. ---- represents sample parameters that were not analyzed; ~ = No value specified.
6. CFU = Colony-Forming Units
7. Water sampled on December 5, 2022 collected from basement faucet pre-treatment

Table 7c: Results of Groundwater Quality Analyses

	Residence		192 Maltby Rd.
	Sample Description/Location		Outdoor Spigot / Raw Water
	Laboratory Job Number		C2Z3556
	Sampling Date		2022-12-01
Parameters	**Criteria 1**	**Criteria 2**	**Concentration**
	ODWS - MAC	**ODWS - A/O**	
Hardness (CaCO3) (mg/L)			330
Total Ammonia-N (mg/L)			<0.050
Conductivity (µS/cm)			650
Dissolved Organic Cabon (mg/L)			0.58
pH			8.01
Nitrite (N) (mg/L)	1		0.01
Nitrate (N) (mg/L)	10		2.73
Nitrate + Nitrite (N) (mg/L)	10		2.74
Total Suspended Solids (mg/L)		***500***	<10
Turbidity (NTU)			0.3
Alkalinity (Total as CaCO3) (mg/L)			270
Total Calcium (Ca) (µg/L)			88,000
Total Iron (Fe) (µg/L)		***300***	<100
Total Magnesium (Mg) (µg/L)			28,000
Total Manganese (Mn) (µg/L)		***50***	<2.0
Total Sodium (Na) (µg/L)		***200,000***	10,000
Microbiology: Fecal Coliforms (CFU/100 mL)			0
Microbiology: Background (CFU/100 mL)			79
Microbiology: Total Coliforms (CFU/100 mL)	0		1
Escherichia Coli (CFU/100 mL)	0		0

Notes:

1. Criteria are from the *Ontario Drinking Water Standards Maximum Acceptable Concentration* (Criteria 1) and *Aesthetic Objectives* (Criteria 2) . Criteria are indicated by: **White Text** for Criteria 1, ***Bold Italics*** for Criteria 2
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate (where available).
5. ---- represents sample parameters that were not analyzed; ~ = No value specified.
6. CFU = Colony-Forming Units
7. Water sampled on December 1, 2022 collected from basement faucet pre-treatment

Table 7d: Results of Groundwater Quality Analyses

Residence	519 Maltby Rd.
Sample Description/Location	Basement Faucet / Raw Water
Laboratory Job Number	C2Z3556
Sampling Date	2022-12-01

Parameters	Criteria 1	Criteria 2	Concentration
	ODWS - MAC	ODWS - A/O	
Hardness (CaCO3) (mg/L)			330
Total Ammonia-N (mg/L)			<0.050
Conductivity (µS/cm)			610
Dissolved Organic Cabon (mg/L)			0.78
pH			7.94
Nitrite (N) (mg/L)	1		0.012
Nitrate (N) (mg/L)	10		4.58
Nitrate + Nitrite (N) (mg/L)	10		4.59
Total Suspended Solids (mg/L)		***500***	<10
Turbidity (NTU)			0.3
Alkalinity (Total as CaCO3) (mg/L)			280
Total Calcium (Ca) (µg/L)			88,000
Total Iron (Fe) (µg/L)		***300***	<100
Total Magnesium (Mg) (µg/L)			27,000
Total Manganese (Mn) (µg/L)		***50***	<2.0
Total Sodium (Na) (µg/L)		***200,000***	6,000
Microbiology: Fecal Coliforms (CFU/100 mL)			0
Microbiology: Total Coliforms (CFU/100 mL)	0		0
Escherichia Coli (CFU/100 mL)	0		0

Notes:

1. Criteria are from the *Ontario Drinking Water Standards Maximum Acceptable Concentration* (Criteria 1) and *Aesthetic Objectives* (Criteria 2) . Criteria are indicated by: **White Text** for Criteria 1, ***Bold Italics*** for Criteria 2
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate (where available).
5. ---- represents sample parameters that were not analyzed; ~ = No value specified.
6. CFU = Colony-Forming Units
7. Water sampled on December 1, 2022 collected from basement faucet pre-treatment

Table 7e: Results of Groundwater Quality Analyses

	Residence		519 Maltby Rd.
	Sample Description/Location		Basement Faucet / Raw Water
	Laboratory Job Number		C2Z3556
	Sampling Date		2022-12-01
Parameters	**Criteria 1**	**Criteria 2**	**Concentration**
	ODWS - MAC	**ODWS - A/O**	
Hardness (CaCO3) (mg/L)			330
Total Ammonia-N (mg/L)			<0.050
Conductivity (µS/cm)			610
Dissolved Organic Cabon (mg/L)			0.78
pH			7.94
Nitrite (N) (mg/L)	1		0.012
Nitrate (N) (mg/L)	10		4.58
Nitrate + Nitrite (N) (mg/L)	10		4.59
Total Suspended Solids (mg/L)		***500***	<10
Turbidity (NTU)			0.3
Alkalinity (Total as CaCO3) (mg/L)			280
Total Calcium (Ca) (µg/L)			88,000
Total Iron (Fe) (µg/L)		***300***	<100
Total Magnesium (Mg) (µg/L)			27,000
Total Manganese (Mn) (µg/L)		***50***	<2.0
Total Sodium (Na) (µg/L)		***200,000***	6,000
Microbiology: Fecal Coliforms (CFU/100 mL)			0
Microbiology: Total Coliforms (CFU/100 mL)	0		0
Escherichia Coli (CFU/100 mL)	0		0

Notes:

1. Criteria are from the *Ontario Drinking Water Standards Maximum Acceptable Concentration* (Criteria 1) and *Aesthetic Objectives* (Criteria 2) . Criteria are indicated by: **White Text** for Criteria 1, ***Bold Italics*** for Criteria 2
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate (where available).
5. ---- represents sample parameters that were not analyzed; ~ = No value specified.
6. CFU = Colony-Forming Units
7. Water sampled on December 1, 2022 collected from basement faucet pre-treatment

Table 7f: Results of Groundwater Quality Analyses

Parameters	Criteria 1	Criteria 2	Concentration
	Residence		4646 Sideroad 20 N
	Sample Description/Location		Basement Faucet / Raw Water
	Laboratory Job Number		C2Z3556
	Sampling Date		2022-12-01
	ODWS - MAC	**ODWS - A/O**	
Hardness (CaCO3) (mg/L)			230
Total Ammonia-N (mg/L)			0.1
Conductivity (µS/cm)			430
Dissolved Organic Cabon (mg/L)			0.52
pH			8.12
Nitrite (N) (mg/L)	1		0.019
Nitrate (N) (mg/L)	10		<0.10
Nitrate + Nitrite (N) (mg/L)	10		<0.10
Total Suspended Solids (mg/L)		***500***	<10
Turbidity (NTU)			2.4
Alkalinity (Total as CaCO3) (mg/L)			210
Total Calcium (Ca) (µg/L)			46,000
Total Iron (Fe) (µg/L)		***300***	***350***
Total Magnesium (Mg) (µg/L)			27,000
Total Manganese (Mn) (µg/L)		***50***	8.5
Total Sodium (Na) (µg/L)		***200,000***	5,700
Microbiology: Fecal Coliforms (CFU/100 mL)			0
Microbiology: Total Coliforms (CFU/100 mL)	0		0
Escherichia Coli (CFU/100 mL)	0		0

Notes:

1. Criteria are from the *Ontario Drinking Water Standards Maximum Acceptable Concentration* (Criteria 1) and *Aesthetic Objectives* (Criteria 2) . Criteria are indicated by: **White Text** for Criteria 1, ***Bold Italics*** for Criteria 2
2. Criteria and concentrations are given in units consistent with the units listed for the associated parameter.
3. Concentrations with bold, italic, or underlined text in shaded cells exceed the corresponding criteria.
4. Screened well intervals presented are approximate (where available).
5. ---- represents sample parameters that were not analyzed; ~ = No value specified.
6. CFU = Colony-Forming Units
7. Water sampled on December 1, 2022 collected from basement faucet pre-treatment

Table 8a: Water Balance Summary of Recharge and Runoff Quantities for Each Wetland

		Catchment Areas	WET-01	WET-02	WET-03 WET-05	WET-04 WET-11	WET-06 WET-07 WET-12	WET-08	WET-09	WET-10	WET-13	Other Areas - West of Wetland Corridor†	Other Areas - East of Wetland Corridor‡
Pre-Development Annual...	**Precipitation**	(mm/yr)	946	946	946	946	946	946	946	946	946	946	946
	Catchment Area	(ha)	1.25	8.48	7.38	2.78	18.02	2.48	4.02	0.84	2.72	19.24	5.91
	Runoff (Estimated)	(mm/yr)	156	158	183	162	116	155	218	197	215	0	0
		(m^3/yr)	1,949	13,394	13,536	4,494	20,976	3,847	8,758	1,661	5,839	0	0
	Recharge (Estimated)	(mm/yr)	245	244	198	215	272	232	160	197	155	396	373
		(m^3/yr)	3,048	20,673	14,613	5,970	48,944	5,771	6,451	1,661	4,228	76,118	22,062
	Evapotranspiration (Estimated)	(mm/yr)	545	544	564	569	558	559	568	552	576	550	573
		(m^3/yr)	6,791	46,099	41,644	15,832	100,568	13,882	22,828	4,650	15,658	105,888	33,863
After Phase 1 Construction Annual...	**Catchment Area**	(ha)	1.59	6.76	7.38	2.78	17.99	2.40	4.02	0.78	2.72	21.17	5.91
	Runoff (Estimated)	(mm/yr)	156	152	184	162	115	155	183	191	215	0	0
		(m^3/yr)	2,477	10,248	13,542	4,492	20,727	3,717	7,362	1,491	5,839	0	0
	Recharge (Estimated)	(mm/yr)	245	252	198	215	269	232	183	191	155	534	370
		(m^3/yr)	3,892	17,046	14,611	5,972	48,363	5,575	7,362	1,491	4,229	113,050	21,880
	Evapotranspiration (Estimated)	(mm/yr)	545	542	564	570	562	559	580	564	576	412	576
		(m^3/yr)	8,670	36,649	41,654	15,832	101,058	13,410	23,306	4,397	15,660	79,254	34,037

*Includes only those areas outside the wetland limits as established by NRSI and GRCA. Wetland areas themselves will not be altered by development and so changes to the water budget can be determined by estimating the changes to the external catchment areas.

** Due to closed depressions and requirement to retain runoff on-site for infiltration, runoff is set to zero.
For pre-development catchments 102, 104 and 112, evapotranspiration is calculated using a weighted average assuming that evapotranspiration over 75% of the catchment area is equal to the estimate of "Actual Evapotranspiration" (as per the usual Thornthwaite and Mather approach), whereas over 25% of the catchment it is equal to the midpoint between the estimated "Actual Evapotranspiration (AE)" and the estimated "Adjusted Potential Evapotranspiration (PE)". The remainder of the water balance then goes to recharge.
Catchments not developed by Phase 1 (i.e., 102P, 104P) and for catchments pre-graded at Phase 1 (i.e., 201, 205, 206, and part of 109P draining to an erosion and sediment control pond) are subject to the same procedure as the pre-development catchments.
For developed areas with infiltration galleries (e.g. 202, 203, 204 and 300-series) all computed runoff is assumed to be recharged because of the controlled discharge to subsurface structures which will inhibit evapotranspiration.

† Areas that do not drain to a wetland. Pre-Development Catchment 112; Post Development Catchments 109P (Portion Affected by Pre-Grade), 200-series, 300 series.

‡ Areas that do not drain to a wetland. Pre-Development Catchments 102 and 104; Post-Development Catchments 102P and 104P

Table 8b: Summary of Monthly Volumes of Runoff

	Pre-Development Runoff by Catchment (m^3)										
Month	**WET-01**	**WET-02**	**WET-03 WET-05**	**WET-04 WET-11**	**WET-06 WET-07 WET-12**	**WET-08**	**WET-09**	**WET-10**	**WET-13**	**Other Areas†**	**TOTAL**
January	57	392	352	112	564	105	220	48	134	0	1,985
February	28	196	176	56	282	53	110	24	67	0	992
March	14	98	92	29	146	27	57	12	35	0	511
April	236	1,617	1,713	574	2,612	481	1,116	204	759	0	9,311
May	633	4,340	4,619	1,548	7,046	1,295	3,013	549	2,053	0	25,096
June	316	2,170	2,309	774	3,523	648	1,506	275	1,027	0	12,548
July	158	1,085	1,155	387	1,761	324	753	137	513	0	6,274
August	79	543	577	194	881	162	377	69	257	0	3,137
September	40	271	289	97	440	81	188	34	128	0	1,569
October	47	328	144	48	335	40	94	21	64	0	1,122
November	227	1,569	1,407	450	2,257	421	882	191	535	0	7,940
December	114	785	704	225	1,129	210	441	96	267	0	3,970
TOTAL	1,949	13,394	13,536	4,494	20,976	3,847	8,758	1,661	5,839	0	74,456

	After Construction of Phase 1 Runoff by Catchment (m^3)										
Month	**WET-01**	**WET-02**	**WET-03 WET-05**	**WET-04 WET-11**	**WET-06 WET-07 WET-12**	**WET-08**	**WET-09**	**WET-10**	**WET-13**	**Other Areas†**	**TOTAL**
January	72	303	352	112	541	102	160	39	134	0	1,815
February	36	151	176	56	271	51	80	19	67	0	907
March	19	78	91	29	140	26	42	10	35	0	470
April	300	1,232	1,714	573	2,605	464	967	188	759	0	8,802
May	805	3,309	4,621	1,548	7,031	1,251	2,617	508	2,053	0	23,743
June	402	1,655	2,310	774	3,515	626	1,309	254	1,027	0	11,872
July	201	827	1,155	387	1,758	313	654	127	513	0	5,936
August	101	414	578	193	879	156	327	64	257	0	2,968
September	50	207	289	97	439	78	164	32	128	0	1,484
October	59	256	144	48	301	39	82	16	64	0	1,010
November	288	1,211	1,408	449	2,165	407	640	155	535	0	7,259
December	144	605	704	225	1,082	203	320	78	267	0	3,629
TOTAL	2,477	10,248	13,542	4,492	20,727	3,717	7,362	1,491	5,839	0	69,895

	Estimated Change in Runoff by Catchment (%)**										
Month	**WET-01**	**WET-02**	**WET-03 WET-05**	**WET-04 WET-11**	**WET-06 WET-07 WET-12**	**WET-08**	**WET-09**	**WET-10**	**WET-13**	**Other Areas†**	**% Change (for Entire Site)**
January	26.8	-22.8	0.1	-0.1	-4.1	-3.4	-27.4	-18.7	0.0	0	-8.6
February	26.8	-22.8	0.1	-0.1	-4.1	-3.4	-27.4	-18.7	0.0	0	-8.6
March	30.4	-20.7	-0.7	-0.6	-4.0	-3.4	-26.8	-18.4	0.0	0	-8.0
April	27.1	-23.8	0.1	0.0	-0.3	-3.4	-13.4	-7.7	0.0	0	-5.5
May	27.2	-23.8	0.1	0.0	-0.2	-3.4	-13.1	-7.5	0.0	0	-5.4
June	27.2	-23.8	0.1	0.0	-0.2	-3.4	-13.1	-7.5	0.0	0	-5.4
July	27.2	-23.8	0.1	0.0	-0.2	-3.4	-13.1	-7.5	0.0	0	-5.4
August	27.2	-23.8	0.1	0.0	-0.2	-3.4	-13.1	-7.5	0.0	0	-5.4
September	27.2	-23.8	0.1	0.0	-0.2	-3.4	-13.1	-7.5	0.0	0	-5.4
October	26.4	-22.0	0.1	0.0	-10.2	-3.4	-13.1	-24.6	0.0	0	-10.1
November	26.8	-22.8	0.1	-0.1	-4.1	-3.4	-27.4	-18.7	0.0	0	-8.6
December	26.8	-22.8	0.1	-0.1	-4.1	-3.4	-27.4	-18.7	0.0	0	-8.6
AVERAGE	27.1	-23.5	0.0	0.0	-1.2	-3.4	-15.9	-10.3	0.0	0	-6.1

** Percent change calculated by (Post-Pre)/Pre.

†Other Areas - These areas do not generate runoff due to current topography consisting of closed depressions.

Table 8c: Summary of Monthly Volumes of Recharge

	Pre-Development Recharge by Catchment (m^3)											
Month	WET-01	WET-02	WET-03 WET-05	WET-04 WET-11	WET-06 WET-07 WET-12	WET-08	WET-09	WET-10	WET-13	Other Areas - West of Wetland Corridor†	Other Areas - East of Wetland Corridor‡	TOTAL
January	88	602	377	144	1,317	158	160	48	96	2,083	537	5,610
February	44	301	188	72	658	79	80	24	48	1,042	268	2,805
March	22	151	98	38	340	41	42	12	25	538	139	1,447
April	370	2,501	1,852	767	6,095	721	825	204	550	9,352	2,859	26,097
May	993	6,716	4,996	2,073	16,440	1,943	2,226	549	1,488	25,204	7,706	70,334
June	496	3,358	2,498	1,037	8,220	971	1,113	275	744	12,655	3,839	35,206
July	248	1,679	1,249	518	4,110	486	557	137	372	6,064	1,854	17,274
August	124	839	625	259	2,055	243	278	69	186	3,155	916	8,749
September	62	420	312	130	1,028	121	139	34	93	1,829	482	4,649
October	72	498	156	65	782	61	70	21	46	1,699	241	3,710
November	353	2,406	1,507	578	5,267	631	641	191	386	8,331	2,147	22,438
December	176	1,203	754	289	2,633	316	321	96	193	4,167	1,074	11,220
TOTAL	3,048	20,673	14,613	5,970	48,944	5,771	6,451	1,661	4,228	76,118	22,062	209,540

	After Construction of Phase 1 Recharge by Catchment (m^3)											
Month	WET-01	WET-02	WET-03 WET-05	WET-04 WET-11	WET-06 WET-07 WET-12	WET-08	WET-09	WET-10	WET-13	Other Areas - West of Wetland Corridor†	Other Areas - East of Wetland Corridor‡	TOTAL
January	112	503	377	145	1,263	153	160	39	96	2,888	514	6,249
February	56	251	188	72	631	76	80	19	48	1,444	257	3,124
March	29	129	98	38	327	39	42	10	25	741	134	1,611
April	472	2,051	1,852	768	6,079	697	967	188	550	11,130	2,847	27,601
May	1,269	5,508	4,996	2,074	16,405	1,877	2,617	508	1,488	30,061	7,697	74,501
June	634	2,754	2,498	1,037	8,203	938	1,309	254	744	17,839	3,837	40,048
July	317	1,377	1,249	518	4,101	469	654	127	372	11,628	1,864	22,678
August	159	689	624	259	2,051	235	327	64	186	8,572	924	14,088
September	79	344	312	130	1,025	117	164	32	93	6,463	481	9,240
October	91	424	156	65	702	59	82	16	47	4,959	241	6,840
November	449	2,011	1,507	578	5,051	610	640	155	386	11,551	2,056	24,994
December	224	1,005	754	289	2,525	305	320	78	193	5,775	1,028	12,497
TOTAL	3,892	17,046	14,611	5,972	48,363	5,575	7,362	1,491	4,229	113,050	21,880	243,471

	Estimated Change in Recharge by Catchment (%)											
Month	WET-01	WET-02	WET-03 WET-05	WET-04 WET-11	WET-06 WET-07 WET-12	WET-08	WET-09	WET-10	WET-13	Other Areas - West of Wetland Corridor†	Other Areas - East of Wetland Corridor‡	% Change (for Entire Site)
January	27.3	-16.4	0.0	0.0	-4.1	-3.4	-0.1	-18.7	0.0	38.6	-4.2	11.4
February	27.3	-16.4	0.0	0.0	-4.1	-3.4	-0.1	-18.7	0.0	38.6	-4.2	11.4
March	30.8	-14.2	-0.7	-0.4	-4.0	-3.4	0.6	-18.4	0.0	37.7	-4.1	11.4
April	27.7	-18.0	0.0	0.0	-0.3	-3.4	17.2	-7.7	0.0	19.0	-0.4	5.8
May	27.8	-18.0	0.0	0.0	-0.2	-3.4	17.6	-7.5	0.0	19.3	-0.1	5.9
June	27.8	-18.0	0.0	0.0	-0.2	-3.4	17.6	-7.5	0.0	41.0	-0.1	13.8
July	27.8	-18.0	0.0	0.0	-0.2	-3.4	17.6	-7.5	0.0	91.8	0.5	31.3
August	27.8	-18.0	0.0	0.0	-0.2	-3.4	17.6	-7.5	0.0	171.7	0.8	61.0
September	27.8	-18.0	0.0	0.0	-0.2	-3.4	17.6	-7.5	0.0	253.5	-0.1	98.8
October	26.7	-15.0	0.0	0.0	-10.2	-3.4	17.6	-24.6	0.0	191.9	-0.1	84.4
November	27.3	-16.4	0.0	0.0	-4.1	-3.4	-0.1	-18.7	0.0	38.6	-4.2	11.4
December	27.3	-16.4	0.0	0.0	-4.1	-3.4	-0.1	-18.7	0.0	38.6	-4.2	11.4
AVERAGE	27.7	-17.5	0.0	0.0	-1.2	-3.4	14.1	-10.3	0.0	48.5	-0.8	16.2

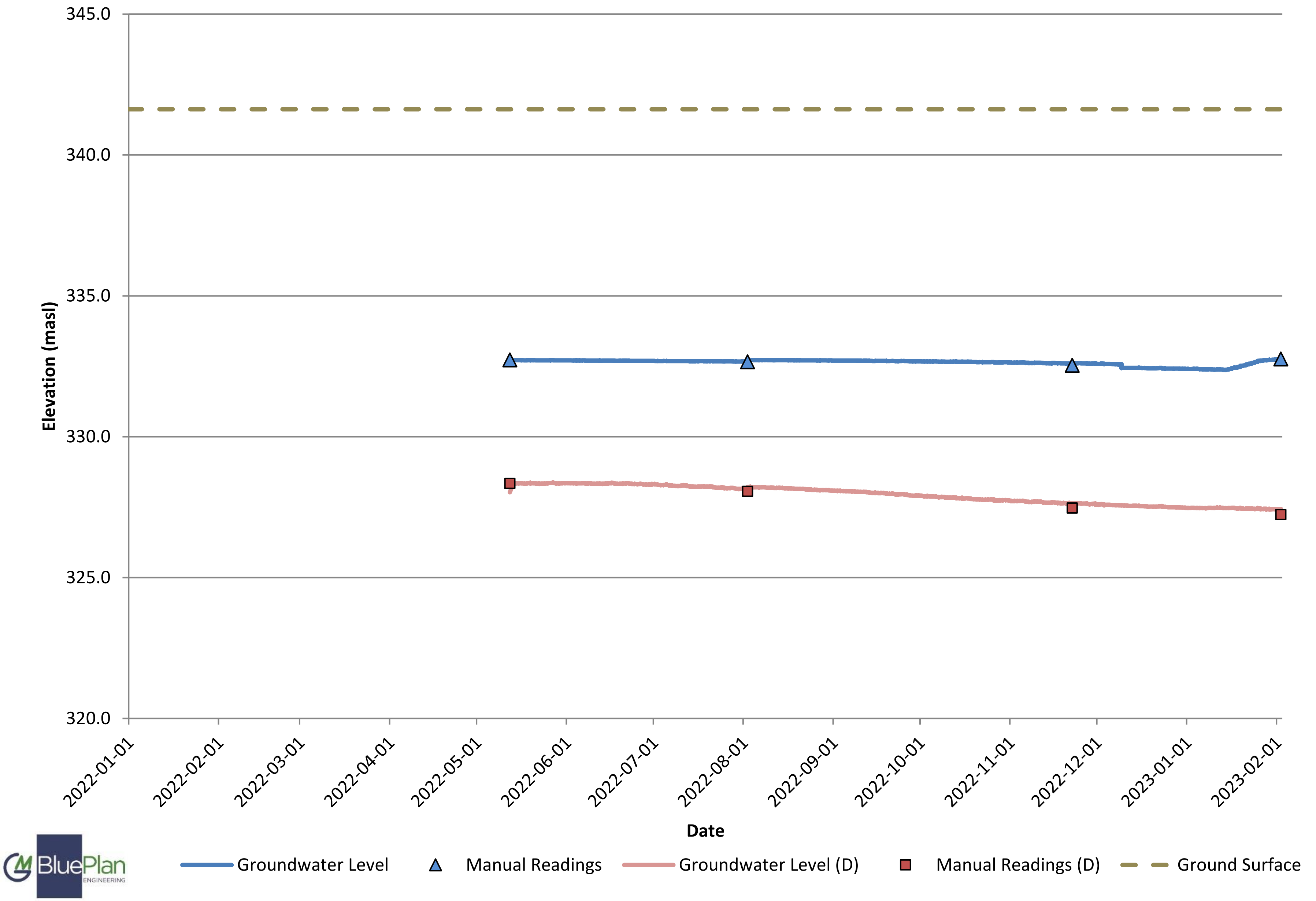
** Percent change calculated by (Post-Pre)/Pre.

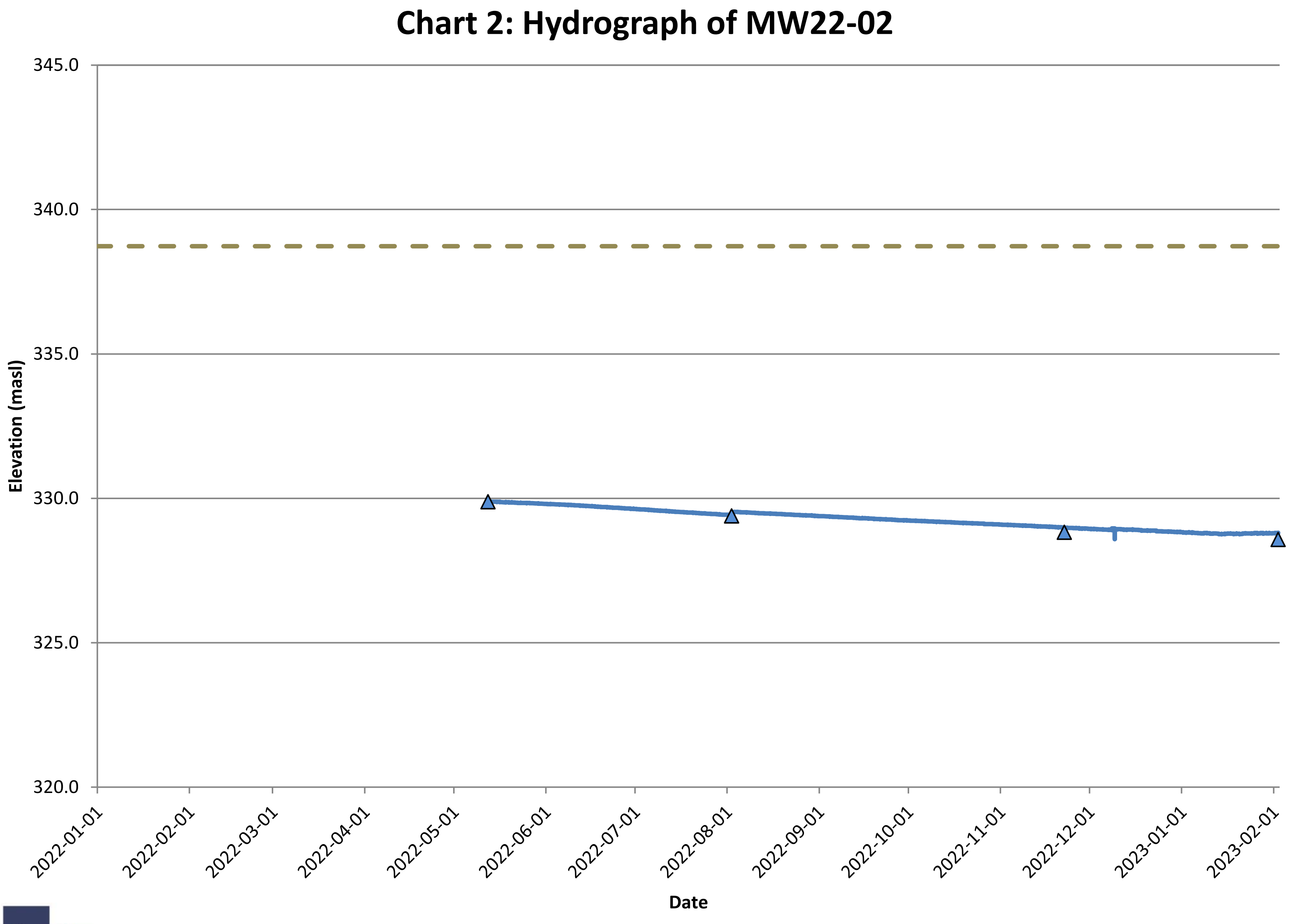
† Areas that do not drain to a wetland. Pre-Development Catchment 112; Post Development Catchments 109P (Portion Affected by Pre-Grade), 200-series, 300 series.

‡ Areas that do not drain to a wetland. Pre-Development Catchments 102 and 104; Post-Development Catchments 102P and 104P

CHARTS

Chart 1: Hydrograph of MW22-01S/D





Groundwater Level

△ Manual Readings

Ground Surface

Chart 3: Hydrograph of MW22-04S/D

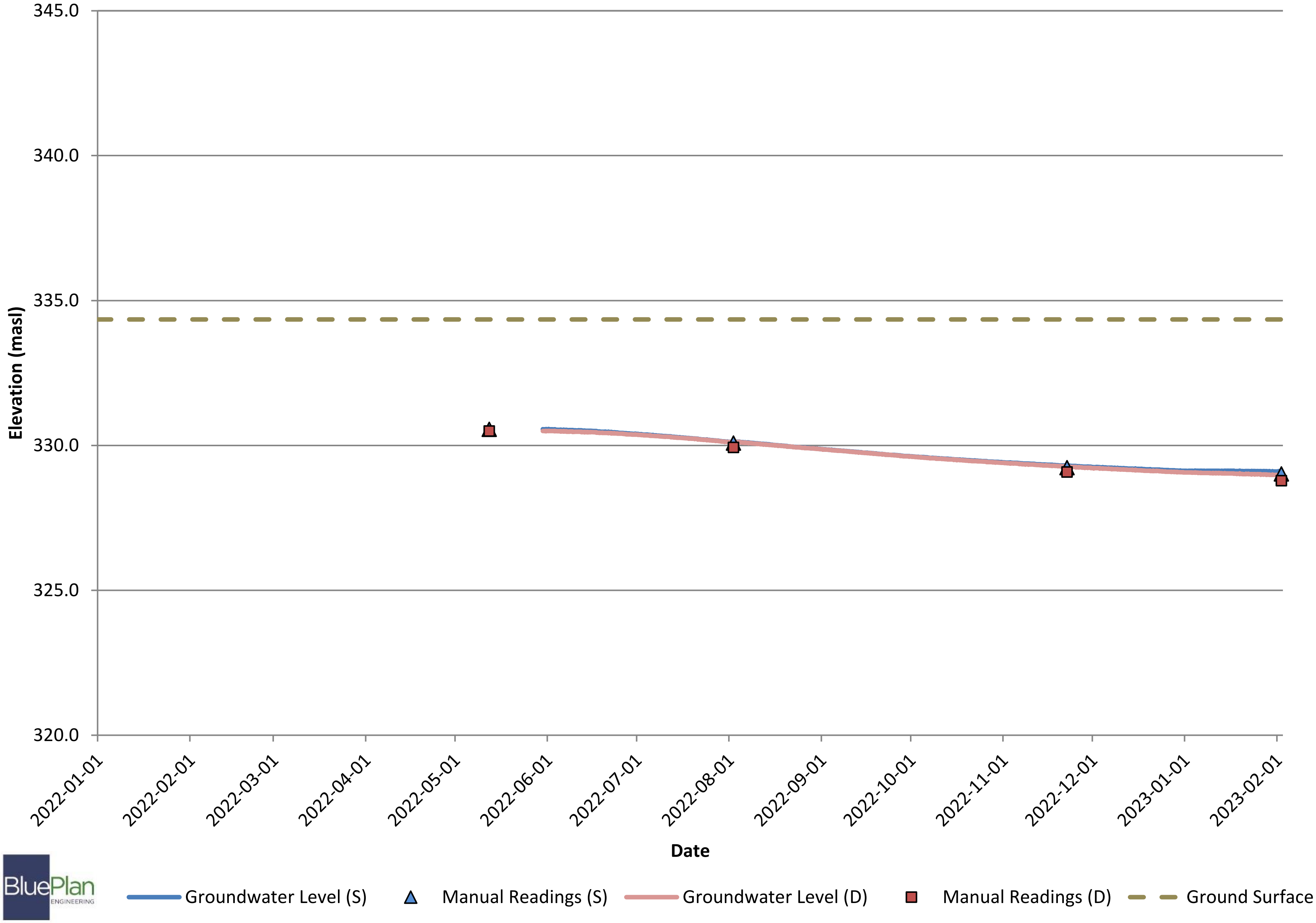


Chart 4: Hydrograph of MW22-05

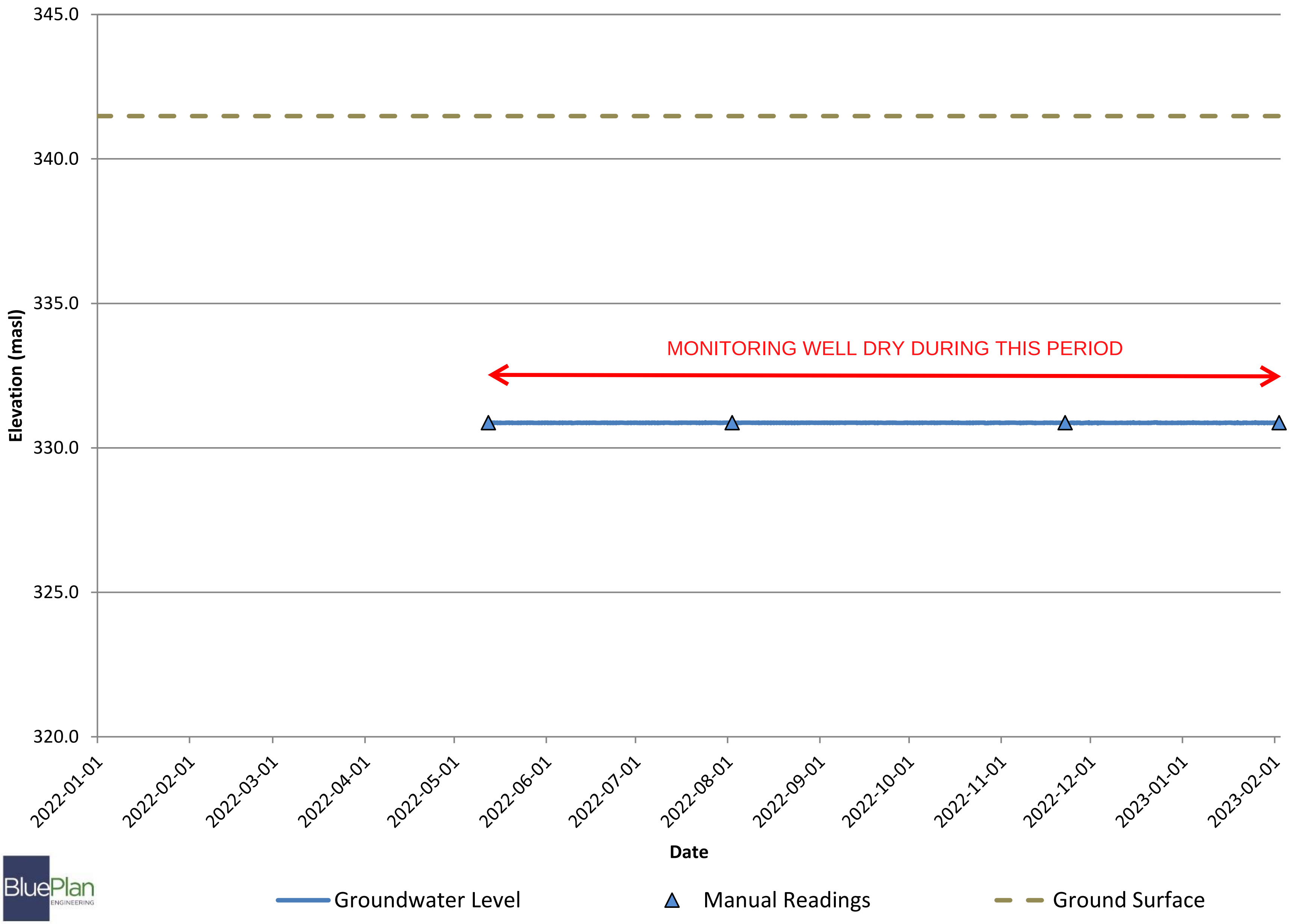


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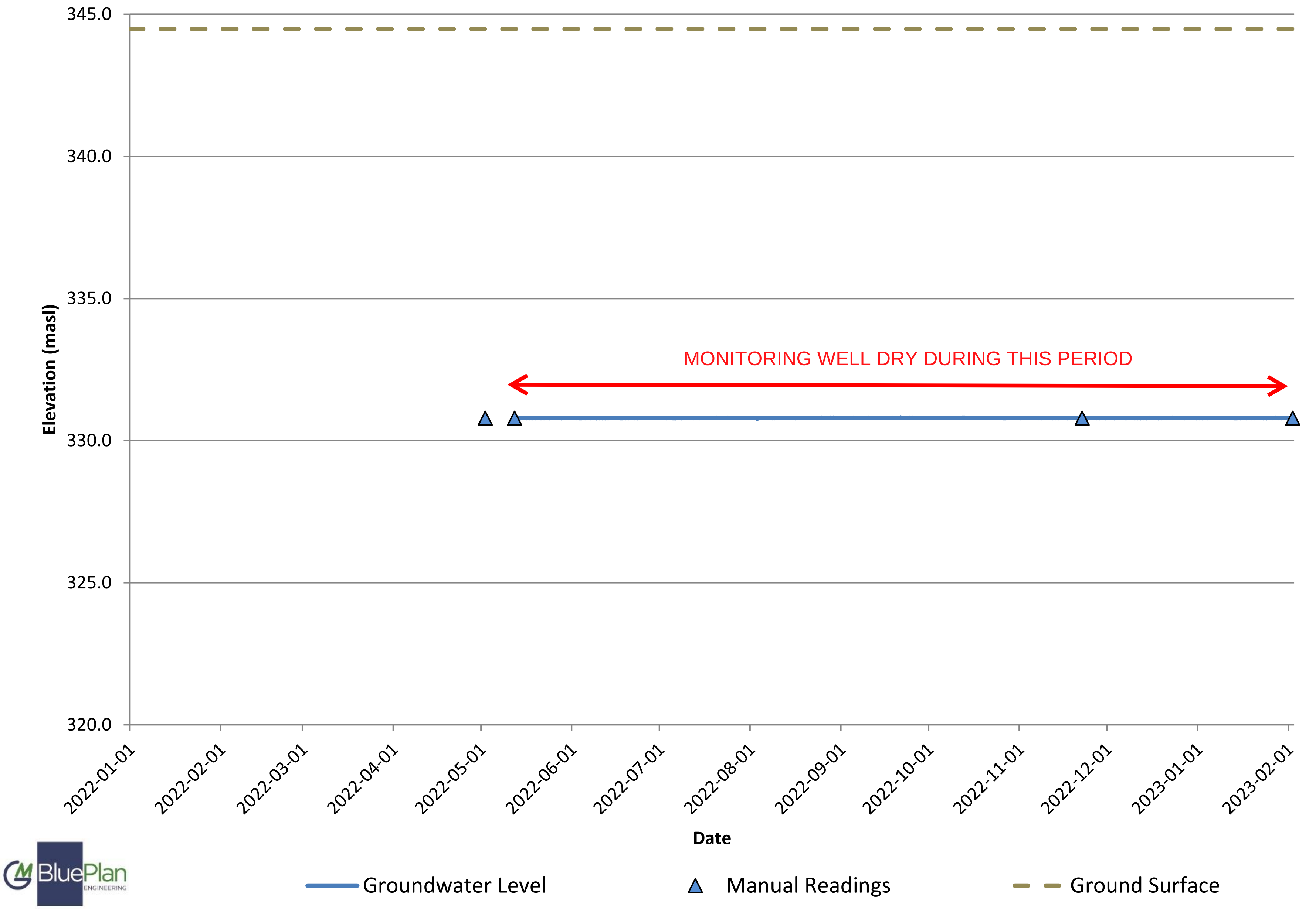
Chart 5: Hydrograph of MW22-06



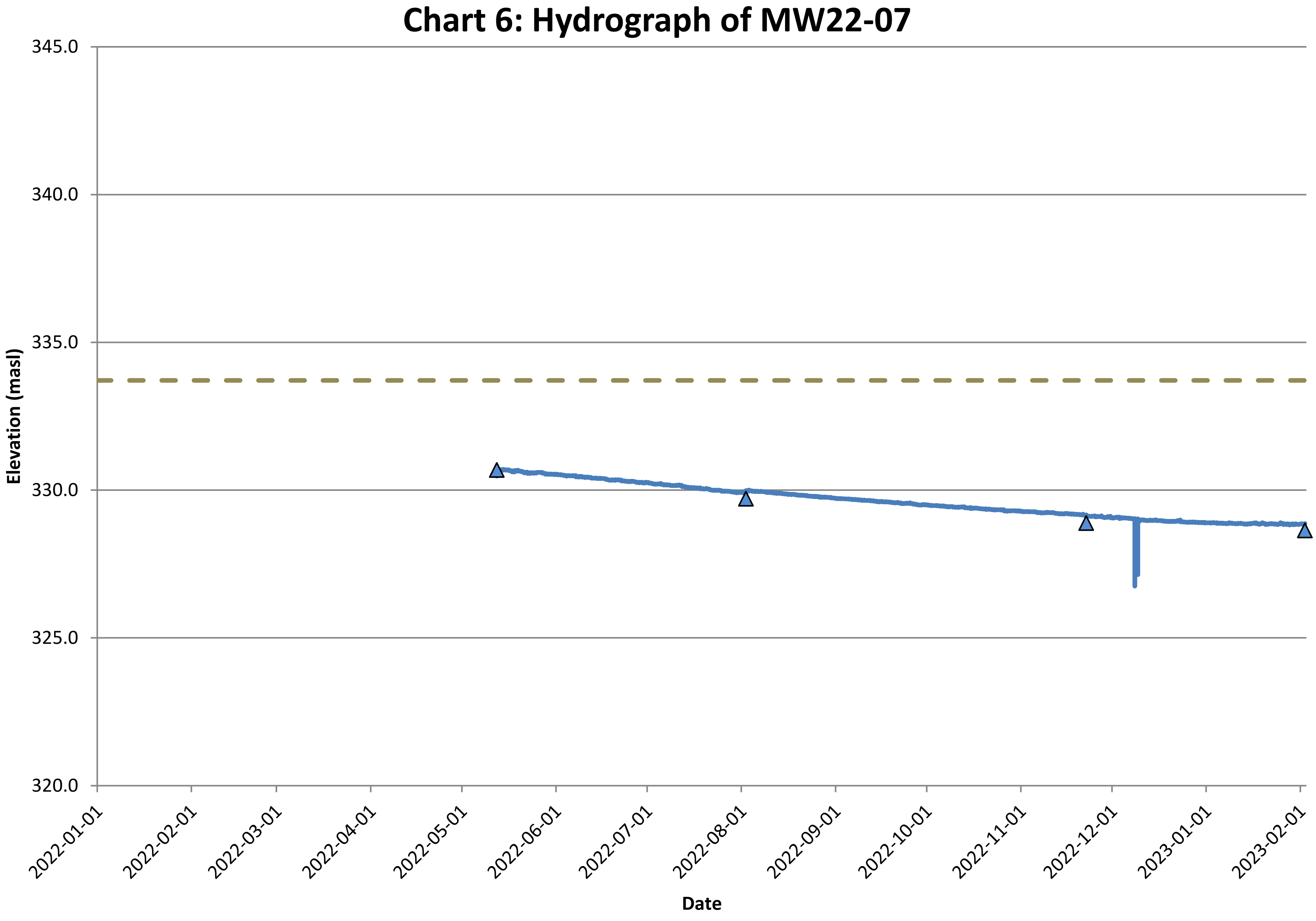


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Chart 7: Hydrograph of MW22-08

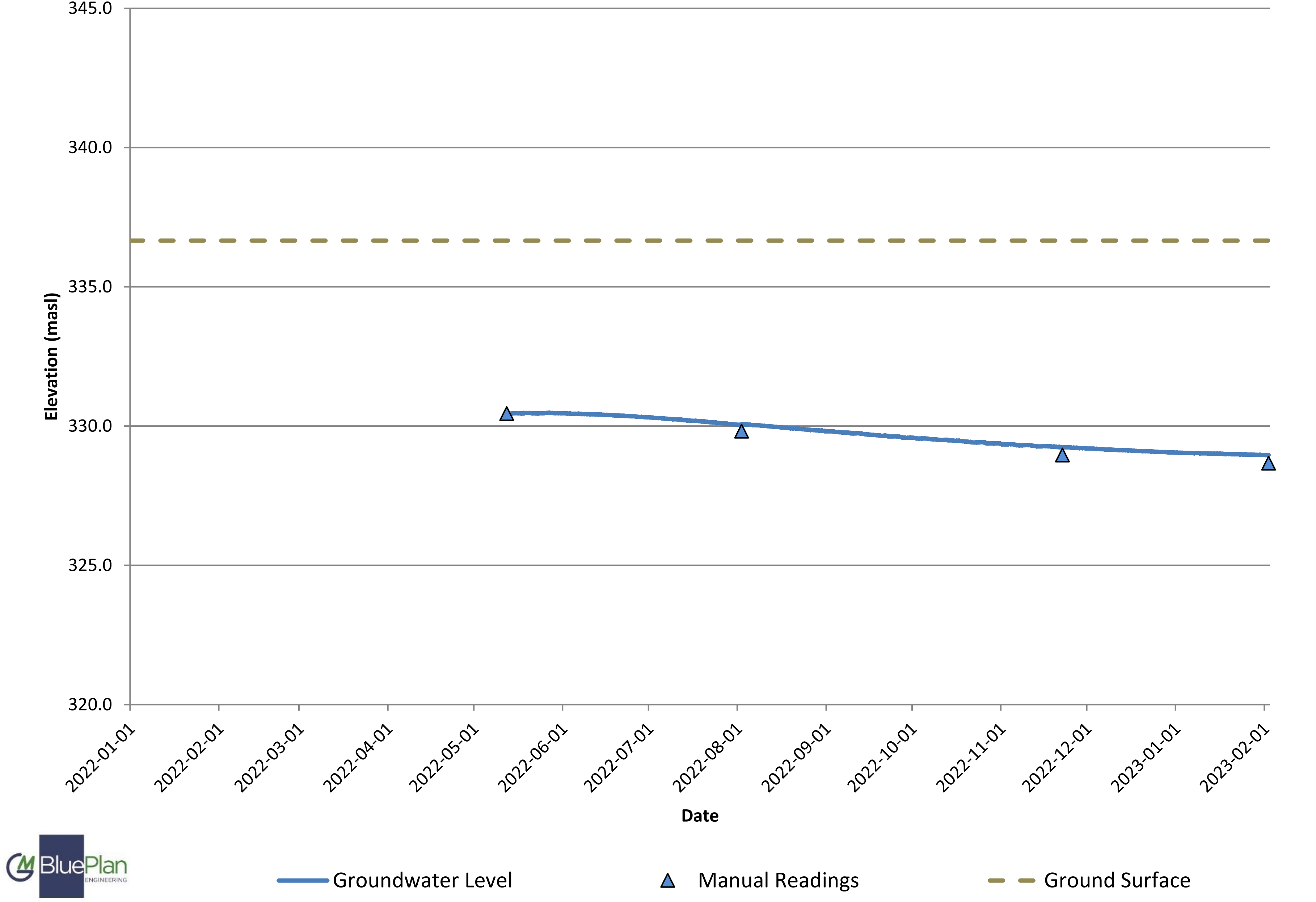


Chart 8: Hydrograph of MW22-09

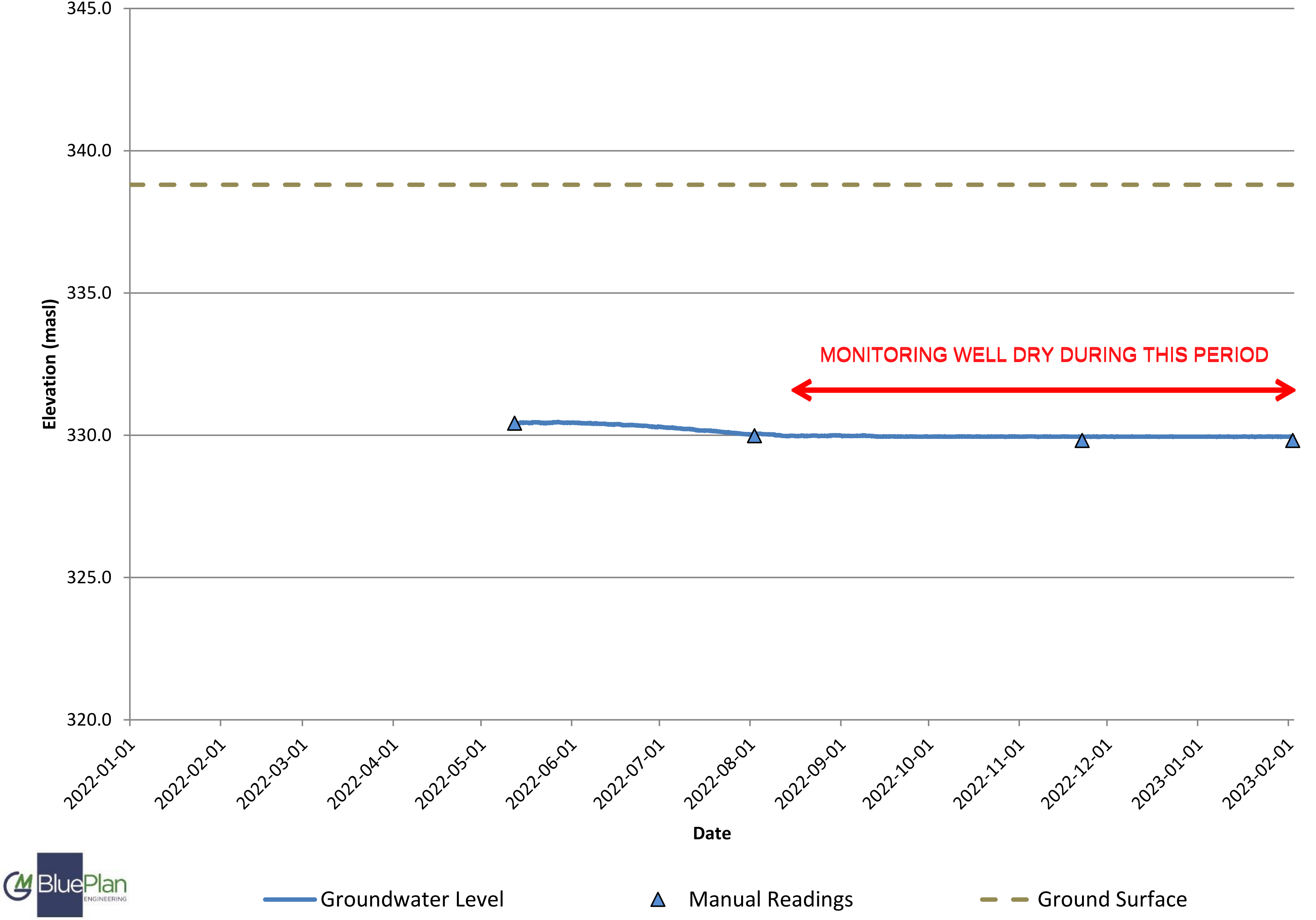


Chart 9: Hydrograph of MW22-10

Chart 10: Hydrograph of MW1-09 (Pre-Existing)

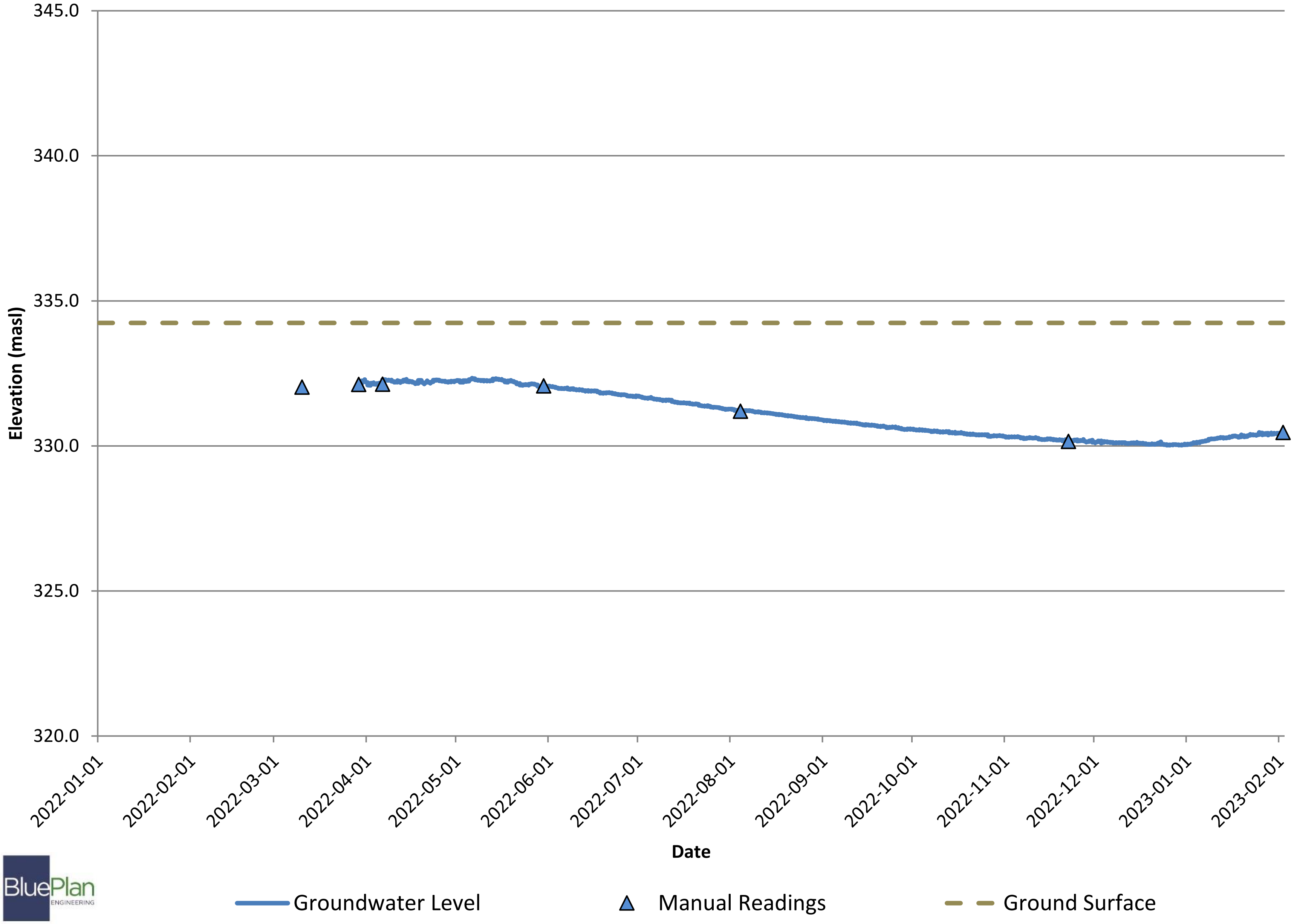
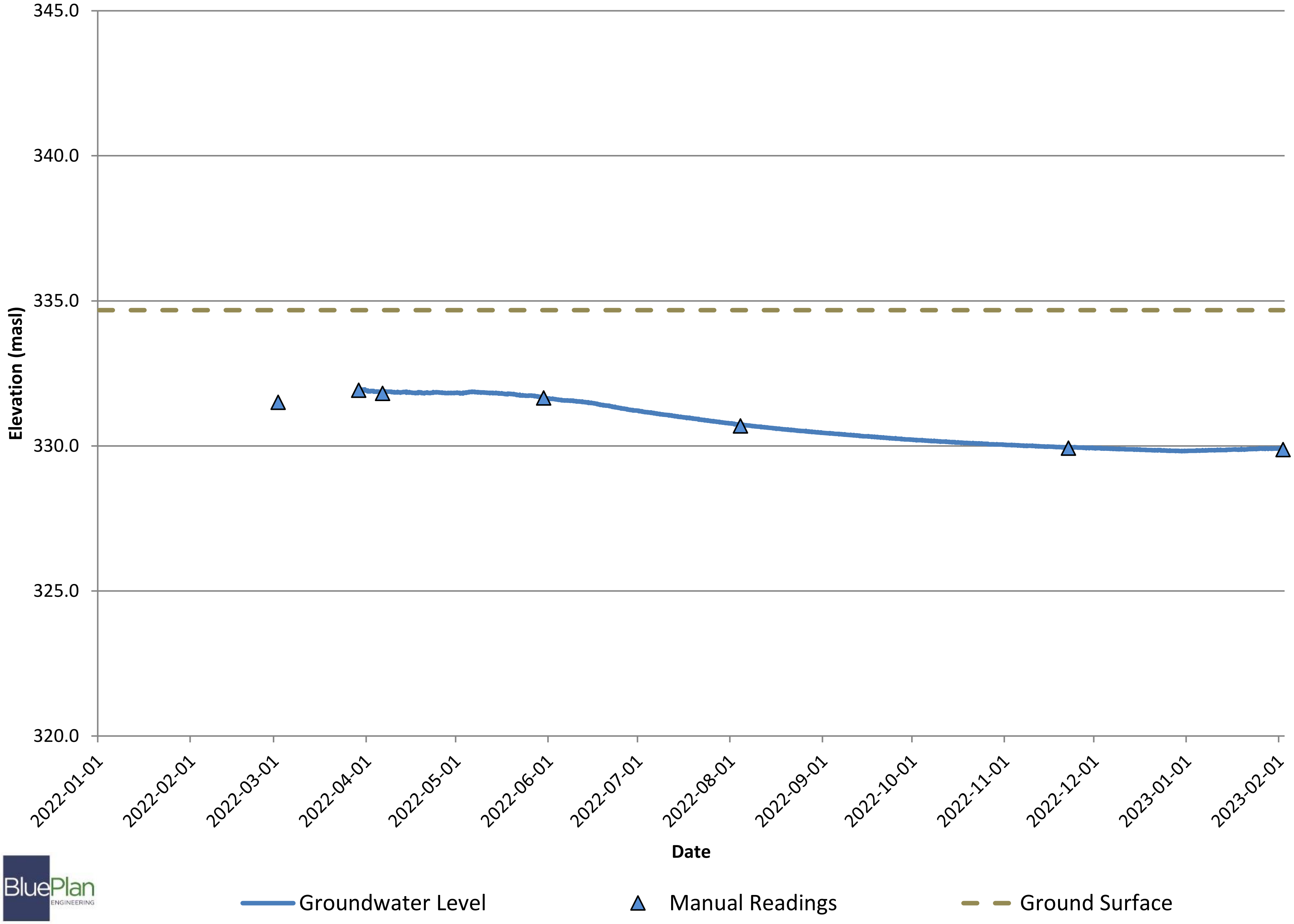


Chart 11: Hydrograph of MW2-09 (Pre-Existing)



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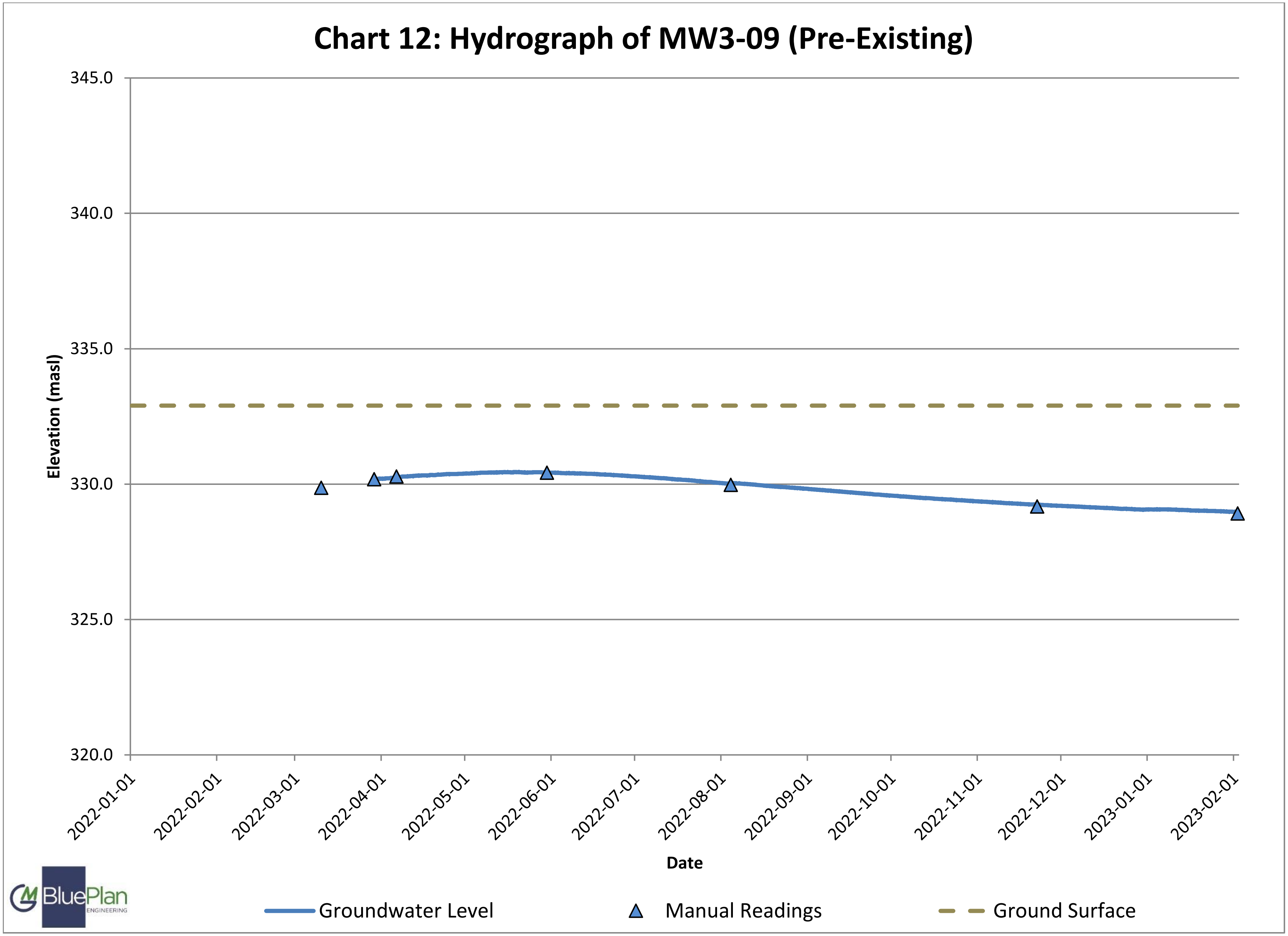
Chart 12: Hydrograph of MW3-09 (Pre-Existing)
345.0
340.0
335.0
330.0
325.0
320.0
Elevation (masl)
2022-01-01
2022-02-01
2022-03-01
2022-04-01
2022-05-01
2022-06-01
2022-07-01
2022-08-01
2022-09-01
2022-10-01
2022-11-01
2022-12-01
2023-01-01
2023-02-01
Date
Groundwater Level
Manual Readings
Ground Surface

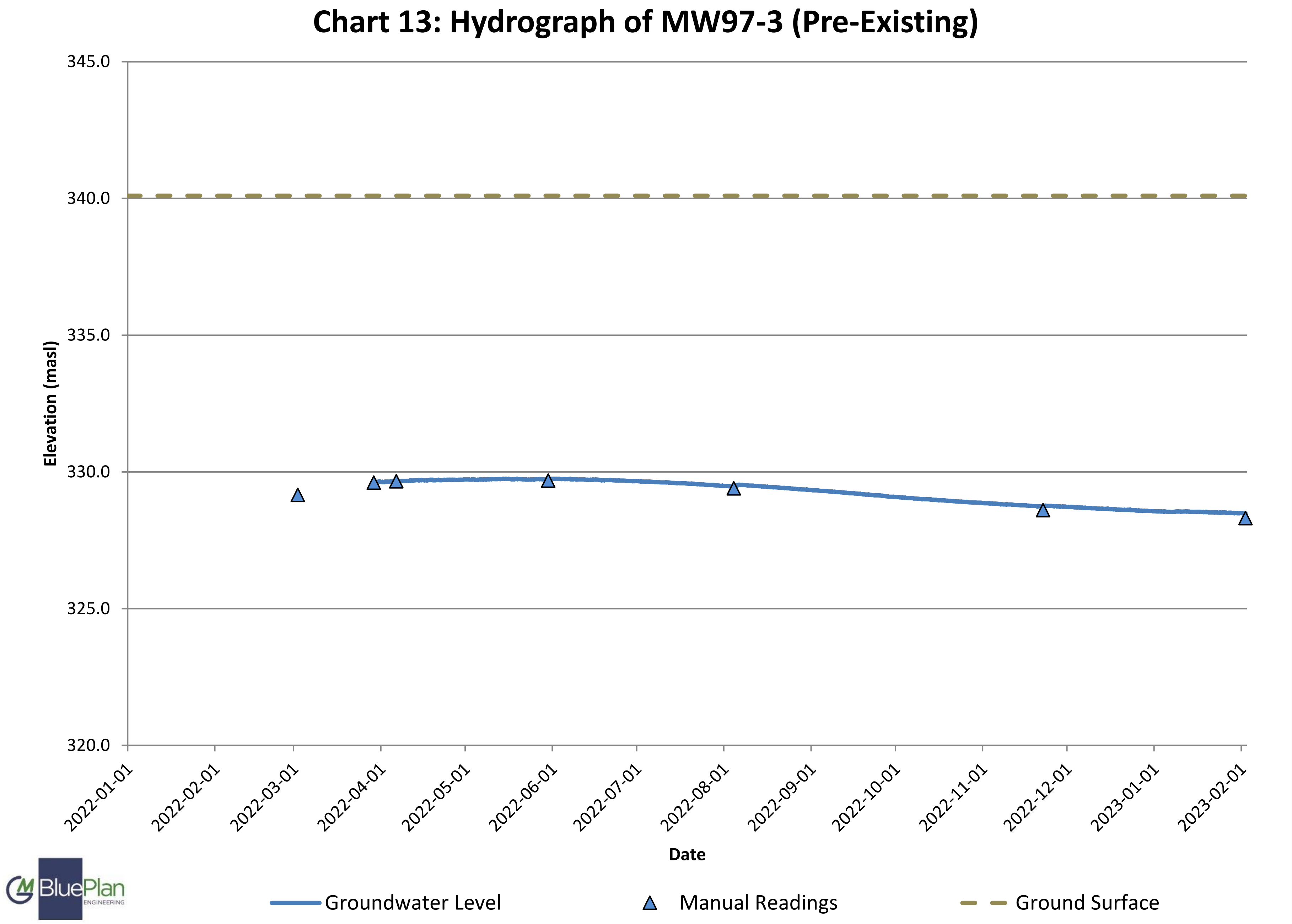
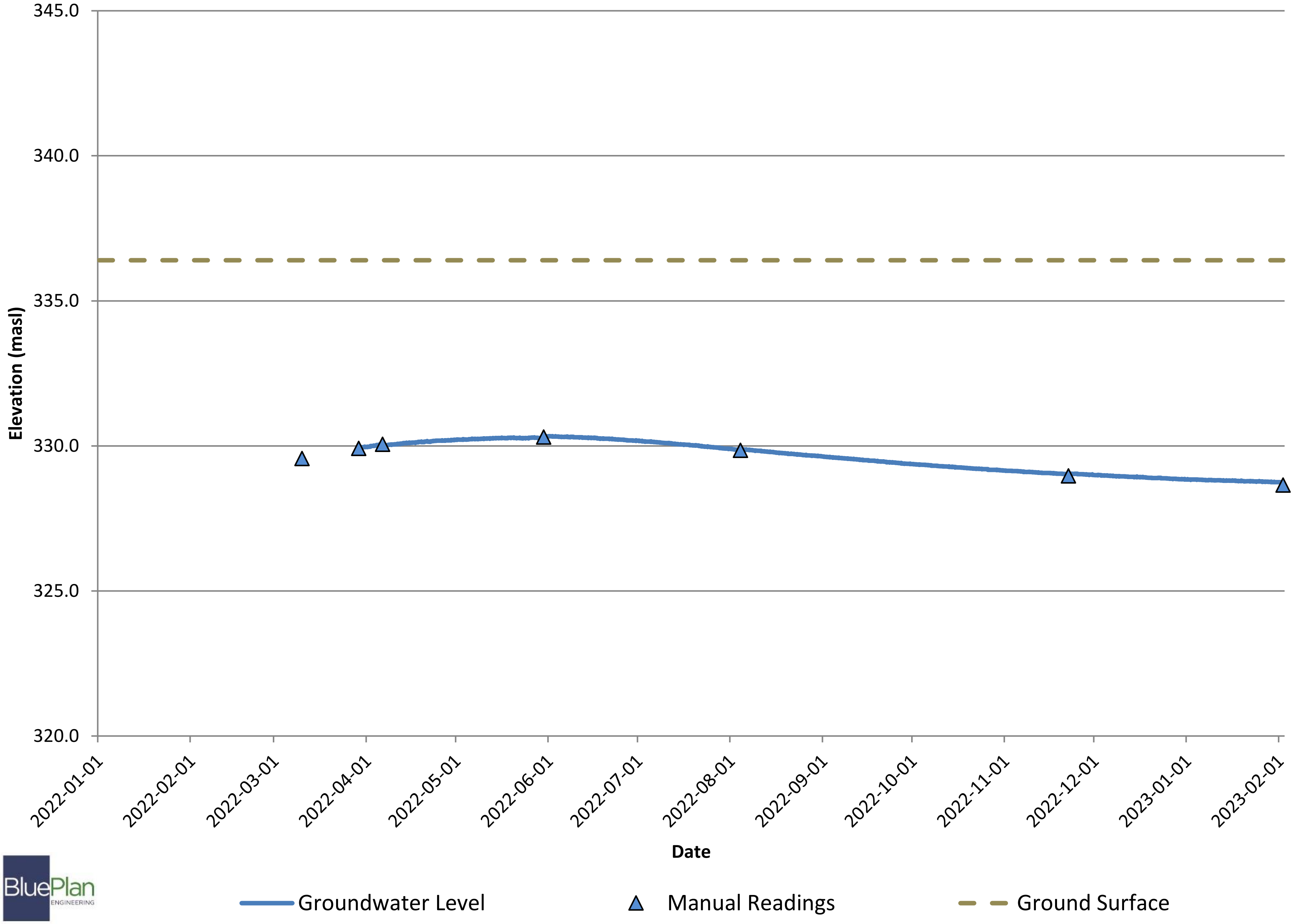


Chart 13: Hydrograph of MW97-3 (Pre-Existing)
345.0
340.0
335.0
330.0
325.0
320.0
Elevation (masl)
2022-01-01
2022-02-01
2022-03-01
2022-04-01
2022-05-01
2022-06-01
2022-07-01
2022-08-01
2022-09-01
2022-10-01
2022-11-01
2022-12-01
2023-01-01
2023-02-01
Date
Groundwater Level
Manual Readings
Ground Surface

Chart 14: Hydrograph of MW97-5 (Pre-Existing)



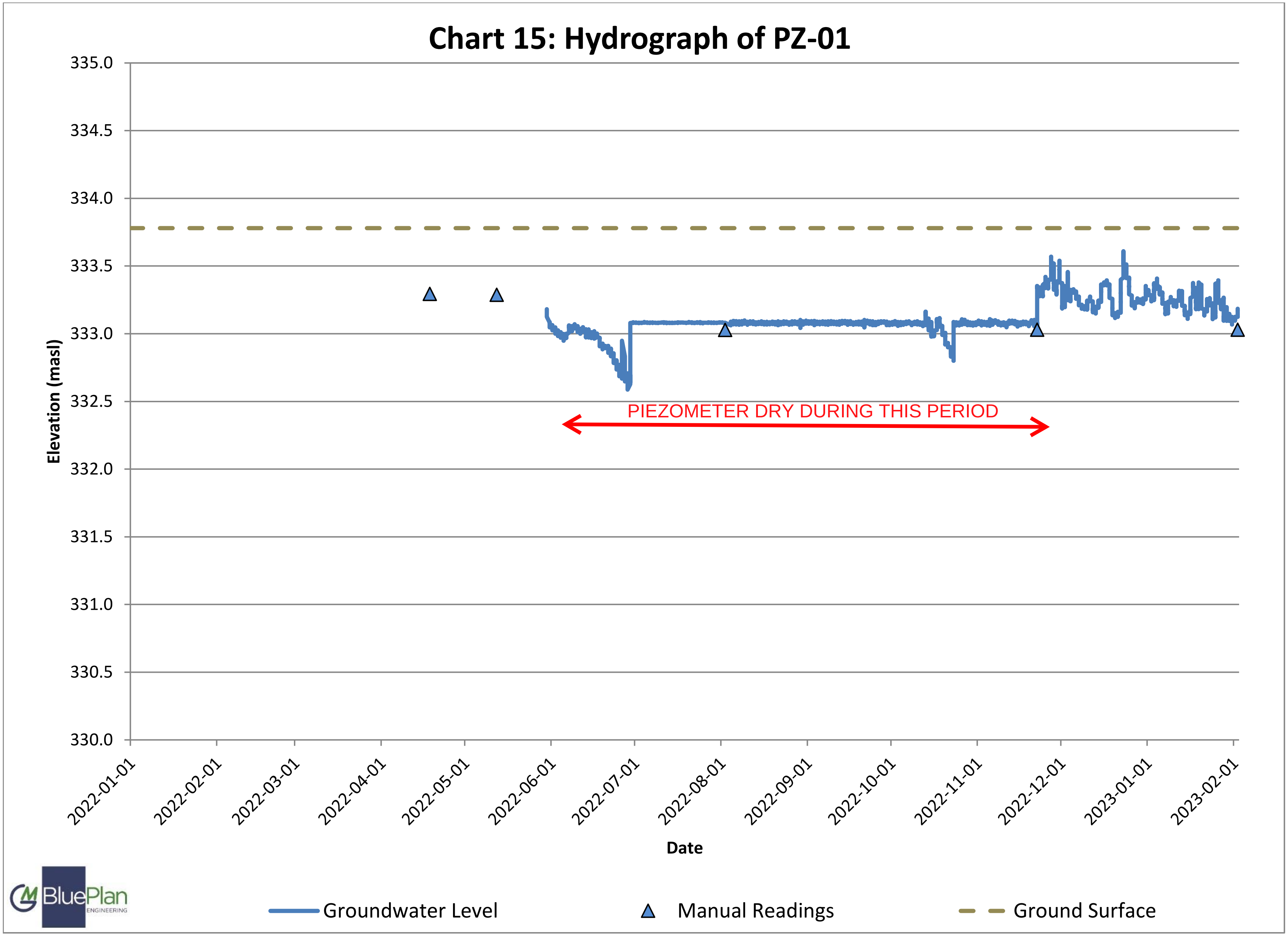
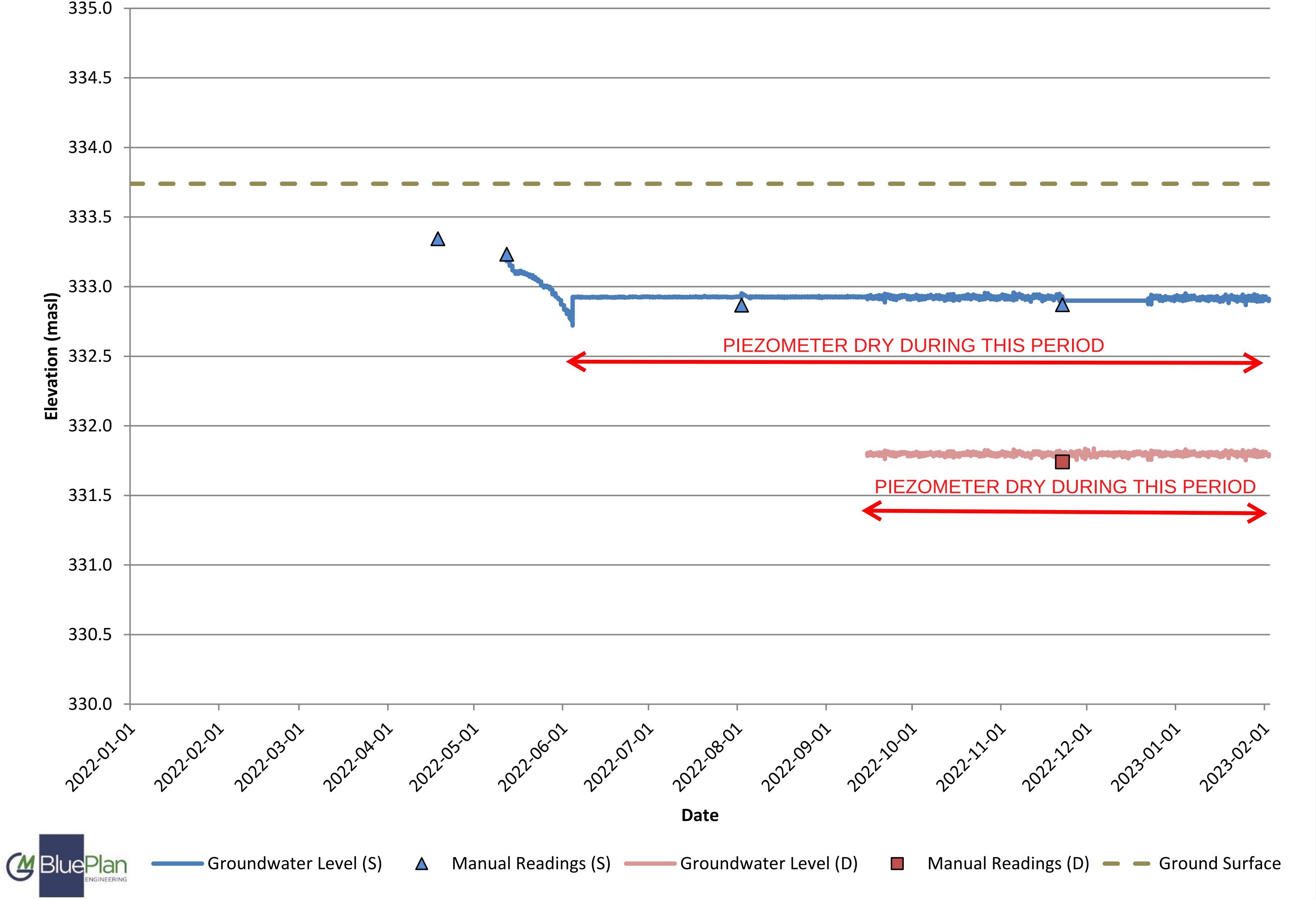
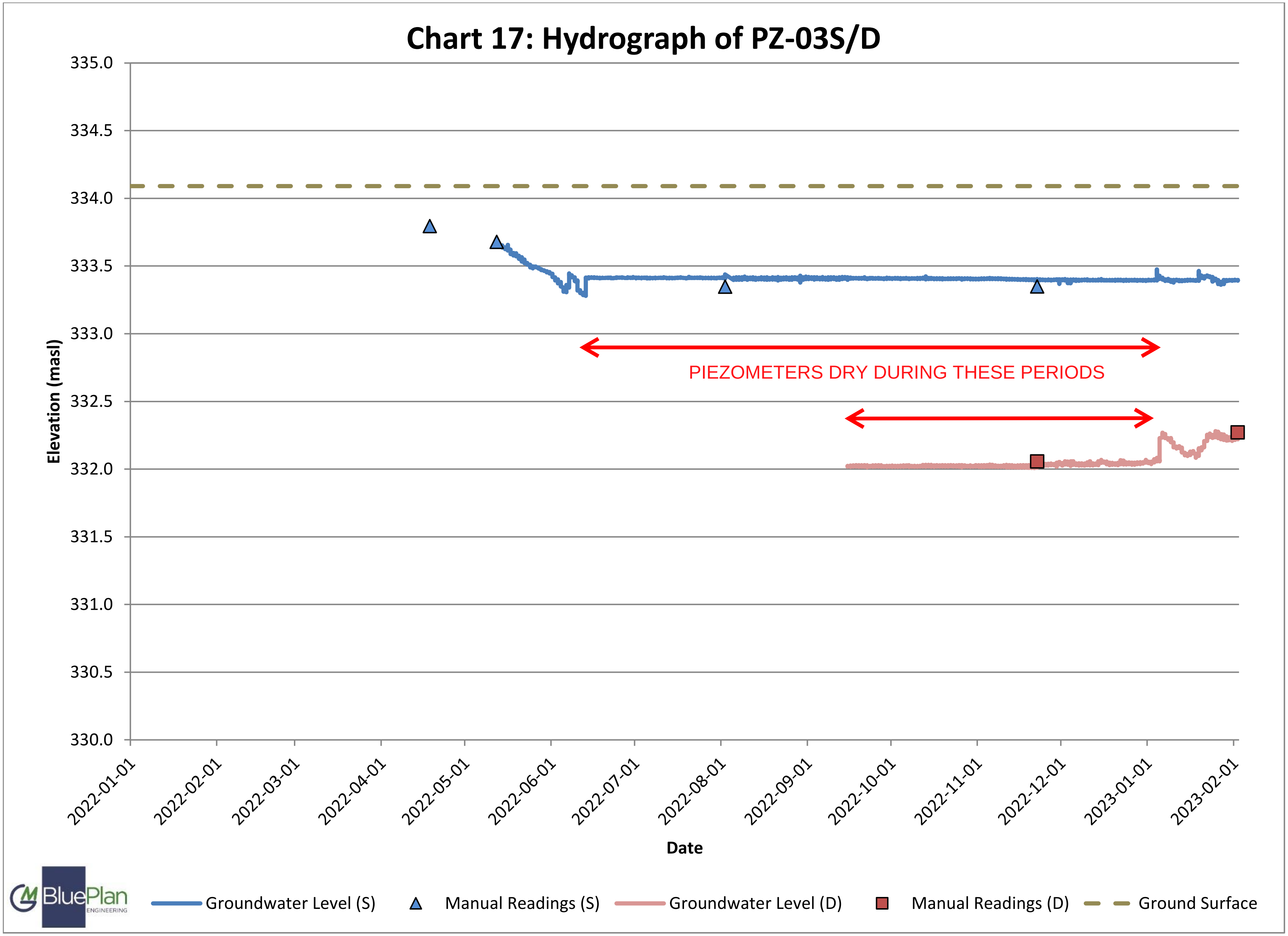


Chart 15: Hydrograph of PZ-01
335.0
334.5
334.0
333.5
333.0
332.5
332.0
331.5
331.0
330.5
330.0
Elevation (masl)
PIEZOMETER DRY DURING THIS PERIOD
2022-01-01
2022-02-01
2022-03-01
2022-04-01
2022-05-01
2022-06-01
2022-07-01
2022-08-01
2022-09-01
2022-10-01
2022-11-01
2022-12-01
2023-01-01
2023-02-01
Date
BluePlan ENGINEERING
Groundwater Level
Manual Readings
Ground Surface

Chart 16: Hydrograph of PZ-02S/D





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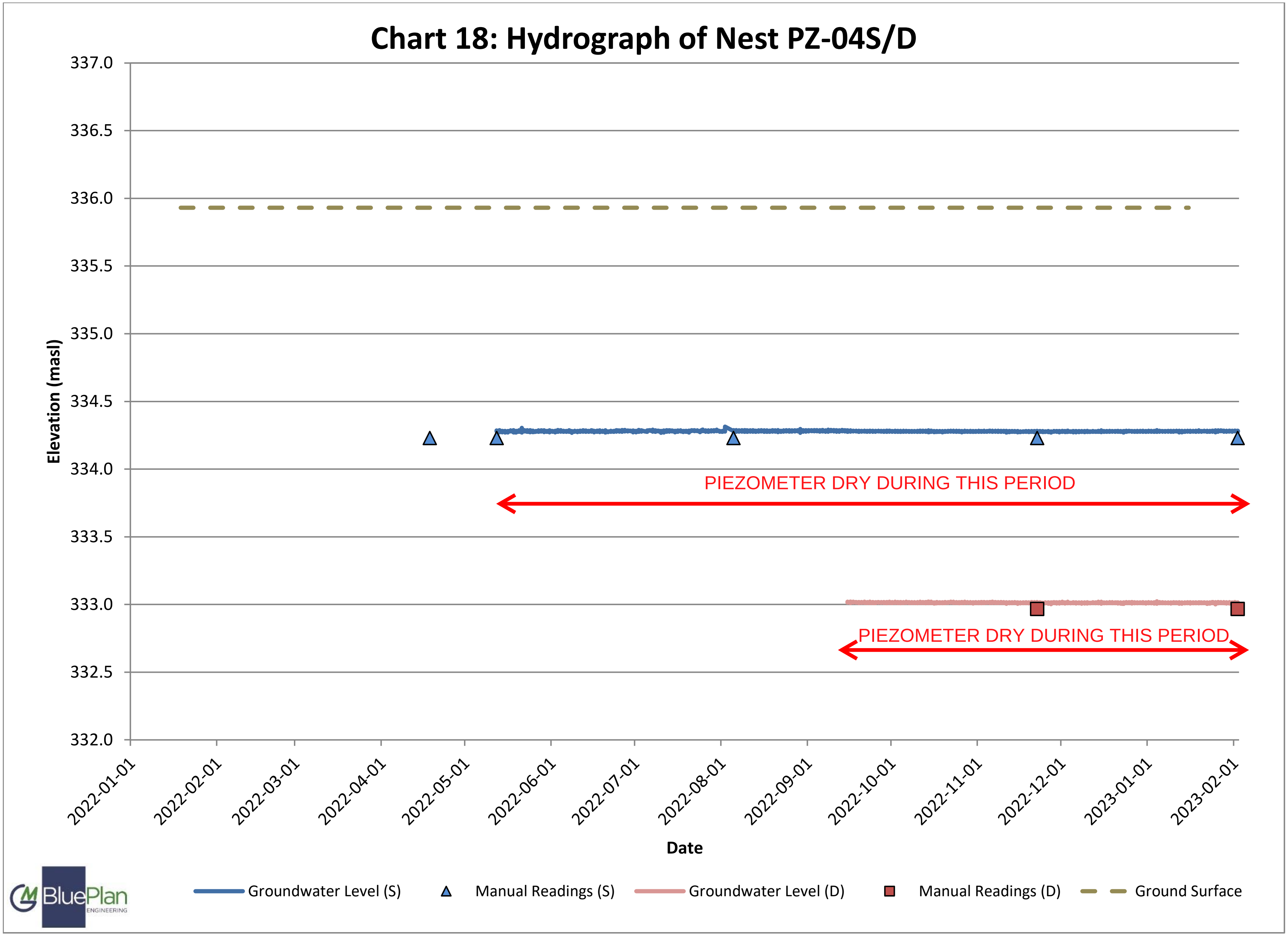
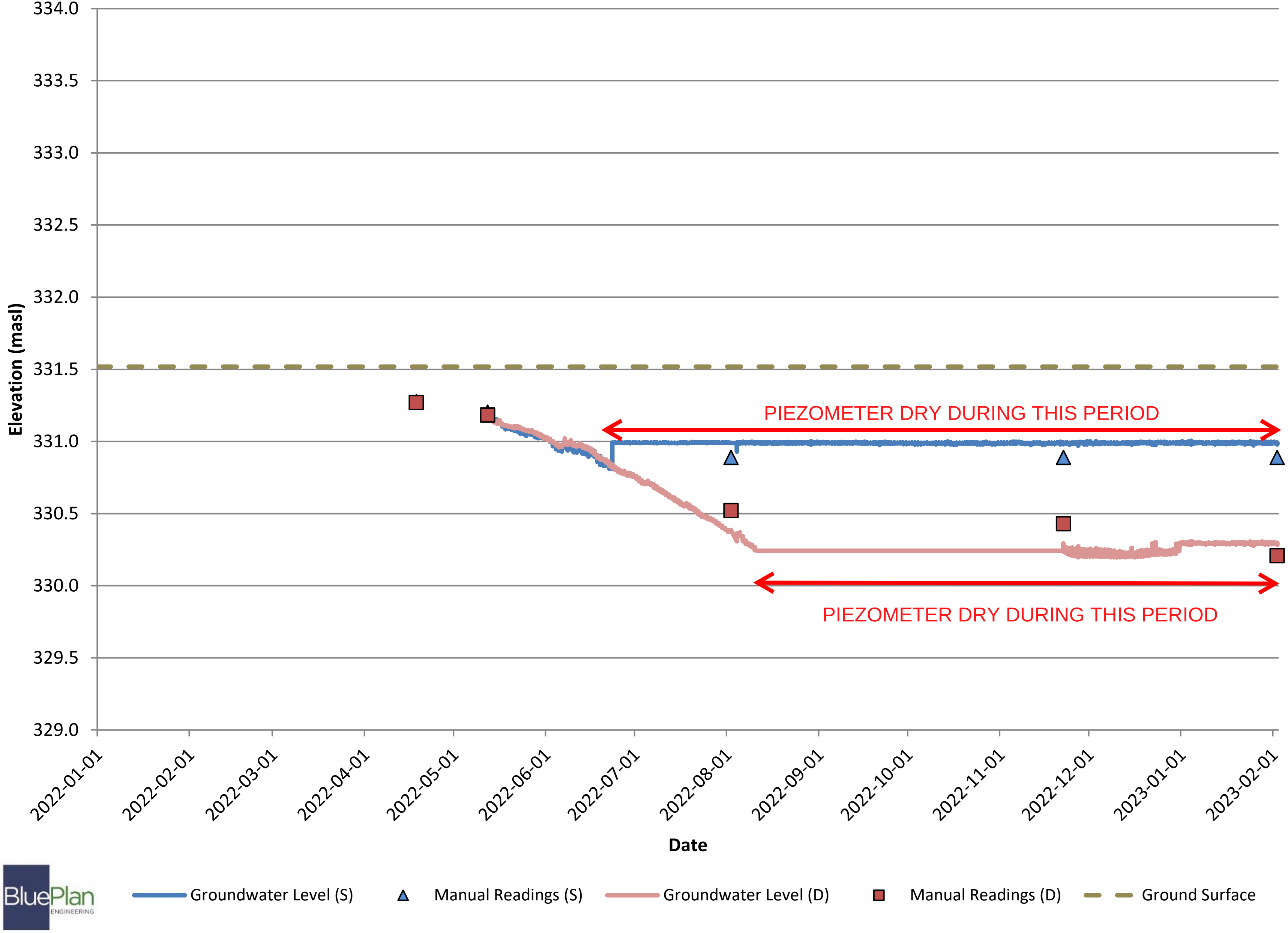


Chart 18: Hydrograph of Nest PZ-04S/D

Chart 19: Hydrograph of Nest PZ-05S/D



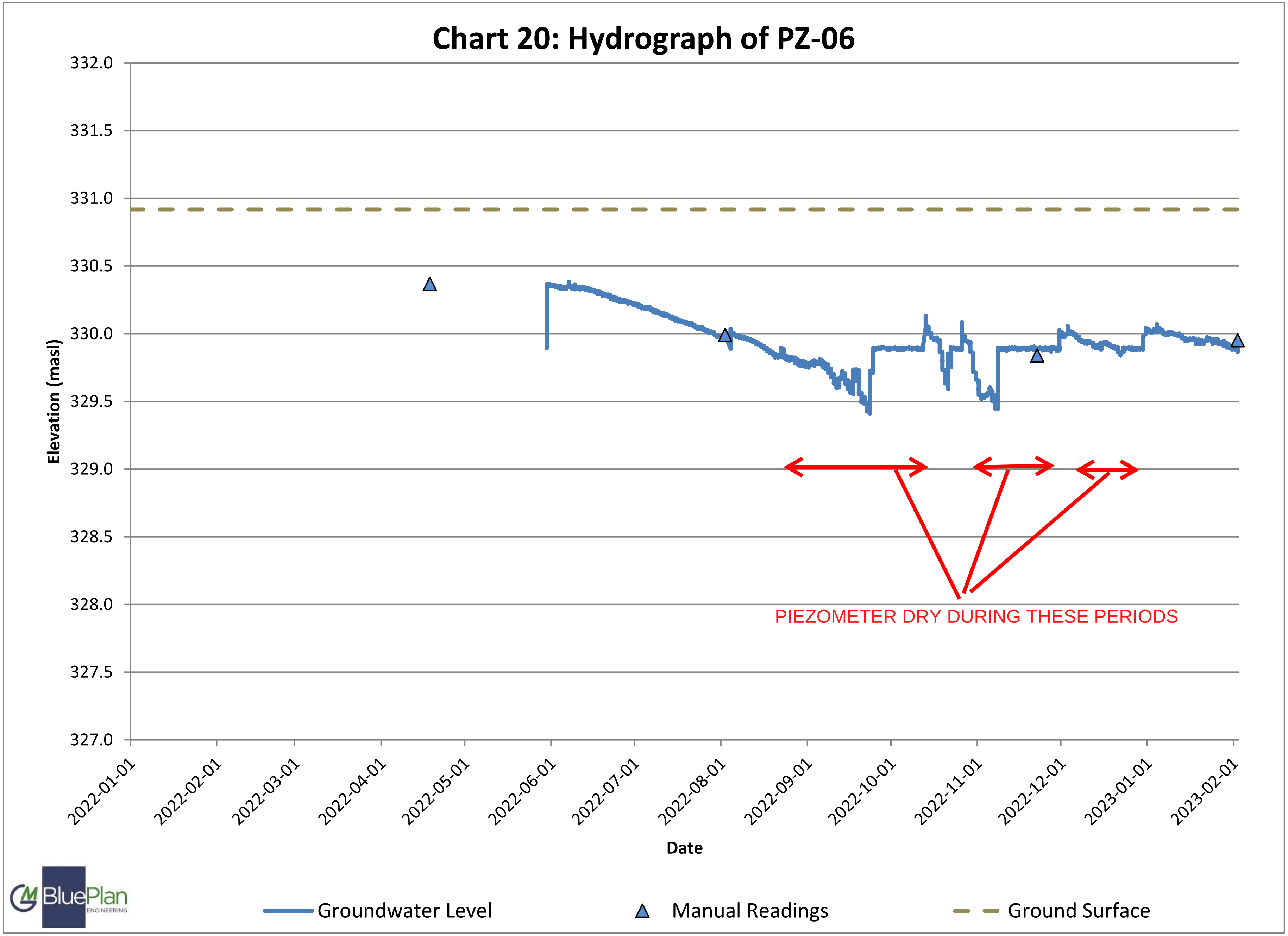


Chart 20: Hydrograph of PZ-06
332.0
331.5
331.0
330.5
330.0
329.5
329.0
328.5
328.0
327.5
327.0
Elevation (masl)
2022-01-01
2022-02-01
2022-03-01
2022-04-01
2022-05-01
2022-06-01
2022-07-01
2022-08-01
2022-09-01
2022-10-01
2022-11-01
2022-12-01
2023-01-01
2023-02-01
Date
PIEZOMETER DRY DURING THESE PERIODS
Groundwater Level
Manual Readings
Ground Surface
BluePlan
ENGINEERING

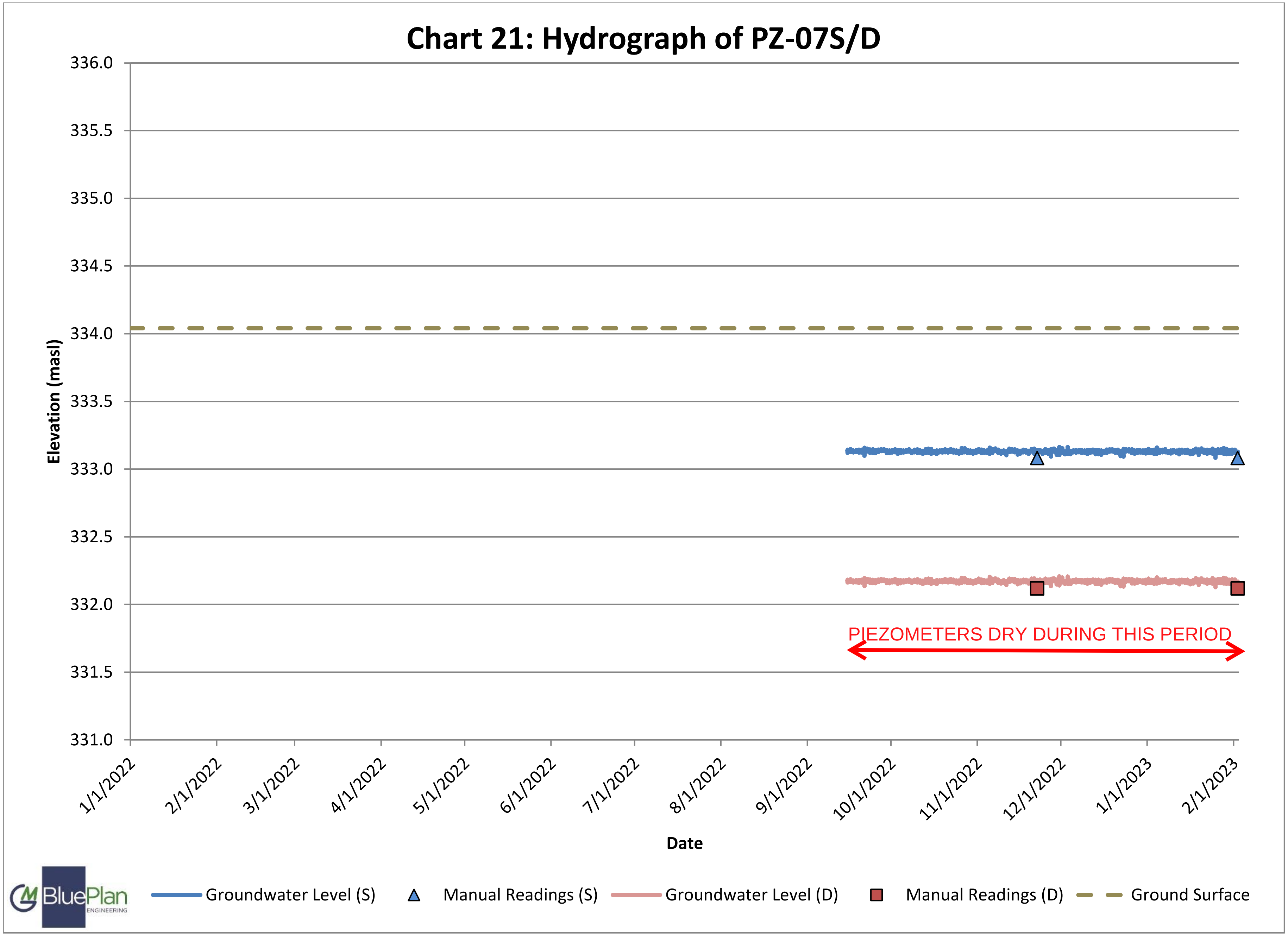


Chart 21: Hydrograph of PZ-07S/D

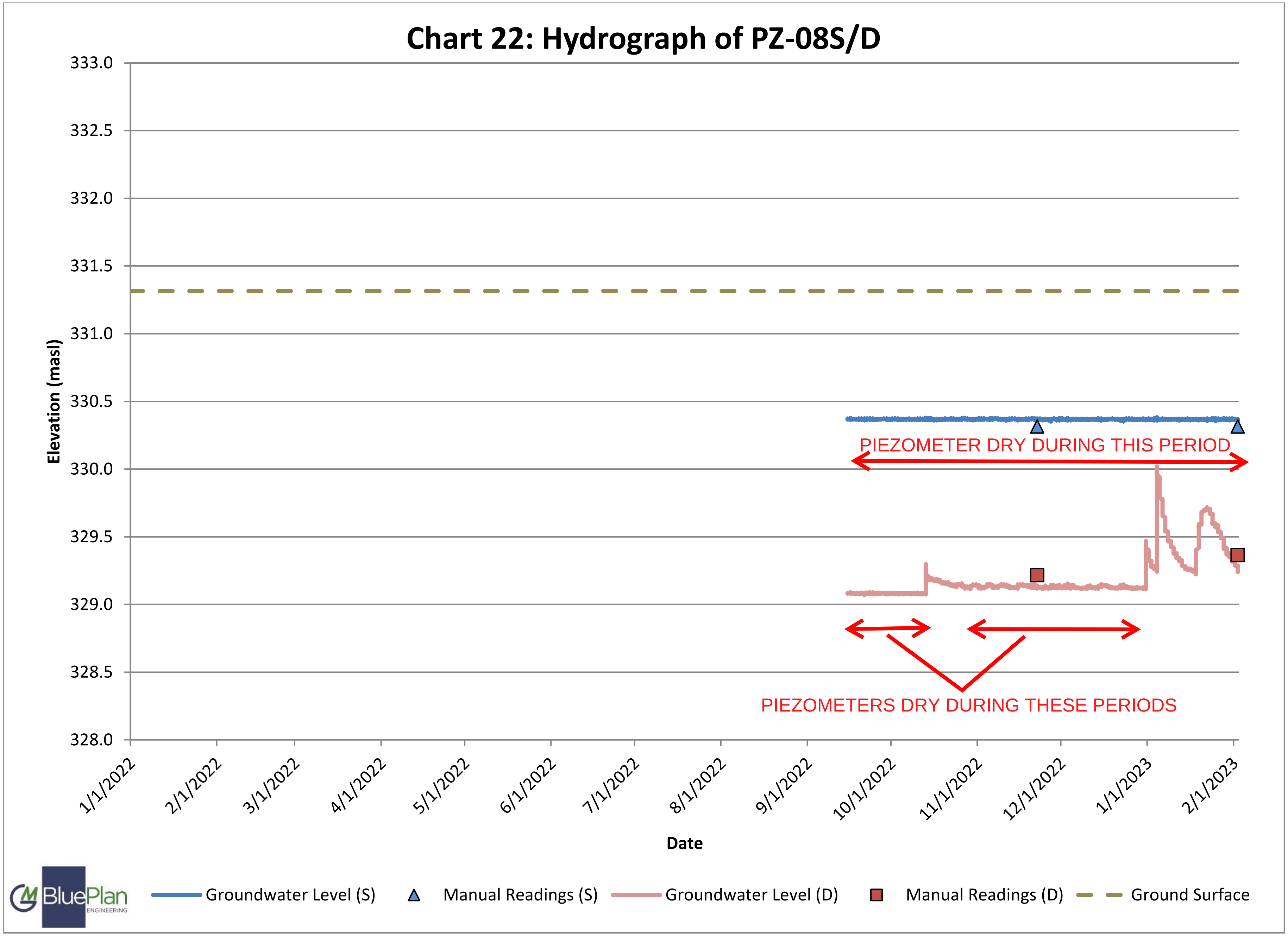
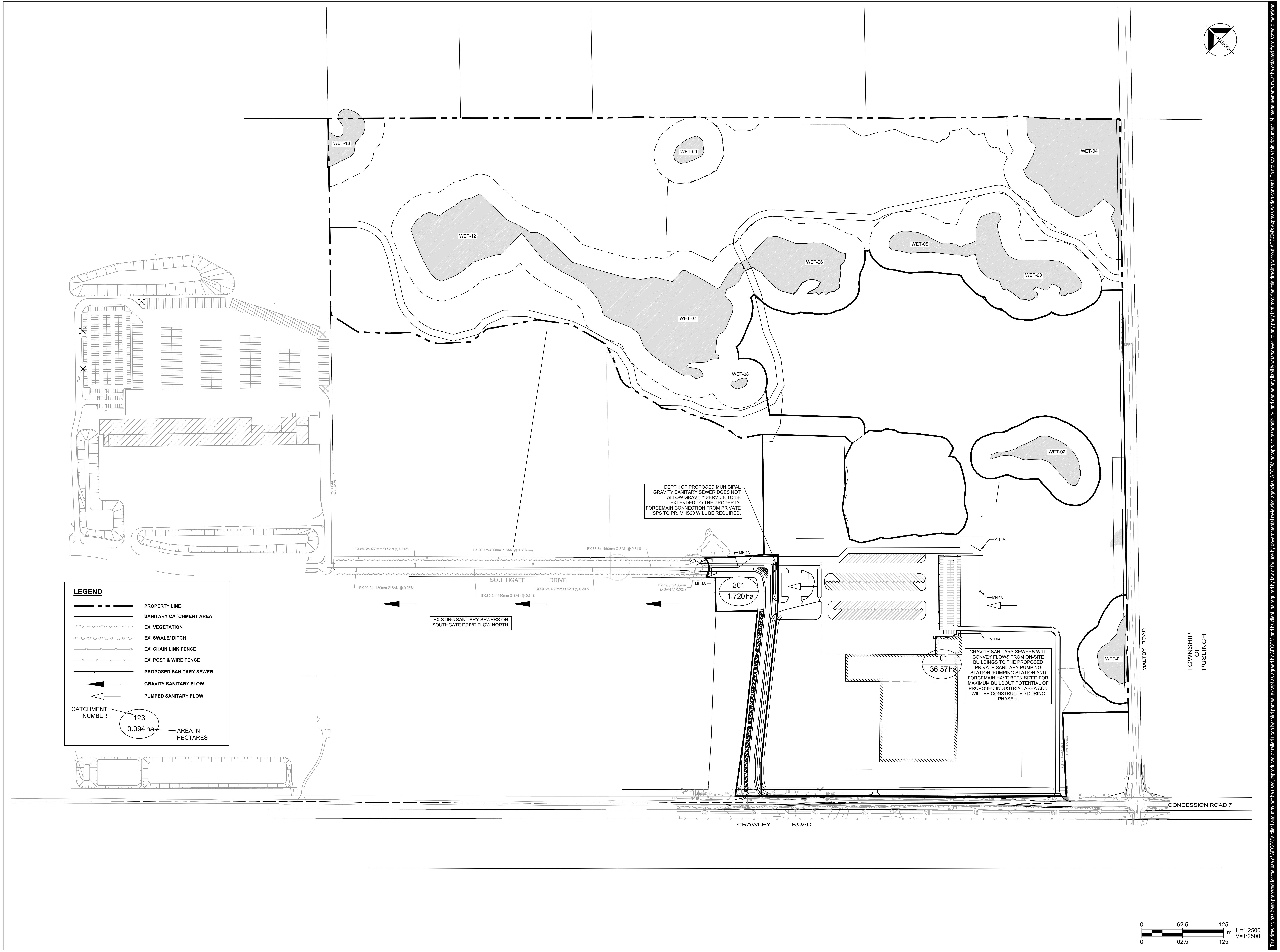


Chart 22: Hydrograph of PZ-08S/D
Elevation (masl)
333.0
332.5
332.0
331.5
331.0
330.5
330.0
329.5
329.0
328.5
328.0
1/1/2022
2/1/2022
3/1/2022
4/1/2022
5/1/2022
6/1/2022
7/1/2022
8/1/2022
9/1/2022
10/1/2022
11/1/2022
12/1/2022
1/1/2023
2/1/2023
Date
PIEZOMETER DRY DURING THIS PERIOD
PIEZOMETERS DRY DURING THESE PERIODS
Groundwater Level (S)
Manual Readings (S)
Groundwater Level (D)
Manual Readings (D)
Ground Surface
BluePlan ENGINEERING

APPENDIX A:
PROPOSED SITE PLAN

Last saved by: ALEX.FUNSTON(2022-12-19) Last Plotted: 2023-02-10
Filename: \\NA.AECOMNET.COM\LFS\AMER\MARKHAM-CATRT4\DCS\PROJECTS\BDL\60682143_NEWCOLD\900_CAD_GIS\911_CIVIL\911_3_PUBLISHED\PHASE I\60682143 NEWCOLD - POST-CATCHMENT AREA (SAN).DWG

Project Management Initials: Designer:AA Checked:AA Approved:AA ARCH D 24" x 36"



AECOM

PROJECT

NEWCOLD GUELPH
- TO01
GUELPH, ONTARIO

CLIENT

NEWCOLD®

CONSULTANT

AECOM Canada Ltd.
50 Sportsworld Crossing Road, Suite 290
Kitchener, Ontario, N2P 0A4
519 650 5313 tel 519 650 3424 fax
www.aecom.com

NOTE:

IT IS THE RESPONSIBILITY OF THE CONTRACTORS TO INFORM THEMSELVES OF THE EXACT LOCATION OF, AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES, SERVICES AND STRUCTURES WHETHER ABOVE GROUND OR BELOW GRADE BEFORE COMMENCING THE WORK. SUCH INFORMATION IS NOT NECESSARILY SHOWN ON THE DRAWING, AND WHERE SHOWN, THE ACCURACY CANNOT BE GUARANTEED.

WITH THE SOLE EXCEPTION OF THE BENCHMARK(S) SPECIFICALLY DESCRIBED FOR THIS PROJECT, NO ELEVATION INDICATED OR ASSUMED HEREON IS TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

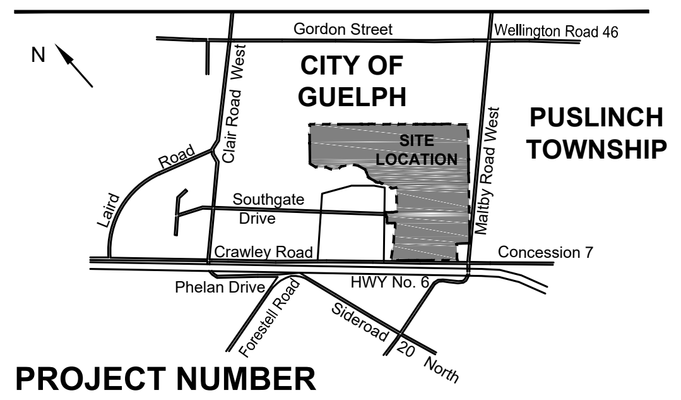
REGISTRATION

Preliminary
02/10/2023 2:50:13 PM

ISSUE/REVISION

6		
5		
4		
3		
2		
1	2022-12-15	ISSUED FOR SPA - PHASE 1
I/R	DATE	DESCRIPTION

KEY PLAN



PROJECT NUMBER

60682143

SHEET TITLE

SANITARY CATCHMENT
AREA

SHEET NUMBER

SSP-1

APPENDIX B:
MECP WATER WELL RECORDS

UTM ~~5~~ 6 Z Con VII Lot 14 E

15 R N

Elev. A R 1 1 1 0

Basin 23

County or District Well

Township, Village, Town or City Puslinch PUSLINCH

Con. 7 VII Lot 14

Date completed 1st Sept 1967 (day month year)

[redacted]ress RR 1 Guelph

67 № 67 24997

WATER RESOURCES DIVISION
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 67 Feet

~~Type of screen~~

~~Length of screen~~

~~Depth to top of screen~~

Diameter of finished hole 5"

Pumping Test

Static level 50 Feet

Test-pumping rate 12 G.P.M.

Pumping level 56

Duration of test pumping 2 hours

Water clear or cloudy at end of test clear

Recommended pumping rate 8 G.P.M.

with pump setting of 60 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
stones clay gravel	0	40		
sand	40	45		
gravel	45	51		
sand	51	60		
stones gravel	60	67	67	fresh

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

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

Drilling or Boring Firm Albert Earley

Address 202 Reeve St

Licence Number 2423

Name of Driller or Borer Albert Earley

Address 202 Reeve St

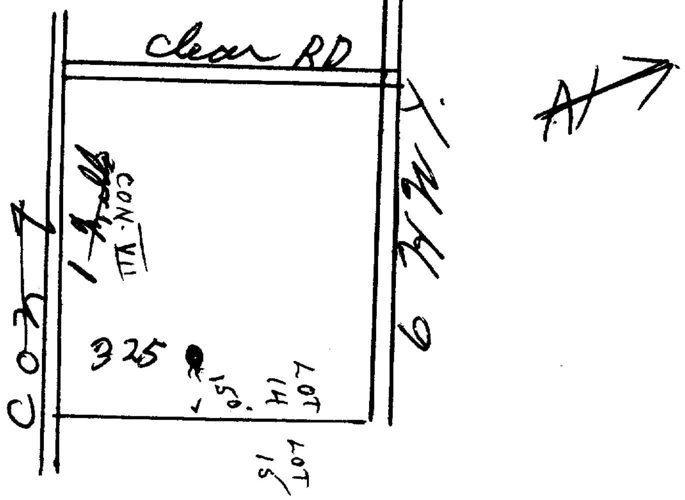
Date Sept 4 1967

[redacted]

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



Form 7 15M-60-4138

OWRC COPY

CSS.S8

The Ontario Water Resources Commission Act

WATER WELL RECORD

40P/89

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6703865 ~~4703865~~

MUNICIP. 67012

CON. C04N 07

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
WELLINGTON	PUSLINCH	7	014

[redacted] R.R.6 GUELPH

DATE COMPLETED 48-53 DAY 28 MO. 10 ~~6~~ YR. 70

13950 RC. 4 ELEVATION 1115 RC. 5 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
		Top soil		0	1
		clay gravel stones		1	22
		clay gravel		22	45
		gravel sand		45	70
		sand clay		70	99
Gray		clay		99	118
		gravel clay sand		118	136
		Hard packed gravel		136	140
		Lime rock		140	165

31 0001 02 | 0022 05N12 | 0045 05N | 0070 1109 | 0099 0905T | 0118205T | 1

32 0136 1105T09 | 0140 11 | 0165 15

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0165	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
~~2~~ 04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	205"	0	~~741~~ 0141
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0165
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

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

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE 0008 GPM.

DURATION OF PUMPING 02 HOURS 00 MINS.

WATER LEVELS DURING 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
070 FEET	100 FEET	100 FEET	100 FEET	100 FEET	100 FEET

IF FLOWING, GIVE RATE GPM.

PUMP INTAKE SET AT 100 FEET

WATER AT END OF TEST 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING 120 FEET

RECOMMENDED PUMPING RATE 0007 GPM.

000.3 GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

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

WATER USE 01

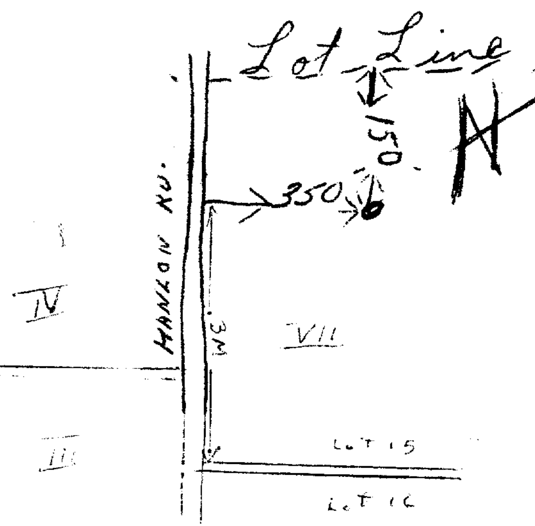
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

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

LOCATION OF WELL

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



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: Albert Earley — LICENCE NUMBER: 1906

ADDRESS: 202 Neeve St Guelph

NAME OF DRILLER OR BORER: [redacted] — LICENCE NUMBER: 1906

SIGNATURE OF CONTRACTOR: [redacted]

SUBMISSION DATE DAY 6 MO. Nov YR. 70

OFFICE USE ONLY

DATA SOURCE 1 — CONTRACTOR 1906 — DATE RECEIVED 080171

DATE OF INSPECTION 19/2/71 — INSPECTOR

REMARKS:

P

WI

OWRC COPY

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

6708738

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

MUNICIP. 10 14 | CON. 15 22 23 24

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
[redacted]	linch	VII	15

#6 Guelph Ont.

DATE COMPLETED 48-53 DAY 12 MO. Nov YR. 86

RC ELEVATION RC BASIN CODE
10 12 17 15 24 25 26 30 31 47

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	clay	stones		0	22
Brown	clay	gravel sand		22	70
	gravel			70	75

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13 75	14 1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	19 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	24 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	29 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	34 80 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
10-11 6 1/4	12 1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	13-16 75
17-18	19 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	26 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING 31-33 (SLOT NO.)	DIAMETER 34-38 INCHES	LENGTH 39-40 FEET
MATERIAL AND TYPE	DEPTH TO TOP 41-44 30 OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10: 1 ☒ PUMP Air 2 ☐ BAILER

PUMPING RATE 11-14: 30 GPM

DURATION OF PUMPING: 15-16 1 HOURS 17-18 0 MINS

STATIC LEVEL 19-21	WATER LEVEL END OF PUMPING 22-24	15 MINUTES 26-28	30 MINUTES 29-31	45 MINUTES 32-34	60 MINUTES 35-37
51 FEET	72 FEET	51 FEET	51 FEET	51 FEET	51 FEET

25 WATER LEVELS DURING 1 ☐ PUMPING 2 ☒ RECOVERY

IF FLOWING, GIVE RATE 38-41: GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST 42: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING 43-45: 70 FEET

RECOMMENDED PUMPING RATE 46-49: 15 GPM

50-53

FINAL STATUS OF WELL 54

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

WATER USE 55-56

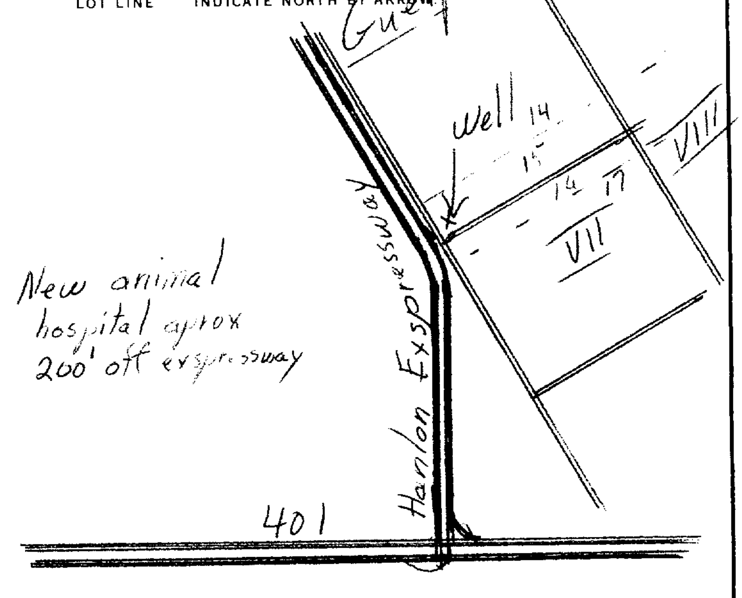
1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER Veterinary Clinic
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
☐ NOT USED

METHOD OF DRILLING 57

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

LOCATION OF WELL

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



New animal hospital aprox 200' off expressway

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR	LICENCE NUMBER
Packham Well Drilling Inc.	4207

ADDRESS: 1235 Trinity Rd Ancaster Ont

NAME OF DRILLER OR BORER	LICENCE NUMBER
Mervin Packham	T0058

SIGNATURE OF CONTRACTOR: [redacted]

SUBMISSION DATE DAY 18 MO. Nov. YR. 86

OFFICE USE ONLY

DATA SOURCE 58 | CONTRACTOR 59-62 | DATE RECEIVED 63-68 020487 | 80

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77 FORM 7

Ontario Ministry of the Environment

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

A 083374

04-0044-00

Master Well Record for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Master Well Owner's and Land Owner's Information

First Name: Industrial Guelph Equities
Last Name:
[redacted]

Mailing Address (Street Number/Name, RR): 55 Kelfield Street
Municipality: Toronto
Province: ON
Postal Code: M9W5A3
Telephone No. *(inc. area code)*: 4166180715

Location and Construction of the Master Well in the Cluster

Address of Well Location (Street Number/Name, RR): Maltby Road
Township: Guelph
Lot: 14+15
Concession: 7

County/District/Municipality: Wellington
City/Town/Village: Guelph
Province: **Ontario**
Postal Code:

UTM Coordinates NAD 83
Zone: 17
Easting: 565979
Northing: 4814180
GPS Unit Make: Garmin
Model:
Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(Metres)* From	To
brown	gravel	sand	sandy gravel	0	9

Hole Details

Depth *(Metres)* From	To	Diameter *(Centimetres)*
0	9	21

Water Use

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

Method of Construction

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

Status of Well

☒ Test Hole ☐ Replacement Well ☐ Dewatering Well ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Other, *specify* ☐ Abandoned, other, *specify*

Construction Details

Inside Diameter *(Centimetres)*	Material *(steel, plastic, fibreglass, concrete, galvanized)*	Wall Thickness	Depth *(Metres)* From	To
5	plastic	0.65	0	9

No Casing and Screen Used

Open Hole ☐ Yes ☐ No

Static Water Level Test

Metres

Screen

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Concrete ☒ Plastic

Outside Diameter *(Centimetres)*: 6.4
Slot No.: 10

Water Details

Water found at Depth Metres ☐ Gas — Kind of Water ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Water found at Depth Metres ☐ Gas — Kind of Water ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Water found at Depth Metres ☐ Gas — Kind of Water ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Disinfected ☐ Yes ☐ No If no, provide reason:
Date Master Well Completed *(yyyy/mm/dd)*: 2009/07/13

Annular Space/Abandonment Sealing Record

Depth Set at *(Metres)* From	To	Type of Sealant Used *(Material and Type)*	Volume Used *(Cubic Metres)*
0	0.3	concrete	
0.3	5.4	bentonite chips	
5.4	9	sand	

Cluster Information *(Please also fill out the additional Cluster Well Information for Well Construction for each parcel of land and cluster.)*

Total Wells in Cluster: 3
Total Wells on this Property: 3
Please indicate Number of Cluster Well Information Log Sheets Submitted: 1

Location of Well Cluster

Detailed Map must be provided as an attachment no larger than legal size (8.5" x 14"). Sketches are not allowed.

☐ Check box to confirm detailed map is provided as per Section 11.1 (3)

Consent to release additional information concerning the cluster to the Director upon request

Signature of Technician/Contractor:
Date *(yyyy/mm/dd)*:

Master Well Owner's/Land Owner's consent to use Cluster Form

Signature:
Date *(yyyy/mm/dd)*:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Aardvark Drilling Inc.
Well Contractor's Licence No.: 7238
Business Address (Street No./Name, number, RR): 25 Lewis Road - Unit C
Municipality: Guelph
Province: ON
Postal Code: N1H1E9
Business E-mail Address: England M
Bus.Telephone No. *(inc. area code)*: 5198269340
Name of Well Technician (Last Name/First Name): [redacted]
Well Technician's Licence No.: 3059
Signature of Technician: [redacted]
Date Submitted *(yyyy/mm/dd)*: 2009/08/11

Ministry Use Only

Audit No.: M 02368
Well Contractor No.:
Date Received *(yyyy/mm/dd)*: AUG 17 2009
Date of Inspection *(yyyy/mm/dd)*:
Remarks:

1992 (11/2006)

Ministry's Copy

09-0099-00

Ontario Ministry of the Environment

Wel' … il Well Tag No.)
A 083374

Cluster Well Information for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page 2 of 2

[redacted]
upon request

Signature of Technician/Contractor
Date *(yyyy/mm/dd)*

Property Owner's Information

First Name: Industrial Guelph Equities
Last Name:
Mailing Address (Street No./Name, RR): 55 Kelfield Street
Municipality: Toronto
Province: ON
Postal Code: M9W5A3
E-mail Address:
Telephone No. (inc. area code): 4166180715

Cluster Well Information

Address of Well Location (Street Number/Name, RR): Maltby Road
Lot: 14+15
Concession: 7
Township: Guelph
County/District/Municipality: Wellington
City/Town/Village: Guelph
Province: Ontario
Postal Code:
GPS Unit Make: Garmin
Model:
Unit Mode of Operation ☐ Undifferentiated ☐ Averaged
☐ Differentiated, specify:

Well # on Sketch	UTM Coordinates Zone	Easting	Northing	Full Depth of Hole (metres)	Hole Diameter (cm)	Method of Construction	Casing Material	Casing Length (metres)	Screen Interval (metres) From	To	Annular Space Sealant Used	Static Water Level (metres)	Abandonment Sealant Used	Comments	Date of Completion *(yyyy/mm/dd)*
1	17	565879	4814180	9	21	auger	plastic	6	6	9	sand, bentonite			master well	2009/07/13
2	17	565967	4814452	9	21	auger	plastic	6	6	9	sand, bentonite				2009/07/13
3	17	565585	4814692	7.6	21	auger	plastic	4.5	4.5	7.6	sand, bentonite				2009/07/1

Well Contractor and Well Technician Information

Business Name of Well Contractor: Aardvark Drilling Inc.
Business Address (Street Number/Name, RR): 25 Lewis Road - Unit C
Municipality: Guelph
Province: ON
Postal Code: N1H1E9
Business Telephone No. *(inc. area code)*: 5198269340
Well Contractor's Licence No.: 7238
Business E-mail Address: [redacted]
Name of Well Technician (First Name, Last Name):
Well Technician's Licence No.:
Date Submitted *(yyyy/mm/dd)*
Signature of Technician

Date 1st Well in Cluster Constructed *(yyyy/mm/dd)*: 2009/07/13
Date Last Well in Cluster Constructed *(yyyy/mm/dd)*: 2009/07/13

Ministry Use Only

Date Received *(yyyy/mm/dd)*: AUG 17 2009
Date Inspected *(yyyy/mm/dd)*:
Audit No.: c05321
Remarks: M02368

1991 (11/2006)

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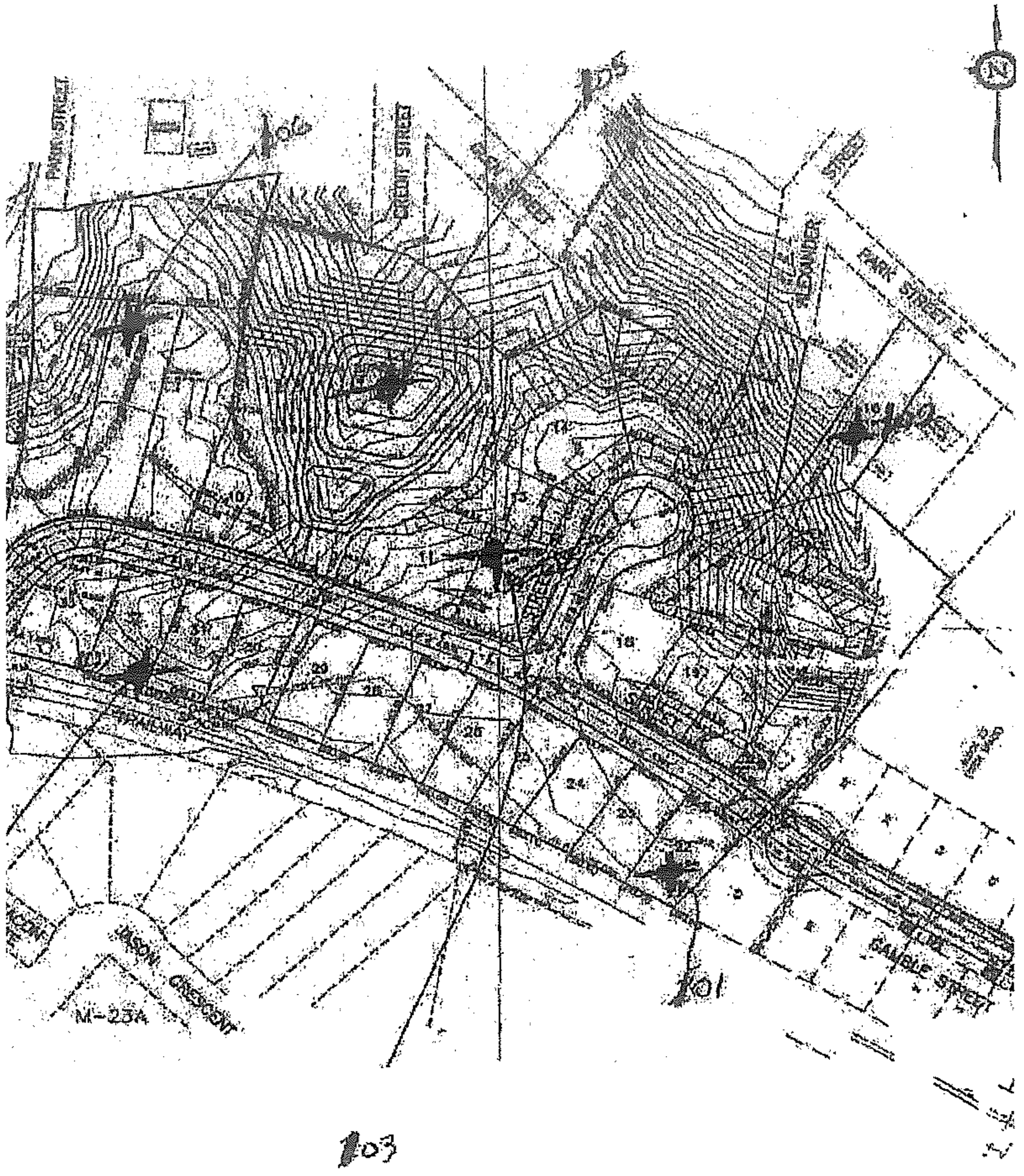


C-7238
M02360
C01555

AUG 17 2009

Southgate Business Park Phase 2 – Additional Monitoring Well Locations

13 July 2009

AUG 17 2009

C-7238
M02368
C08321

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

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

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

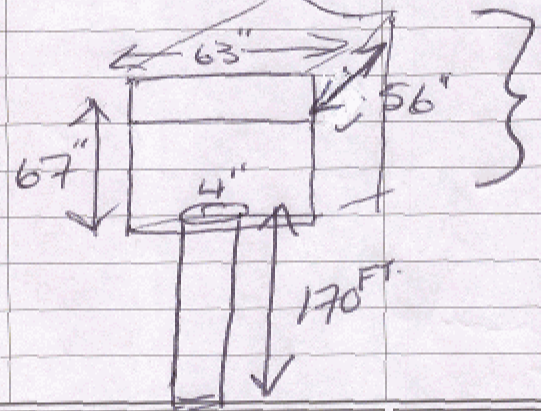
First Name / Last Name / Organization: Industrial Equities Guelph Ltd Partnership.
E-mail Address:
☐ Well Constructed by Well Owner
Mailing Address (Street Number/Name): 55 Kelfield St
Municipality: Etobicoke
Province: Ont
Postal Code: M9W5A3
Telephone No. *(inc. area code)*:

Well Location

Address of Well Location (Street Number/Name): 384 Crawley Rd
Township: Puslinch.
Lot: 14.
Concession: 7
County/District/Municipality: Wellington
City/Town/Village: Guelph
Province: Ontario
Postal Code: N1L1G5
UTM Coordinates: NAD 8 3 Zone 17 Easting 565268 Northing 4814239
Municipal Plan and Sublot Number:
Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (*m/ft*) From	To
Well Abandonment			Concrete Vault Excavated & Disposed		



Annular Space

Depth Set at (*m/ft*) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (*m³/ft³*)
-67	170FT	Bentonite Grout	750 lb.
0	-67	Fill	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* ____
If pumping discontinued, give reason:
Pump intake set at (*m/ft*)
Pumping rate (*l/min / GPM*)
Duration of pumping ____ hrs + ____ min
Final water level end of pumping (*m/ft*)
If flowing give rate (*l/min / GPM*)
Recommended pump depth (*m/ft*)
Recommended pump rate (*l/min / GPM*)
Well production (*l/min / GPM*)
Disinfected? ☑ Yes ☐ No

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

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (*cm/in*)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (*cm/in*)	Depth (*m/ft*) From	To

Construction Record - Screen

Outside Diameter (*cm/in*)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (*m/ft*) From	To

Status of Well

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

Water Details

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

Hole Diameter

Depth (*m/ft*) From	To	Diameter (*cm/in*)

Map of Well Location

Please provide a map below following instructions on the back.

Well Contractor and Well Technician Information

Business Name of Well Contractor: Hannon Well Drilling Ltd
Well Contractor's Licence No.: 2663
Business Address (Street Number/Name): RR#5 #5896 Well. Rd. #7
Municipality: Wellington
Province: Ont.
Postal Code: N1H6J2
Business E-mail Address: [redacted]
Bus.Telephone No. *(inc. area code)*: 5197638239
Name of Well Technician (Last Name, First Name): Hannon Henry
Well Technician's Licence No.: 0590
Signature of Technician and/or Contractor: [redacted]
Date Submitted: 20100701

Comments:

Well owner's information package delivered: ☐ Yes ☑ No
Date Package Delivered: Y Y Y Y M M D D
Date Work Completed: 20100615

Ministry Use Only
Audit No. Z113986
JUL 29 2010
Received

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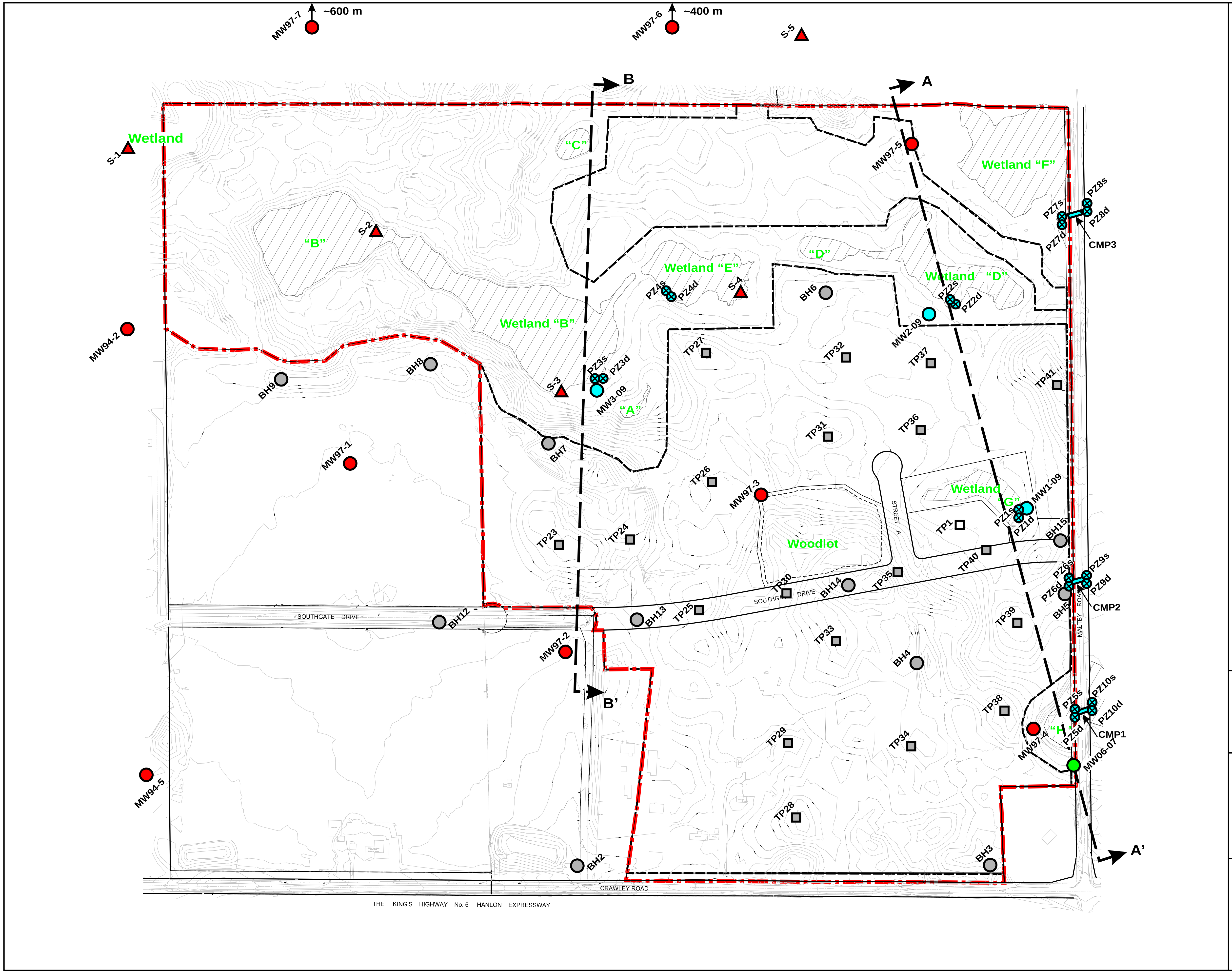
APPENDIX C:
EXCERPTS FROM PREVIOUS HYDROGEOLOGICAL STUDY
(ANDERSON 2010)



LEGEND

MW2-09 ●	Monitoring Well (Installed 2009)
PZ2s PZ2d ⊗	Drive Point Piezometer Nest s-shallow, d-deep (Installed 2009)
MW06-07 ●	Monitoring Well (Installed 2007)
BH6 ●	Monitoring Well (Installed 2006)
MW97-6 ●	Monitoring Well (Installed 1997 &1994)
S-5 ▲	Surface Water Staff Gauge (Installed 1997)
TP32 ■	Test Pit (May 2006)
TP1 □	Test Pit (June 2007)
A A'	Cross-Section Location

N

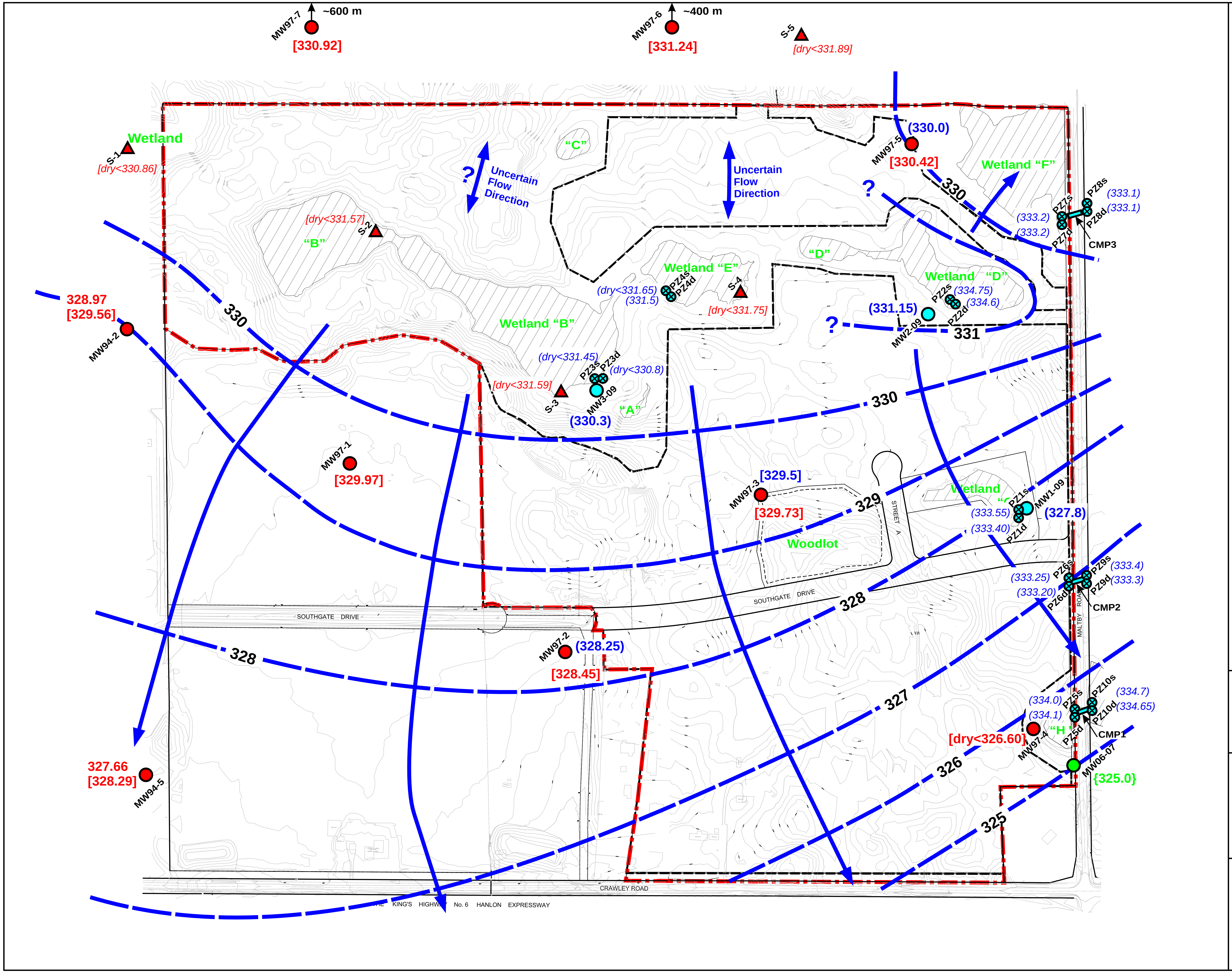
Scale 1:5,000

0 125 250 m

Figure 3
Test Locations
& Cross-Section Location

Hydrogeological Assessment
for EIR, Southgate Business Park
Guelph, Ontario
Project No. 267

Anderson GeoLogic Limited



LEGEND

327.66	November 30, 1994 Water Table Elevation - mASL
[328.29]*	November 27, 1997 Water Table Elevation (mASL)
{325.2}	December 15, 2007 Water Table Elevation (mASL)
(331.15)	March 8, 2010 Water Table Elevation (mASL)
*	Note: Nov 1997 Elevations Not Strictly Used in Contour Interpretation (0.2 to 0.6 m higher than other "lows")
[dry<331.89]	November 27, 1997 Surface Water Elevation (mASL)
(334.75) (334.6)	March 8, 2010 0.5-m &1.0-m Piezometer (s&d) Water Elevation (mASL)
205	Interpreted "Low" Water Table Contour (mASL)
→	Interpreted Groundwater Flow Direction

N

Scale 1:5,000

0 125 250 m

Figure 4
Interpreted 'Low' Water Table Configuration

Hydrogeological Assessment
for EIR, Southgate Business Park
Guelph, Ontario
Project No. 267

Anderson GeoLogic Limited

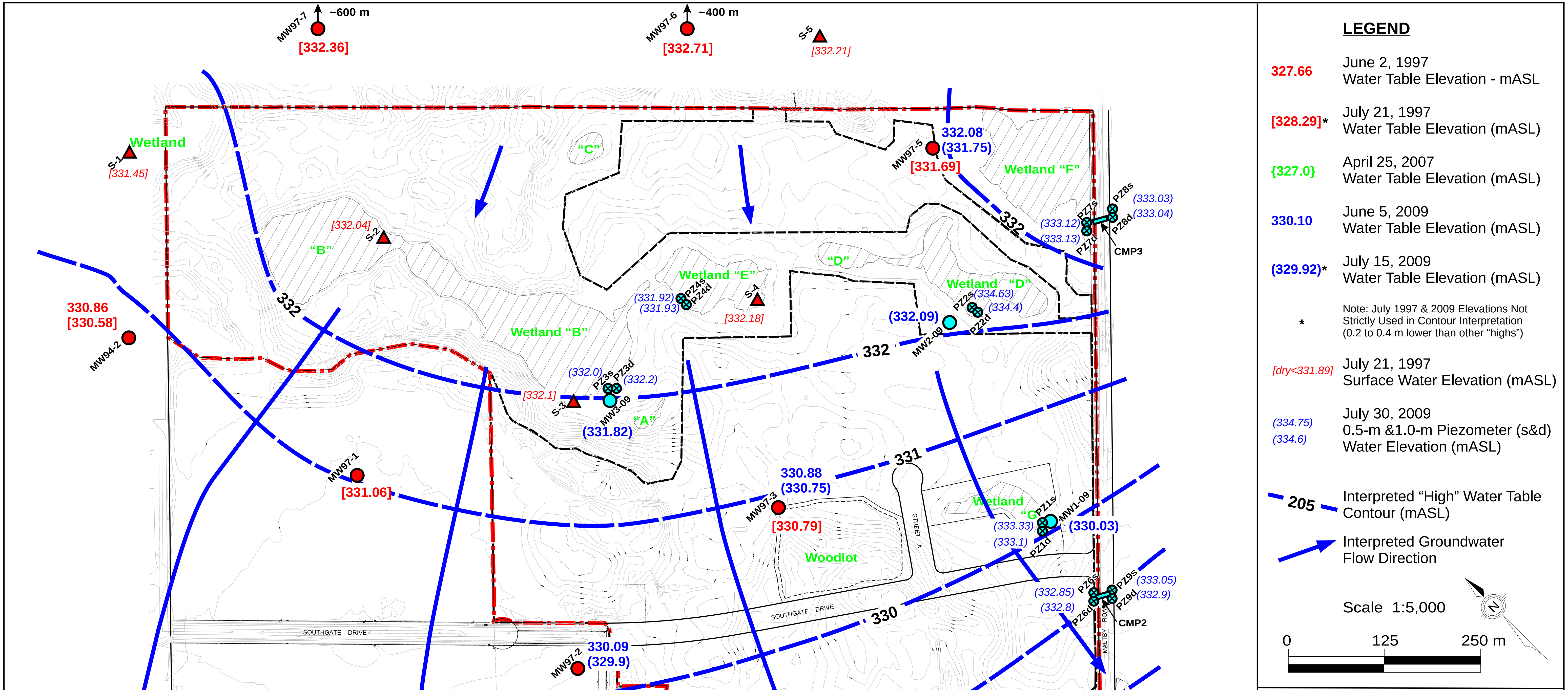
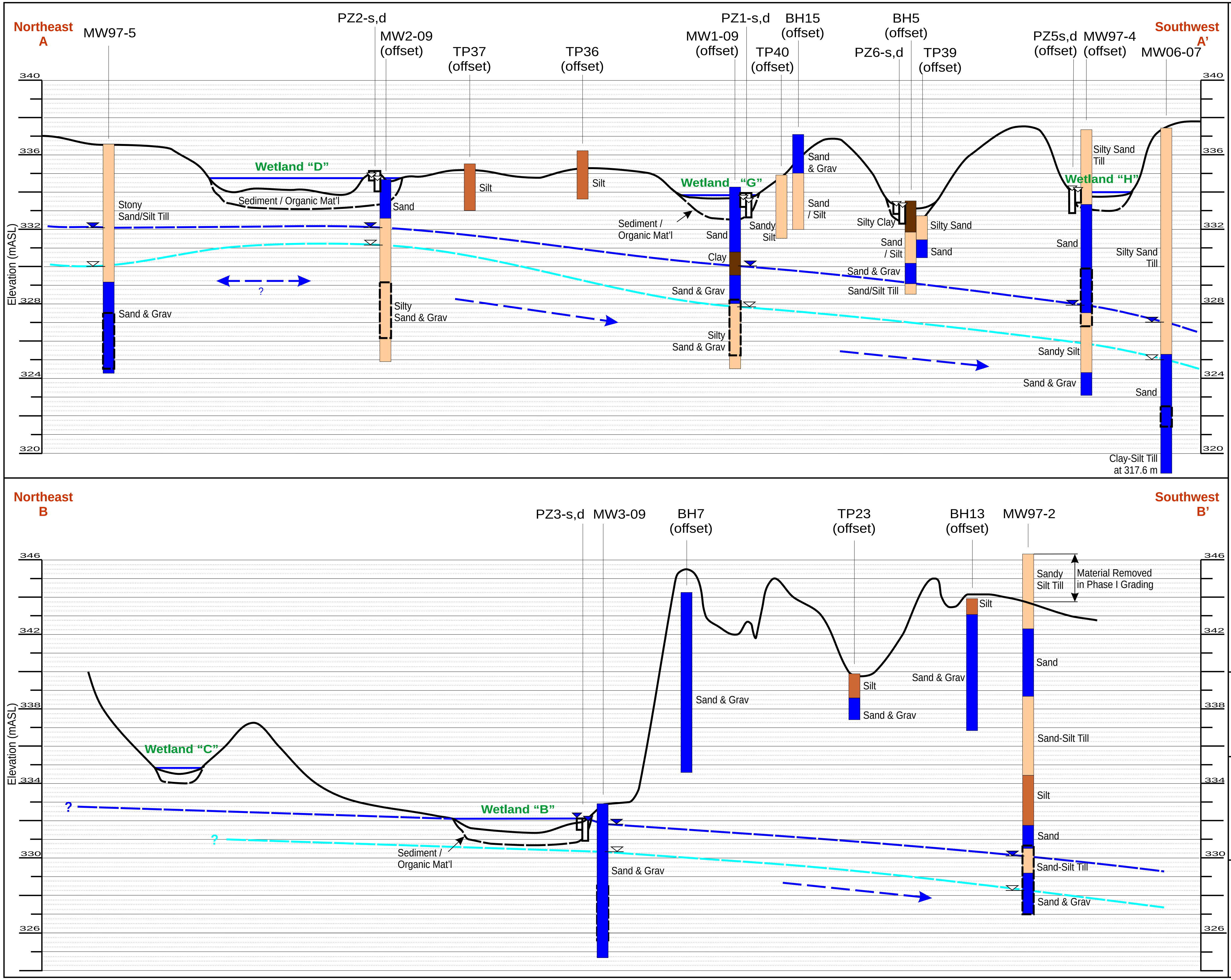


Figure 5
Interpreted 'High' Water Table Configuration

Hydrogeological Assessment
for EIR, Southgate Business Park
Guelph, Ontario
Project No. 267

Anderson GeoLogic Limited



LEGEND

BH9	Borehole
PZ2-s,d	Piezometer
TP27	Test Pit
🟦	Sand / Sand & Gravel
🟧	Silty Sand / Sand-Silt Till
🟫	Silt
■	Silt-Clay Till
▯	Well Screen
—	Highest Surface Water Level
⊥	Piezometer Water Level (Highest 2009/10 Water Level)
▼	Main Water Table Level - High - Low
→	Groundwater Flow

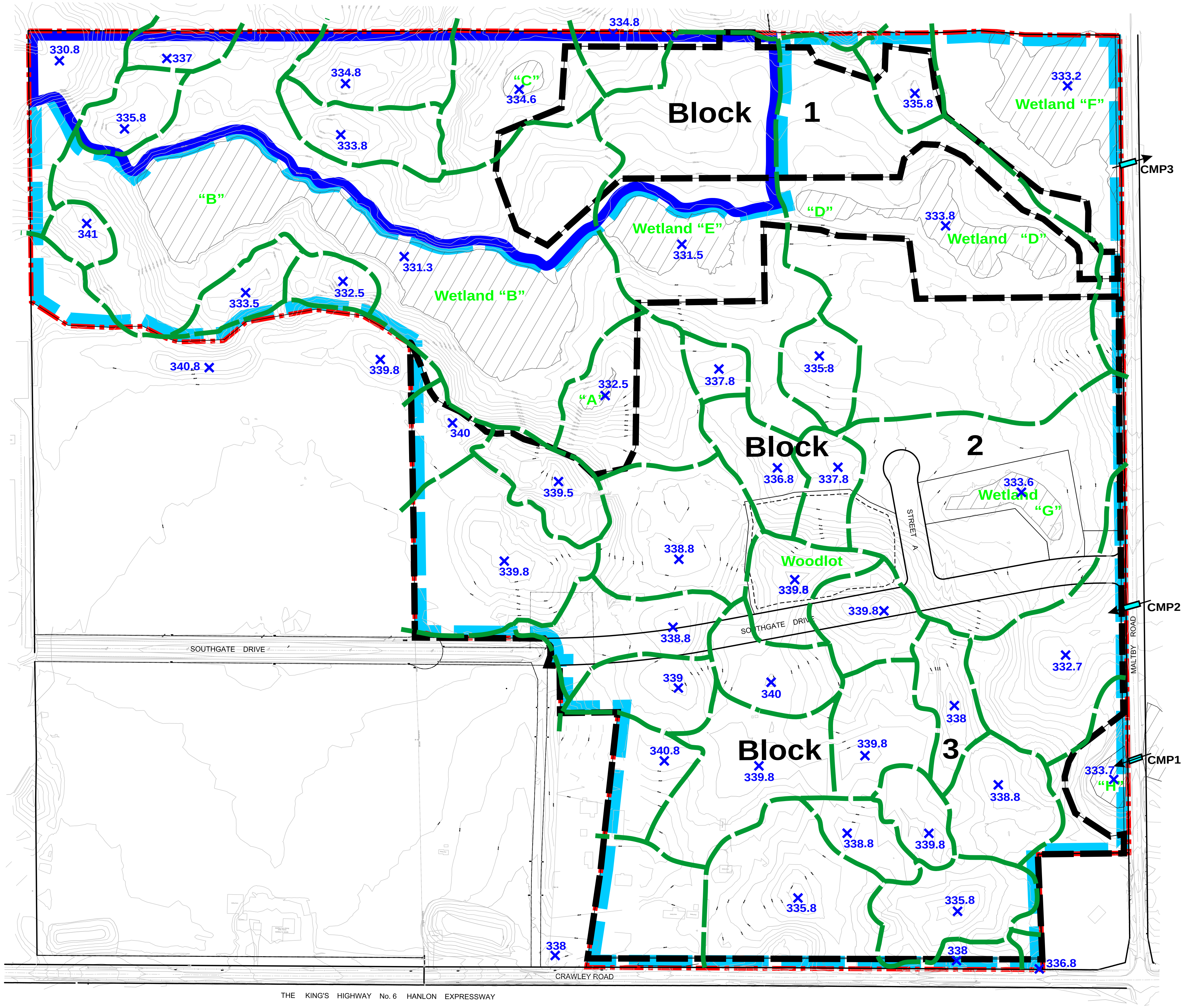
Approximate Horizontal Scale 1:3000
Approximate Vertical Scale 1:200

Approximate Vertical Exaggeration 1:15

Figure 6
Hydrogeologic Cross-Sections

Hydrogeological Assessment
for EIR, Southgate Business Park
Guelph, Ontario
Project No. 267

Anderson GeoLogic Limited



LEGEND

- Existing Culvert (CMP) & Inferred Flow Direction (CMP3)
- Development Blocks
- Pre-Development Surface Water Catchment Area
- × 333.2 Recharge Focus Point & Approximate Elevation (mASL)
- Area with a Recharge Function to the Regional Water Table only
- Area with a Recharge Function to both a Local Wetland and the Regional Water Table

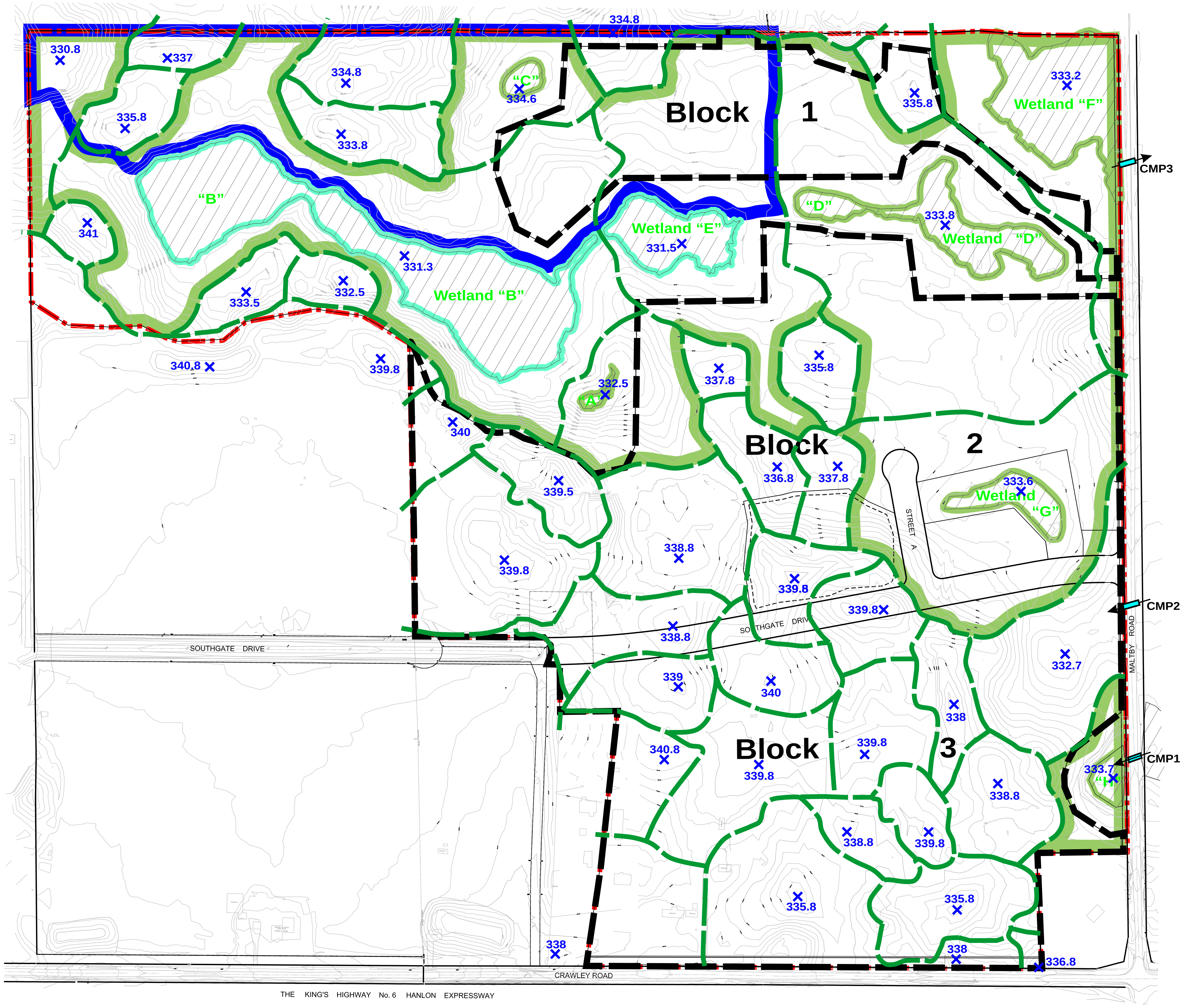
Scale 1:5,000

0 125 250 m

Figure 7
Pre-Development Recharge Functions

Hydrogeological Assessment
for EIR, Southgate Business Park
Guelph, Ontario
Project No. 267

Anderson GeoLogic Limited



LEGEND

CMP3 Existing Culvert (CMP) & Inferred Flow Direction

Development Blocks

Pre-Development Surface Water Catchment Area

333.2 Recharge Focus Point & Approximate Elevation (mASL)

Catchment Areas Providing Surface Water Runoff to Individual Local Wetlands

Area with a Recharge Function to both a Local Wetland and the Regional Water Table

Wetland is Sustained by Runoff in Local Catchment and Precipitation Falling on Wetland

Wetland is Sustained by Runoff in Local Catchment, Precipitation Falling on Wetland, & Recharge Upgradient from Wetland

Scale 1:5,000

0 125 250 m

Figure 8
Pre-Development
Wetland Sustainability

Hydrogeological Assessment
for EIR, Southgate Business Park
Guelph, Ontario
Project No. 267

Anderson GeoLogic Limited

Borehole and Monitor Installation Log

Banks Groundwater Engineering Limited

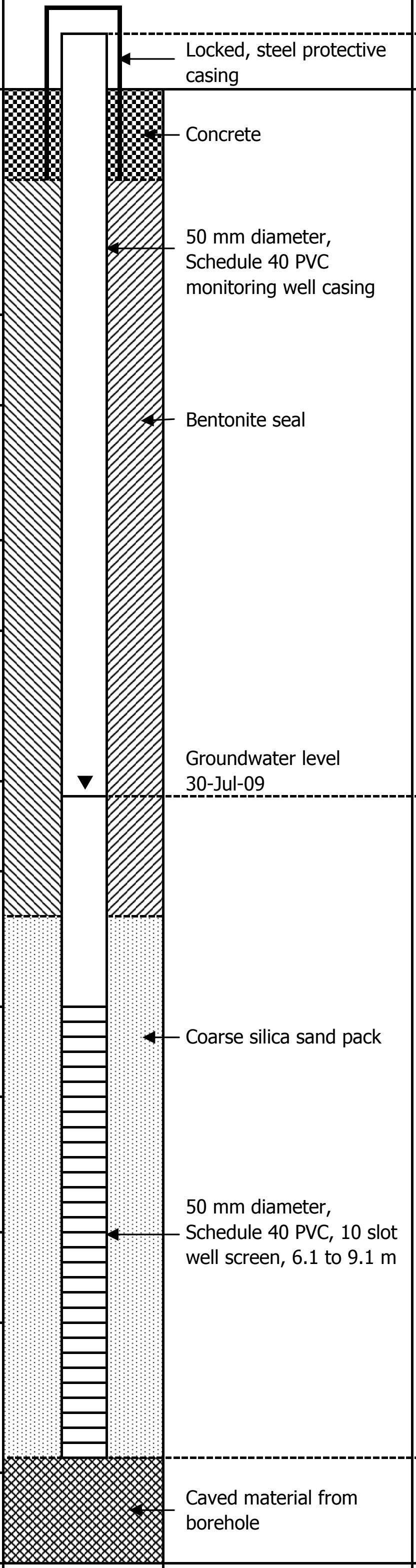
Southgate Business Park, Phase 2
Maltby Road and Crawley Road
Guelph, Ontario

Date Completed: 13-Jul-09
Drilling Method: H.S.A.
Oversight By: WDB

Monitor Number: MW1-09

Depth (m bgl)	Stratigraphic Description	Sampling		Elevation (m amsl)
0		Number	Type	335.23 334.24
	Topsoil			
1	Sand and gravel, with silt and minor clay, tan with some grey, moist			
2		1	SS	
3	Sand and gravel, with stones, silt and minor clay, grey, saturated	2	SS	
4	Clay with minor stones, yellowish changing to buff, saturated			329.54
5		3	SS	
6	Sand and gravel, with some stones, buff, saturated			
7	Silty fine sand, with gravel and stones, saturated	4	SS	
8		5	SS	
9				325.10
		6	SS	
10	Borehole terminated at 9.75 m			

Monitor Installation Details



Borehole and Monitor Installation Log

Banks Groundwater Engineering Limited

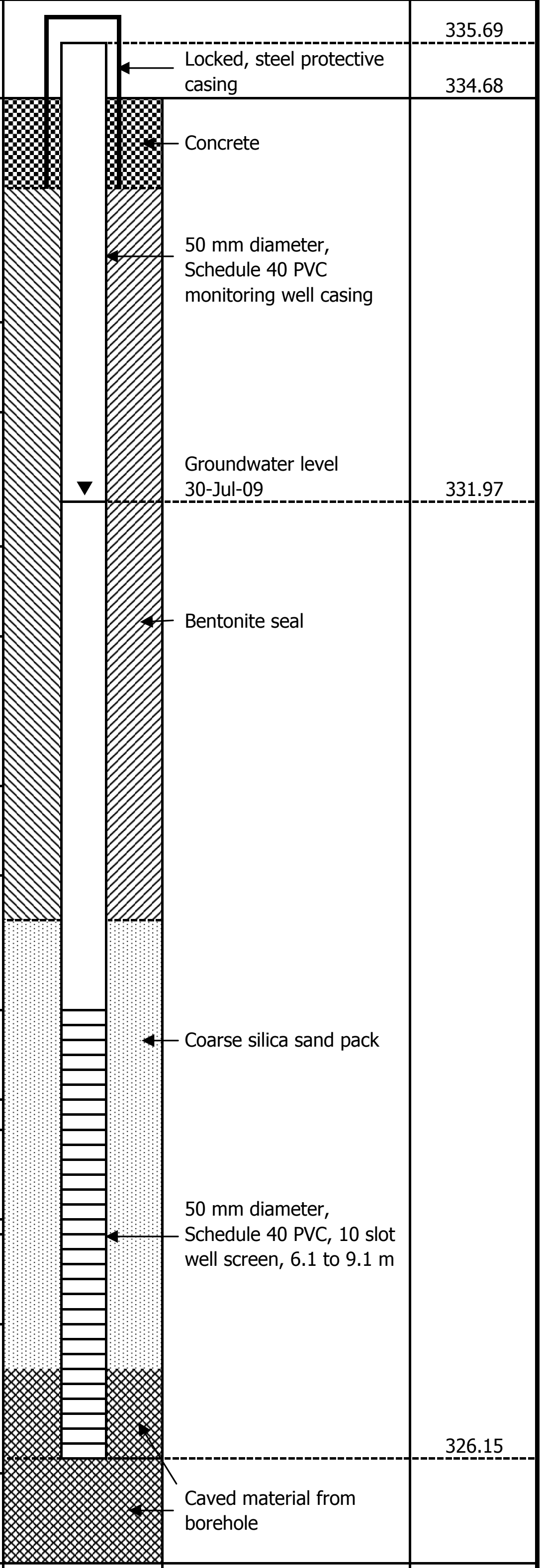
Southgate Business Park, Phase 2
Maltby Road and Crawley Road
Guelph, Ontario

Date Completed: 13-Jul-09
Drilling Method: H.S.A.
Oversight By: WDB

Monitor Number: MW2-09

Depth (m bgl)	Stratigraphic Description	Sampling Number	Sampling Type
0			
	Topsoil		
1	Fine to coarse sand, tan, moist		
2		1	SS
3	Silty sand and gravel, with stones, tan, moist		
		2	SS
4			
5	Silty sand and gravel, with stones, tan, saturated	3	SS
6			
	Stones, possible boulder	4	SS
7		5	SS
8		6	SS
9	Silty sand and gravel, with stones, tan becoming grey at about 8m, saturated		
		7	SS
10	Borehole terminated at 9.75 m		

Monitor Installation Details | **Elevation (m amsl)**



Borehole and Monitor Installation Log

Banks Groundwater Engineering Limited

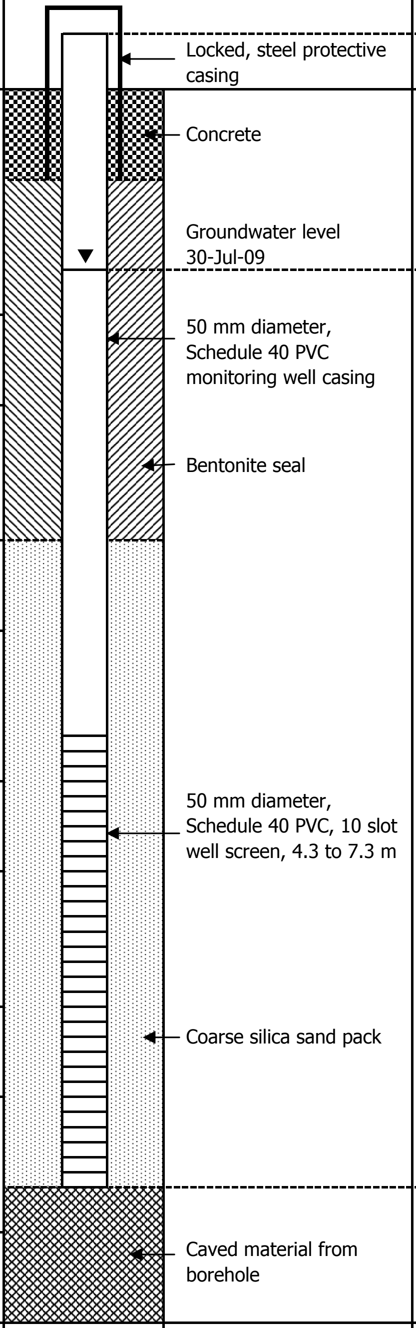
Southgate Business Park, Phase 2
Maltby Road and Crawley Road
Guelph, Ontario

Date Completed: 13-Jul-09
Drilling Method: H.S.A.
Oversight By: WDB

Monitor Number: MW3-09

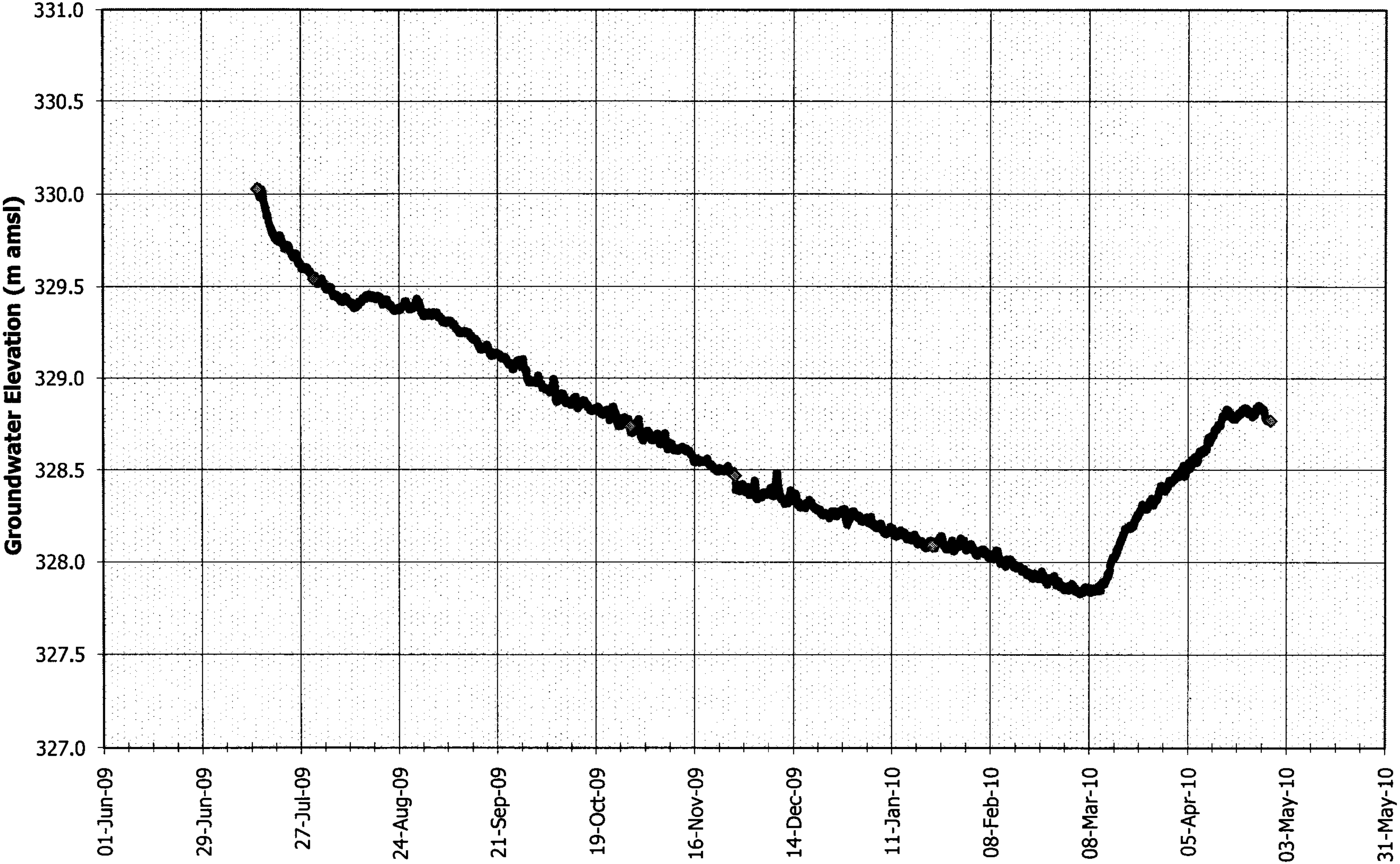
Depth (m bgl)	Stratigraphic Description	Sampling		Elevation (m amsl)
		Number	Type	
0				333.92 332.90
	Topsoil and stones			
1	Fine to coarse sand, gravel and stones yellow-tan, moist			331.73
2	Fine to coarse sand, gravel and stones yellow-tan, saturated	1	SS	
3	Medium to coarse sand, with gravel and stones, grey, saturated			
		2	SS	
4				
5		3	SS	
6				
		4	SS	
7				325.58
8		5	SS	
9	Borehole terminated at 8.23 m			
10				

Monitor Installation Details



MW1-09

Ground Elevation: 334.24 m amsl



Banks Groundwater Engineering Limited

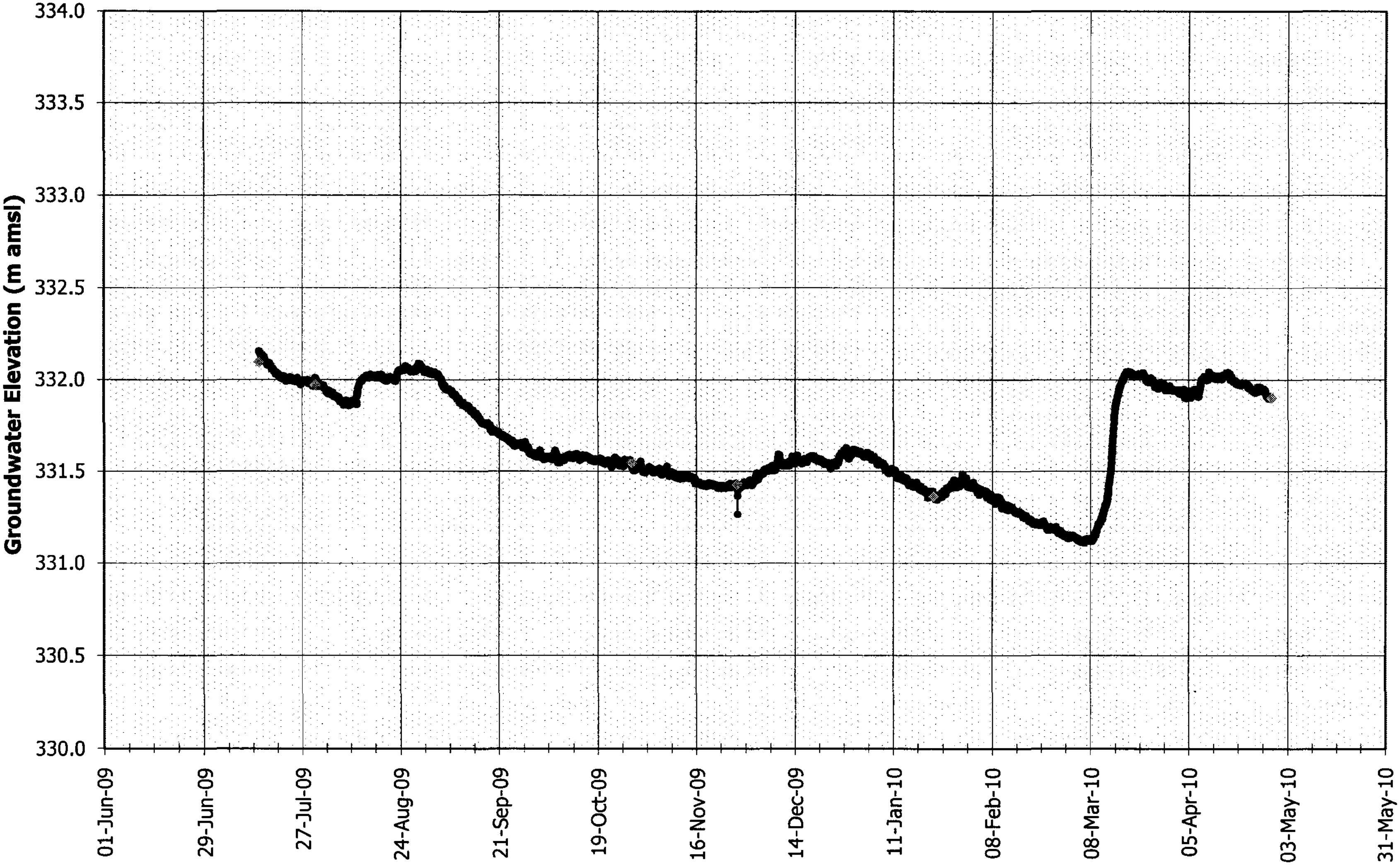
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 1

MW2-09

Ground Elevation: 334.68 m amsl



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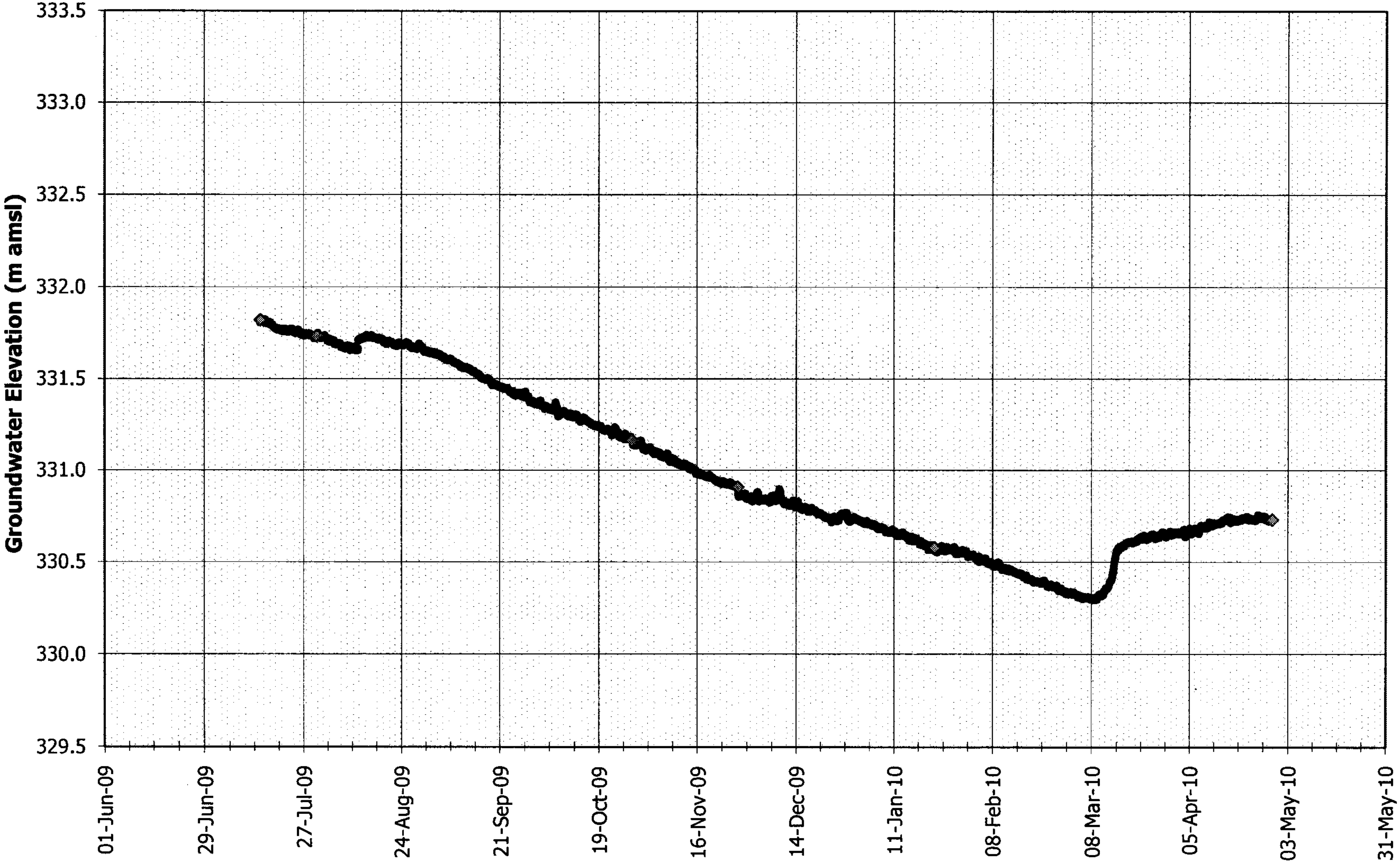
Southgate Business Park - Groundwater Monitoring Program

April 2010 **Graph 2**

MW3-09

Ground Elevation: 332.90 m amsl



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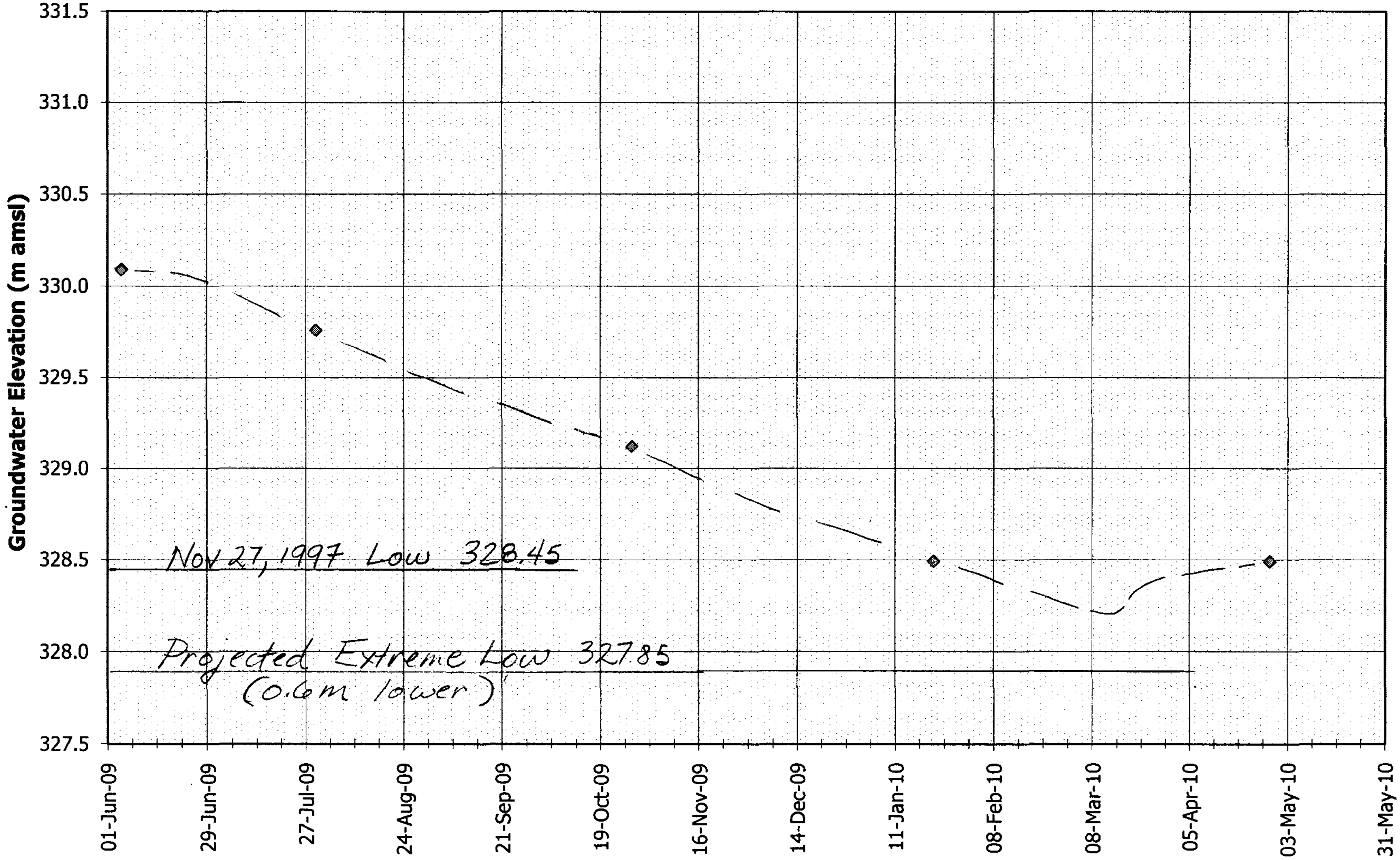
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 3

MW97-2

Ground Elevation: 343.40 m amsl



Nov 27, 1997 Low 328.45

Projected Extreme Low 327.85
(0.6m lower)

Banks Groundwater Engineering Limited

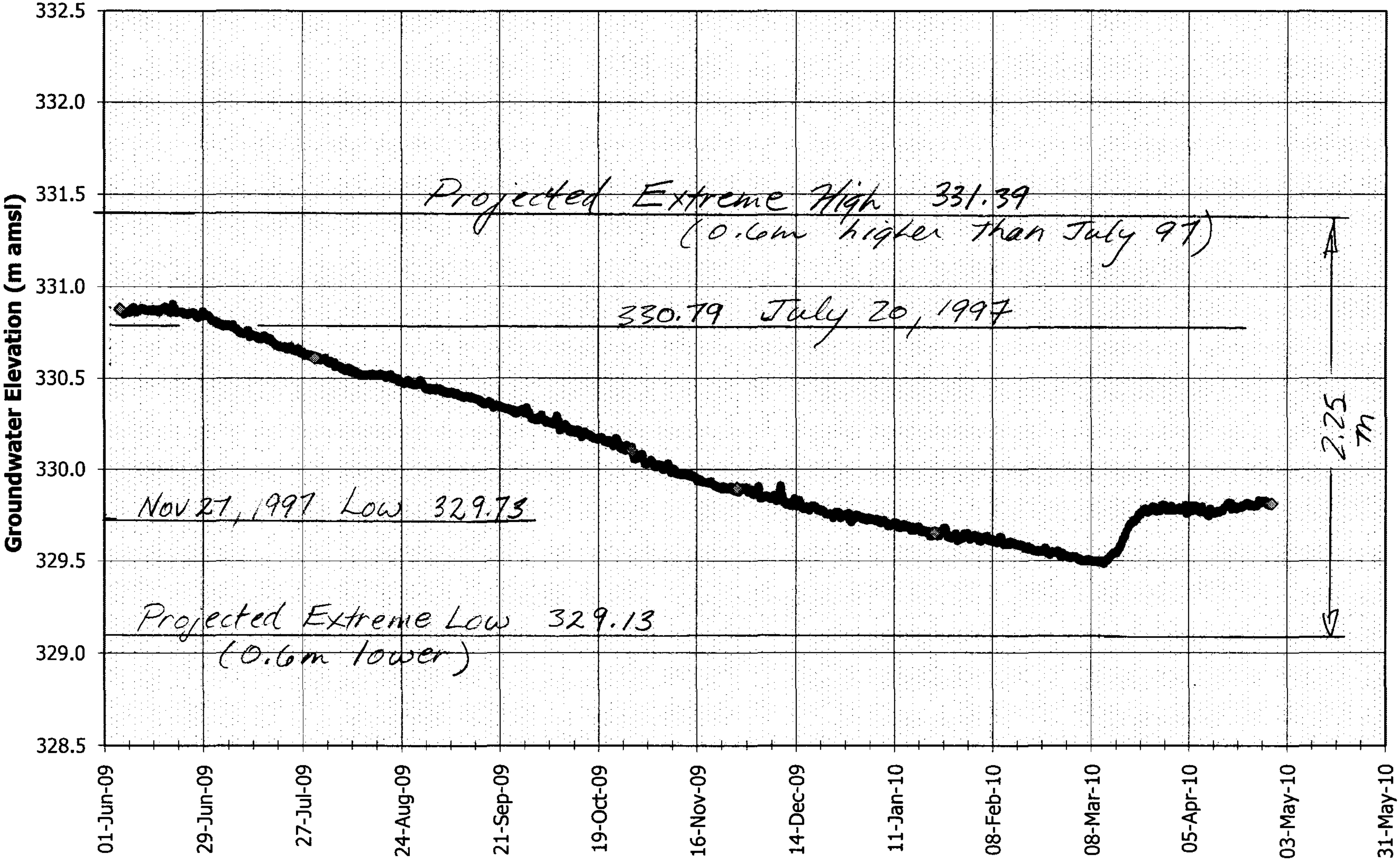
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 4

MW97-3

Ground Elevation: 340.17 m amsl



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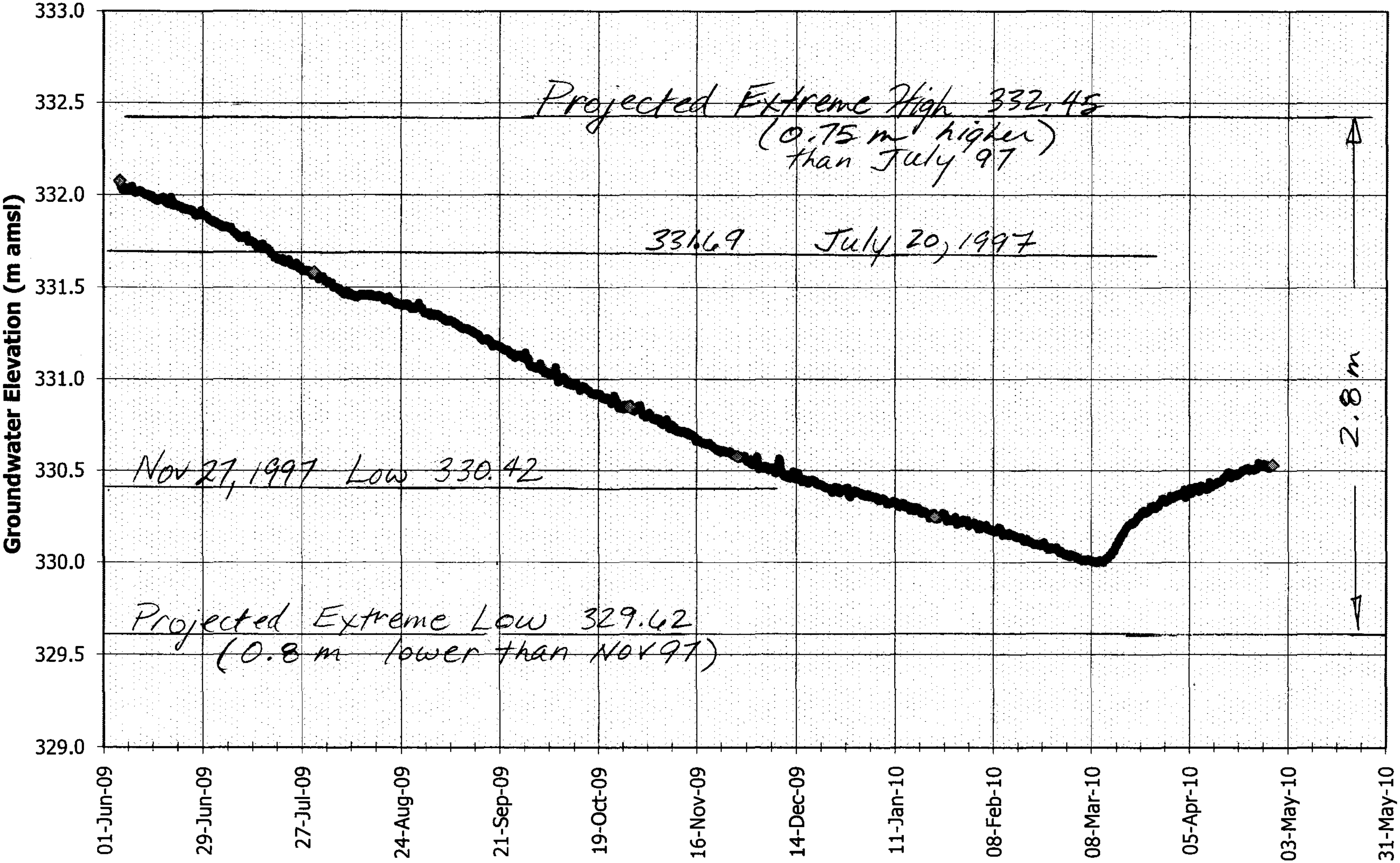
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 5

MW97-5

Ground Elevation: 336.36 m amsl



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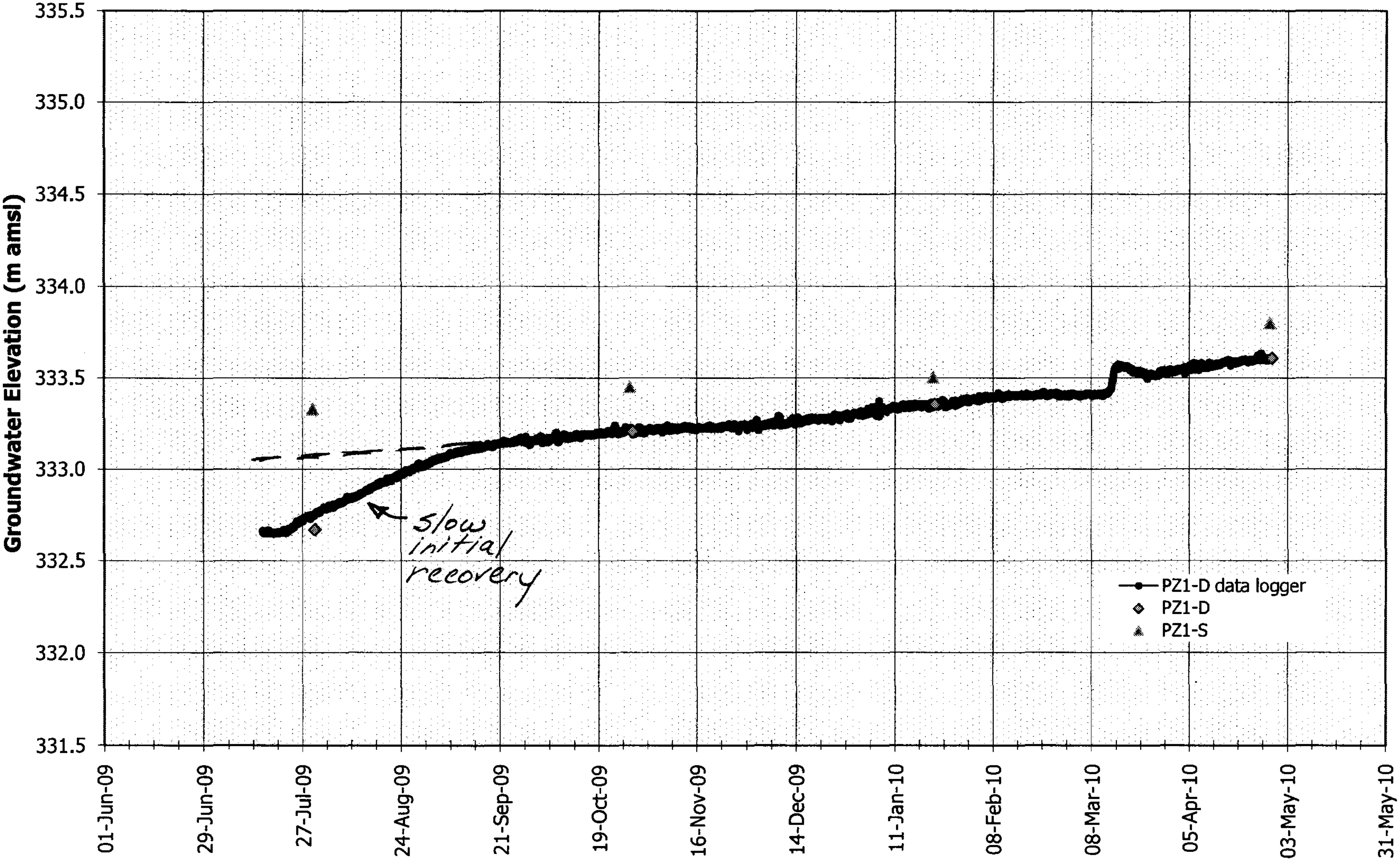
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 6

PZ1-09
Ground Elevation: 333.67 m amsl



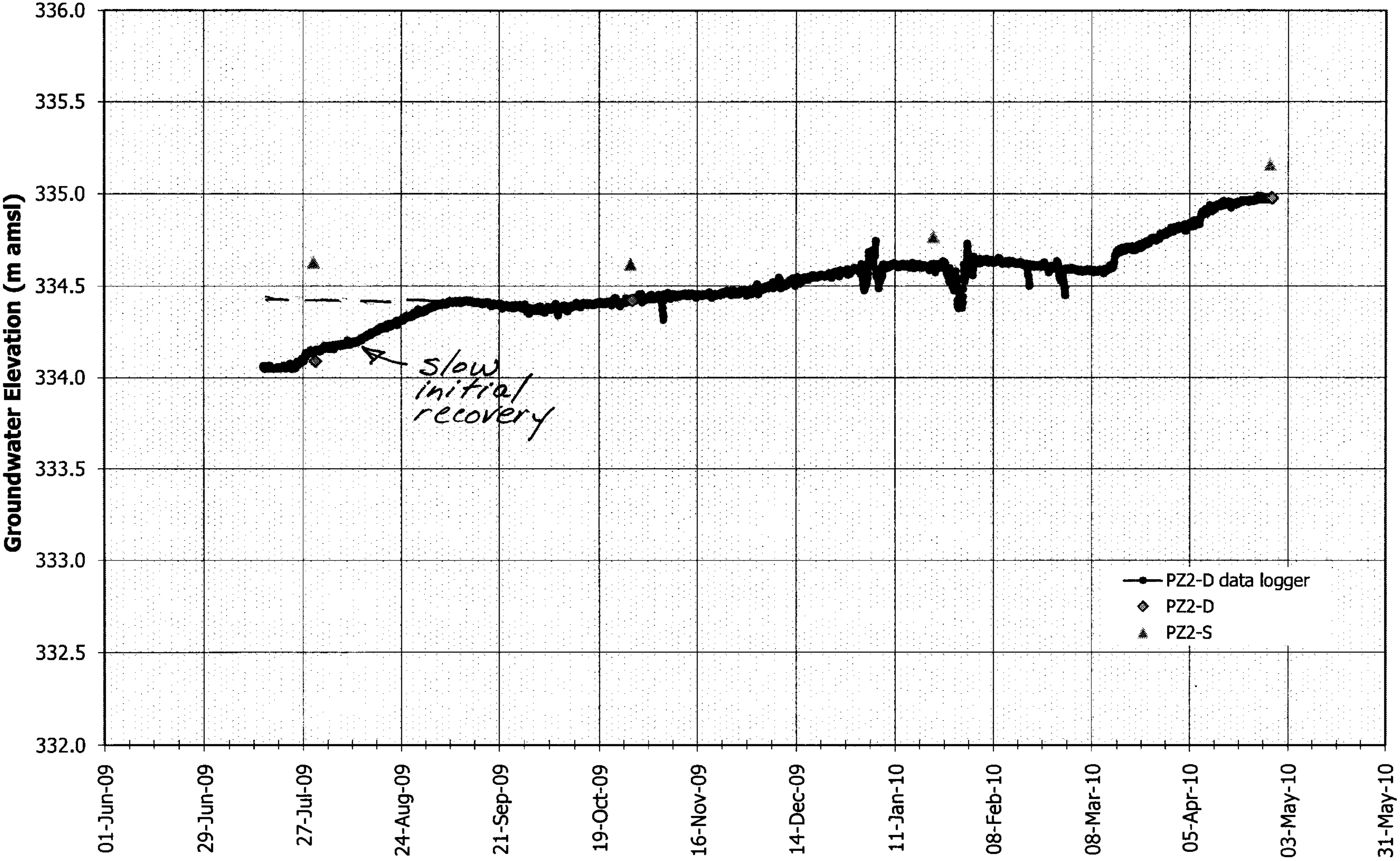
Banks Groundwater Engineering Limited

Southgate Business Park - Groundwater Monitoring Program

April 2010 **Graph 7**

PZ2-09

Ground Elevation: 335.15 m amsl



slow initial recovery

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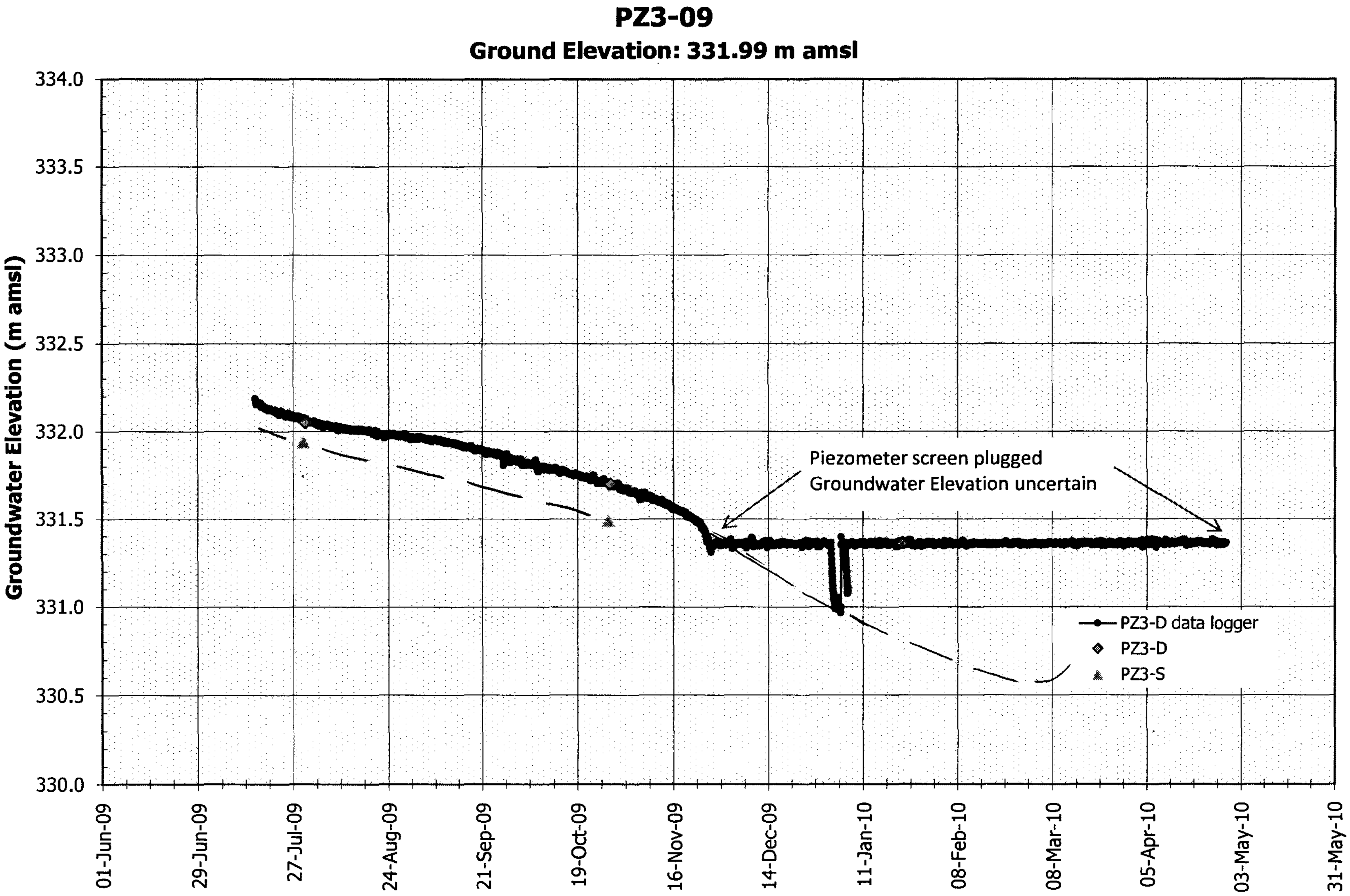
Southgate Business Park - Groundwater Monitoring Program

April 2010 **Graph 8**



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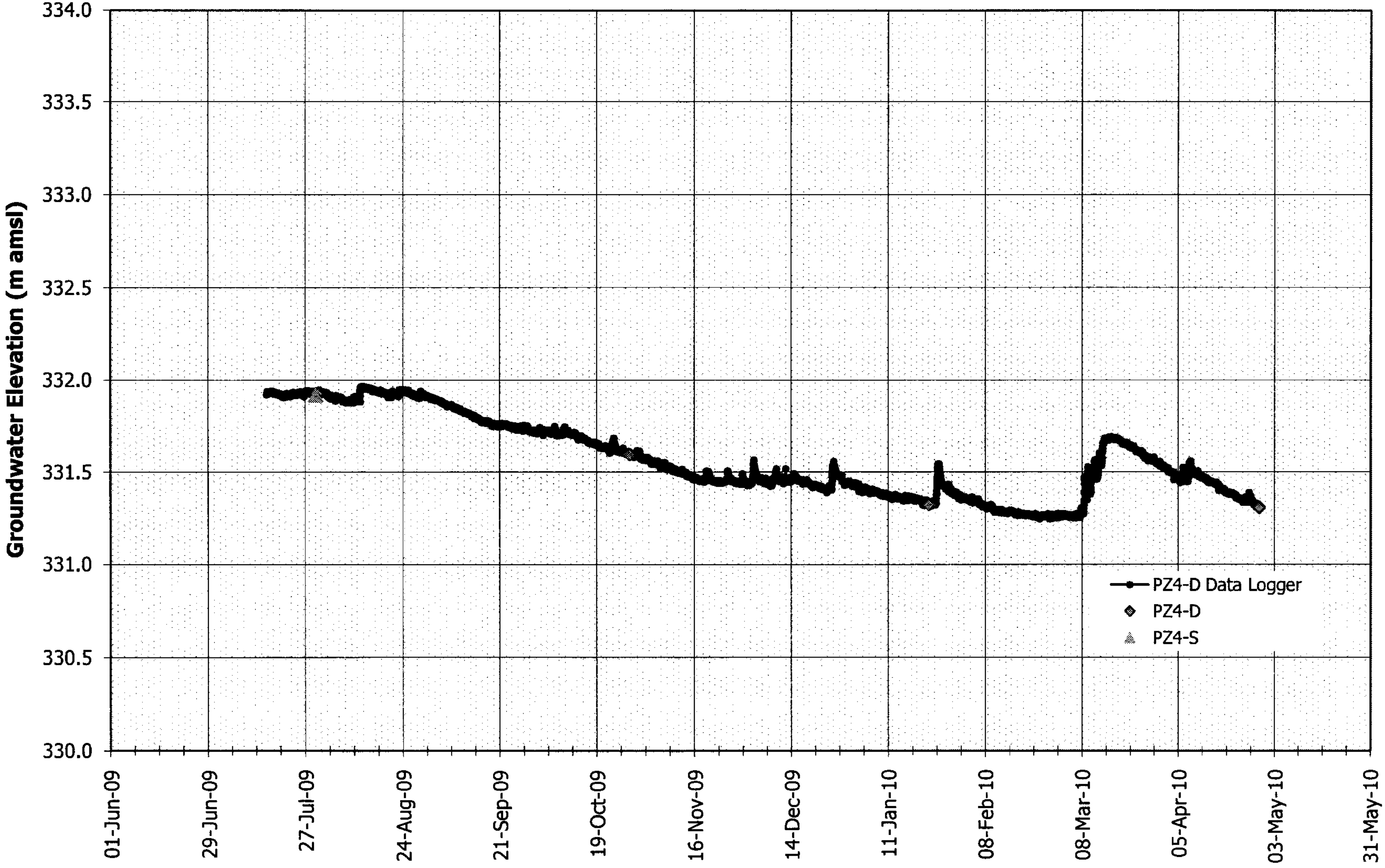
Southgate Business Park - Groundwater Monitoring Program

April 2010 **Graph 9**

PZ4-09

Ground Elevation: 331.95 m amsl



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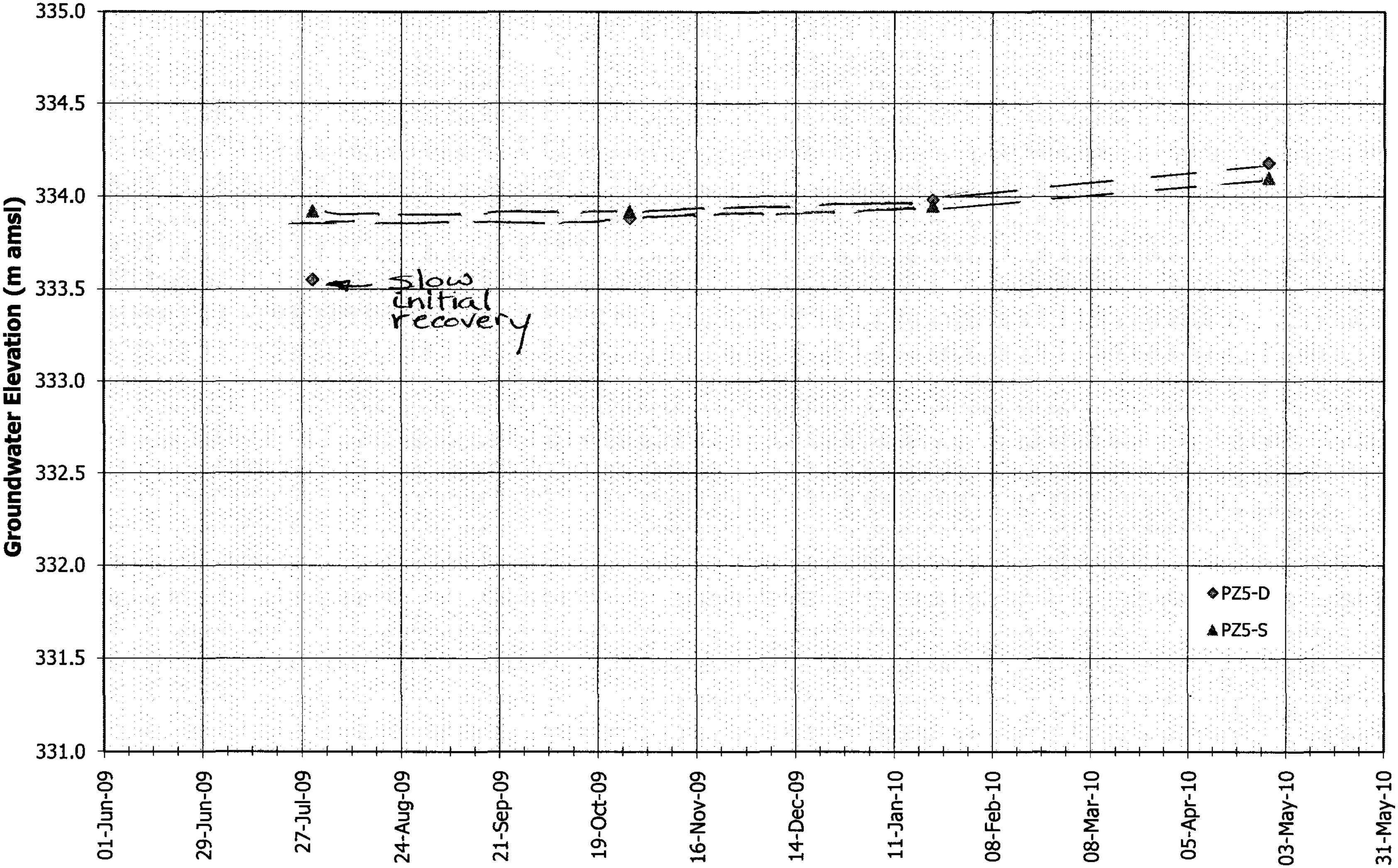
Southgate Business Park - Groundwater Monitoring Program

April 2010 **Graph 10**

PZ5-09

Ground Elevation: 333.97 m amsl



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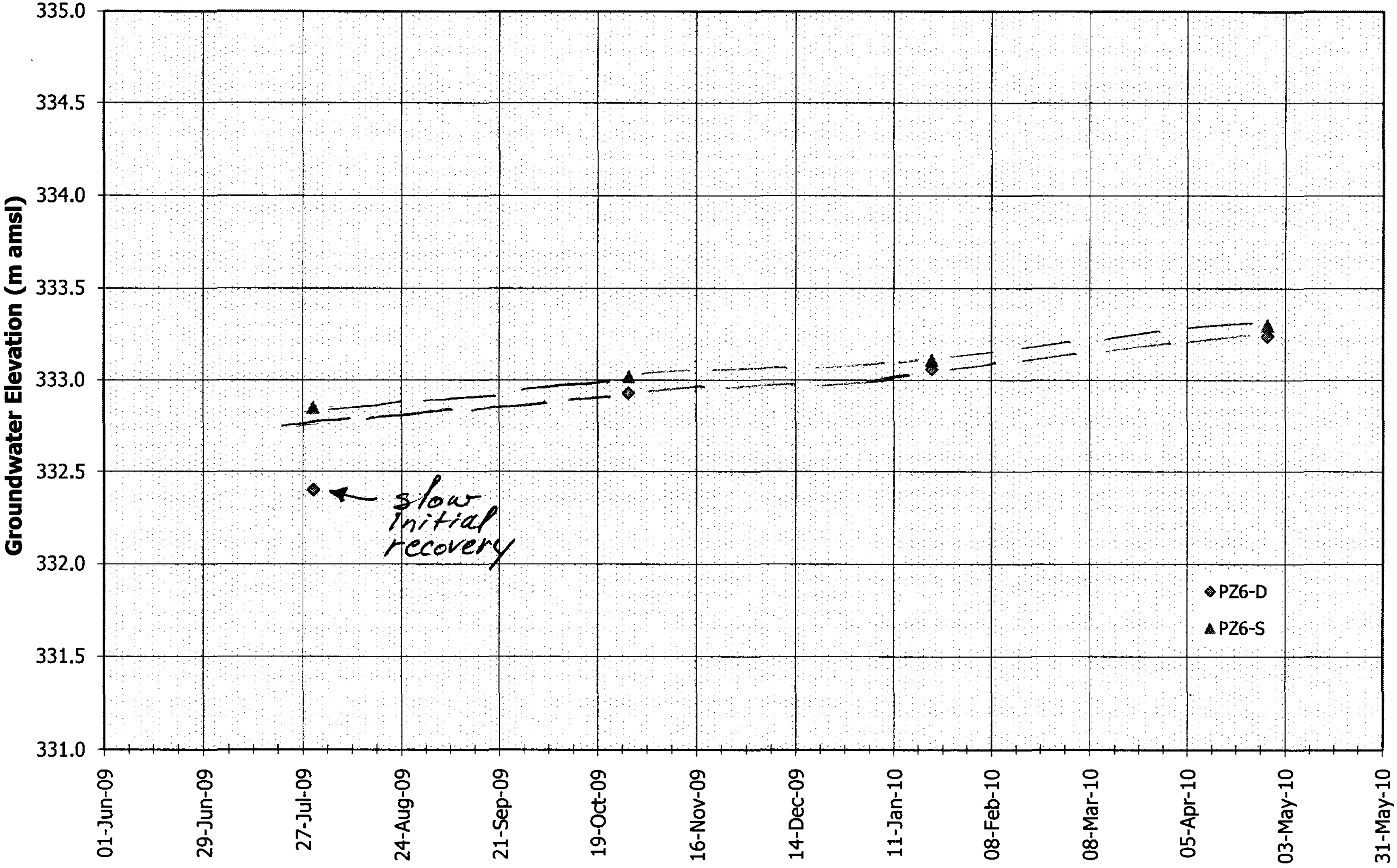
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 11

PZ6-09

Ground Elevation: 333.34 m amsl

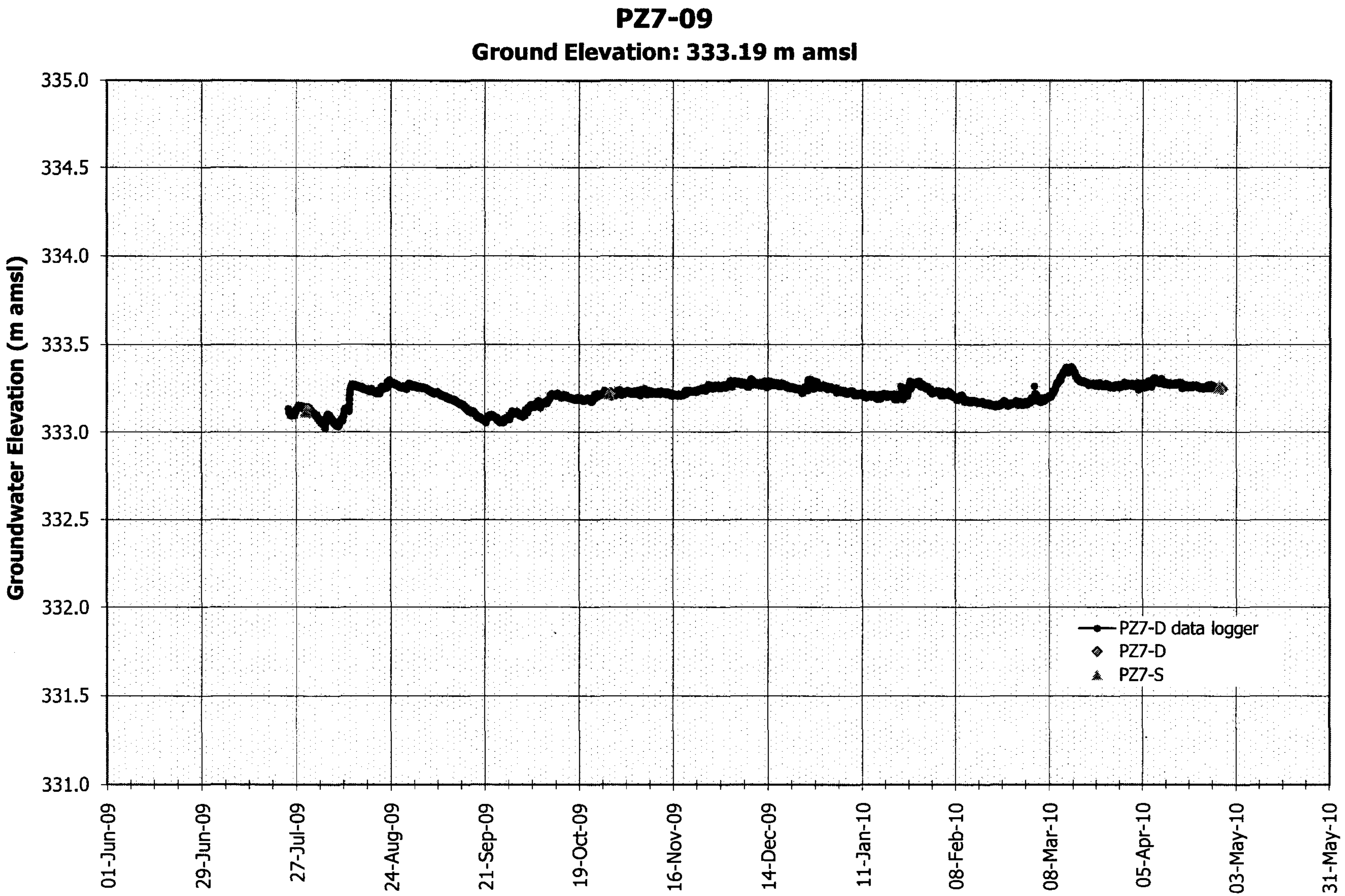


Banks Groundwater Engineering Limited

Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 12

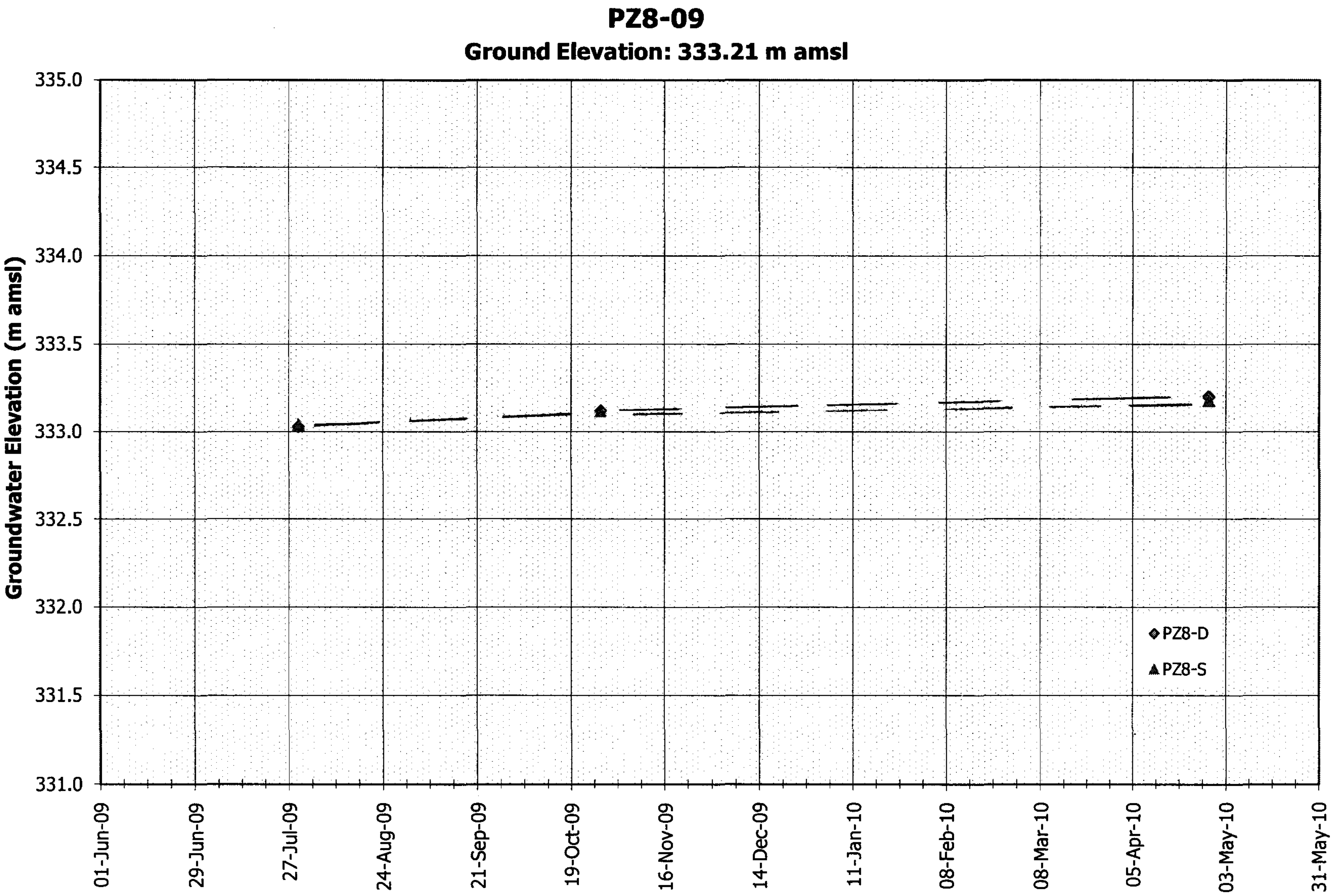


Banks Groundwater Engineering Limited

Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 13

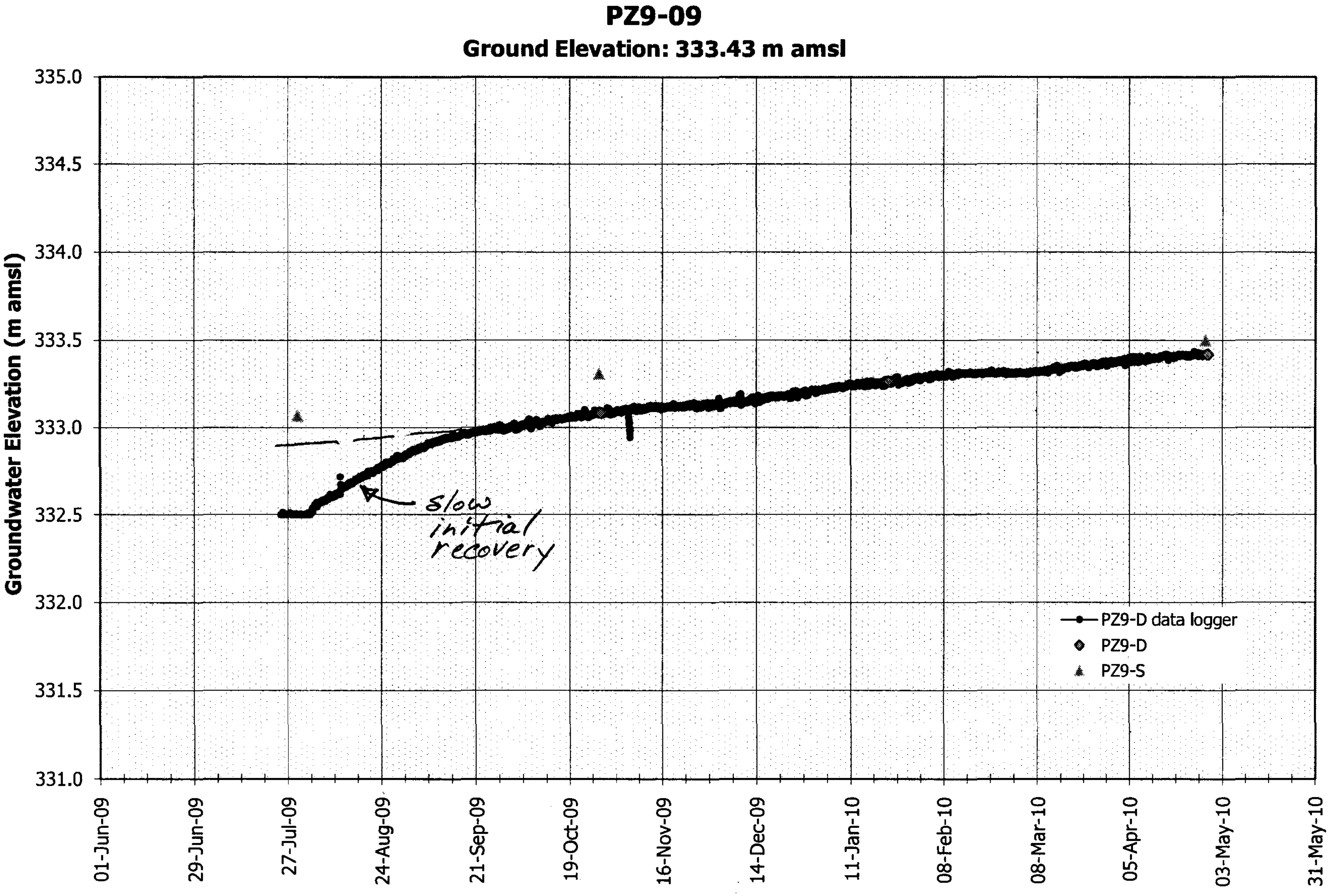


Banks Groundwater Engineering Limited

Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 14



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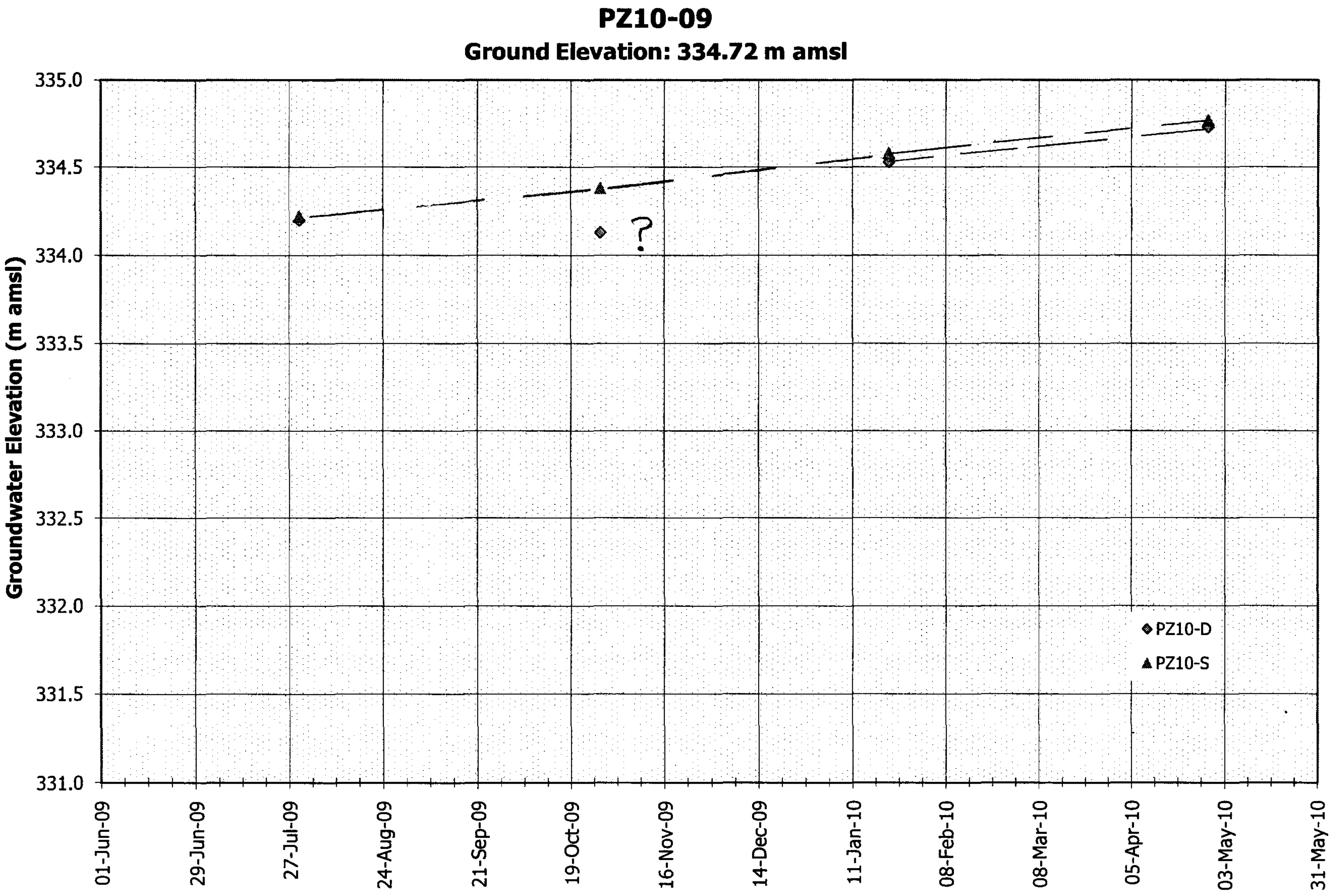
Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 15



Banks Groundwater Engineering Limited

Southgate Business Park - Groundwater Monitoring Program

April 2010

Graph 16

BOREHOLE LOG

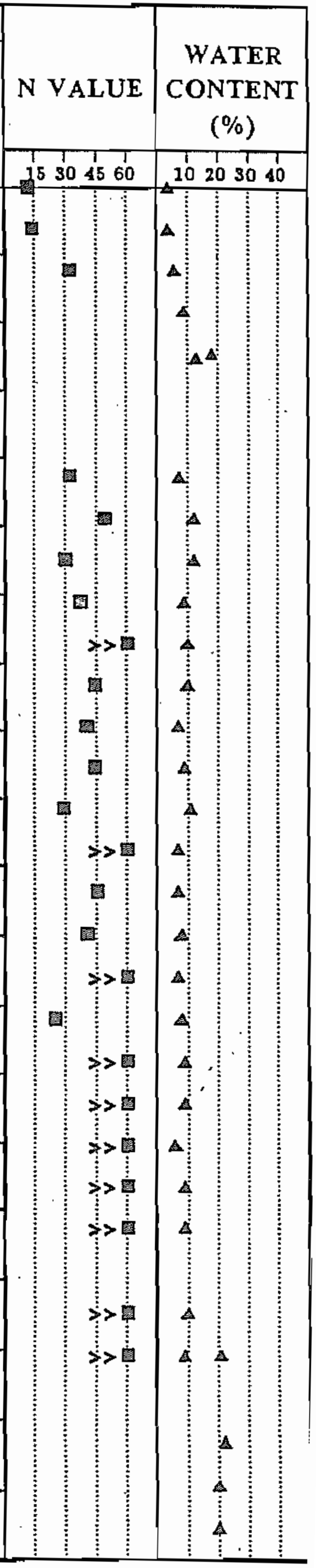
PROJECT: 93-509

BOREHOLE: 2-I 1 of 3

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 10 November 1994
GEOLOGIST PW
ELEVATION 346.2 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD
0.2	**TOPSOIL** Dark brown sandy silt, rootlets, moist.	1	SS	12	4	63	
1	**SANDY SILT TILL**	2	SS	14	4	75	
	Brown sandy silt, trace fine gravel, moist, compact to very dense.	3	SS	32	6	58	
2		4	SS	52/ 0.08m	9	100	
	-Occasional boulders and gravel from about 2.6 to 4.0 m.	5	SS	52/ 0.03m	18	100	
3		6	PQ		13	27	
4	-Becoming reddish brown with subrounded to subangular gravel below about 4.0 m.	7	PQ	32	7.3	100	
		8	SS			75	
5		9	SS	49	12	71	
6.1 6	-Reddish brown silty clay from about 5.5 to 6.1 m.	10	SS	30	12	58	
	GRAVELLY SAND TO SAND	11	SS	37	9	54	
7	Light brown fine to coarse sand and gravel, some silt, moist, dense to very dense.	12	SS	61	10	38	
		13	SS	44	10	46	
8		14	SS	40	7	21	
		15	SS	44	9	38	
9		16	SS	29	11	33	
10	-Medium to coarse sand, some fine gravel from about 9.1 to 9.8 m.	17	SS	62	7	75	
		18	SS	45	7	13	
11	-Increasing sand fraction below about 11.0 m.	19	SS	40	8	38	
12	-Red fine sand, occasional gravel, trace silt from about 11.5 to 12.2 m.	20	SS	65	7	25	
	-Increase in gravel fraction and light grey below about 12.2 m.	21	SS	25	8	46	
13		22	SS	64	9	42	
		23	SS	87	9	71	
14		24	SS	70	6	71	
15		25	SS	86	9	75	
		26	SS	102	9	92	
16							
17.1 17		27	SS	117	10	67	
	SAND	28	SS	65	21	88	
18	Reddish brown fine to coarse sand, occasional gravel, trace silt, compact, saturated.	29	PQ		9	73	
	-Becoming brown medium sand, occasional subrounded gravel, uniform, below about 18.3 m.	30	PQ		22	92	
19		31	PQ		20	58	
		32	PQ		20	73	



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Gartner Lee Limited

BOREHOLE LOG

PROJECT: 93-509

BOREHOLE: 2-I 2 of 3

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 10 November 1994
GEOLOGIST PW
ELEVATION 346.2 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
20.3	**SILT TO SANDY SILT** Grey silt to fine sandy silt, saturated, dense.	33	PQ		21	100			
21		34	PQ		20	63			
22		35	PQ		23	100			
23.3 23	-Silty fine sand from about 23.3 to 25.6 m.	36	PQ		21	100			
24		37	PQ		18	80			
25		38	PQ		23	100			
25.6 26		39	PQ		28	100			
27		40	PQ		18	100			
28									
29	-Becoming reddish with trace clay below about 28.7 m.	41	PQ		19	100			
30	-Becoming laminated with reddish grey clay below about 30.2 m.	42	PQ		20	100			
31									
32		43	PQ		10	93			
32.8 33	**SANDY SILT TILL** Dark grey sandy silt, occasional fine gravel and cobbles, trace to some clay, moist, very dense.	44	PQ		16	54			
34		45	PQ		9	54			
		46	PQ		9	33			
35	-Becoming reddish brown below about 35.1 m.	47	PQ		10	90			
36		48	PQ		9	100			
37		49	PQ			100			
38		50	PQ			27			
39.2 39	**DOLOSTONE**	51	PQ			83	55		

Printed: 6 DEC 94

Gartner Lee Limited

BOREHOLE LOG	PROJECT: 93-509	BOREHOLE: 2-I 3 of 3

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 10 November 1994
GEOLOGIST PW
ELEVATION 346.2 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE							N VALUE	WATER CONTENT (%)
				NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	15 30 45 60	10 20 30 40
41 42 42.4	▨	Light brown, fine crystalline, thick to massive bedded dolostone, locally porous, minor occurrance of shale stringers and stylolites. -Very weathered from about 39.2 to 39.6 m.	▨	52 53	▨	PQ PQ			100 100	73 98		
		Borehole terminated at 42.42 m in dolostone.										

Printed: 8 DEC 94

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 93-509

BOREHOLE: 2-II 1 of 2

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 10 November 1994
GEOLOGIST PW
ELEVATION 346.4 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
0.2		**TOPSOIL** Dark brown sandy silt, rootlets, moist.										
1		**SANDY SILT TILL** Brown sandy silt, trace fine gravel, moist, compact to very dense.										
2												
3		-Occasional boulders and gravel from about 2.6 to 4.0 m.										
4		-Becoming reddish brown with subrounded to subangular gravel below about 4.0 m.										
5												
6.1 6		-Reddish brown silty clay from about 5.5 to 6.1 m.										
7		**GRAVELLY SAND TO SAND** Light brown fine to coarse sand, some silt and fine gravel, moist, dense to very dense.										
8												
9												
10		-Medium to coarse sand, some fine gravel from about 9.1 to 9.8 m.										
11		-Increasing sand fraction below about 11.0 m.										
12		-Red fine sand, occasional gravel, trace silt from about 11.5 to 12.2 m. -Increase in gravel fraction and light grey below about 12.2 m.										
13												
14												
15												
16												
17.1 17												
18		**SAND** Reddish brown fine to coarse sand, occasional gravel, trace silt, compact, saturated. -Becoming brown medium sand, occasional subrounded gravel, uniform, below about 18.3 m.										
19												
19.8												

Printed: 8 DEC 94

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 93-509

BOREHOLE: 2-II 2 of 2

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 10 November 1994
GEOLOGIST PW
ELEVATION 346.4 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE							N VALUE	WATER CONTENT (%)
				NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	15 30 45 60	10 20 30 40
		Borehole terminated at 19.86 m in gravelly sand to sand. **NOTE :** Borehole drilled directly to 19.86 m without sampling. Stratigraphy inferred from adjacent borehole 2-I.										

Printed: 8 DEC 94

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 93-509

BOREHOLE: 5-I

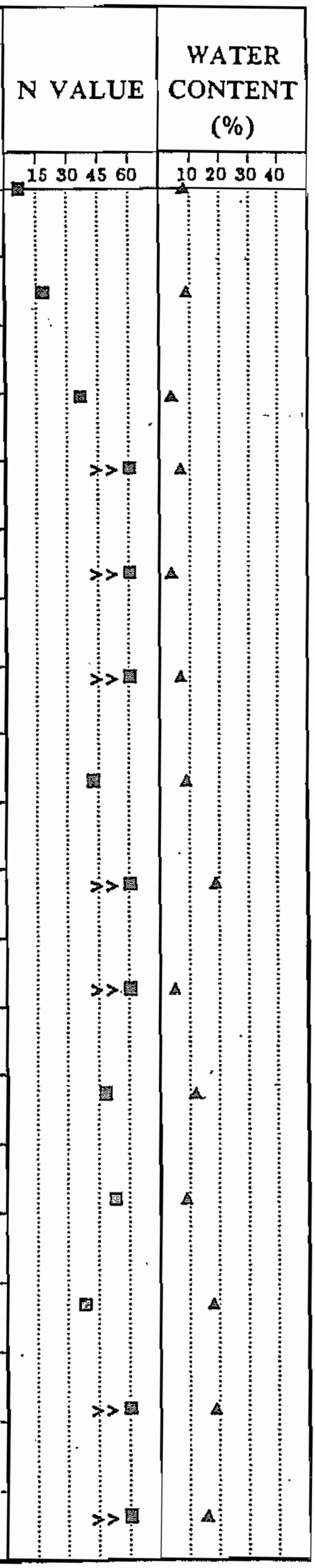
1 of 2

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 28 November 1994
GEOLOGIST PW
ELEVATION 340.5 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION
0.2	**TOPSOIL** Dark brown sandy silt, rootlets, moist.
	SANDY SILT TILL Brown sandy silt with gravel, occasional cobbles, compact to very dense.
	-Reddish brown with increasing coarse fraction below about 4.1 m.
5.8	**GRAVELLY SAND TO SAND** Grey fine to coarse sand and fine to coarse gravel, some silt, occasional cobbles, moist, dense to very dense.
	-Very gravelly from about 10.2 to 11.7 m.
	-Becoming brown with decrease silt content below about 12.1 m.
	-Medium to coarse sand with some gravel below about 16.2 m.
16.9	**SAND** Grey fine sand, trace silt, saturated, dense to very dense.

SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD
1		SS	7	8	33	
2		SS	18	9	54	
3		SS	36	4	63	
4		SS	65	7	67	
5		SS	78	4	83	
6		SS	68	7	88	
7		SS	42	9	58	
8		SS	105	19	92	
9		SS	78	5	96	
10		SS	48	12	67	
11		SS	53	9	83	
12		SS	38	18	83	
13		SS	78	19	88	
14		SS	67	16	67	



Printed: 8 DEC 94

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BOREHOLE LOG

PROJECT: 93-509

BOREHOLE: 5-I 2 of 2

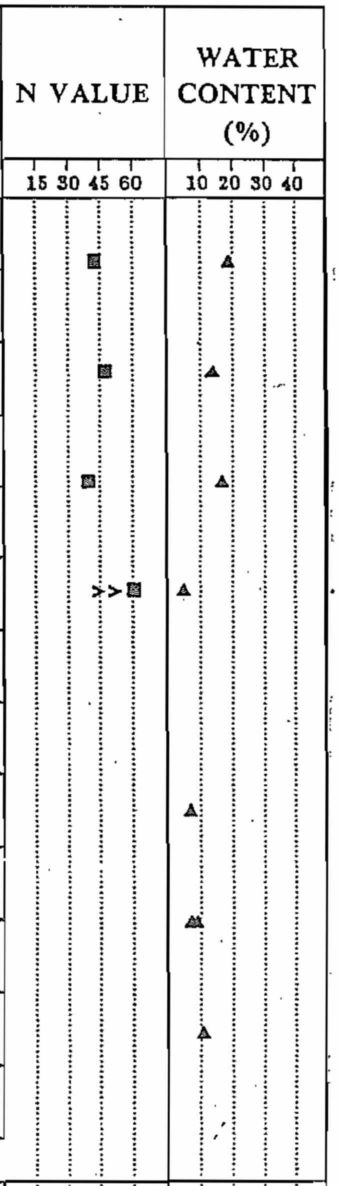
Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 28 November 1994
GEOLOGIST PW
ELEVATION 340.5 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION
20.1	**SILT** Grey silt, with clay laminations (-2 mm thick), trace fine sand, saturated, dense.
	-Occasional thin fine sand seams below about 22.5 m.
23.7	**SANDY SILT TILL** Grey sandy silt, some fine to coarse gravel, moist, very dense.
	-Becoming reddish brown below about 30.0 m.
32.9	**DOLOSTONE** light brown, fine crystalline, thick to massive bedded dolostone, porous, occasional stylolites.
33.6	Borehole terminated at 33.58 m in dolostone.

Depth scale: 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33

SAMPLE						
NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD
15	▨	SS	42	19	96	
16	▨	SS	47	14	88	
17	▨	SS	39	17	83	
18	▨	SS	129	5	17	
19	▧	PQ			75	
20	▨	SS	72/ 0.10m	7	100	
21	▨	SS	104/ 0.10m	7	100	
22	▧	PQ		9	100	
23	▧	PQ		11	100	
24	▧	PQ			100	50



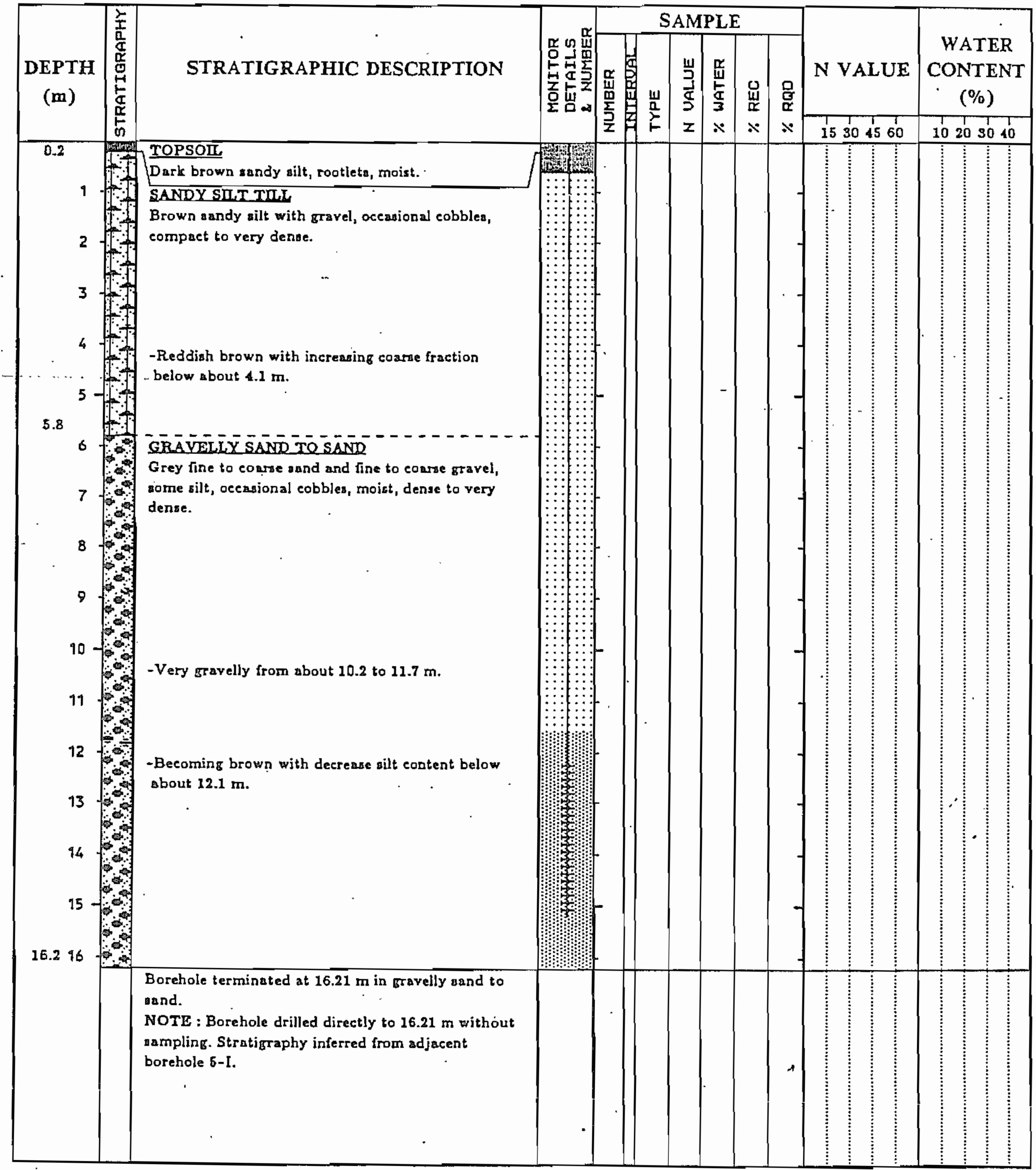
BOREHOLE LOG

PROJECT: 93-509

BOREHOLE: 5-II 1 of 1

Guelph Landfill Site Search
Hanlon Road, Guelph Ontario
FOR: City of Guelph

DATE: 29 November 1994
GEOLOGIST PW
ELEVATION 340.6 m ASL



DEPTH (m)	STRATIGRAPHIC DESCRIPTION
0.2	**TOPSOIL** Dark brown sandy silt, rootlets, moist.
	SANDY SILT TILL Brown sandy silt with gravel, occasional cobbles, compact to very dense.
	-Reddish brown with increasing coarse fraction below about 4.1 m.
5.8	**GRAVELLY SAND TO SAND** Grey fine to coarse sand and fine to coarse gravel, some silt, occasional cobbles, moist, dense to very dense.
	-Very gravelly from about 10.2 to 11.7 m.
	-Becoming brown with decrease silt content below about 12.1 m.
16.2	Borehole terminated at 16.21 m in gravelly sand to sand. NOTE : Borehole drilled directly to 16.21 m without sampling. Stratigraphy inferred from adjacent borehole 5-I.

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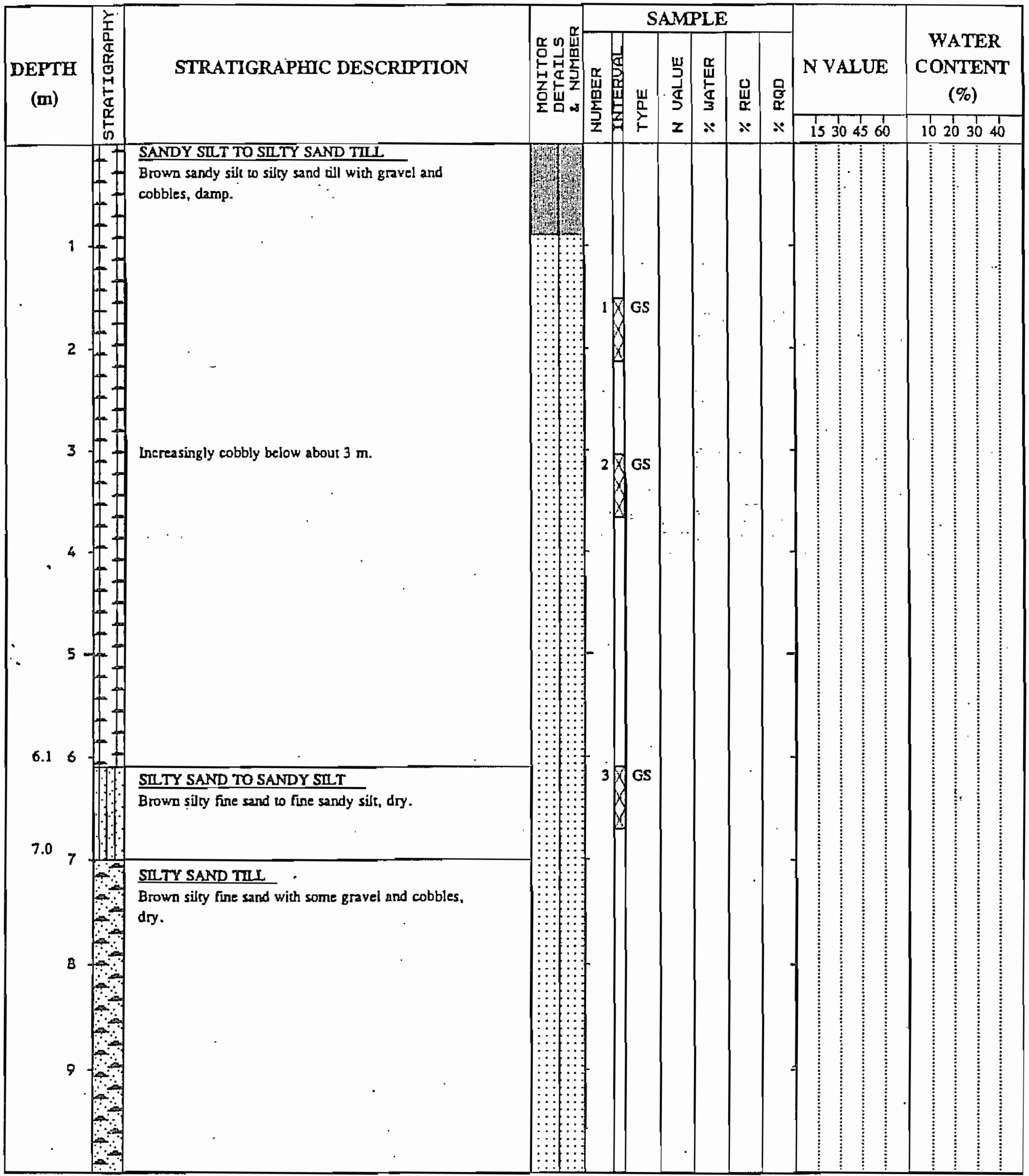
BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-1 1 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 21 July 1997
GEOLOGIST PW
ELEVATION 345.1 m ASL



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE	WATER CONTENT (%)
	SANDY SILT TO SILTY SAND TILL Brown sandy silt to silty sand till with gravel and cobbles, damp.								
		1	GS						
	Increasingly cobbly below about 3 m.	2	GS						
6.1	**SILTY SAND TO SANDY SILT** Brown silty fine sand to fine sandy silt, dry.	3	GS						
7.0	**SILTY SAND TILL** Brown silty fine sand with some gravel and cobbles, dry.								

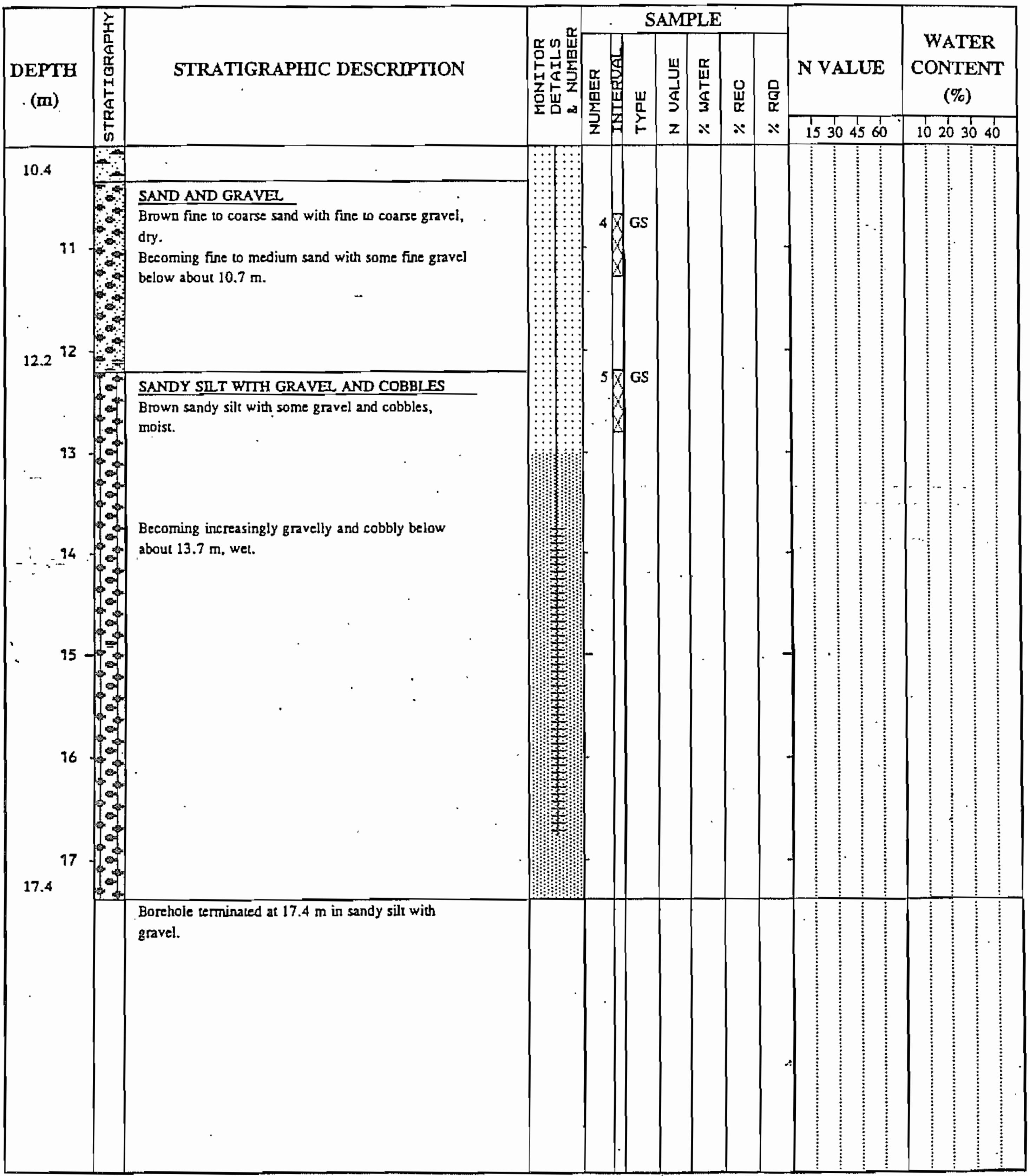
BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-1 2 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 21 July 1997
GEOLOGIST PW
ELEVATION 345.1 m ASL



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD
10.4								
12.2	SAND AND GRAVEL Brown fine to coarse sand with fine to coarse gravel, dry. Becoming fine to medium sand with some fine gravel below about 10.7 m.	4	☒	GS				
17.4	SANDY SILT WITH GRAVEL AND COBBLES Brown sandy silt with some gravel and cobbles, moist. Becoming increasingly gravelly and cobbly below about 13.7 m, wet.	5	☒	GS				
	Borehole terminated at 17.4 m in sandy silt with gravel.							

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Gartner Lee Limited

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-2 1 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 17 July 1997
GEOLOGIST PW
ELEVATION 346.3 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
	SANDY SILT TILL Brown sandy silt with some gravel and cobbles, dry.										
1											
2											
3			1	☒	GS						
4.0	**SAND** Brown fine to medium sand, trace to some cobbles and some fine gravel, dry.		2	☒	GS						
5											
6	Becoming moist below about 5.8 m. No cobbles or gravel below about 5.8 m.		3	☒	GS						
7											
7.6	**SILTY SAND TO SANDY SILT TILL** Brown silty sand with gravel and cobbles, moist.										
8											
9			4	☒	GS						

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-2 2 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 17 July 1997
GEOLOGIST PW
ELEVATION 346.3 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD
	Becoming siltier below about 10.4 m.						
11.9	**SILT** Brown silt with trace fine sand, moist.	5	GS				
14.6	**FINE SAND** Brown fine sand with some silt, damp. **GRAIN SIZE DISTRIBUTION** Sample 6 15.2 - 15.9 m 0% Gravel 78% Sand 18% Silt 4% Clay	6	GS				
15.9	**SANDY SILT** Brown sandy silt, dry.						
16.5	**SANDY SILT TILL** Brown sandy silt with some gravel, dry.						
17.1	**SAND AND GRAVEL** Brown fine to coarse sand and fine to coarse gravel with some cobbles, moist. Becoming wet below about 18 m.	7	GS				
19.2	Borehole terminated at 19.2 m in sand and gravel.						

N VALUE: 15 30 45 60

WATER CONTENT (%): 10 20 30 40

BOREHOLE LOG	**PROJECT:** 97-206	**BOREHOLE:** 97-3	1 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 18 July 1997
GEOLOGIST PW
ELEVATION 340.1 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
0.6	**TOPSOIL** Dark brown sandy silt topsoil with cobbles.								
6.0	**SANDY SILT TILL** Brown sandy silt with some gravel and cobbles, dry. Very cobbly sections.	1	GS						
	Occasional layers of silty fine to coarse sand below about 2.5 m.	2	GS						
8.5	**SAND AND GRAVEL** Brown fine to coarse sand and fine to coarse gravel with cobbles, dry.	3	GS						
	SANDY SILT TILL Brown sandy silt with gravel and cobbles, damp.	4	GS						

Printed: 21 NOV 97

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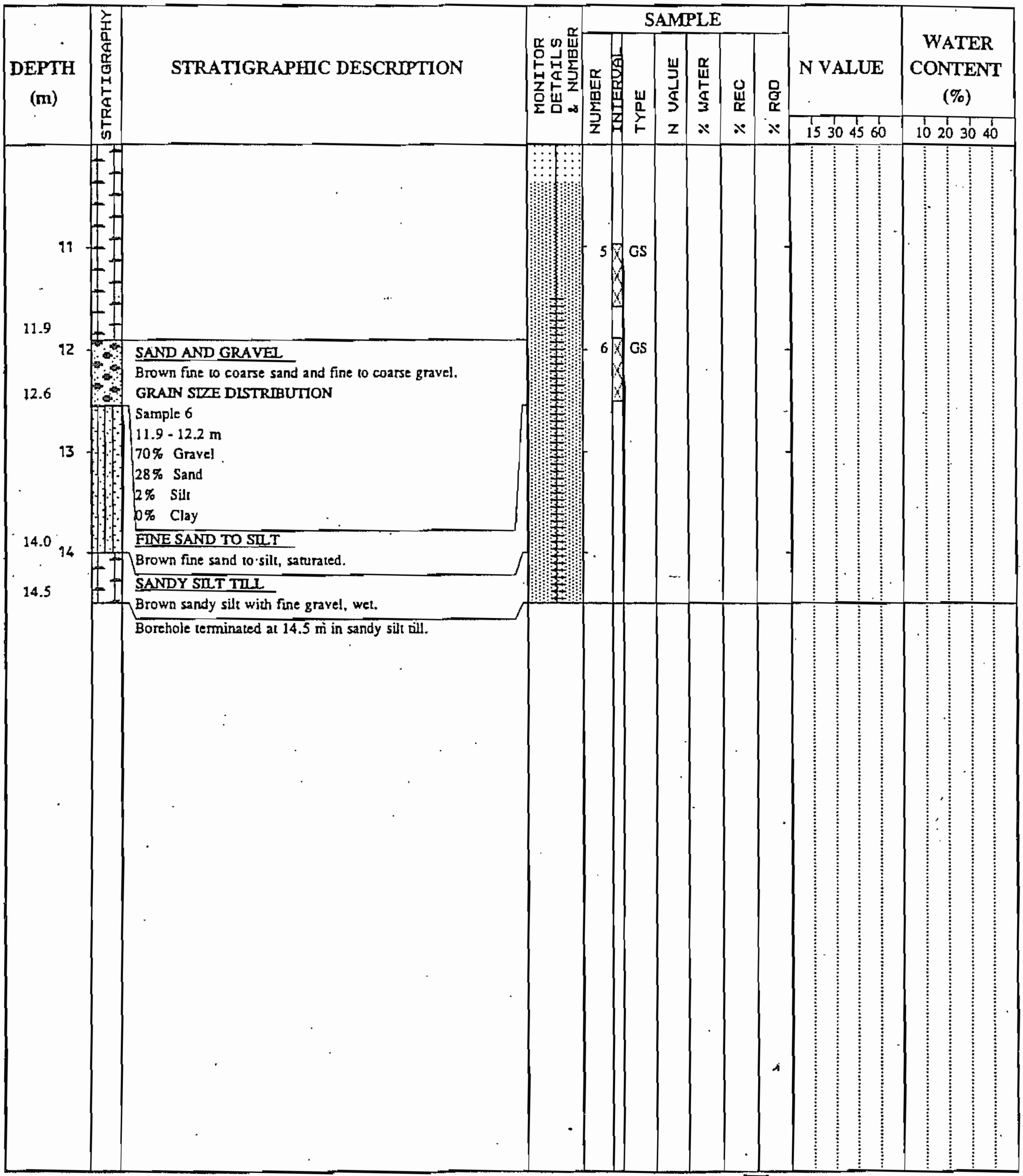
BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-3 2 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 18 July 1997
GEOLOGIST PW
ELEVATION 340.1 m ASL



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	NUMBER	TYPE
11		5	GS
11.9 / 12	**SANDY AND GRAVEL** Brown fine to coarse sand and fine to coarse gravel. **GRAIN SIZE DISTRIBUTION** Sample 6 11.9 - 12.2 m 70% Gravel 28% Sand 2% Silt 0% Clay	6	GS
12.6 / 13			
14.0 / 14	**FINE SAND TO SILT** Brown fine sand to silt, saturated.		
14.5	**SANDY SILT TILL** Brown sandy silt with fine gravel, wet. Borehole terminated at 14.5 m in sandy silt till.		

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-4 1 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 22 July 1997
GEOLOGIST PW
ELEVATION 337.3 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
0.3	**TOPSOIL** Black sandy silt topsoil with some gravel, damp.									
	SILTY SAND TILL Brown silty fine sand with occasional cobbles and some medium sand, dry.	1	☒	GS						
4.0	**SAND** Brown fine to medium sand with trace silt and occasional cobbles, dry.	2	☒	GS						
	Becoming fine sand with trace silt , some medium sand and trace cobbles below about 5.5 m.	3	☒	GS						
8.5	**SAND AND GRAVEL** Reddish-brown fine to coarse sand and fine to coarse gravel with occasional cobbles, moist. Brown fine to medium sand layer between about 8.8 m and 9.1 m, dry.	4	☒	GS						
9.8	**SANDY SILT**									

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-4 2 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 22 July 1997
GEOLOGIST PW
ELEVATION 337.3 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
		Brown sandy silt, moist.										
11												
12				5	☒	GS						
13.1 13		<u>SAND AND GRAVEL</u> Brown fine to coarse sand with fine to coarse gravel, moist.										
13.8		<u>SILTY FINE SAND</u> Greyish-brown fine sand to silty fine sand, saturated.										
14												
14.3		Borehole terminated at 14.3 m in silty fine sand.										

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-5 1 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 21 July 1997
GEOLOGIST PW
ELEVATION 336.4 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
	SANDY SILT TO SILTY SAND TILL Brown sandy silt to silty sand with some gravel and cobbles, damp.									
1	Silty fine to coarse sand with some fine gravel and occasional cobbles below about 0.9 m.									
2		1	☒	GS						
3										
4										
5	Becoming silty fine to medium sand with fine to coarse gravel and cobbles below about 4.5 m.	2	☒	GS						
6		3	☒	GS						
7										
7.3	**SAND AND GRAVEL** Brown fine to coarse sand and fine to coarse gravel with cobbles, dry.	4	☒	GS						
8										
9	Becoming moist, silty sand and gravel below about 8.5 m.									
	Becoming wet below about 9.6 m.									

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-5 2 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 21 July 1997
GEOLOGIST PW
ELEVATION 336.4 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
11												
11.6		**SAND** Grey fine to medium sand, saturated.		5	☒	GS						
12												
12.2		Borehole terminated at 12.2 m in sand.										

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-6 1 of 3

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 18 July 1997
GEOLOGIST PW
ELEVATION 347.6 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
		SANDY SILT TO SILTY SAND TILL Brown sandy silt to silty sand with gravel and cobbles, fine to medium sand, dry.										
1												
				1		GS						
2												
3		Becoming silty fine sand with gravel and cobbles below about 3 m.		2		GS						
4												
5												
5.2		**SAND** Brown fine to medium sand, damp.										
6.1 6		**SANDY SILT TILL** Brown sandy silt with occasional cobbles, damp.		3		GS						
7												
8												
9												

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-6 2 of 3

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 18 July 1997
GEOLOGIST PW
ELEVATION 347.6 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE
	Increasingly cobbly below about 10.5 m.		
11			
12		4	GS
13			
14			
14.3	**SAND** Brown fine to medium sand, damp.		
15			
15.3	**SILTY SAND TILL** Brown silty sand till with gravel and cobbles, damp.	5	GS
16			
17			
18			
19			
	Becoming grey-brown in colour below about 19.5 m.		

Other column headings on the form, with no entries on this page:
- MONITOR DETAILS & NUMBER
- SAMPLE: INTERVAL
- SAMPLE: N VALUE
- SAMPLE: % WATER
- SAMPLE: % REC
- SAMPLE: % RQD
- N VALUE: 15 30 45 60
- WATER CONTENT (%): 10 20 30 40

BOREHOLE LOG | **PROJECT:** 97-206 | **BOREHOLE:** 97-6 | 3 of 3

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 18 July 1997
GEOLOGIST PW
ELEVATION 347.6 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
21												
21.5		Thin sand and gravel layer at about 21.3 m.										
		FINE SAND Brown fine sand, wet.										
22												
23												
23.6												
		Borehole terminated at 23.6 m in fine sand.										

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-7 1 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 17 July 1997
GEOLOGIST PW
ELEVATION 347.5 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
		<u>SILTY SAND TO SANDY SILT TILL</u> Brown silty fine sand with some cobbles, dry.										
1												
2												
3				1	☒	GS						
4		Becoming siltier in sections below about 4 m.										
5		Becoming damp below about 4.9 m.										
6				2	☒	GS						
7												
		Becoming moist below about 7.6 m.										
8												
9		GRAIN SIZE DISTRIBUTION Sample 3 9.1 - 9.8 m 33% Gravel		3	☒	GS						

BOREHOLE LOG

PROJECT: 97-206

BOREHOLE: 97-7 2 of 2

Hydrogeological Investigation - South Guelph EIS
Guelph, Ontario
FOR: City of Guelph

DATE: 17 July 1997
GEOLOGIST PW
ELEVATION 347.5 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE (15 30 45 60)	WATER CONTENT (%) (10 20 30 40)
11 12 13	40% Sand 22% Silt 5% Clay								
14.0	**SAND** Brown fine to medium sand, damp to moist.								
14.6	**SAND AND GRAVEL** Brown fine to coarse sand with fine to medium gravel, damp.	4	GS						
15.9	**SILTY SAND** Brown silty fine sand, wet.	5	GS						
19.3	Borehole terminated at 19.3 m in silty sand.								

Printed: 21 NOV 97

Gartner Lee Limited

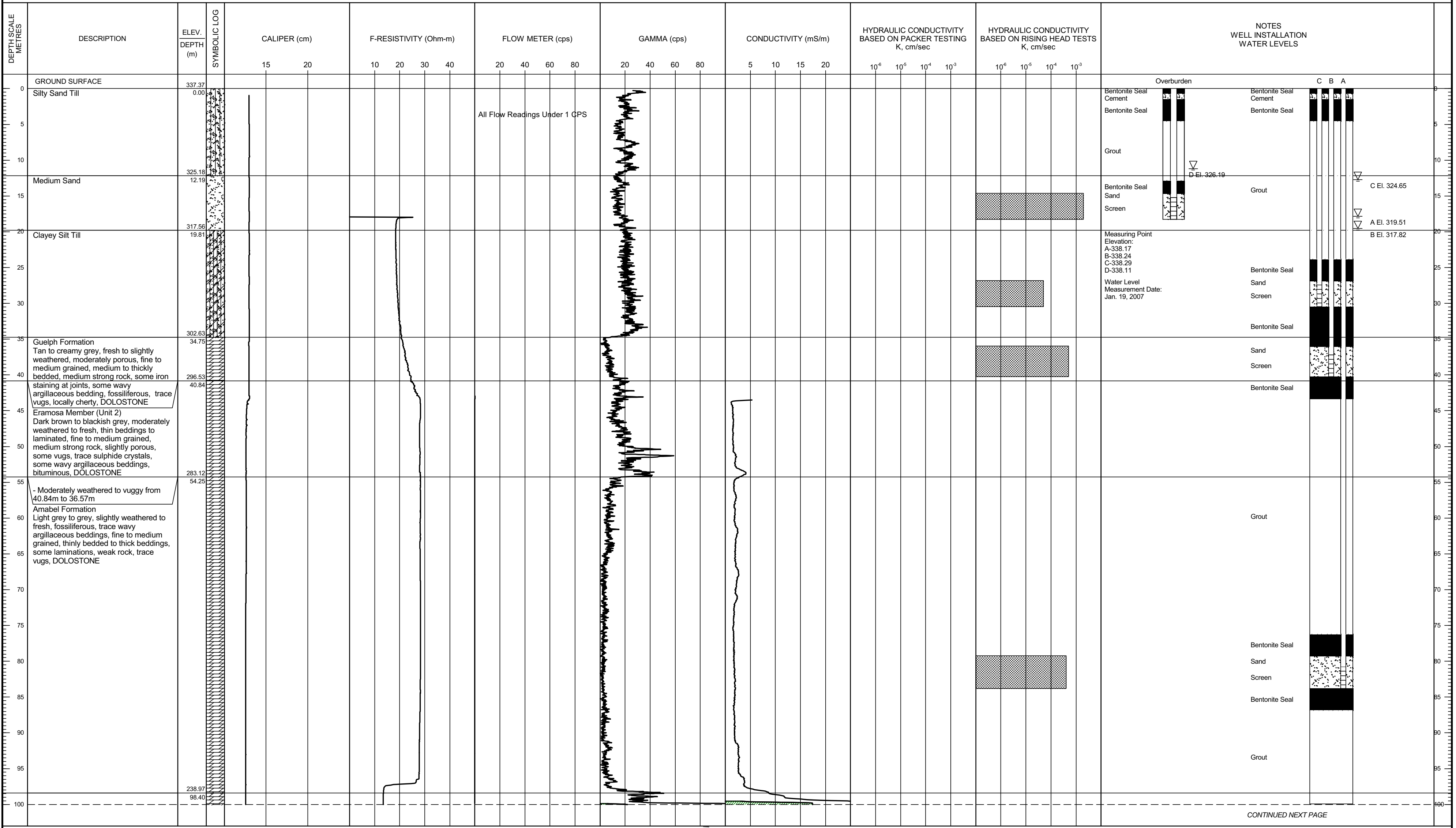
PROJECT: 06-1112-032

LOCATION: N 565685.4 ;E 4813871.7

RECORD OF DRILLHOLE: MW 06-07

SHEET 1 OF 2

DATUM: Geodetic



ELEV. / DEPTH (m)	DESCRIPTION
337.37	GROUND SURFACE
0.00	Silty Sand Till
325.18 12.19	Medium Sand
317.56 19.81	Clayey Silt Till
302.63 34.75	Guelph Formation Tan to creamy grey, fresh to slightly weathered, moderately porous, fine to medium grained, medium to thickly bedded, medium strong rock, some iron staining at joints, some wavy argillaceous bedding, fossiliferous, trace vugs, locally cherty, DOLOSTONE
296.53 40.84	Eramosa Member (Unit 2) Dark brown to blackish grey, moderately weathered to fresh, thin beddings to laminated, fine to medium grained, medium strong rock, slightly porous, some vugs, trace sulphide crystals, some wavy argillaceous beddings, bituminous, DOLOSTONE
283.12 54.25	- Moderately weathered to vuggy from 40.84m to 36.57m Amabel Formation Light grey to grey, slightly weathered to fresh, fossiliferous, trace wavy argillaceous beddings, fine to medium grained, thinly bedded to thick beddings, some laminations, weak rock, trace vugs, DOLOSTONE
238.97 98.40	

Measuring Point
Elevation:
A-338.17
B-338.24
C-338.29
D-338.11

Water Level
Measurement Date:
Jan. 19, 2007

CONTINUED NEXT PAGE

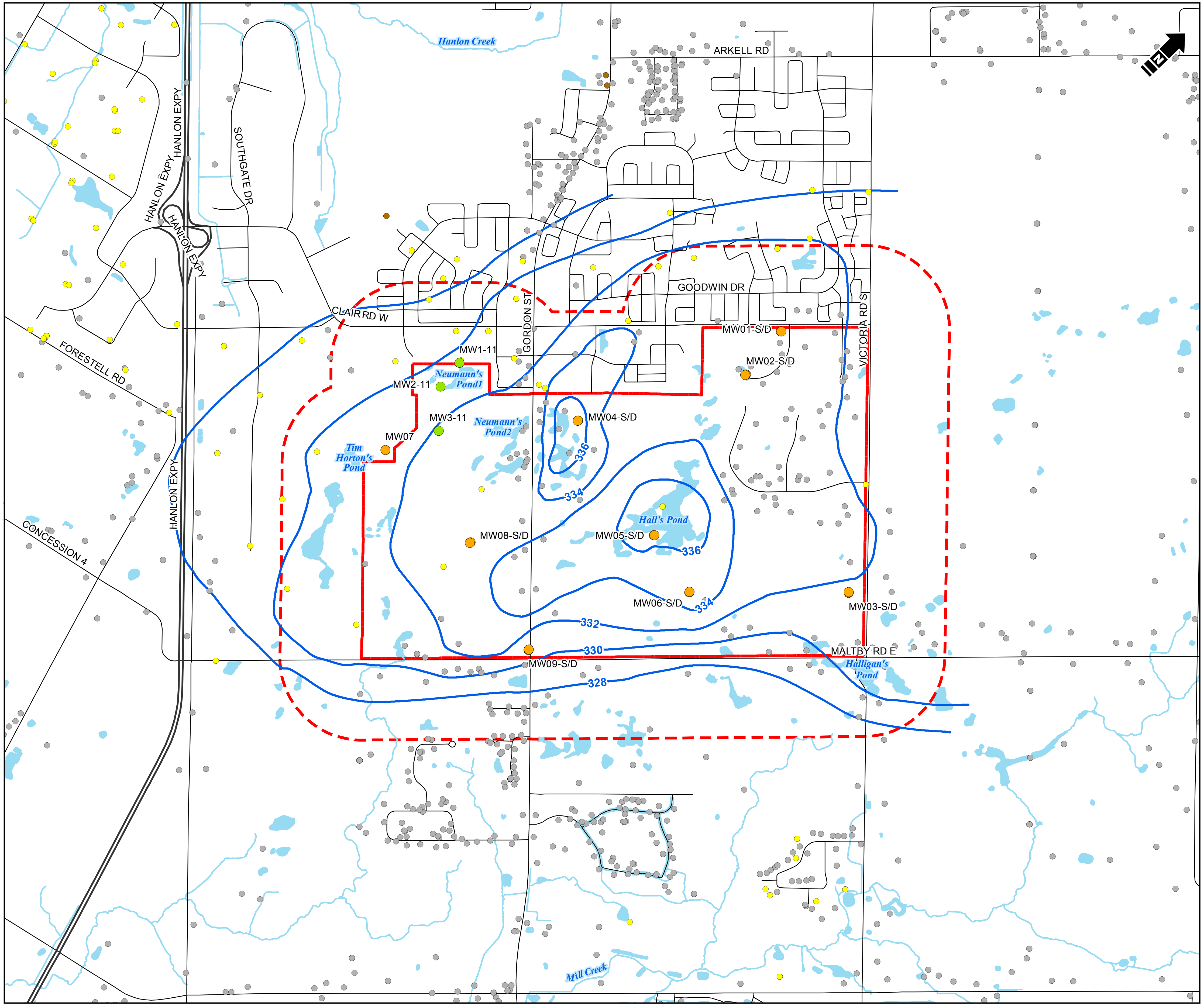
DEPTH SCALE

1 : 500

LOGGED: GY

CHECKED: SD

APPENDIX D:
EXCERPTS FROM CLAIR-MALTBY SECONDARY PLAN



- 🟥 Primary Study Area Boundary
- 🟥 Secondary Plan Area Boundary
- Water Body
- Watercourse
- Water Table Elevation Contour (2m)
- Highway
- Road
- ● Monitoring Well (Matrix)
- ● Monitoring Well (132 Clair Rd.)
- ● Consultant Well
- ● GPW Well
- ● WWIS Well

1:25,000 metres
260 0 260 520
NAD 1983 UTM Zone 17N

Reference: Da ta pro vided b y the City o f Guelph, Geo Base® and Province of Ontario used under license.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

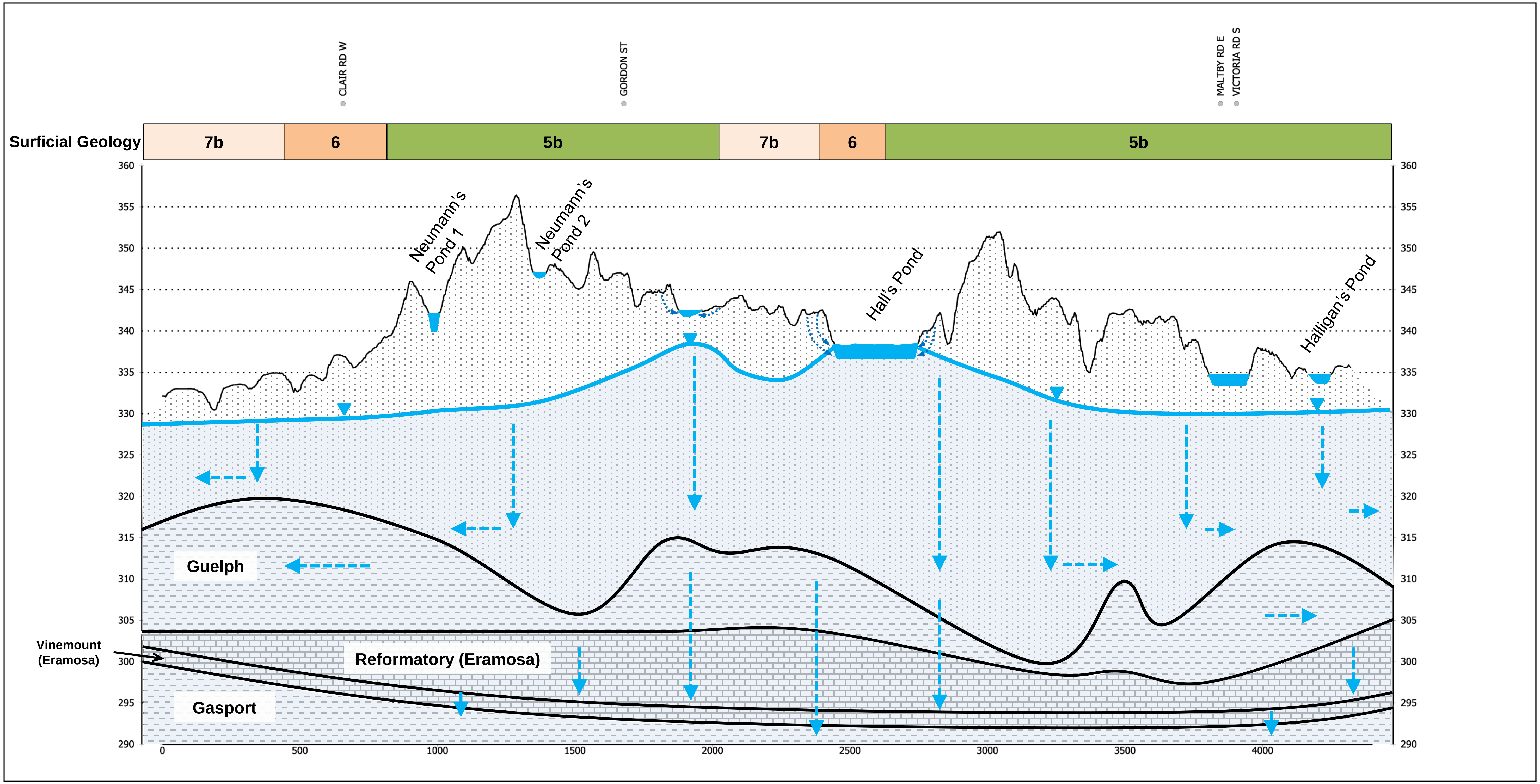
City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 1 Characterization Report

Water Table Map Observed Data

Date:	Project:	Submitter:	Reviewer:
May, 2018	23089	D. Martin	B. Blackport

Figure
GW-5

I:\CityofGuelph\23089\FiguresandTables\QHG\2018\Report\Phase1_Characterization_Report\Figure-GW-5-Water_Table_Map_Observed_Data.mxd - Tabloid_L - 25-May-18, 11:19 AM - ccurry - TID005



Overburden – Silt/Sand/Sand/Gravel Till (minor clay)

Bedrock – Aquifer unit

Bedrock - Aquitard unit

Saturated zone

🟩 5b: Stone-poor, sandy silt to silty sand till (Wentworth Till)

🟧 6: Ice-contact stratified sand and gravel deposits

⬜ 7b: Glaciofluvial gravel deposits

🟦 Ponded areas

▼ Approximate water table

➜ Interpreted groundwater flow

➜ Local groundwater flow (seasonal)

— Approximate geological contact

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

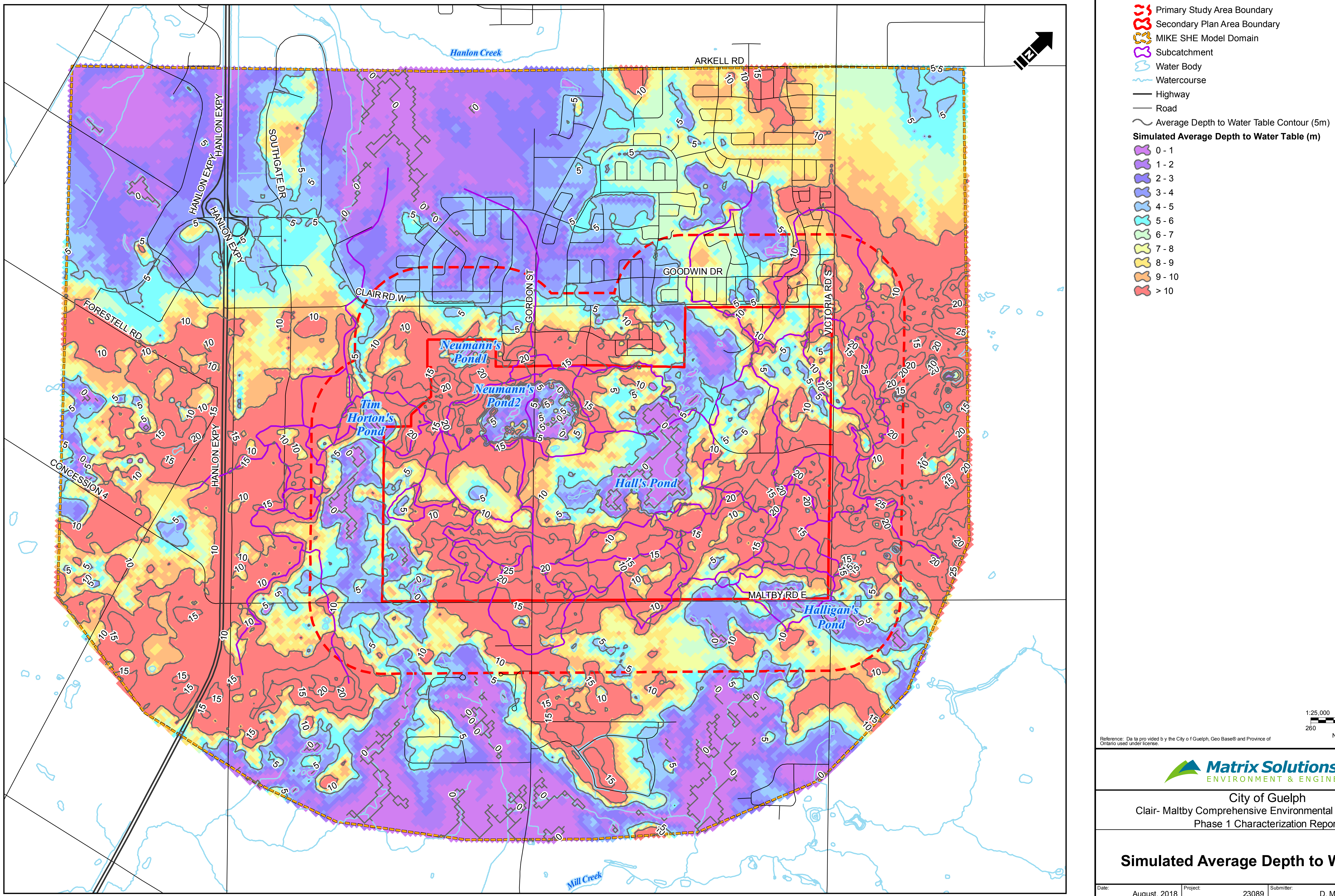
City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 1 Characterization Report

Conceptual Groundwater Flow System

Date:	Project:	Submitter:	Reviewer:
Mar 2018	23089	D. Martin	B. Blackport

Figure
GW-6

I:\CityofGuelph\23089\FiguresandTables\QHG\2018\Report\Phase1_Characterization_Report\Figure-GW-6-Conceptual_Groundwater_Flow_System.mxd - Tabloid_L - 25-May-18, 11:19 AM - ccurry - TID004



1:25,000 metres
260 0 260 520
NAD 1983 UTM Zone 17N

Reference: Da ta pro vided b y the City o f Guelph, Geo Base® and Province of Ontario used under license.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

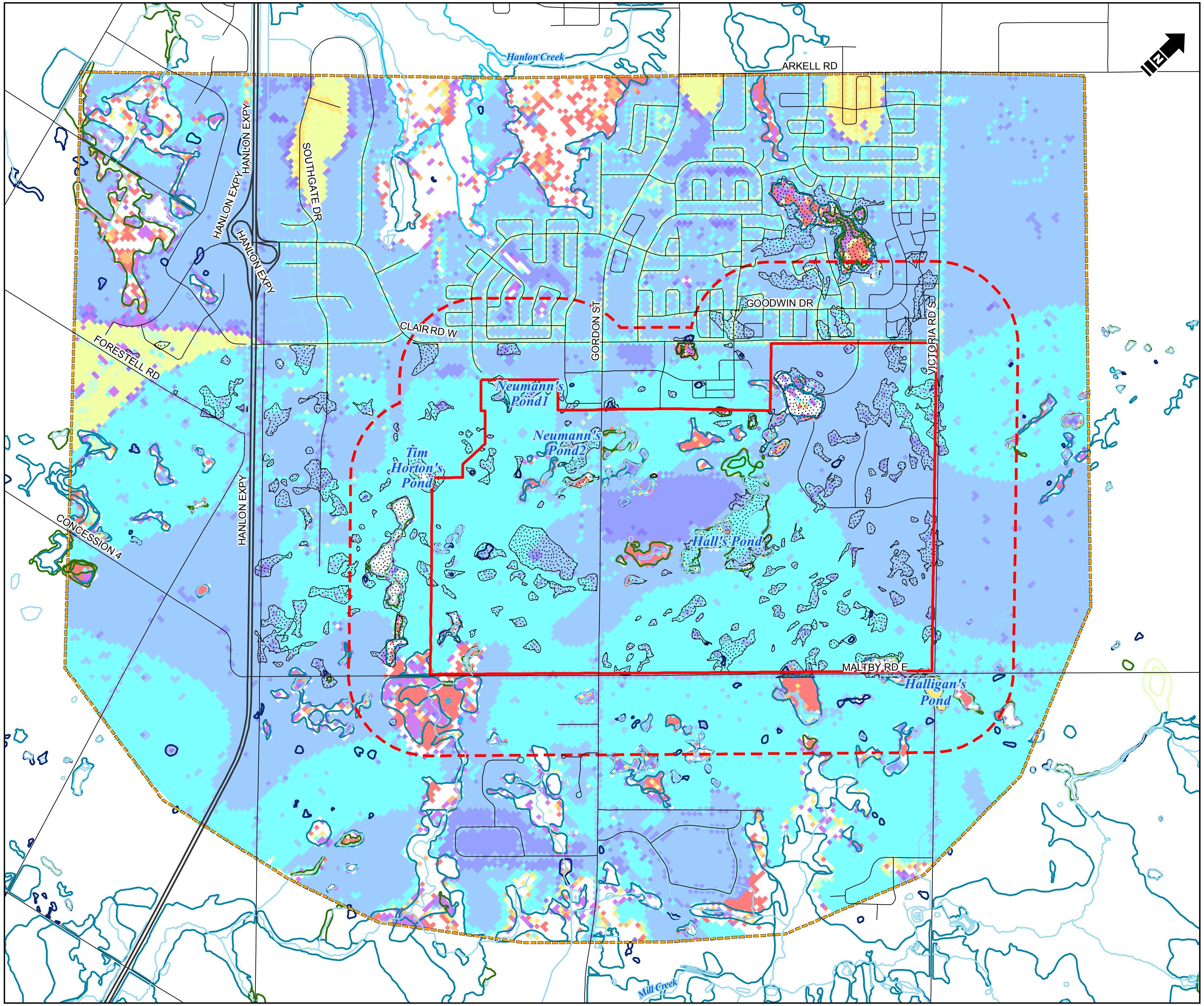
City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 1 Characterization Report

Simulated Average Depth to Water Table

Date:	Project:	Submitter:	Reviewer:
August, 2018	23089	D. Martin	B. Blackport

Figure
GW-8

I:\CityofGuelph\23089\FiguresandTables\QHG\2018\Report\Phase1_Characterization_Report\Figure-GW-8-Simulated_Average_Depth_to_Water_Table.mxd - Tabloid_L - 29-Aug-18, 08:10 AM - ccurry - TID005



Reference: Da ta pro vided b y the City o f Guelph, Geo Base® and Province of Ontario used under license.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 1 Characterization Report

Simulated Groundwater Recharge

Date:	Project:	Submitter:	Reviewer:
June, 2018	23089	D. Martin	B. Blackport

Figure
GW-11

I:\CityofGuelph\23089\FiguresandTables\QHG\2018\Report\Phase1_Characterization_Report\Figure-GW-11-Simulated_Groundwater_Recharge.mxd - Tabloid_L - 08-Jun-18, 08:51 AM - ccurry - TID005

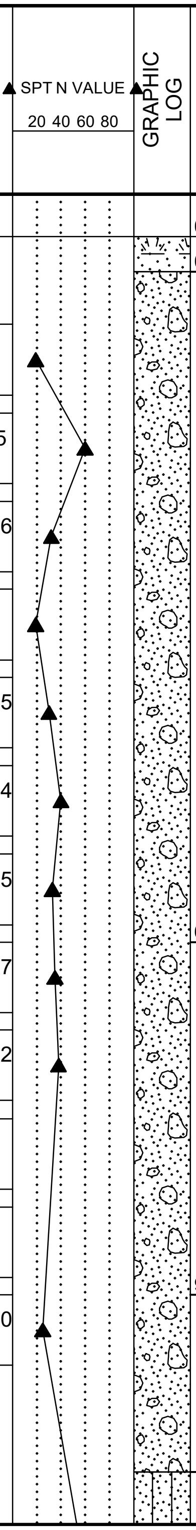
APPENDIX E1:
MONITORING WELL LOGS

MONITORING WELL ID: MW22-01 D

PAGE 1 OF 2

CLIENT Industrial Equities Guelph Corp.
PROJECT NAME Southgate Business Park
PROJECT NUMBER 121123
PROJECT LOCATION
DATE COMPLETED 2022-04-19
CONTRACTOR Aardvark Drilling Inc.
LOGGED BY AF
METHOD Hollow Stem Auger
WELL CONSTRUCTION 2" PVC Well Construction
NOTES Groundwater Level Measured On 2022-05-12 = 328.34 masl

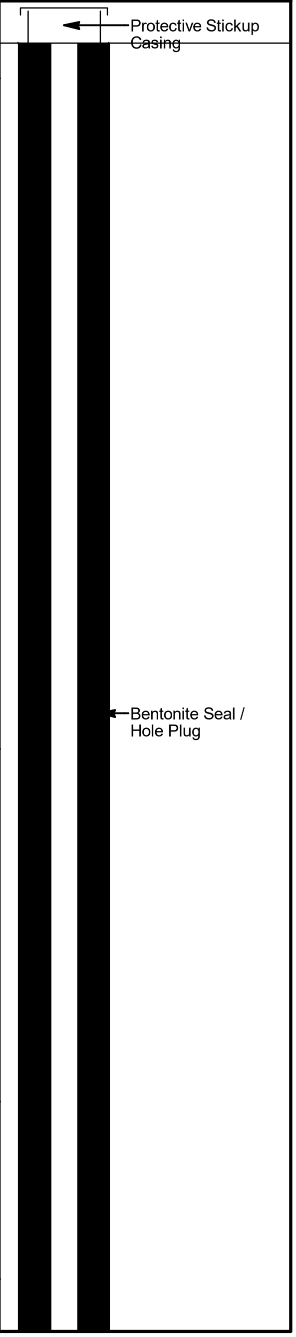
SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	5-8-11-12 (19)
SS	7-26-34-15 (60)
SS	11-17-15-16 (32)
SS	9-8-11-11 (19)
SS	12-16-14-15 (30)
SS	12-18-22-14 (40)
SS	12-18-15-15 (33)
SS	13-15-20-17 (35)
SS	10-21-17-12 (38)
SS	50
SS	12-50
SS	13-11-14-20 (25)



DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)
0.00	Ground Surface	341.46
0.31	[TOPSOIL] Dark Brown TOPSOIL, some organics.	341.16
	Grey SAND and GRAVEL, some cobbles, dry.	
6.10	Becomes moist starting at 6.1 m.	335.36
9.15	Becomes wet starting at 9.15 m.	332.31
10.68	[TILL] Brown SILTY SAND TILL, some gravel, wet.	330.78

DEPTH (m): 0, 2, 4, 6, 8, 10
DEPTH (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36
ELEVATION (m): 340, 338, 336, 334, 332

WELL DIAGRAM



MONITORING WELL ID: MW22-01 D

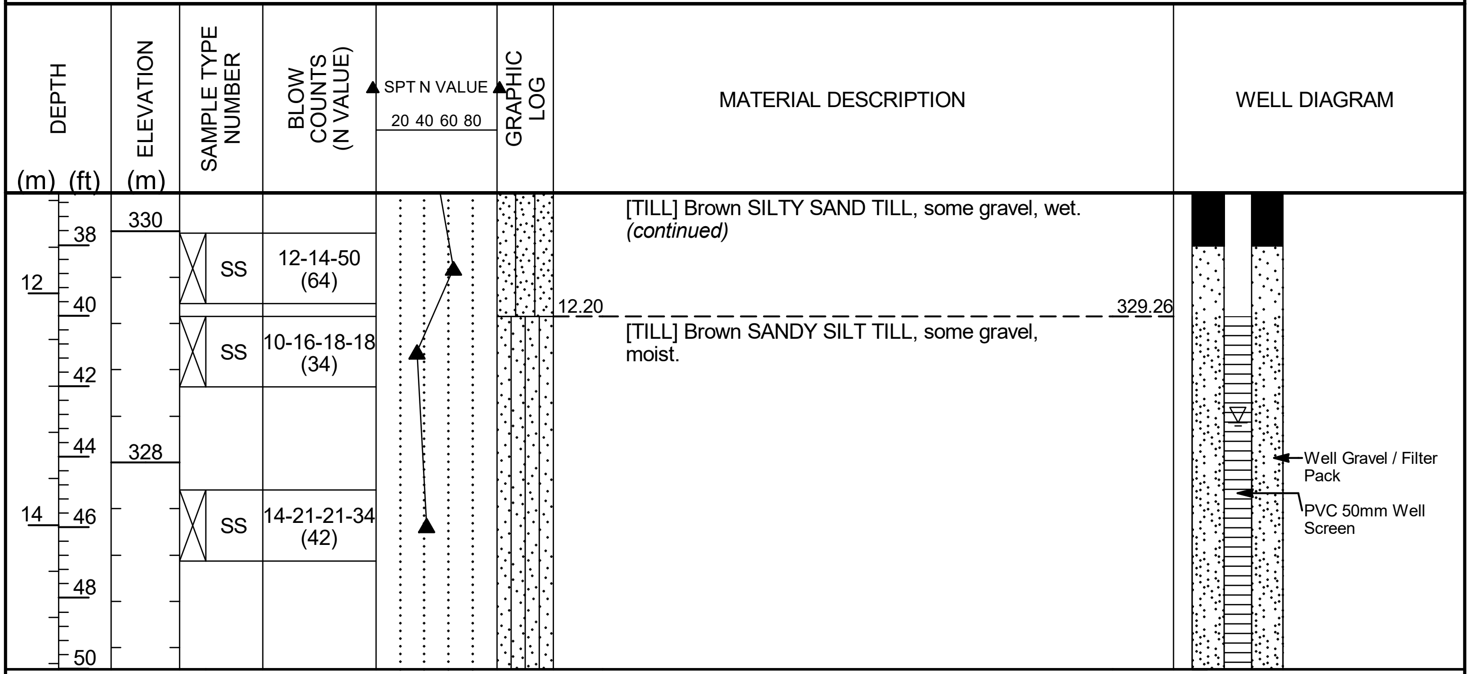
PAGE 2 OF 2

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	12-14-50 (64)
SS	10-16-18-18 (34)
SS	14-21-21-34 (42)

[TILL] Brown SILTY SAND TILL, some gravel, wet. *(continued)*

12.20 — 329.26

[TILL] Brown SANDY SILT TILL, some gravel, moist.

Borehole Terminated at 15.25 m.

MONITORING WELL ID: MW22-01 S

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-19

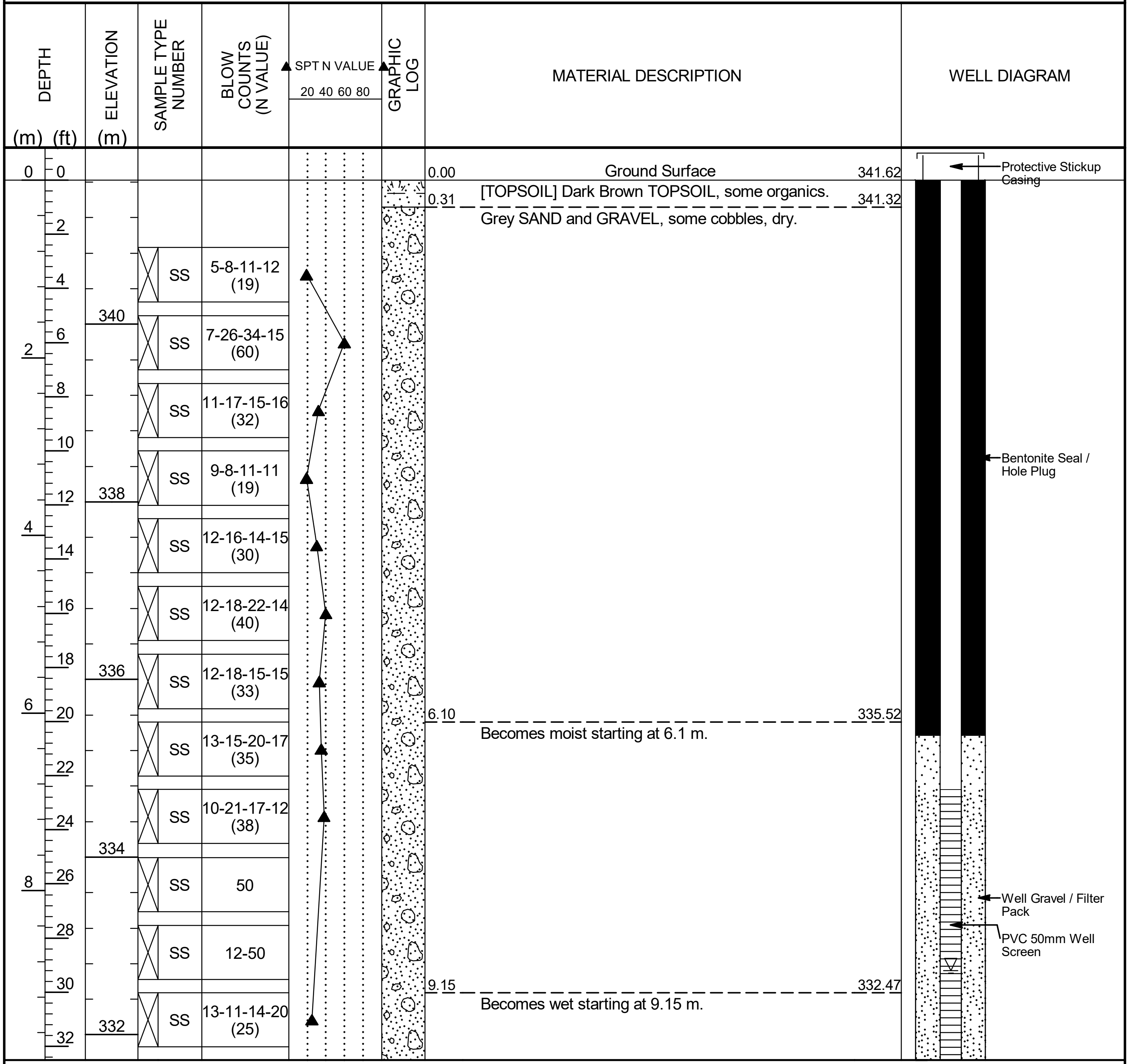
CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

METHOD Hollow Stem Auger

WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = 332.73 masl



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	5-8-11-12 (19)
SS	7-26-34-15 (60)
SS	11-17-15-16 (32)
SS	9-8-11-11 (19)
SS	12-16-14-15 (30)
SS	12-18-22-14 (40)
SS	12-18-15-15 (33)
SS	13-15-20-17 (35)
SS	10-21-17-12 (38)
SS	50
SS	12-50
SS	13-11-14-20 (25)

	MATERIAL DESCRIPTION	
0.00	Ground Surface	341.62
0.31	[TOPSOIL] Dark Brown TOPSOIL, some organics.	341.32
	Grey SAND and GRAVEL, some cobbles, dry.	
6.10	Becomes moist starting at 6.1 m.	335.52
9.15	Becomes wet starting at 9.15 m.	332.47

Borehole Terminated at 9.91 m.

BluePlan ENGINEERING

MONITORING WELL ID: MW22-02

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-20

CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

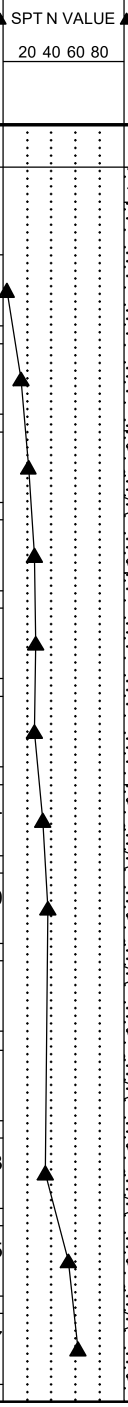
METHOD Hollow Stem Auger

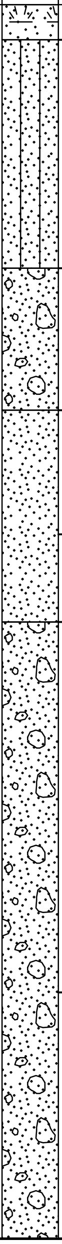
WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = 329.88 masl

DEPTH (m) (ft) | ELEVATION (m) | SAMPLE TYPE NUMBER | BLOW COUNTS (N VALUE) | SPT N VALUE | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM

SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	2-2-1-2 (3)
SS	8-11-4-13 (15)
SS	6-10-11-12 (21)
SS	36-15-11-9 (26)
SS	5-15-12-10 (27)
SS	4-11-15-15 (26)
SS	16-17-16-34 (33)
SS	10-16-21-50 (37)
SS	20-50
SS	24-50
SS	37-22-13-13 (35)
SS	30-40-14-15 (54)
SS	34-32-30-27 (62)

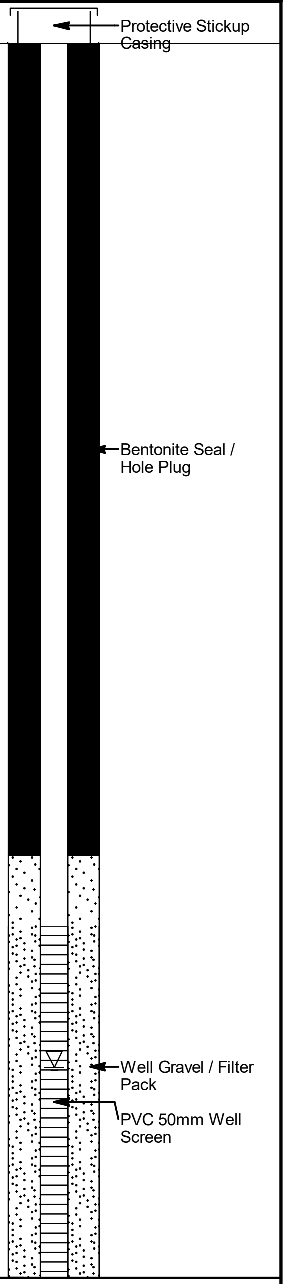




Depth (m)	MATERIAL DESCRIPTION	Elevation
0.00	Ground Surface	338.73
0.31	[TOPSOIL] Dark Brown TOPSOIL, some organics.	338.43
	Brown SILTY SAND, damp.	
2.28	Brown SAND and GRAVEL, some silt, damp.	336.45
3.51	Brown fine to medium SAND, damp.	335.22
4.58	Becomes moist at 4.58 m.	334.15
5.34	Grey SAND and GRAVEL, some cobbles, dry to damp.	333.39
8.54	Becomes wet starting at 8.54 m.	330.19

Depth scale (m): 0, 2, 4, 6, 8, 10; (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34

Elevation (m): 338, 336, 334, 332, 330



Borehole Terminated at 10.67 m.

BluePlan ENGINEERING

MONITORING WELL ID: MW22-04 D

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-18

CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

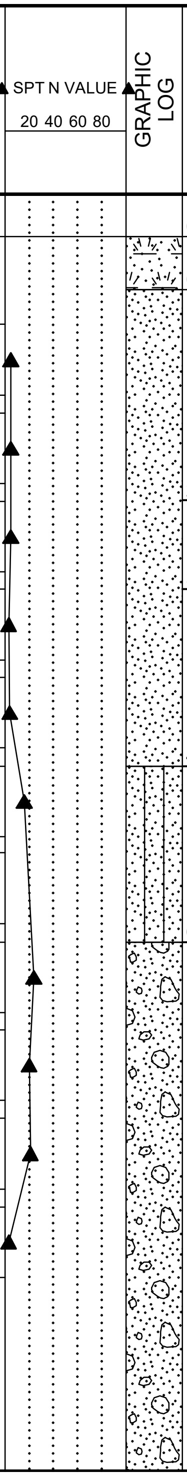
METHOD Hollow Stem Auger

WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = 330.50 masl

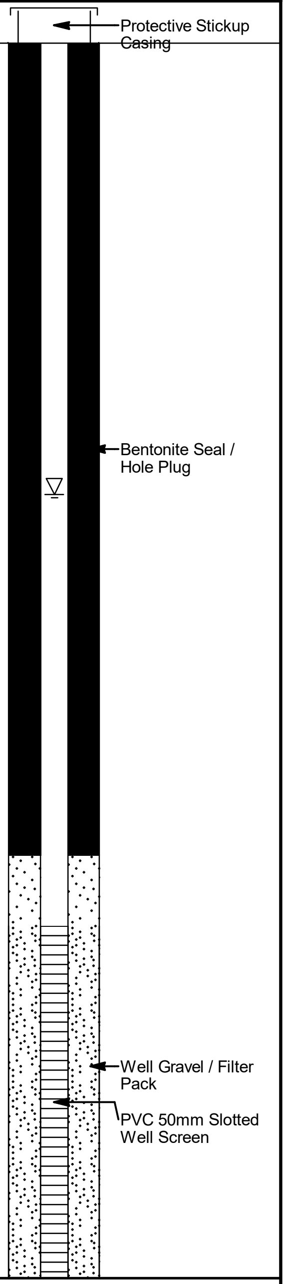
DEPTH (m) 0, 2, 4, 6, 8, 10
DEPTH (ft) 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34
ELEVATION (m) 334, 332, 330, 328, 326, 324

SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	1-2-3-1 (5)
SS	2-2-3-3 (5)
SS	2-2-3-2 (5)
SS	1-2-1-3 (3)
SS	1-2-2-3 (4)
SS	7-10-6-11 (16)
SS	50
SS	4-12-12-14 (24)
SS	6-8-12-14 (20)
SS	9-10-11-11 (21)
SS	1-1-2-3 (3)



Depth	MATERIAL DESCRIPTION	Elevation
0.00	Ground Surface	334.40
	[TOPSOIL] Dark Brown TOPSOIL, some organics, moist.	
0.46		333.94
	Brown SAND, minor silt, damp to moist.	
2.28	Increasing gravel content, moist.	332.12
3.05	Becomes Wet starting at 3.05 m.	331.35
4.58	Brown SILTY SAND, wet.	329.82
6.10	Grey SAND and GRAVEL, wet.	328.30

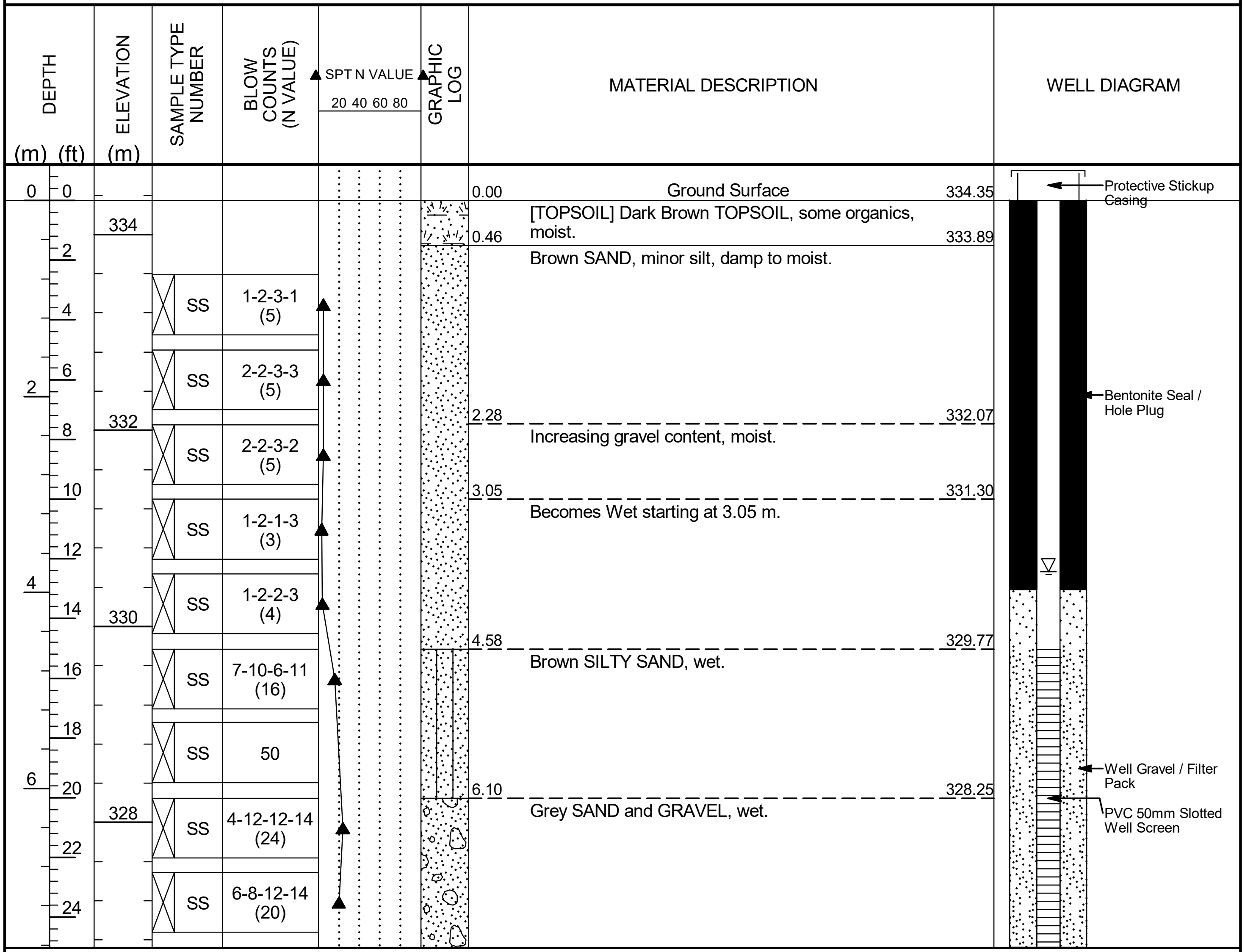
WELL DIAGRAM



Borehole Terminated at 10.67 m.

MONITORING WELL ID: MW22-04 S

CLIENT Industrial Equities Guelph Corp.
PROJECT NAME Southgate Business Park
PROJECT NUMBER 121123
PROJECT LOCATION
DATE COMPLETED 2022-04-18
CONTRACTOR Aardvark Drilling Inc.
LOGGED BY AF
METHOD Hollow Stem Auger
WELL CONSTRUCTION 2" PVC Well Construction
NOTES Groundwater Level Measured On 2022-05-12 = 330.56 masl



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	1-2-3-1 (5)
SS	2-2-3-3 (5)
SS	2-2-3-2 (5)
SS	1-2-1-3 (3)
SS	1-2-2-3 (4)
SS	7-10-6-11 (16)
SS	50
SS	4-12-12-14 (24)
SS	6-8-12-14 (20)

	MATERIAL DESCRIPTION	
0.00	Ground Surface	334.35
0.46	[TOPSOIL] Dark Brown TOPSOIL, some organics, moist.	333.89
	Brown SAND, minor silt, damp to moist.	
2.28	Increasing gravel content, moist.	332.07
3.05	Becomes Wet starting at 3.05 m.	331.30
4.58	Brown SILTY SAND, wet.	329.77
6.10	Grey SAND and GRAVEL, wet.	328.25

Borehole Terminated at 7.63 m.

MONITORING WELL ID: MW22-05

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-20

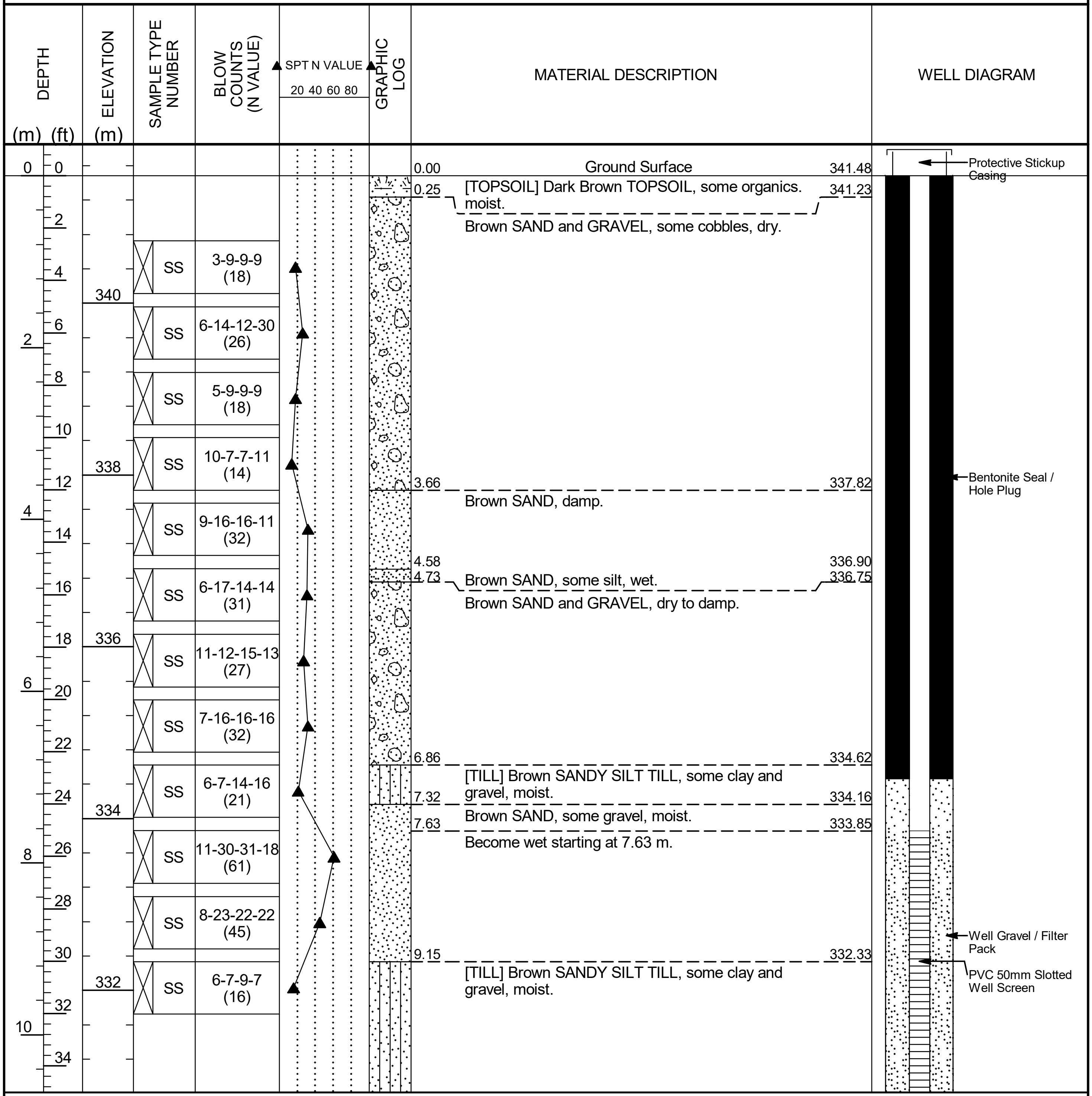
CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

METHOD Hollow Stem Auger

WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = DRY



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	3-9-9-9 (18)
SS	6-14-12-30 (26)
SS	5-9-9-9 (18)
SS	10-7-7-11 (14)
SS	9-16-16-11 (32)
SS	6-17-14-14 (31)
SS	11-12-15-13 (27)
SS	7-16-16-16 (32)
SS	6-7-14-16 (21)
SS	11-30-31-18 (61)
SS	8-23-22-22 (45)
SS	6-7-9-7 (16)

Depth (m)	MATERIAL DESCRIPTION	Elevation (m)
0.00	Ground Surface	341.48
0.25	[TOPSOIL] Dark Brown TOPSOIL, some organics. moist.	341.23
	Brown SAND and GRAVEL, some cobbles, dry.	
3.66	Brown SAND, damp.	337.82
4.58		336.90
4.73	Brown SAND, some silt, wet.	336.75
	Brown SAND and GRAVEL, dry to damp.	
6.86	[TILL] Brown SANDY SILT TILL, some clay and gravel, moist.	334.62
7.32	Brown SAND, some gravel, moist.	334.16
7.63	Become wet starting at 7.63 m.	333.85
9.15	[TILL] Brown SANDY SILT TILL, some clay and gravel, moist.	332.33

Borehole Terminated at 10.67 m.

MONITORING WELL ID: MW22-06

PAGE 1 OF 2

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-22

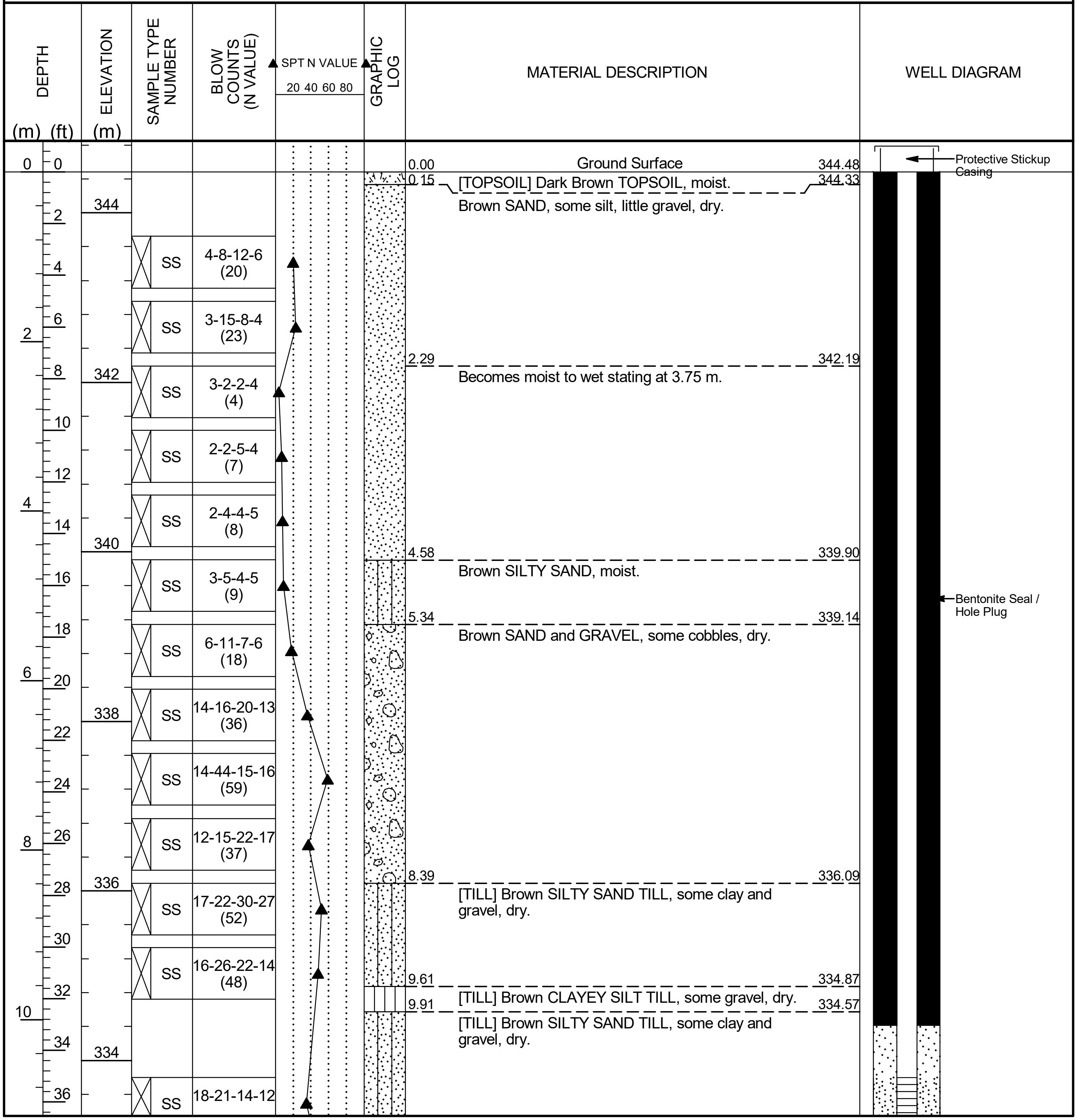
CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

METHOD Hollow Stem Auger

WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = DRY



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	4-8-12-6 (20)
SS	3-15-8-4 (23)
SS	3-2-2-4 (4)
SS	2-2-5-4 (7)
SS	2-4-4-5 (8)
SS	3-5-4-5 (9)
SS	6-11-7-6 (18)
SS	14-16-20-13 (36)
SS	14-44-15-16 (59)
SS	12-15-22-17 (37)
SS	17-22-30-27 (52)
SS	16-26-22-14 (48)
SS	18-21-14-12

Depth (m)	MATERIAL DESCRIPTION	Elevation (m)
0.00	Ground Surface	344.48
0.15	[TOPSOIL] Dark Brown TOPSOIL, moist.	344.33
	Brown SAND, some silt, little gravel, dry.	
2.29	Becomes moist to wet stating at 3.75 m.	342.19
4.58	Brown SILTY SAND, moist.	339.90
5.34	Brown SAND and GRAVEL, some cobbles, dry.	339.14
8.39	[TILL] Brown SILTY SAND TILL, some clay and gravel, dry.	336.09
9.61	[TILL] Brown CLAYEY SILT TILL, some gravel, dry.	334.87
9.91	[TILL] Brown SILTY SAND TILL, some clay and gravel, dry.	334.57

MONITORING WELL ID: MW22-06

PAGE 2 OF 2

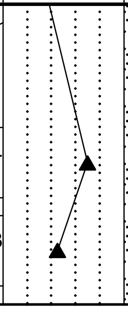
CLIENT Industrial Equities Guelph Corp.

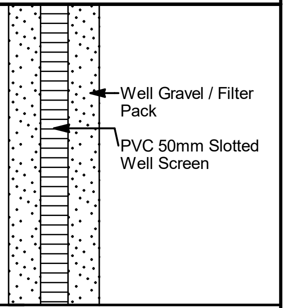
PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DEPTH (m)	DEPTH (ft)	ELEVATION (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	MATERIAL DESCRIPTION
	38		☒	(35)	[TILL] Brown SILTY SAND TILL, some clay and gravel, dry. *(continued)*
12	40				
	42	332	SS	19-30-40-14 (70)	
12.96		331.52			
	44		SS	38-24-21-23 (45)	Becomes damp to moist starting at 12.96 m.



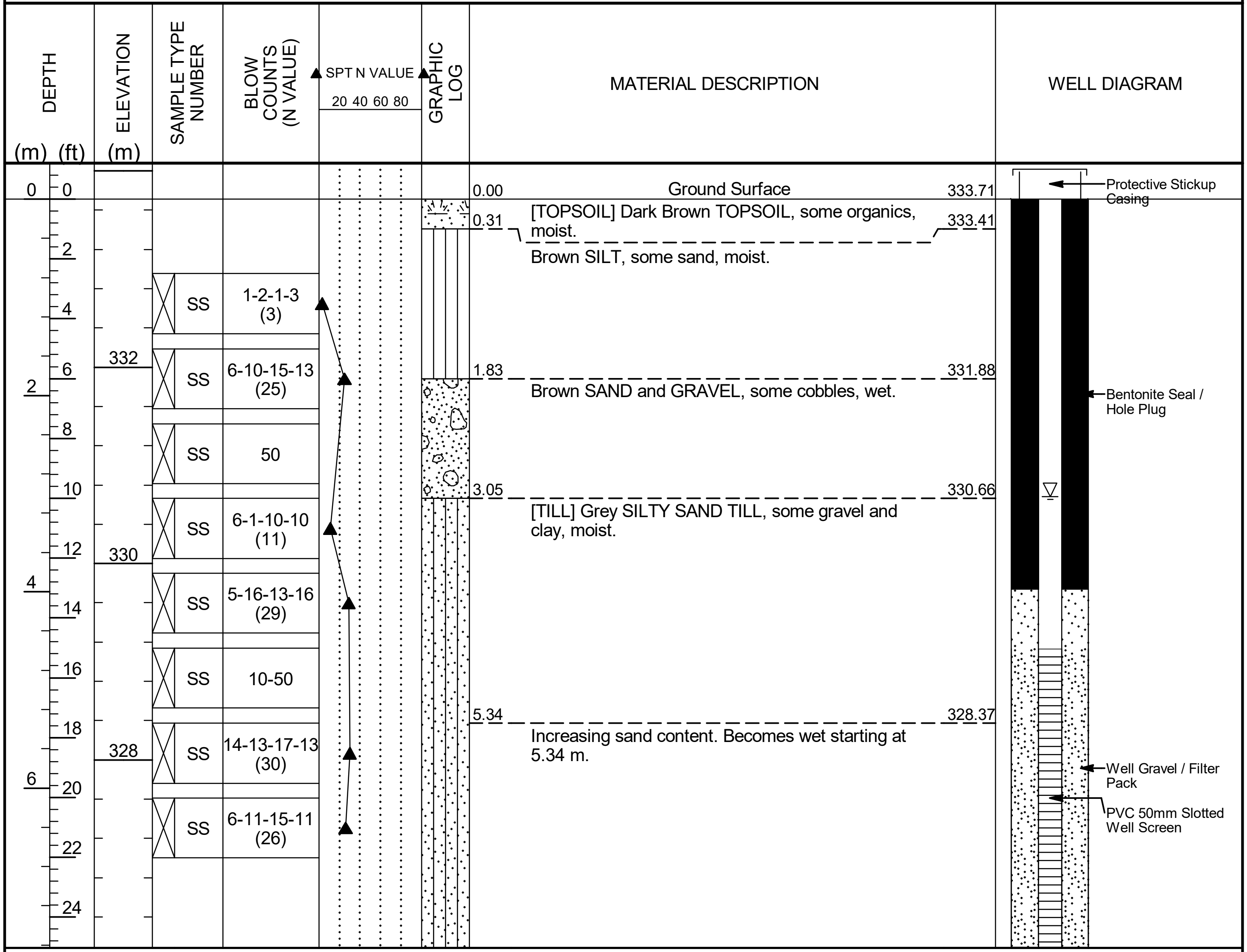


Borehole Terminated at 13.73 m.

MONITORING WELL ID: MW22-07

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.
PROJECT NAME Southgate Business Park
PROJECT NUMBER 121123
PROJECT LOCATION
DATE COMPLETED 2022-04-22
CONTRACTOR Aardvark Drilling Inc.
LOGGED BY AF
METHOD Hollow Stem Auger
WELL CONSTRUCTION 2" PVC Well Construction
NOTES Groundwater Level Measured On 2022-05-12 = 330.68 masl



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	1-2-1-3 (3)
SS	6-10-15-13 (25)
SS	50
SS	6-1-10-10 (11)
SS	5-16-13-16 (29)
SS	10-50
SS	14-13-17-13 (30)
SS	6-11-15-11 (26)

	MATERIAL DESCRIPTION	
0.00	Ground Surface	333.71
	[TOPSOIL] Dark Brown TOPSOIL, some organics, moist.	
0.31		333.41
	Brown SILT, some sand, moist.	
1.83		331.88
	Brown SAND and GRAVEL, some cobbles, wet.	
3.05		330.66
	[TILL] Grey SILTY SAND TILL, some gravel and clay, moist.	
5.34		328.37
	Increasing sand content. Becomes wet starting at 5.34 m.	

Borehole Terminated at 7.63 m.

MONITORING WELL ID: MW22-08

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-21

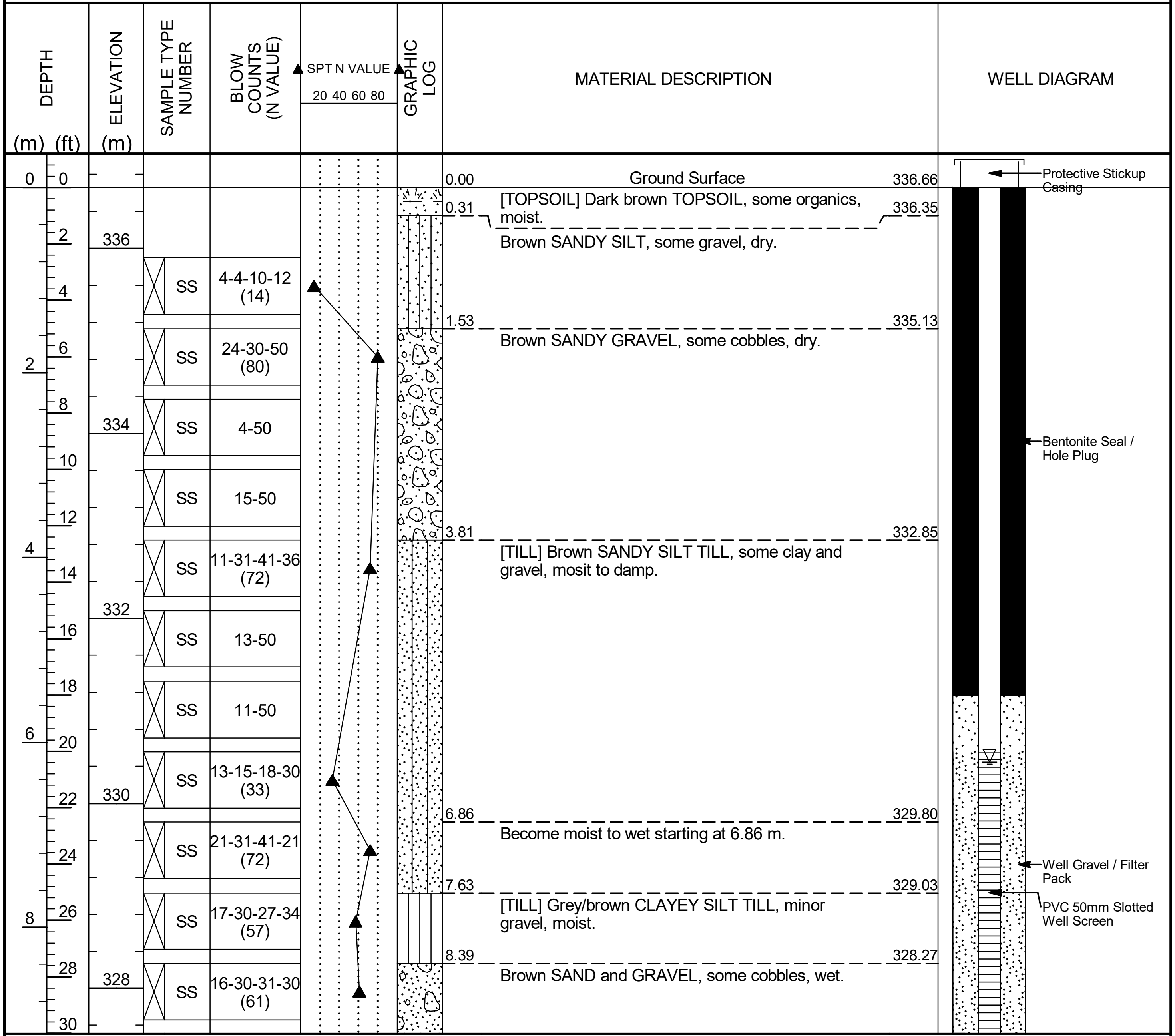
CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

METHOD Hollow Stem Auger

WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = 330.45 masl



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	4-4-10-12 (14)
SS	24-30-50 (80)
SS	4-50
SS	15-50
SS	11-31-41-36 (72)
SS	13-50
SS	11-50
SS	13-15-18-30 (33)
SS	21-31-41-21 (72)
SS	17-30-27-34 (57)
SS	16-30-31-30 (61)

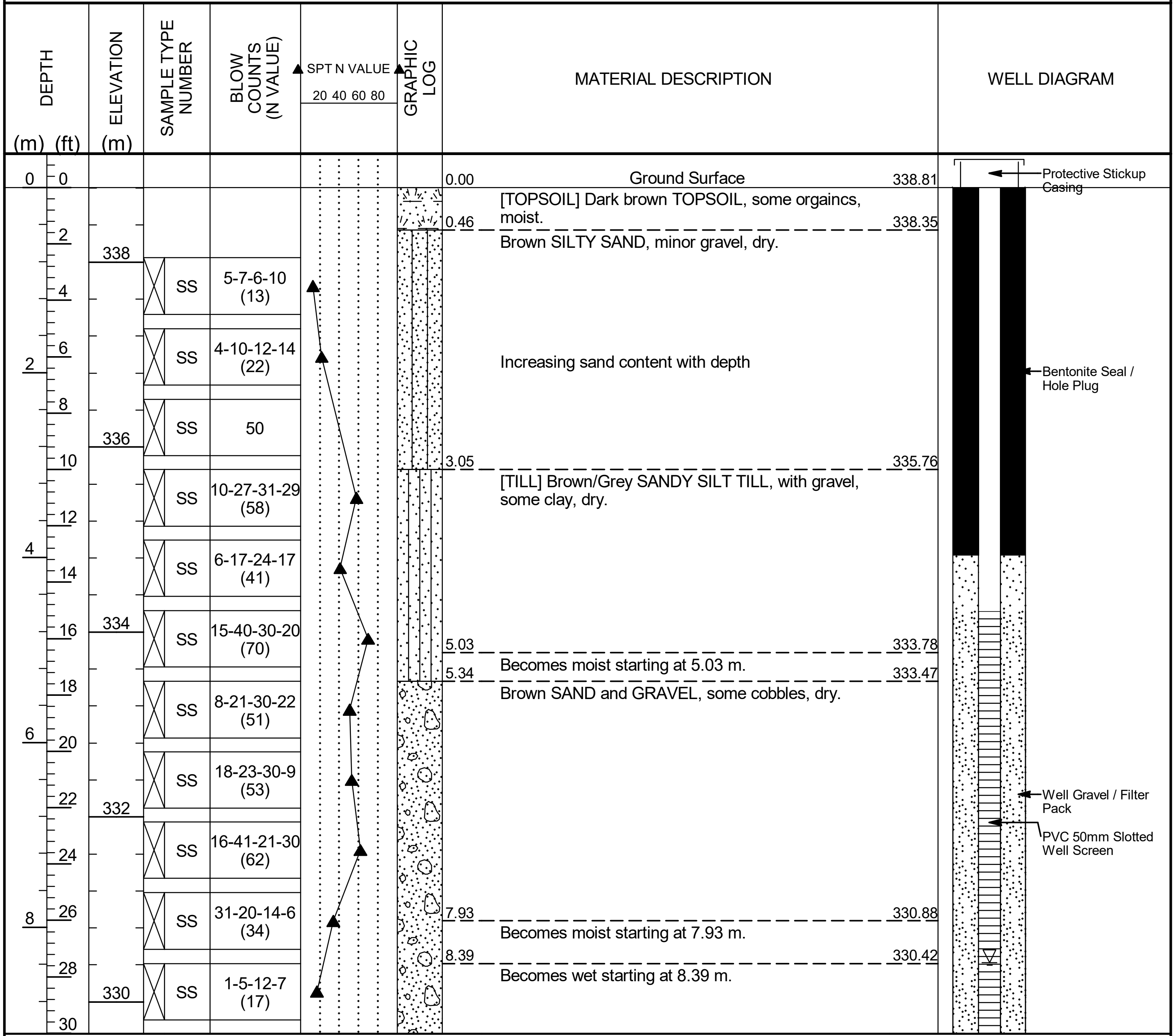
0.00	Ground Surface	336.66
	[TOPSOIL] Dark brown TOPSOIL, some organics, moist.	
0.31		336.35
	Brown SANDY SILT, some gravel, dry.	
1.53		335.13
	Brown SANDY GRAVEL, some cobbles, dry.	
3.81		332.85
	[TILL] Brown SANDY SILT TILL, some clay and gravel, mosit to damp.	
6.86		329.80
	Become moist to wet starting at 6.86 m.	
7.63		329.03
	[TILL] Grey/brown CLAYEY SILT TILL, minor gravel, moist.	
8.39		328.27
	Brown SAND and GRAVEL, some cobbles, wet.	

Borehole Terminated at 9.15 m.

MONITORING WELL ID: MW22-09

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.
PROJECT NUMBER 121123
DATE COMPLETED 2022-04-18
LOGGED BY AF
WELL CONSTRUCTION 2" PVC Well Construction
PROJECT NAME Southgate Business Park
PROJECT LOCATION
CONTRACTOR Aardvark Drilling Inc.
METHOD Hollow Stem Auger
NOTES Groundwater Level Measured On 2022-05-12 = 330.42 masl



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	5-7-6-10 (13)
SS	4-10-12-14 (22)
SS	50
SS	10-27-31-29 (58)
SS	6-17-24-17 (41)
SS	15-40-30-20 (70)
SS	8-21-30-22 (51)
SS	18-23-30-9 (53)
SS	16-41-21-30 (62)
SS	31-20-14-6 (34)
SS	1-5-12-7 (17)

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)
0.00	Ground Surface	338.81
	[TOPSOIL] Dark brown TOPSOIL, some orgaincs, moist.	
0.46	Brown SILTY SAND, minor gravel, dry. Increasing sand content with depth	338.35
3.05	[TILL] Brown/Grey SANDY SILT TILL, with gravel, some clay, dry.	335.76
5.03	Becomes moist starting at 5.03 m.	333.78
5.34	Brown SAND and GRAVEL, some cobbles, dry.	333.47
7.93	Becomes moist starting at 7.93 m.	330.88
8.39	Becomes wet starting at 8.39 m.	330.42

Borehole Terminated at 9.15 m.

MONITORING WELL ID: MW22-10

PAGE 1 OF 1

CLIENT Industrial Equities Guelph Corp.

PROJECT NAME Southgate Business Park

PROJECT NUMBER 121123

PROJECT LOCATION

DATE COMPLETED 2022-04-22

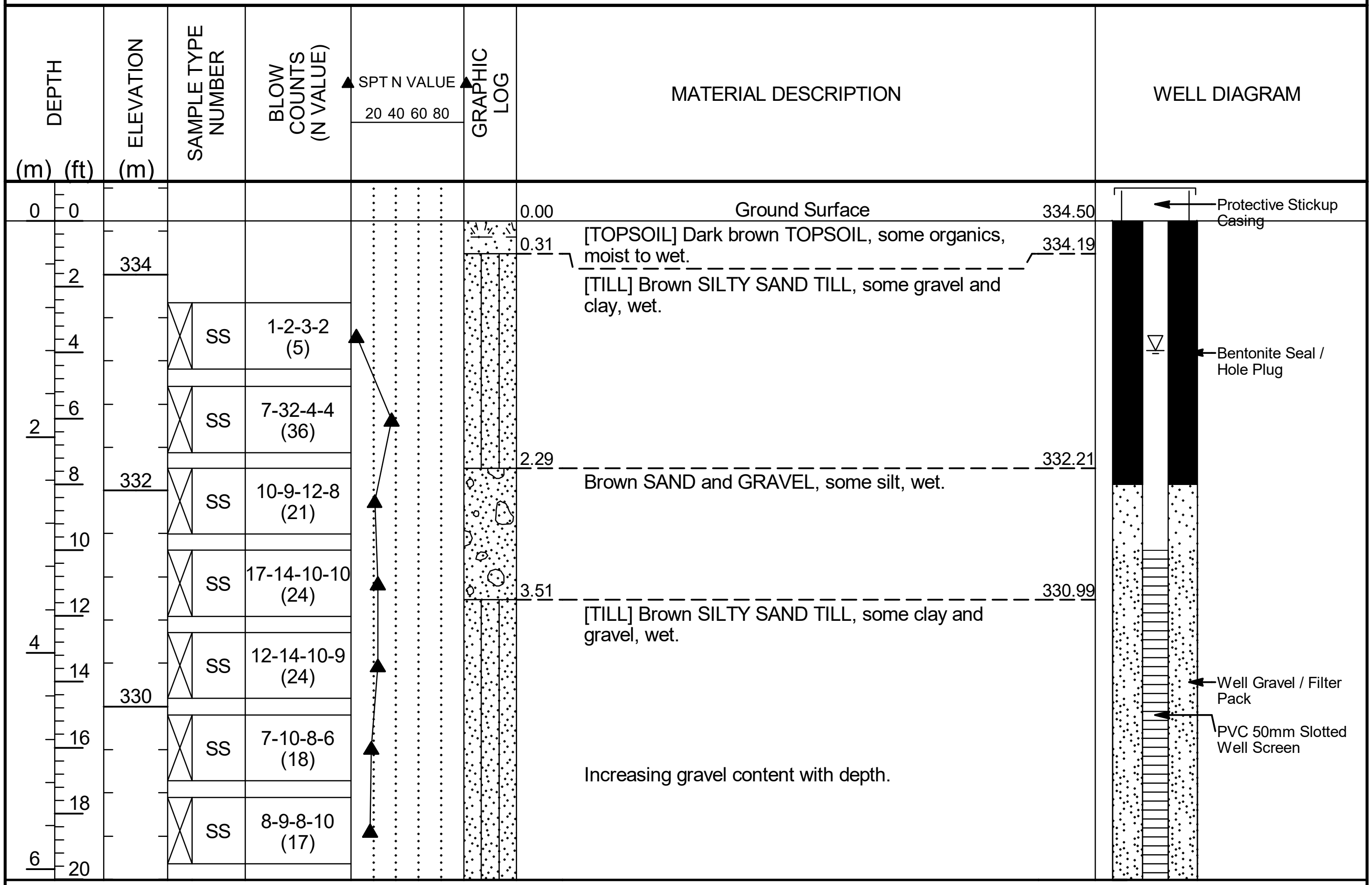
CONTRACTOR Aardvark Drilling Inc.

LOGGED BY AF

METHOD Hollow Stem Auger

WELL CONSTRUCTION 2" PVC Well Construction

NOTES Groundwater Level Measured On 2022-05-12 = 333.30 masl



SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
SS	1-2-3-2 (5)
SS	7-32-4-4 (36)
SS	10-9-12-8 (21)
SS	17-14-10-10 (24)
SS	12-14-10-9 (24)
SS	7-10-8-6 (18)
SS	8-9-8-10 (17)

MATERIAL DESCRIPTION

0.00 Ground Surface 334.50

[TOPSOIL] Dark brown TOPSOIL, some organics, moist to wet.

0.31 334.19

[TILL] Brown SILTY SAND TILL, some gravel and clay, wet.

2.29 332.21

Brown SAND and GRAVEL, some silt, wet.

3.51 330.99

[TILL] Brown SILTY SAND TILL, some clay and gravel, wet.

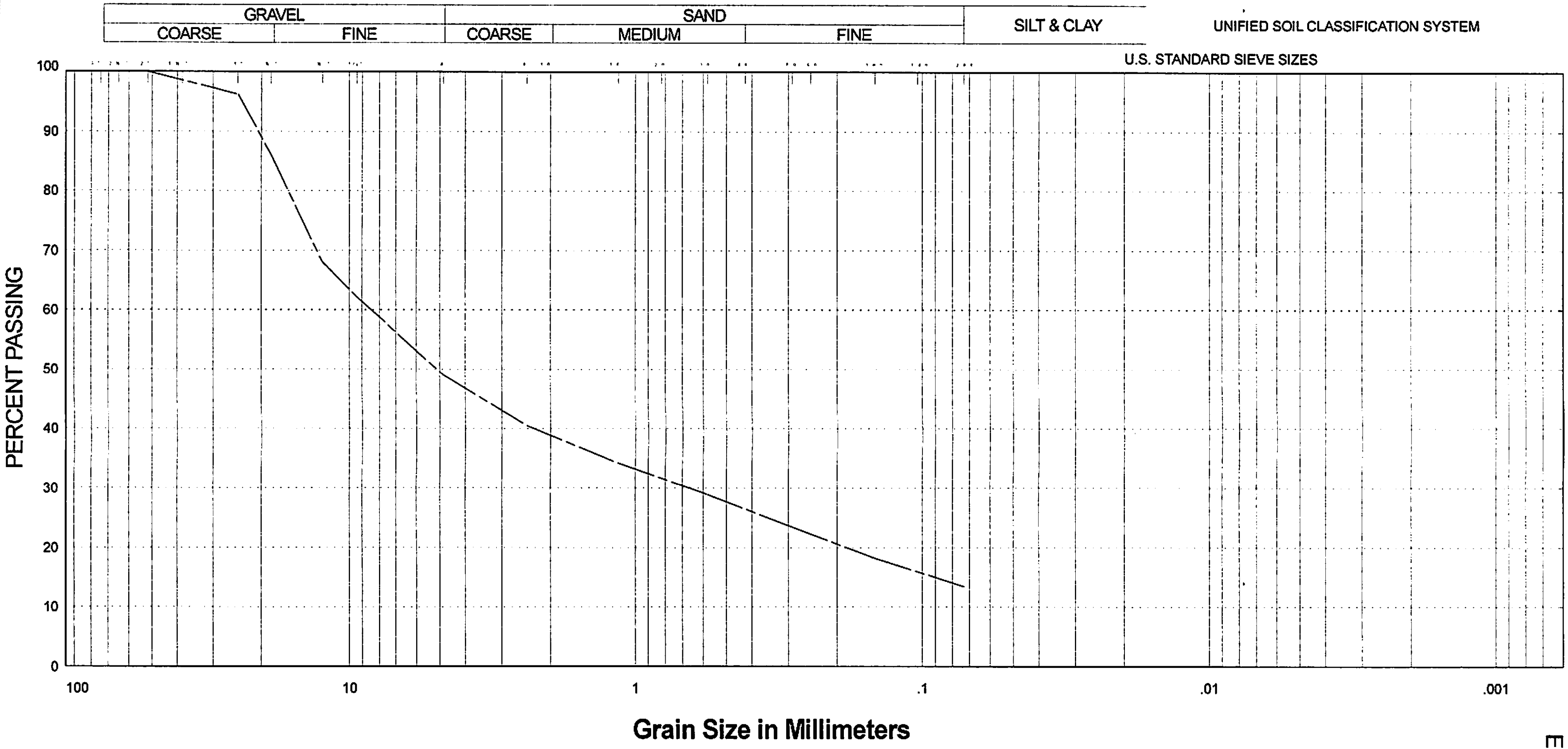
Increasing gravel content with depth.

Borehole Terminated at 6.10 m.

APPENDIX E2:
RESULTS OF GRAIN SIZE ANALYSES

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4579-22-5



PROJECT: 121123
LOCATION: -
BOREHOLE N°: MW 22-02
SAMPLE N°: -
DEPTH: 5.3 - 8.54m±
ELEVATION: -

COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

GRAVEL AND SAND, some silt

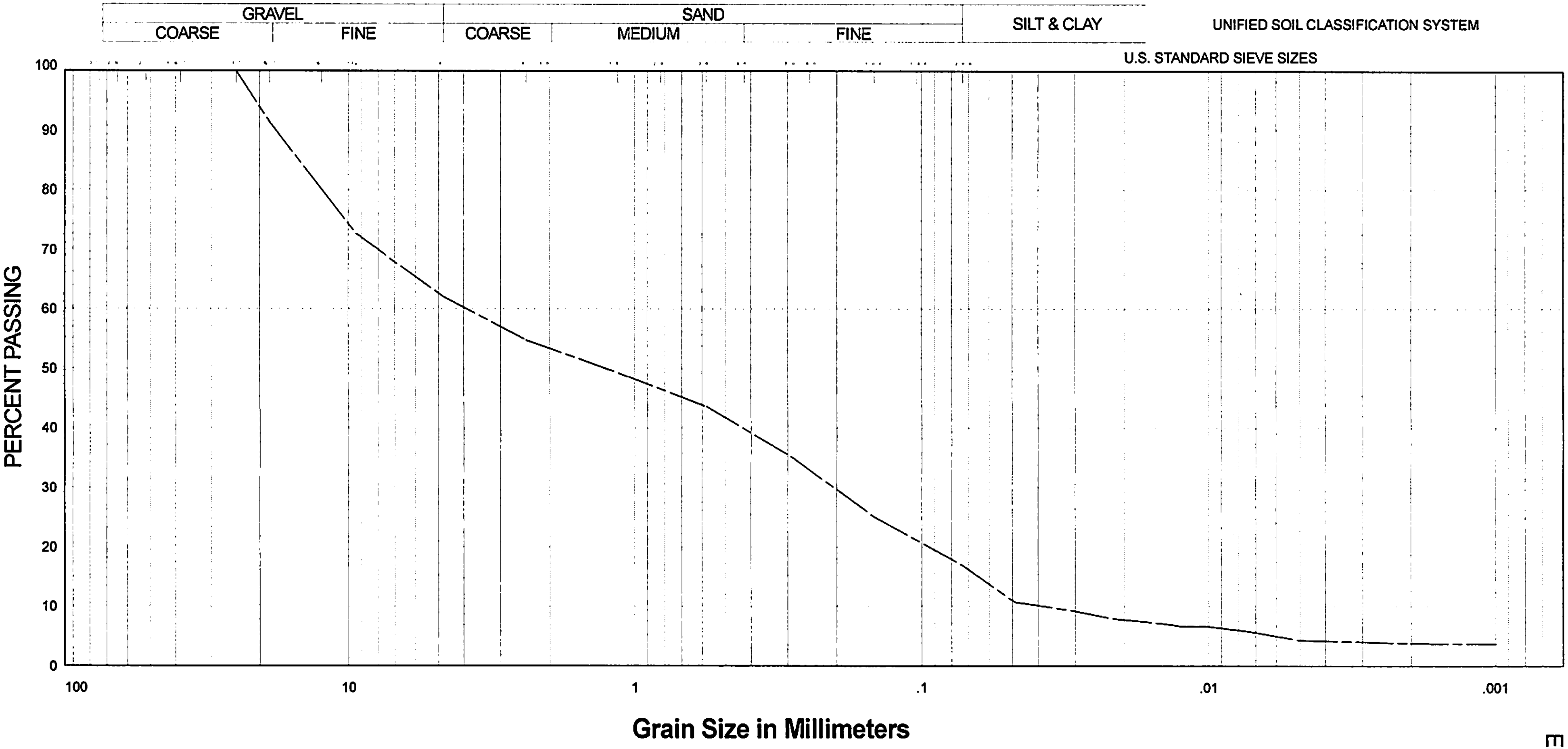
PLASTIC PROPERTIES
LIQUID LIMIT % =
PLASTIC LIMIT % =
PLASTICITY INDEX % =
MOISTURE CONTENT % = 4.1

ENCLOSURE N°

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4579-22-5



PROJECT: 121123

LOCATION: -

BOREHOLE N°: MW 22-05

SAMPLE N°: -

DEPTH: 7.32 - 9.15m±

ELEVATION: -

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

SAND AND GRAVEL, some silt, trace clay

PLASTIC PROPERTIES

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

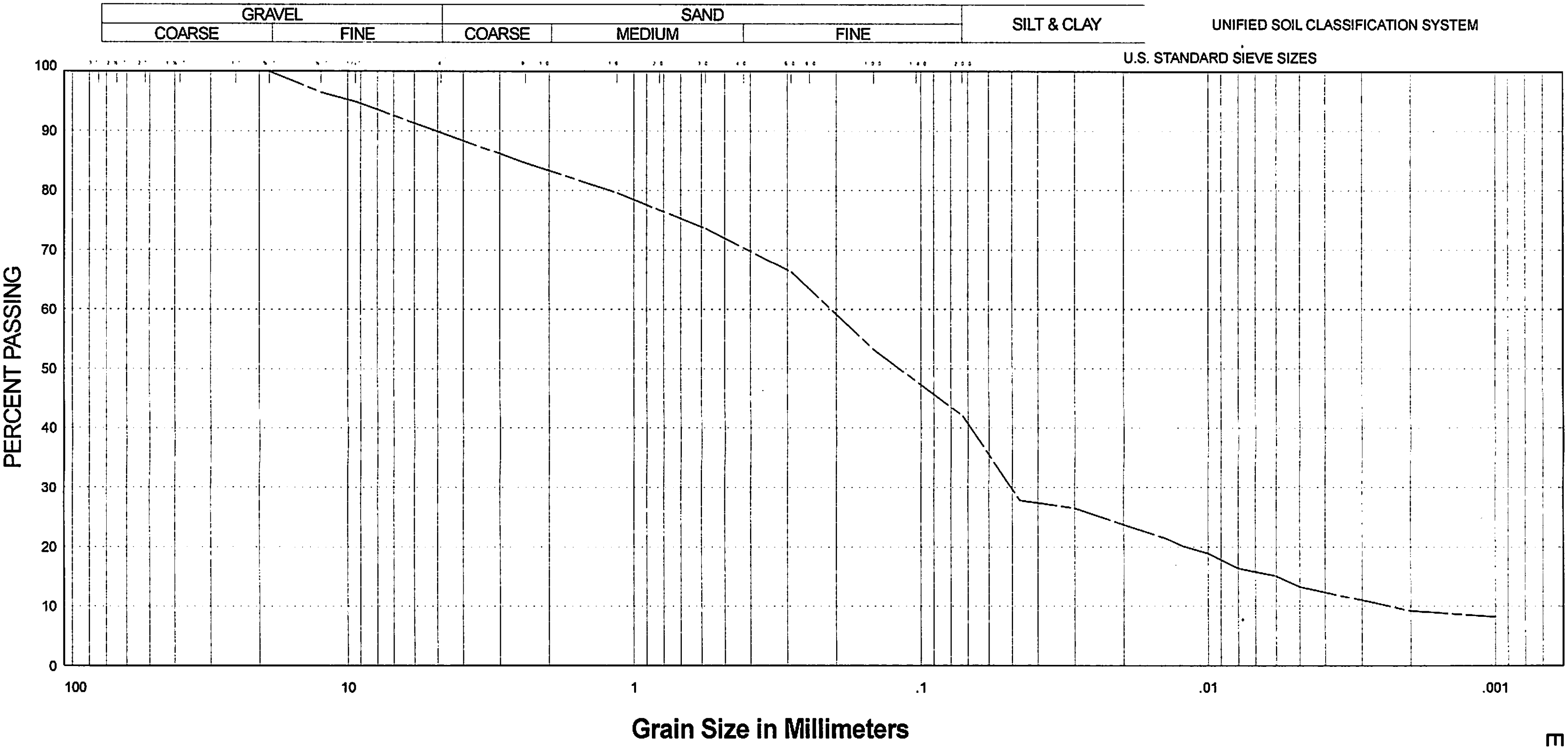
MOISTURE CONTENT % = 6.3

ENCLOSURE N°

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4579-22-5



PROJECT: 121123

LOCATION: -

BOREHOLE N°: MW 22-05

SAMPLE N°: -

DEPTH: 6.66 - 7.32m±

ELEVATION: -

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

SILTY SAND, some gravel, trace clay

PLASTIC PROPERTIES

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

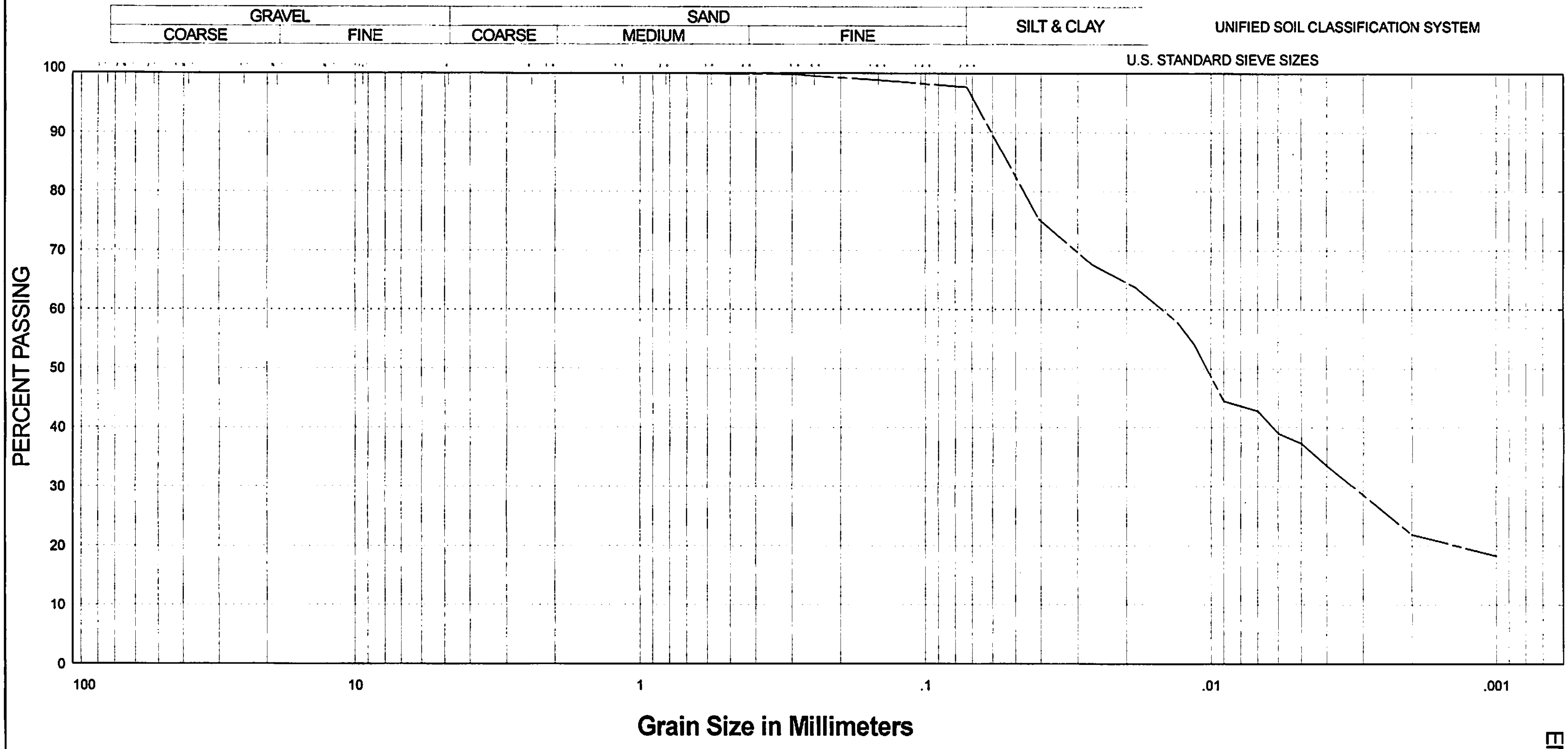
MOISTURE CONTENT % = 9.6

ENCLOSURE N°

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4579-22-5



PROJECT: 121123
LOCATION: -
BOREHOLE N°: MW 22-07
SAMPLE N°: -
DEPTH: 0.31 - 1.83m±
ELEVATION: -

COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

CLAYEY SILT, trace sand

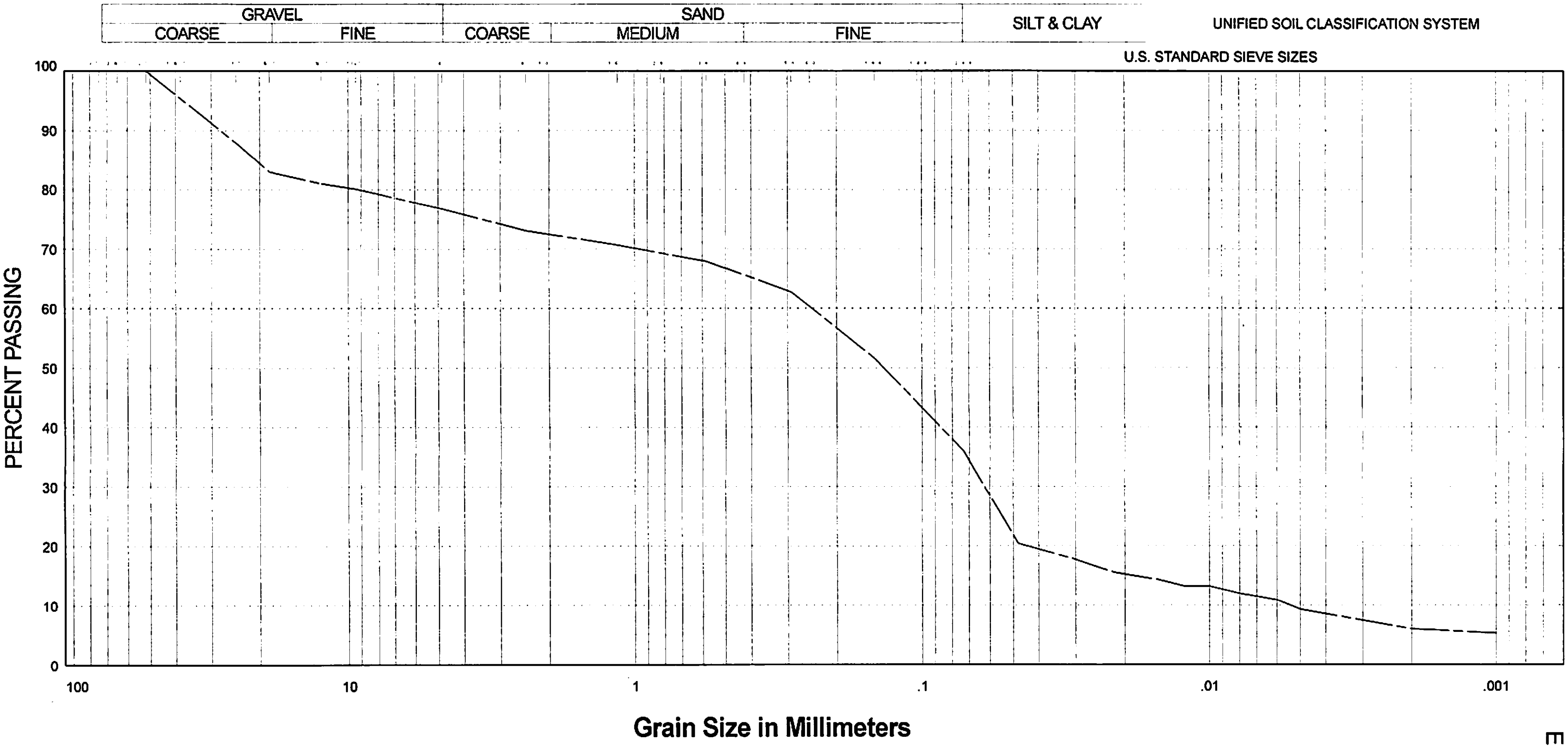
PLASTIC PROPERTIES
LIQUID LIMIT % =
PLASTIC LIMIT % =
PLASTICITY INDEX % =
MOISTURE CONTENT % = 25.5

ENCLOSURE N°

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4579-22-5



PROJECT: 121123

LOCATION: -

BOREHOLE N°: MW 22-07

SAMPLE N°: -

DEPTH: 1.53 - 2.29m±

ELEVATION: -

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

GRAVELLY SILTY SAND, trace clay

PLASTIC PROPERTIES

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

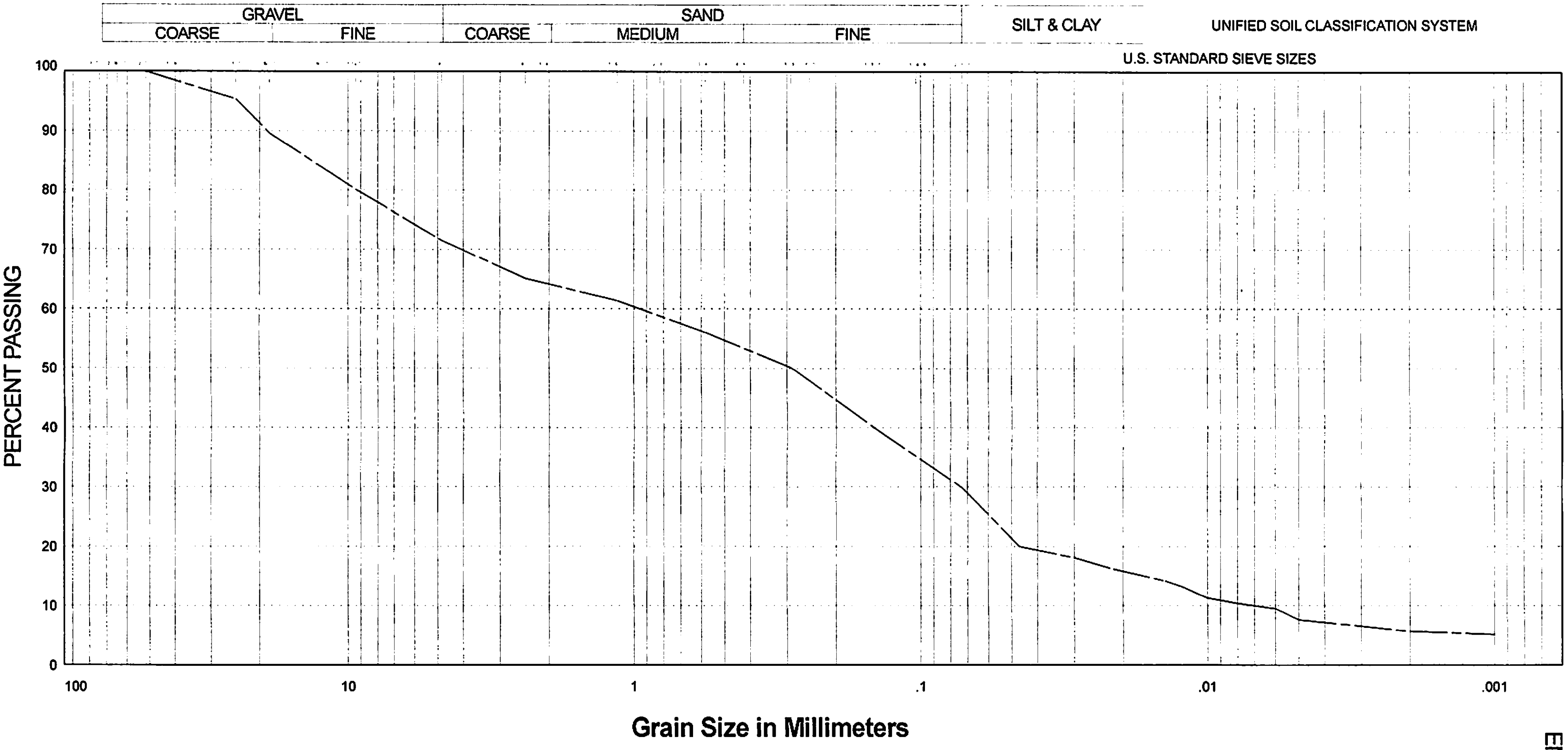
MOISTURE CONTENT % = 14.6

ENCLOSURE N°

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4579-22-5



PROJECT: 121123
LOCATION: -
BOREHOLE N°: MW 22-08
SAMPLE N°: -
DEPTH: 3.81 - 6.85m±
ELEVATION: -

COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

SILTY GRAVELLY SAND, trace clay

PLASTIC PROPERTIES

LIQUID LIMIT	% =
PLASTIC LIMIT	% =
PLASTICITY INDEX	% =
MOISTURE CONTENT	% = 7.4

ENCLOSURE N°

JLP SERVICES INC.

APPENDIX F1:
LABORATORY CERTIFICATES OF ANALYSIS
GROUNDWATER FROM MONITORING WELLS

Your Project #: 121123
Your C.O.C. #: 871977-01-01

Attention: Abdi Faarah

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/04/14
Report #: R7086393
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C291734
Received: 2022/04/06, 17:30

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	4	N/A	2022/04/11	CAM SOP-00448	SM 23 2320 B m
Alkalinity	1	N/A	2022/04/08	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2022/04/11	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	4	N/A	2022/04/12	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	4	N/A	2022/04/12	CAM SOP-00463	SM 23 4500-Cl E m
Chloride by Automated Colourimetry	1	N/A	2022/04/08	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	4	N/A	2022/04/11	CAM SOP-00414	SM 23 2510 m
Conductivity	1	N/A	2022/04/08	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	5	N/A	2022/04/11	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	5	N/A	2022/04/14	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	5	N/A	2022/04/13	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	5	N/A	2022/04/14		
Anion and Cation Sum	5	N/A	2022/04/14		
Total Ammonia-N	5	N/A	2022/04/11	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	4	N/A	2022/04/13	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate & Nitrite as Nitrogen in Water (2)	1	N/A	2022/04/08	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	1	2022/04/07	2022/04/08	CAM SOP-00413	SM 4500H+ B m
pH	4	2022/04/08	2022/04/11	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	4	N/A	2022/04/11	CAM SOP-00461	EPA 365.1 m
Orthophosphate	1	N/A	2022/04/08	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	5	N/A	2022/04/14		Auto Calc
Sat. pH and Langelier Index (@ 4C)	5	N/A	2022/04/14		Auto Calc
Sulphate by Automated Colourimetry	4	N/A	2022/04/11	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry	1	N/A	2022/04/08	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	5	N/A	2022/04/14		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

Your Project #: 121123
Your C.O.C. #: 871977-01-01

Attention: Abdi Faarah

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/04/14
Report #: R7086393
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C291734
Received: 2022/04/06, 17:30

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ashton Gibson, Project Manager
Email: Ashton.Gibson@bureauveritas.com
Phone# (905)817-5765
==
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 2

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SHM162	SHM163	SHM164			SHM165		
Sampling Date		2022/04/06 12:00	2022/04/06 12:30	2022/04/06 13:00			2022/04/06 13:30		
	UNITS	**MW97-5**	**MW2-09**	**MW1-09**	**RDL**	**QC Batch**	**MW97-3**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	5.31	6.72	6.12	N/A	7927314	10.2	N/A	7927314
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	230	290	240	1.0	7927310	440	1.0	7927310
Calculated TDS	mg/L	280	350	330	1.0	7927086	540	1.0	7927086
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.2	3.1	2.0	1.0	7927310	2.3	1.0	7927310
Cation Sum	me/L	5.52	6.62	6.11	N/A	7927314	10.5	N/A	7927314
Hardness (CaCO3)	mg/L	270	280	300	1.0	7927170	520	1.0	7927170
Ion Balance (% Difference)	%	2.00	0.690	0.0400	N/A	7927313	1.33	N/A	7927313
Langelier Index (@ 20C)	N/A	0.831	0.956	0.828		7927305	1.06		7927305
Langelier Index (@ 4C)	N/A	0.582	0.707	0.579		7927306	0.815		7927306
Saturation pH (@ 20C)	N/A	7.18	7.10	7.12		7927305	6.67		7927305
Saturation pH (@ 4C)	N/A	7.43	7.34	7.37		7927306	6.92		7927306
Inorganics									
Total Ammonia-N	mg/L	<0.050	0.062	<0.050	0.050	7931134	<0.050	0.050	7931134
Conductivity	umho/cm	490	590	570	1.0	7931410	870	1.0	7929132
Dissolved Organic Carbon	mg/L	0.46	1.4	0.93	0.40	7929063	1.6	0.40	7929063
Orthophosphate (P)	mg/L	<0.010	<0.010	<0.010	0.010	7931375	<0.050 (1)	0.050	7929088
pH	pH	8.01	8.05	7.95		7931411	7.73		7929134
Dissolved Sulphate (SO4)	mg/L	9.1	30	15	1.0	7931379	23	1.0	7929087
Alkalinity (Total as CaCO3)	mg/L	230	300	250	1.0	7931408	440	1.0	7929130
Dissolved Chloride (Cl-)	mg/L	6.1	5.1	9.7	1.0	7931362	3.8	1.0	7929108
Nitrite (N)	mg/L	<0.010	0.016	<0.010	0.010	7931348	<0.010	0.010	7929402
Nitrate (N)	mg/L	5.13	<0.10	8.52	0.10	7931348	10.1	0.10	7929402
Nitrate + Nitrite (N)	mg/L	5.13	<0.10	8.52	0.10	7931348	10.1	0.10	7929402

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SHM166		
Sampling Date		2022/04/06 14:00		
	UNITS	**MW3-09**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	5.93	N/A	7927314
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	280	1.0	7927310
Calculated TDS	mg/L	290	1.0	7927086
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.6	1.0	7927310
Cation Sum	me/L	6.14	N/A	7927314
Hardness (CaCO3)	mg/L	290	1.0	7927170
Ion Balance (% Difference)	%	1.75	N/A	7927313
Langelier Index (@ 20C)	N/A	0.690		7927305
Langelier Index (@ 4C)	N/A	0.441		7927306
Saturation pH (@ 20C)	N/A	7.08		7927305
Saturation pH (@ 4C)	N/A	7.33		7927306
Inorganics				
Total Ammonia-N	mg/L	0.073	0.050	7931134
Conductivity	umho/cm	530	1.0	7931410
Dissolved Organic Carbon	mg/L	1.6	0.40	7929063
Orthophosphate (P)	mg/L	<0.010	0.010	7931375
pH	pH	7.77		7931411
Dissolved Sulphate (SO4)	mg/L	7.1	1.0	7931379
Alkalinity (Total as CaCO3)	mg/L	290	1.0	7931408
Dissolved Chloride (Cl-)	mg/L	1.9	1.0	7931362
Nitrite (N)	mg/L	<0.010	0.010	7931348
Nitrate (N)	mg/L	<0.10	0.10	7931348
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	7931348

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		SHM162		SHM163	SHM163	SHM164	SHM165	SHM166		
Sampling Date		2022/04/06 12:00		2022/04/06 12:30	2022/04/06 12:30	2022/04/06 13:00	2022/04/06 13:30	2022/04/06 14:00		
	UNITS	**MW97-5**	**QC Batch**	**MW2-09**	**MW2-09 Lab-Dup**	**MW1-09**	**MW97-3**	**MW3-09**	**RDL**	**QC Batch**
Metals										
Dissolved Aluminum (Al)	ug/L	<4.9	7930567	<4.9	<4.9	<4.9	6.0	18	4.9	7930511
Dissolved Antimony (Sb)	ug/L	<0.50	7930567	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7930511
Dissolved Arsenic (As)	ug/L	<1.0	7930567	<1.0	<1.0	<1.0	<1.0	1.9	1.0	7930511
Dissolved Barium (Ba)	ug/L	48	7930567	140	150	14	48	28	2.0	7930511
Dissolved Beryllium (Be)	ug/L	<0.40	7930567	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	7930511
Dissolved Boron (B)	ug/L	<10	7930567	11	11	<10	13	<10	10	7930511
Dissolved Cadmium (Cd)	ug/L	<0.090	7930567	<0.090	<0.090	<0.090	<0.090	<0.090	0.090	7930511
Dissolved Calcium (Ca)	ug/L	75000	7930567	73000	76000	82000	140000	76000	200	7930511
Dissolved Chromium (Cr)	ug/L	<5.0	7930567	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	7930511
Dissolved Cobalt (Co)	ug/L	<0.50	7930567	<0.50	<0.50	<0.50	<0.50	1.1	0.50	7930511
Dissolved Copper (Cu)	ug/L	<0.90	7930567	<0.90	<0.90	<0.90	1.3	<0.90	0.90	7930511
Dissolved Iron (Fe)	ug/L	<100	7930567	<100	<100	<100	<100	4300	100	7930511
Dissolved Lead (Pb)	ug/L	<0.50	7930567	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7930511
Dissolved Magnesium (Mg)	ug/L	21000	7930567	24000	24000	23000	39000	24000	50	7930511
Dissolved Manganese (Mn)	ug/L	<2.0	7930567	43	42	<2.0	<2.0	620	2.0	7930511
Dissolved Molybdenum (Mo)	ug/L	<0.50	7930567	5.4	5.5	<0.50	<0.50	<0.50	0.50	7930511
Dissolved Nickel (Ni)	ug/L	<1.0	7930567	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7930511
Dissolved Phosphorus (P)	ug/L	<100	7930567	<100	<100	<100	<100	<100	100	7930511
Dissolved Potassium (K)	ug/L	490	7930567	1500	1400	510	870	1000	200	7930511
Dissolved Selenium (Se)	ug/L	<2.0	7930567	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7930511
Dissolved Silicon (Si)	ug/L	4500	7930567	8300	8600	4100	5400	1600	50	7930511
Dissolved Silver (Ag)	ug/L	<0.090	7930567	<0.090	<0.090	<0.090	<0.090	<0.090	0.090	7930511
Dissolved Sodium (Na)	ug/L	1700	7930567	23000	22000	2800	1900	3800	100	7930511
Dissolved Strontium (Sr)	ug/L	78	7930567	110	110	85	140	67	1.0	7930511
Dissolved Thallium (Tl)	ug/L	<0.050	7930567	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7930511
Dissolved Titanium (Ti)	ug/L	<5.0	7930567	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	7930511
Dissolved Uranium (U)	ug/L	0.25	7930567	2.2	2.2	0.36	0.31	<0.10	0.10	7930511
Dissolved Vanadium (V)	ug/L	<0.50	7930567	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7930511
Dissolved Zinc (Zn)	ug/L	7.5	7930567	<5.0	<5.0	<5.0	7.5	<5.0	5.0	7930511

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

TEST SUMMARY

Bureau Veritas ID: SHM162
Sample ID: MW97-5
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7931408	N/A	2022/04/11	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7927310	N/A	2022/04/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	7931362	N/A	2022/04/12	Alina Dobreanu
Conductivity	AT	7931410	N/A	2022/04/11	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7929063	N/A	2022/04/11	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7927170	N/A	2022/04/14	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7930567	N/A	2022/04/13	Arefa Dabhad
Ion Balance (% Difference)	CALC	7927313	N/A	2022/04/14	Automated Statchk
Anion and Cation Sum	CALC	7927314	N/A	2022/04/14	Automated Statchk
Total Ammonia-N	LACH/NH4	7931134	N/A	2022/04/11	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7931348	N/A	2022/04/13	Samuel Law
pH	AT	7931411	2022/04/08	2022/04/11	Surinder Rai
Orthophosphate	KONE	7931375	N/A	2022/04/11	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7927305	N/A	2022/04/14	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7927306	N/A	2022/04/14	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7931379	N/A	2022/04/11	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7927086	N/A	2022/04/14	Automated Statchk

Bureau Veritas ID: SHM163
Sample ID: MW2-09
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7931408	N/A	2022/04/11	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7927310	N/A	2022/04/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	7931362	N/A	2022/04/12	Alina Dobreanu
Conductivity	AT	7931410	N/A	2022/04/11	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7929063	N/A	2022/04/11	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7927170	N/A	2022/04/14	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7930511	N/A	2022/04/13	Arefa Dabhad
Ion Balance (% Difference)	CALC	7927313	N/A	2022/04/14	Automated Statchk
Anion and Cation Sum	CALC	7927314	N/A	2022/04/14	Automated Statchk
Total Ammonia-N	LACH/NH4	7931134	N/A	2022/04/11	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7931348	N/A	2022/04/13	Samuel Law
pH	AT	7931411	2022/04/08	2022/04/11	Surinder Rai
Orthophosphate	KONE	7931375	N/A	2022/04/11	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7927305	N/A	2022/04/14	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7927306	N/A	2022/04/14	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7931379	N/A	2022/04/11	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7927086	N/A	2022/04/14	Automated Statchk

TEST SUMMARY

Bureau Veritas ID: SHM163 Dup
Sample ID: MW2-09
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	7930511	N/A	2022/04/13	Arefa Dabhad

Bureau Veritas ID: SHM164
Sample ID: MW1-09
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7931408	N/A	2022/04/11	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7927310	N/A	2022/04/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	7931362	N/A	2022/04/12	Alina Dobreanu
Conductivity	AT	7931410	N/A	2022/04/11	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7929063	N/A	2022/04/11	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7927170	N/A	2022/04/14	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7930511	N/A	2022/04/13	Arefa Dabhad
Ion Balance (% Difference)	CALC	7927313	N/A	2022/04/14	Automated Statchk
Anion and Cation Sum	CALC	7927314	N/A	2022/04/14	Automated Statchk
Total Ammonia-N	LACH/NH4	7931134	N/A	2022/04/11	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7931348	N/A	2022/04/13	Samuel Law
pH	AT	7931411	2022/04/08	2022/04/11	Surinder Rai
Orthophosphate	KONE	7931375	N/A	2022/04/11	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7927305	N/A	2022/04/14	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7927306	N/A	2022/04/14	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7931379	N/A	2022/04/11	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7927086	N/A	2022/04/14	Automated Statchk

Bureau Veritas ID: SHM165
Sample ID: MW97-3
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7929130	N/A	2022/04/08	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7927310	N/A	2022/04/11	Automated Statchk
Chloride by Automated Colourimetry	KONE	7929108	N/A	2022/04/08	Alina Dobreanu
Conductivity	AT	7929132	N/A	2022/04/08	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7929063	N/A	2022/04/11	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7927170	N/A	2022/04/14	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7930511	N/A	2022/04/13	Arefa Dabhad
Ion Balance (% Difference)	CALC	7927313	N/A	2022/04/14	Automated Statchk
Anion and Cation Sum	CALC	7927314	N/A	2022/04/14	Automated Statchk
Total Ammonia-N	LACH/NH4	7931134	N/A	2022/04/11	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7929402	N/A	2022/04/08	Samuel Law
pH	AT	7929134	2022/04/07	2022/04/08	Surinder Rai
Orthophosphate	KONE	7929088	N/A	2022/04/08	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7927305	N/A	2022/04/14	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7927306	N/A	2022/04/14	Automated Statchk

TEST SUMMARY

Bureau Veritas ID: SHM165
Sample ID: MW97-3
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate by Automated Colourimetry	KONE	7929087	N/A	2022/04/08	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7927086	N/A	2022/04/14	Automated Statchk

Bureau Veritas ID: SHM166
Sample ID: MW3-09
Matrix: Water

Collected: 2022/04/06
Shipped:
Received: 2022/04/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7931408	N/A	2022/04/11	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7927310	N/A	2022/04/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	7931362	N/A	2022/04/12	Alina Dobreanu
Conductivity	AT	7931410	N/A	2022/04/11	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7929063	N/A	2022/04/11	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7927170	N/A	2022/04/14	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7930511	N/A	2022/04/13	Arefa Dabhad
Ion Balance (% Difference)	CALC	7927313	N/A	2022/04/14	Automated Statchk
Anion and Cation Sum	CALC	7927314	N/A	2022/04/14	Automated Statchk
Total Ammonia-N	LACH/NH4	7931134	N/A	2022/04/11	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7931348	N/A	2022/04/13	Samuel Law
pH	AT	7931411	2022/04/08	2022/04/11	Surinder Rai
Orthophosphate	KONE	7931375	N/A	2022/04/11	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7927305	N/A	2022/04/14	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7927306	N/A	2022/04/14	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7931379	N/A	2022/04/11	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7927086	N/A	2022/04/14	Automated Statchk

GENERAL COMMENTS

Results relate only to the items tested.

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7929063	Dissolved Organic Carbon	2022/04/11	96	80 - 120	100	80 - 120	<0.40	mg/L	0.18	20
7929087	Dissolved Sulphate (SO4)	2022/04/08	NC	75 - 125	99	80 - 120	<1.0	mg/L	0.82	20
7929088	Orthophosphate (P)	2022/04/08	113	75 - 125	101	80 - 120	<0.010	mg/L	NC	25
7929108	Dissolved Chloride (Cl-)	2022/04/08	NC	80 - 120	105	80 - 120	<1.0	mg/L	1.6	20
7929130	Alkalinity (Total as CaCO3)	2022/04/08			99	85 - 115	<1.0	mg/L	1.4	20
7929132	Conductivity	2022/04/08			101	85 - 115	<1.0	umho/cm	0.72	25
7929134	pH	2022/04/08			102	98 - 103			1.1	N/A
7929402	Nitrate (N)	2022/04/08	93	80 - 120	98	80 - 120	<0.10	mg/L	0.44	20
7929402	Nitrite (N)	2022/04/08	99	80 - 120	103	80 - 120	<0.010	mg/L	NC	20
7930511	Dissolved Aluminum (Al)	2022/04/13	101	80 - 120	101	80 - 120	<4.9	ug/L	NC	20
7930511	Dissolved Antimony (Sb)	2022/04/13	102	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
7930511	Dissolved Arsenic (As)	2022/04/13	101	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
7930511	Dissolved Barium (Ba)	2022/04/13	99	80 - 120	99	80 - 120	<2.0	ug/L	0.24	20
7930511	Dissolved Beryllium (Be)	2022/04/13	95	80 - 120	97	80 - 120	<0.40	ug/L	NC	20
7930511	Dissolved Boron (B)	2022/04/13	96	80 - 120	97	80 - 120	<10	ug/L	6.8	20
7930511	Dissolved Cadmium (Cd)	2022/04/13	101	80 - 120	99	80 - 120	<0.090	ug/L	NC	20
7930511	Dissolved Calcium (Ca)	2022/04/13	NC	80 - 120	100	80 - 120	<200	ug/L	2.9	20
7930511	Dissolved Chromium (Cr)	2022/04/13	100	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
7930511	Dissolved Cobalt (Co)	2022/04/13	97	80 - 120	95	80 - 120	<0.50	ug/L	NC	20
7930511	Dissolved Copper (Cu)	2022/04/13	94	80 - 120	95	80 - 120	<0.90	ug/L	NC	20
7930511	Dissolved Iron (Fe)	2022/04/13	98	80 - 120	94	80 - 120	<100	ug/L	NC	20
7930511	Dissolved Lead (Pb)	2022/04/13	99	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
7930511	Dissolved Magnesium (Mg)	2022/04/13	95	80 - 120	97	80 - 120	<50	ug/L	2.6	20
7930511	Dissolved Manganese (Mn)	2022/04/13	99	80 - 120	99	80 - 120	<2.0	ug/L	1.9	20
7930511	Dissolved Molybdenum (Mo)	2022/04/13	98	80 - 120	95	80 - 120	<0.50	ug/L	2.9	20
7930511	Dissolved Nickel (Ni)	2022/04/13	96	80 - 120	95	80 - 120	<1.0	ug/L	NC	20
7930511	Dissolved Phosphorus (P)	2022/04/13	102	80 - 120	105	80 - 120	<100	ug/L	NC	20
7930511	Dissolved Potassium (K)	2022/04/13	101	80 - 120	98	80 - 120	<200	ug/L	1.2	20
7930511	Dissolved Selenium (Se)	2022/04/13	101	80 - 120	101	80 - 120	<2.0	ug/L	NC	20
7930511	Dissolved Silicon (Si)	2022/04/13	100	80 - 120	101	80 - 120	<50	ug/L	3.9	20
7930511	Dissolved Silver (Ag)	2022/04/13	97	80 - 120	95	80 - 120	<0.090	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
7930511	Dissolved Sodium (Na)	2022/04/13	106	80 - 120	101	80 - 120	<100	ug/L	4.9	20
7930511	Dissolved Strontium (Sr)	2022/04/13	101	80 - 120	98	80 - 120	<1.0	ug/L	0.88	20
7930511	Dissolved Thallium (Tl)	2022/04/13	103	80 - 120	102	80 - 120	<0.050	ug/L	NC	20
7930511	Dissolved Titanium (Ti)	2022/04/13	100	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
7930511	Dissolved Uranium (U)	2022/04/13	97	80 - 120	99	80 - 120	<0.10	ug/L	1.7	20
7930511	Dissolved Vanadium (V)	2022/04/13	98	80 - 120	95	80 - 120	<0.50	ug/L	NC	20
7930511	Dissolved Zinc (Zn)	2022/04/13	99	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
7930567	Dissolved Aluminum (Al)	2022/04/13	103	80 - 120	100	80 - 120	<4.9	ug/L		
7930567	Dissolved Antimony (Sb)	2022/04/13	103	80 - 120	98	80 - 120	<0.50	ug/L		
7930567	Dissolved Arsenic (As)	2022/04/13	104	80 - 120	99	80 - 120	<1.0	ug/L		
7930567	Dissolved Barium (Ba)	2022/04/13	101	80 - 120	100	80 - 120	<2.0	ug/L		
7930567	Dissolved Beryllium (Be)	2022/04/13	100	80 - 120	95	80 - 120	<0.40	ug/L		
7930567	Dissolved Boron (B)	2022/04/13	100	80 - 120	94	80 - 120	<10	ug/L	4.1	20
7930567	Dissolved Cadmium (Cd)	2022/04/13	101	80 - 120	99	80 - 120	<0.090	ug/L		
7930567	Dissolved Calcium (Ca)	2022/04/13	NC	80 - 120	101	80 - 120	<200	ug/L	0.45	20
7930567	Dissolved Chromium (Cr)	2022/04/13	102	80 - 120	98	80 - 120	<5.0	ug/L		
7930567	Dissolved Cobalt (Co)	2022/04/13	101	80 - 120	94	80 - 120	<0.50	ug/L		
7930567	Dissolved Copper (Cu)	2022/04/13	96	80 - 120	96	80 - 120	<0.90	ug/L		
7930567	Dissolved Iron (Fe)	2022/04/13	100	80 - 120	93	80 - 120	<100	ug/L	NC	20
7930567	Dissolved Lead (Pb)	2022/04/13	99	80 - 120	99	80 - 120	<0.50	ug/L		
7930567	Dissolved Magnesium (Mg)	2022/04/13	105	80 - 120	94	80 - 120	<50	ug/L	4.1	20
7930567	Dissolved Manganese (Mn)	2022/04/13	NC	80 - 120	98	80 - 120	<2.0	ug/L	0.73	20
7930567	Dissolved Molybdenum (Mo)	2022/04/13	99	80 - 120	95	80 - 120	<0.50	ug/L		
7930567	Dissolved Nickel (Ni)	2022/04/13	100	80 - 120	95	80 - 120	<1.0	ug/L		
7930567	Dissolved Phosphorus (P)	2022/04/13	104	80 - 120	106	80 - 120	<100	ug/L		
7930567	Dissolved Potassium (K)	2022/04/13	103	80 - 120	94	80 - 120	<200	ug/L		
7930567	Dissolved Selenium (Se)	2022/04/13	102	80 - 120	100	80 - 120	<2.0	ug/L		
7930567	Dissolved Silicon (Si)	2022/04/13	106	80 - 120	100	80 - 120	<50	ug/L		
7930567	Dissolved Silver (Ag)	2022/04/13	98	80 - 120	95	80 - 120	<0.090	ug/L		
7930567	Dissolved Sodium (Na)	2022/04/13	108	80 - 120	103	80 - 120	<100	ug/L	0.071	20
7930567	Dissolved Strontium (Sr)	2022/04/13	102	80 - 120	97	80 - 120	<1.0	ug/L		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
7930567	Dissolved Thallium (Tl)	2022/04/13	101	80 - 120	102	80 - 120	<0.050	ug/L		
7930567	Dissolved Titanium (Ti)	2022/04/13	99	80 - 120	99	80 - 120	<5.0	ug/L		
7930567	Dissolved Uranium (U)	2022/04/13	98	80 - 120	98	80 - 120	<0.10	ug/L		
7930567	Dissolved Vanadium (V)	2022/04/13	102	80 - 120	95	80 - 120	<0.50	ug/L		
7930567	Dissolved Zinc (Zn)	2022/04/13	103	80 - 120	96	80 - 120	<5.0	ug/L		
7931134	Total Ammonia-N	2022/04/11	93	75 - 125	99	80 - 120	<0.050	mg/L	NC	20
7931348	Nitrate (N)	2022/04/13	97	80 - 120	98	80 - 120	<0.10	mg/L	0.26	20
7931348	Nitrite (N)	2022/04/13	92	80 - 120	102	80 - 120	<0.010	mg/L	NC	20
7931362	Dissolved Chloride (Cl-)	2022/04/12	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.35	20
7931375	Orthophosphate (P)	2022/04/11	106	75 - 125	101	80 - 120	<0.010	mg/L	0.13	25
7931379	Dissolved Sulphate (SO4)	2022/04/11	102	75 - 125	98	80 - 120	<1.0	mg/L	0.43	20
7931408	Alkalinity (Total as CaCO3)	2022/04/11			99	85 - 115	<1.0	mg/L	0.90	20
7931410	Conductivity	2022/04/11			102	85 - 115	<1.0	umho/cm	0.35	25
7931411	pH	2022/04/11			101	98 - 103			0.83	N/A

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-563-6266 Fax:(905) 817-5777 www.bvna.com

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:

Company Name: #1067 GM BluePlan Engineering Limited
Attention: Kim Wilkinson
Address: 650 Woodlawn Rd W Block C, Unit 2
Guelph ON N1K 1B8
Tel: (519) 824-8150 Fax: (519) 824-8089
Email: info@gmblueplan.ca

REPORT TO:

Company Name:
Attention: Abdi Faarah
Address:
Tel: Fax:
Email: abdi.faarah@gmblueplan.ca

PROJECT INFORMATION:

Quotation #: C20251
P.O. #:
Project: 121123
Project Name:
Site #:
Sampled By: Abdi Faarah

Laboratory Use Only:

Bureau Veritas Job #:
Bottle Order #: 871977
COC #: C#871977-01-01
Project Manager: Ashton Gibson

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality
☐ PWQO ☐ Reg 406 Table
☐ Other

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)?

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: Time Required: ☐
Rush Confirmation Number: *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): [✓ Metals] / Hg / Cr VI	RCAP Comprehensive	# of Bottles	Comments
1		MW97-5	04/06/2022	12:00	GW		✓	5	
2		MW2-09		12:30	GW		✓	5	
3		MW1-09		13:00	GW		✓	5	
4		MW97-3		13:30	GW		✓	5	
5		MW3-09		14:00	GW		✓	5	
6									
7									
8									
9									
10									

06-Apr-22 17:30
Ashton Gibson
C291734
MUM ENV-1110

REC'D IN WATERLOO

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
[redacted]	22/04/06	15:50	[redacted]	2022/04/06	15:53	
				2022/04/06	17:30	

Laboratory Use Only

ice packs

Time Sensitive

Temperature (°C) on Recei 6/9/10°C

Custody Seal	Yes	No
Present		✗
Intact		✗

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

[illegible] 3/3/6 on ice

Your Project #: 121123
Your C.O.C. #: 877774-03-01

Attention: Abdi Faarah

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/05/20
Report #: R7132857
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2D0995
Received: 2022/05/13, 10:00

Sample Matrix: Water
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	9	N/A	2022/05/18	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	9	N/A	2022/05/19	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	9	N/A	2022/05/18	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	9	N/A	2022/05/18	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	9	N/A	2022/05/18	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	9	N/A	2022/05/19	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	9	N/A	2022/05/19	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	9	N/A	2022/05/19		
Anion and Cation Sum	9	N/A	2022/05/19		
Total Ammonia-N	9	N/A	2022/05/19	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	9	N/A	2022/05/18	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	9	2022/05/17	2022/05/18	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	9	N/A	2022/05/18	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	9	N/A	2022/05/19		Auto Calc
Sat. pH and Langelier Index (@ 4C)	9	N/A	2022/05/19		Auto Calc
Sulphate by Automated Colourimetry	9	N/A	2022/05/18	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	9	N/A	2022/05/19		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.

Your Project #: 121123
Your C.O.C. #: 877774-03-01

Attention: Abdi Faarah

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/05/20
Report #: R7132857
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2D0995
Received: 2022/05/13, 10:00

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ashton Gibson, Project Manager
Email: Ashton.Gibson@bureauveritas.com
Phone# (905)817-5765
==
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		SPX541		SPX542	SPX543			SPX543		
Sampling Date		2022/05/12 13:20		2022/05/12 15:30	2022/05/12 14:30			2022/05/12 14:30		
COC Number		877774-03-01		877774-03-01	877774-03-01			877774-03-01		
	UNITS	**MW22-01S**	**RDL**	**MW22-01D**	**MW22-02**	**RDL**	**QC Batch**	**MW22-02 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	7.80	N/A	6.98	7.23	N/A	7999556			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	280	1.0	230	280	1.0	7999549			
Calculated TDS	mg/L	400	1.0	360	380	1.0	7999560			
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.3	1.0	3.4	2.4	1.0	7999549			
Cation Sum	me/L	7.66	N/A	7.11	7.16	N/A	7999556			
Hardness (CaCO3)	mg/L	330	1.0	300	300	1.0	7999552			
Ion Balance (% Difference)	%	0.910	N/A	0.930	0.470	N/A	7999554			
Langelier Index (@ 20C)	N/A	0.967		0.838	0.892		7999557			
Langelier Index (@ 4C)	N/A	0.718		0.589	0.644		7999558			
Saturation pH (@ 20C)	N/A	7.13		7.35	7.06		7999557			
Saturation pH (@ 4C)	N/A	7.38		7.60	7.31		7999558			
Inorganics										
Total Ammonia-N	mg/L	0.19	0.050	0.32	0.096	0.050	8001695			
Conductivity	umho/cm	730	1.0	670	680	1.0	8000939	670	1.0	8000939
Dissolved Organic Carbon	mg/L	1.5	0.40	1.2	0.80	0.40	8001605			
Orthophosphate (P)	mg/L	<0.050 (1)	0.050	<0.010	<0.010	0.010	8000919			
pH	pH	8.10		8.19	7.95		8000937	7.98		8000937
Dissolved Sulphate (SO4)	mg/L	9.7	1.0	12	8.6	1.0	8000917			
Alkalinity (Total as CaCO3)	mg/L	280	1.0	240	290	1.0	8000930	290	1.0	8000930
Dissolved Chloride (Cl-)	mg/L	63	1.0	69	25	1.0	8000916			
Nitrite (N)	mg/L	0.041	0.010	0.111	0.020	0.010	8000913			
Nitrate (N)	mg/L	2.49	0.10	0.55	8.62	0.10	8000913			
Nitrate + Nitrite (N)	mg/L	2.54	0.10	0.66	8.64	0.10	8000913			
Metals										
Dissolved Aluminum (Al)	ug/L	9.8	4.9	12	6.6	4.9	8001432			
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	<0.50	<0.50	0.50	8001432			
Dissolved Arsenic (As)	ug/L	<1.0	1.0	<1.0	<1.0	1.0	8001432			
Dissolved Barium (Ba)	ug/L	53	2.0	48	33	2.0	8001432			
Dissolved Beryllium (Be)	ug/L	<0.40	0.40	<0.40	<0.40	0.40	8001432			
Dissolved Boron (B)	ug/L	37	10	72	12	10	8001432			
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	<0.090	<0.090	0.090	8001432			
Dissolved Calcium (Ca)	ug/L	72000	200	51000	84000	200	8001432			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		SPX541		SPX542	SPX543			SPX543		
Sampling Date		2022/05/12 13:20		2022/05/12 15:30	2022/05/12 14:30			2022/05/12 14:30		
COC Number		877774-03-01		877774-03-01	877774-03-01			877774-03-01		
	UNITS	**MW22-01S**	**RDL**	**MW22-01D**	**MW22-02**	**RDL**	**QC Batch**	**MW22-02 Lab-Dup**	**RDL**	**QC Batch**
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	<5.0	<5.0	5.0	8001432			
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	<0.50	<0.50	0.50	8001432			
Dissolved Copper (Cu)	ug/L	1.9	0.90	1.7	1.4	0.90	8001432			
Dissolved Iron (Fe)	ug/L	<100	100	<100	<100	100	8001432			
Dissolved Lead (Pb)	ug/L	<0.50	0.50	<0.50	<0.50	0.50	8001432			
Dissolved Magnesium (Mg)	ug/L	35000	50	41000	22000	50	8001432			
Dissolved Manganese (Mn)	ug/L	86	2.0	81	24	2.0	8001432			
Dissolved Molybdenum (Mo)	ug/L	17	0.50	15	0.97	0.50	8001432			
Dissolved Nickel (Ni)	ug/L	1.6	1.0	1.9	<1.0	1.0	8001432			
Dissolved Phosphorus (P)	ug/L	100	100	<100	<100	100	8001432			
Dissolved Potassium (K)	ug/L	7200	200	7100	1500	200	8001432			
Dissolved Selenium (Se)	ug/L	<2.0	2.0	<2.0	<2.0	2.0	8001432			
Dissolved Silicon (Si)	ug/L	3400	50	4400	3500	50	8001432			
Dissolved Silver (Ag)	ug/L	<0.090	0.090	<0.090	<0.090	0.090	8001432			
Dissolved Sodium (Na)	ug/L	22000	100	22000	25000	100	8001432			
Dissolved Strontium (Sr)	ug/L	170	1.0	140	120	1.0	8001432			
Dissolved Thallium (Tl)	ug/L	<0.050	0.050	0.059	<0.050	0.050	8001432			
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	<5.0	<5.0	5.0	8001432			
Dissolved Uranium (U)	ug/L	0.74	0.10	0.19	0.23	0.10	8001432			
Dissolved Vanadium (V)	ug/L	<0.50	0.50	<0.50	<0.50	0.50	8001432			
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	<5.0	<5.0	5.0	8001432			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		SPX544	SPX545		SPX546	SPX547		
Sampling Date		2022/05/12 16:15	2022/05/12 16:30		2022/05/12 12:55	2022/05/12 13:45		
COC Number		877774-03-01	877774-03-01		877774-03-01	877774-03-01		
	UNITS	**MW22-04S**	**MW22-04D**	**RDL**	**MW22-07**	**MW22-08**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	me/L	6.27	6.28	N/A	7.64	6.16	N/A	7999556
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	270	280	1.0	320	240	1.0	7999549
Calculated TDS	mg/L	330	310	1.0	400	330	1.0	7999560
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.0	3.2	1.0	2.7	2.3	1.0	7999549
Cation Sum	me/L	6.38	6.01	N/A	7.79	6.18	N/A	7999556
Hardness (CaCO3)	mg/L	300	270	1.0	360	290	1.0	7999552
Ion Balance (% Difference)	%	0.850	2.17	N/A	0.950	0.200	N/A	7999554
Langelier Index (@ 20C)	N/A	1.02	0.962		0.957	0.839		7999557
Langelier Index (@ 4C)	N/A	0.771	0.713		0.709	0.590		7999558
Saturation pH (@ 20C)	N/A	7.05	7.12		7.01	7.17		7999557
Saturation pH (@ 4C)	N/A	7.30	7.37		7.26	7.42		7999558
Inorganics								
Total Ammonia-N	mg/L	0.15	0.13	0.050	0.11	0.13	0.050	8001695
Conductivity	umho/cm	580	550	1.0	700	570	1.0	8000939
Dissolved Organic Carbon	mg/L	1.2	2.2	0.40	1.3	0.73	0.40	8001605
Orthophosphate (P)	mg/L	<0.010	<0.010	0.010	<0.050 (1)	<0.050 (1)	0.050	8000919
pH	pH	8.07	8.08		7.96	8.01		8000937
Dissolved Sulphate (SO4)	mg/L	8.4	8.1	1.0	9.0	8.1	1.0	8000917
Alkalinity (Total as CaCO3)	mg/L	270	280	1.0	320	240	1.0	8000930
Dissolved Chloride (Cl-)	mg/L	6.7	13	1.0	17	12	1.0	8000916
Nitrite (N)	mg/L	0.010	0.011	0.010	0.063	0.015	0.010	8000913
Nitrate (N)	mg/L	5.96	1.78	0.10	8.31	11.0	0.10	8000913
Nitrate + Nitrite (N)	mg/L	5.97	1.79	0.10	8.37	11.0	0.10	8000913
Metals								
Dissolved Aluminum (Al)	ug/L	<4.9	7.7	4.9	9.2	9.3	4.9	8001432
Dissolved Antimony (Sb)	ug/L	<0.50	<0.50	0.50	<0.50	<0.50	0.50	8001432
Dissolved Arsenic (As)	ug/L	<1.0	<1.0	1.0	<1.0	<1.0	1.0	8001432
Dissolved Barium (Ba)	ug/L	11	20	2.0	34	38	2.0	8001432
Dissolved Beryllium (Be)	ug/L	<0.40	<0.40	0.40	<0.40	<0.40	0.40	8001432
Dissolved Boron (B)	ug/L	<10	15	10	18	<10	10	8001432
Dissolved Cadmium (Cd)	ug/L	<0.090	<0.090	0.090	<0.090	<0.090	0.090	8001432
Dissolved Calcium (Ca)	ug/L	88000	71000	200	86000	74000	200	8001432
Dissolved Chromium (Cr)	ug/L	<5.0	<5.0	5.0	<5.0	<5.0	5.0	8001432

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		SPX544	SPX545		SPX546	SPX547		
Sampling Date		2022/05/12 16:15	2022/05/12 16:30		2022/05/12 12:55	2022/05/12 13:45		
COC Number		877774-03-01	877774-03-01		877774-03-01	877774-03-01		
	UNITS	**MW22-04S**	**MW22-04D**	**RDL**	**MW22-07**	**MW22-08**	**RDL**	**QC Batch**
Dissolved Cobalt (Co)	ug/L	<0.50	<0.50	0.50	<0.50	<0.50	0.50	8001432
Dissolved Copper (Cu)	ug/L	1.5	1.1	0.90	1.5	1.5	0.90	8001432
Dissolved Iron (Fe)	ug/L	<100	<100	100	<100	<100	100	8001432
Dissolved Lead (Pb)	ug/L	<0.50	<0.50	0.50	<0.50	<0.50	0.50	8001432
Dissolved Magnesium (Mg)	ug/L	19000	22000	50	35000	26000	50	8001432
Dissolved Manganese (Mn)	ug/L	<2.0	80	2.0	33	21	2.0	8001432
Dissolved Molybdenum (Mo)	ug/L	<0.50	2.4	0.50	3.8	2.7	0.50	8001432
Dissolved Nickel (Ni)	ug/L	<1.0	<1.0	1.0	<1.0	<1.0	1.0	8001432
Dissolved Phosphorus (P)	ug/L	<100	<100	100	<100	<100	100	8001432
Dissolved Potassium (K)	ug/L	2200	1900	200	2400	1700	200	8001432
Dissolved Selenium (Se)	ug/L	<2.0	<2.0	2.0	<2.0	<2.0	2.0	8001432
Dissolved Silicon (Si)	ug/L	2700	2800	50	5600	4300	50	8001432
Dissolved Silver (Ag)	ug/L	<0.090	<0.090	0.090	<0.090	<0.090	0.090	8001432
Dissolved Sodium (Na)	ug/L	7800	14000	100	13000	6700	100	8001432
Dissolved Strontium (Sr)	ug/L	150	120	1.0	160	98	1.0	8001432
Dissolved Thallium (Tl)	ug/L	<0.050	<0.050	0.050	<0.050	<0.050	0.050	8001432
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	5.0	<5.0	<5.0	5.0	8001432
Dissolved Uranium (U)	ug/L	0.27	0.74	0.10	0.53	0.56	0.10	8001432
Dissolved Vanadium (V)	ug/L	<0.50	<0.50	0.50	<0.50	<0.50	0.50	8001432
Dissolved Zinc (Zn)	ug/L	<5.0	<5.0	5.0	<5.0	<5.0	5.0	8001432

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		SPX548	SPX549		
Sampling Date		2022/05/12 10:50	2022/05/12 11:55		
COC Number		877774-03-01	877774-03-01		
	UNITS	**MW22-09**	**MW22-10**	**RDL**	**QC Batch**
Calculated Parameters					
Anion Sum	me/L	6.29	7.25	N/A	7999556
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	270	280	1.0	7999549
Calculated TDS	mg/L	310	390	1.0	7999560
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.2	2.5	1.0	7999549
Cation Sum	me/L	6.43	7.12	N/A	7999556
Hardness (CaCO3)	mg/L	310	350	1.0	7999552
Ion Balance (% Difference)	%	1.05	0.880	N/A	7999554
Langelier Index (@ 20C)	N/A	0.920	0.981		7999557
Langelier Index (@ 4C)	N/A	0.671	0.732		7999558
Saturation pH (@ 20C)	N/A	7.19	7.00		7999557
Saturation pH (@ 4C)	N/A	7.44	7.25		7999558
Inorganics					
Total Ammonia-N	mg/L	0.059	0.095	0.050	8001695
Conductivity	umho/cm	580	680	1.0	8000939
Dissolved Organic Carbon	mg/L	0.59	1.6	0.40	8001605
Orthophosphate (P)	mg/L	<0.010	<0.010	0.010	8000919
pH	pH	8.11	7.99		8000937
Dissolved Sulphate (SO4)	mg/L	5.5	26	1.0	8000917
Alkalinity (Total as CaCO3)	mg/L	270	280	1.0	8000930
Dissolved Chloride (Cl-)	mg/L	25	8.9	1.0	8000916
Nitrite (N)	mg/L	<0.010	0.048	0.010	8000913
Nitrate (N)	mg/L	0.88	12.5	0.10	8000913
Nitrate + Nitrite (N)	mg/L	0.88	12.5	0.10	8000913
Metals					
Dissolved Aluminum (Al)	ug/L	9.2	6.8	4.9	8001432
Dissolved Antimony (Sb)	ug/L	<0.50	<0.50	0.50	8001432
Dissolved Arsenic (As)	ug/L	<1.0	<1.0	1.0	8001432
Dissolved Barium (Ba)	ug/L	44	32	2.0	8001432
Dissolved Beryllium (Be)	ug/L	<0.40	<0.40	0.40	8001432
Dissolved Boron (B)	ug/L	16	<10	10	8001432
Dissolved Cadmium (Cd)	ug/L	<0.090	<0.090	0.090	8001432
Dissolved Calcium (Ca)	ug/L	63000	99000	200	8001432
Dissolved Chromium (Cr)	ug/L	<5.0	<5.0	5.0	8001432
Dissolved Cobalt (Co)	ug/L	<0.50	<0.50	0.50	8001432

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		SPX548	SPX549		
Sampling Date		2022/05/12 10:50	2022/05/12 11:55		
COC Number		877774-03-01	877774-03-01		
	UNITS	**MW22-09**	**MW22-10**	**RDL**	**QC Batch**
Dissolved Copper (Cu)	ug/L	2.6	3.1	0.90	8001432
Dissolved Iron (Fe)	ug/L	<100	<100	100	8001432
Dissolved Lead (Pb)	ug/L	<0.50	<0.50	0.50	8001432
Dissolved Magnesium (Mg)	ug/L	36000	25000	50	8001432
Dissolved Manganese (Mn)	ug/L	8.8	87	2.0	8001432
Dissolved Molybdenum (Mo)	ug/L	2.1	0.83	0.50	8001432
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	1.0	8001432
Dissolved Phosphorus (P)	ug/L	100	110	100	8001432
Dissolved Potassium (K)	ug/L	2000	960	200	8001432
Dissolved Selenium (Se)	ug/L	<2.0	<2.0	2.0	8001432
Dissolved Silicon (Si)	ug/L	3900	3000	50	8001432
Dissolved Silver (Ag)	ug/L	<0.090	<0.090	0.090	8001432
Dissolved Sodium (Na)	ug/L	4700	1900	100	8001432
Dissolved Strontium (Sr)	ug/L	120	110	1.0	8001432
Dissolved Thallium (Tl)	ug/L	<0.050	<0.050	0.050	8001432
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	5.0	8001432
Dissolved Uranium (U)	ug/L	0.26	1.6	0.10	8001432
Dissolved Vanadium (V)	ug/L	<0.50	0.86	0.50	8001432
Dissolved Zinc (Zn)	ug/L	6.9	<5.0	5.0	8001432

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

TEST SUMMARY

Bureau Veritas ID: SPX541
Sample ID: MW22-01S
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX542
Sample ID: MW22-01D
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

TEST SUMMARY

Bureau Veritas ID: SPX543
Sample ID: MW22-02
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX543 Dup
Sample ID: MW22-02
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel

Bureau Veritas ID: SPX544
Sample ID: MW22-04S
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal

TEST SUMMARY

Bureau Veritas ID: SPX544
Sample ID: MW22-04S
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX545
Sample ID: MW22-04D
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX546
Sample ID: MW22-07
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel

TEST SUMMARY

Bureau Veritas ID: SPX546
Sample ID: MW22-07
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX547
Sample ID: MW22-08
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX548
Sample ID: MW22-09
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law

TEST SUMMARY

Bureau Veritas ID: SPX548
Sample ID: MW22-09
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

Bureau Veritas ID: SPX549
Sample ID: MW22-10
Matrix: Water

Collected: 2022/05/12
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8000930	N/A	2022/05/18	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7999549	N/A	2022/05/19	Automated Statchk
Chloride by Automated Colourimetry	KONE	8000916	N/A	2022/05/18	Alina Dobreanu
Conductivity	AT	8000939	N/A	2022/05/18	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8001605	N/A	2022/05/18	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7999552	N/A	2022/05/19	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8001432	N/A	2022/05/19	Arefa Dabhad
Ion Balance (% Difference)	CALC	7999554	N/A	2022/05/19	Automated Statchk
Anion and Cation Sum	CALC	7999556	N/A	2022/05/19	Automated Statchk
Total Ammonia-N	LACH/NH4	8001695	N/A	2022/05/19	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	8000913	N/A	2022/05/18	Samuel Law
pH	AT	8000937	2022/05/17	2022/05/18	Yogesh Patel
Orthophosphate	KONE	8000919	N/A	2022/05/18	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7999557	N/A	2022/05/19	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7999558	N/A	2022/05/19	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8000917	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7999560	N/A	2022/05/19	Automated Statchk

GENERAL COMMENTS

Revised report[5/20/2022]: project number revised.

Results relate only to the items tested.

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8000913	Nitrate (N)	2022/05/18	NC	80 - 120	100	80 - 120	<0.10	mg/L	1.1	20
8000913	Nitrite (N)	2022/05/18	99	80 - 120	104	80 - 120	<0.010	mg/L		
8000916	Dissolved Chloride (Cl-)	2022/05/18	NC	80 - 120	106	80 - 120	<1.0	mg/L	0.52	20
8000917	Dissolved Sulphate (SO4)	2022/05/18	NC	75 - 125	97	80 - 120	<1.0	mg/L	0.18	20
8000919	Orthophosphate (P)	2022/05/18	107	75 - 125	101	80 - 120	<0.010	mg/L	7.2	25
8000930	Alkalinity (Total as CaCO3)	2022/05/18			96	85 - 115	<1.0	mg/L	0.055	20
8000937	pH	2022/05/18			102	98 - 103			0.39	N/A
8000939	Conductivity	2022/05/18			102	85 - 115	<1.0	umho/cm	0.60	25
8001432	Dissolved Aluminum (Al)	2022/05/19	104	80 - 120	99	80 - 120	<4.9	ug/L		
8001432	Dissolved Antimony (Sb)	2022/05/19	110	80 - 120	100	80 - 120	<0.50	ug/L	NC	20
8001432	Dissolved Arsenic (As)	2022/05/19	102	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
8001432	Dissolved Barium (Ba)	2022/05/19	NC	80 - 120	99	80 - 120	<2.0	ug/L	0.70	20
8001432	Dissolved Beryllium (Be)	2022/05/19	105	80 - 120	96	80 - 120	<0.40	ug/L	NC	20
8001432	Dissolved Boron (B)	2022/05/19	98	80 - 120	93	80 - 120	<10	ug/L	0.39	20
8001432	Dissolved Cadmium (Cd)	2022/05/19	102	80 - 120	99	80 - 120	<0.090	ug/L	NC	20
8001432	Dissolved Calcium (Ca)	2022/05/19	NC	80 - 120	97	80 - 120	<200	ug/L		
8001432	Dissolved Chromium (Cr)	2022/05/19	96	80 - 120	94	80 - 120	<5.0	ug/L	NC	20
8001432	Dissolved Cobalt (Co)	2022/05/19	97	80 - 120	97	80 - 120	<0.50	ug/L	0.68	20
8001432	Dissolved Copper (Cu)	2022/05/19	102	80 - 120	98	80 - 120	<0.90	ug/L	1.3	20
8001432	Dissolved Iron (Fe)	2022/05/19	99	80 - 120	98	80 - 120	<100	ug/L		
8001432	Dissolved Lead (Pb)	2022/05/19	94	80 - 120	97	80 - 120	<0.50	ug/L	NC	20
8001432	Dissolved Magnesium (Mg)	2022/05/19	NC	80 - 120	100	80 - 120	<50	ug/L		
8001432	Dissolved Manganese (Mn)	2022/05/19	NC	80 - 120	100	80 - 120	<2.0	ug/L		
8001432	Dissolved Molybdenum (Mo)	2022/05/19	111	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
8001432	Dissolved Nickel (Ni)	2022/05/19	96	80 - 120	97	80 - 120	<1.0	ug/L	4.4	20
8001432	Dissolved Phosphorus (P)	2022/05/19	110	80 - 120	111	80 - 120	<100	ug/L		
8001432	Dissolved Potassium (K)	2022/05/19	103	80 - 120	101	80 - 120	<200	ug/L		
8001432	Dissolved Selenium (Se)	2022/05/19	98	80 - 120	96	80 - 120	<2.0	ug/L	NC	20
8001432	Dissolved Silicon (Si)	2022/05/19	103	80 - 120	98	80 - 120	<50	ug/L		
8001432	Dissolved Silver (Ag)	2022/05/19	98	80 - 120	96	80 - 120	<0.090	ug/L	NC	20
8001432	Dissolved Sodium (Na)	2022/05/19	NC	80 - 120	99	80 - 120	<100	ug/L	0.75	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
8001432	Dissolved Strontium (Sr)	2022/05/19	101	80 - 120	98	80 - 120	<1.0	ug/L		
8001432	Dissolved Thallium (Tl)	2022/05/19	92	80 - 120	98	80 - 120	<0.050	ug/L	NC	20
8001432	Dissolved Titanium (Ti)	2022/05/19	103	80 - 120	94	80 - 120	<5.0	ug/L		
8001432	Dissolved Uranium (U)	2022/05/19	91	80 - 120	95	80 - 120	<0.10	ug/L	0	20
8001432	Dissolved Vanadium (V)	2022/05/19	97	80 - 120	94	80 - 120	<0.50	ug/L	NC	20
8001432	Dissolved Zinc (Zn)	2022/05/19	94	80 - 120	94	80 - 120	<5.0	ug/L	NC	20
8001605	Dissolved Organic Carbon	2022/05/18	95	80 - 120	98	80 - 120	<0.40	mg/L	2.4	20
8001695	Total Ammonia-N	2022/05/19	92	75 - 125	96	80 - 120	<0.050	mg/L	6.1	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]

Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

Bureau Veritas
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-563-6266 Fax:(905) 817-5777 www.bvna.com

CH

Page of

13-May-22 10:00
Ashton Gibson
C2D0995
ASR ENV-644
C#877774-03-01

tle Order #: 377774
ect Manager: Ashton Gibson

INVOICE TO:

Company Name: #1067 GM BluePlan Engineering Limited
Attention: Kim Wilkinson
Address: 650 Woodlawn Rd W Block C, Unit 2
Guelph ON N1K 1B8
Tel: (519) 824-8150 Fax: (519) 824-8089
Email: info@gmblueplan.ca

REPORT TO:

Company Name:
Attention: Abdi Faarah
Address:
Tel: Fax:
Email: abdi.faarah@gmblueplan.ca

PROJECT INFORMATION:

Quotation #: C20251
P.O. #:
Project: 121123
Project Name:
Site #:
Sampled By: AF/MO

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO ☐ Reg 406 Table ___
☐ Other ___

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): [✓ Metals] / Hg / Cr VI	RCAp - Comprehensive										# of Bottles	Comments
1		MW 22-01S	05/12	15:20	Ground Water		✓										5	
2		MW 22-01D	05/12	15:30	Ground Water		✓										5	
3		MW22-02	05/12	14:30	Ground Water		✓										5	
4		MW22-04S	05/12	16:15	Ground Water		✓										5	
5		MW22-04D	05/12	16:30	Ground Water		✓										5	
6		MW 22-07	05/12	12:55	Ground Water		✓										5	
7		MW 22-08	05/12	13:45	Ground Water		✓										5	
8		MW 22-09	05/12	10:50	Ground Water		✓										5	
9		MW 22-10	05/12	11:55	Ground Water		✓										5	
10																		

REC'D IN WATERLOO

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
[redacted]	22/05/13	9:52	[redacted]	2022/05/13	1000	
				2022/05/13	18:10	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	8/7/10	Present		✓
		Intact		✓

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

4/87/1

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

on ice ✓
4/4/5

Bureau Veritas Canada (2019) Inc.

APPENDIX F2:
LABORATORY CERTIFICATES OF ANALYSIS
SURFACE WATER FROM ON-SITE WETLAND AREAS

Your Project #: 121123
Your C.O.C. #: 740605-01-01

Attention: Mark Ongarato

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2023/01/13
Report #: R7466689
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C307788
Received: 2023/01/10, 15:50

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2023/01/11	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2023/01/12	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	2	N/A	2023/01/12	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	2	N/A	2023/01/11	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	2	N/A	2023/01/12	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	2	N/A	2023/01/13	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	2	N/A	2023/01/13	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	2	N/A	2023/01/13		
Anion and Cation Sum	2	N/A	2023/01/13		
Total Ammonia-N	2	N/A	2023/01/12	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	2	N/A	2023/01/12	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	2	2023/01/11	2023/01/11	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	2	N/A	2023/01/12	CAM SOP-00461	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	2	N/A	2023/01/13		Auto Calc
Sat. pH and Langelier Index (@ 4C)	2	N/A	2023/01/13		Auto Calc
Sulphate by Automated Colourimetry	2	N/A	2023/01/11	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	2	N/A	2023/01/13		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.

Your Project #: 121123
Your C.O.C. #: 740605-01-01

Attention: Mark Ongarato

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2023/01/13
Report #: R7466689
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C307788
Received: 2023/01/10, 15:50

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Ashton Gibson, Project Manager
Email: Ashton.Gibson@bureauveritas.com
Phone# (905)817-5765
==
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		UTP935			UTP935			UTP936		
Sampling Date		2023/01/06 10:22			2023/01/06 10:22			2023/01/06 12:27		
COC Number		740605-01-01			740605-01-01			740605-01-01		
	UNITS	**WET-02**	**RDL**	**QC Batch**	**WET-02 Lab-Dup**	**RDL**	**QC Batch**	**WET-06**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	2.77	N/A	8441269				1.67	N/A	8441269
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	87	1.0	8441265				30	1.0	8441265
Calculated TDS	mg/L	160	1.0	8441261				110	1.0	8441261
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8441265				<1.0	1.0	8441265
Cation Sum	me/L	2.72	N/A	8441269				1.75	N/A	8441269
Hardness (CaCO3)	mg/L	120	1.0	8441267				73	1.0	8441267
Ion Balance (% Difference)	%	NC	N/A	8441268				NC	N/A	8441268
Langelier Index (@ 20C)	N/A	-0.555		8441259				-1.63		8441259
Langelier Index (@ 4C)	N/A	-0.805		8441260				-1.88		8441260
Saturation pH (@ 20C)	N/A	7.94		8441259				8.61		8441259
Saturation pH (@ 4C)	N/A	8.19		8441260				8.86		8441260
Inorganics										
Total Ammonia-N	mg/L	0.33	0.050	8443439				0.34	0.050	8443439
Conductivity	umho/cm	260	1.0	8443881				180	1.0	8443881
Dissolved Organic Carbon	mg/L	13	0.40	8442749				8.9	0.40	8442749
Orthophosphate (P)	mg/L	1.3	0.050	8442992	1.3	0.050	8442992	0.13	0.010	8442992
pH	pH	7.38		8443870				6.98		8443870
Dissolved Sulphate (SO4)	mg/L	36	1.0	8443839	36	1.0	8443839	38	1.0	8443839
Alkalinity (Total as CaCO3)	mg/L	87	1.0	8443876				30	1.0	8443876
Dissolved Chloride (Cl-)	mg/L	5.0	1.0	8443842	5.1	1.0	8443842	8.3	1.0	8443842
Nitrite (N)	mg/L	0.070	0.010	8442755	0.071	0.010	8442755	0.017	0.010	8442755
Nitrate (N)	mg/L	0.59	0.10	8442755	0.61	0.10	8442755	0.62	0.10	8442755
Nitrate + Nitrite (N)	mg/L	0.66	0.10	8442755	0.68	0.10	8442755	0.64	0.10	8442755
Metals										
Dissolved Aluminum (Al)	ug/L	10	4.9	8443218				11	4.9	8443218
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	8443218				<0.50	0.50	8443218
Dissolved Arsenic (As)	ug/L	1.2	1.0	8443218				<1.0	1.0	8443218
Dissolved Barium (Ba)	ug/L	13	2.0	8443218				11	2.0	8443218
Dissolved Beryllium (Be)	ug/L	<0.40	0.40	8443218				<0.40	0.40	8443218
Dissolved Boron (B)	ug/L	14	10	8443218				30	10	8443218
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	8443218				<0.090	0.090	8443218
Dissolved Calcium (Ca)	ug/L	31000	200	8443218				18000	200	8443218
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	8443218				<5.0	5.0	8443218

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		UTP935			UTP935			UTP936		
Sampling Date		2023/01/06 10:22			2023/01/06 10:22			2023/01/06 12:27		
COC Number		740605-01-01			740605-01-01			740605-01-01		
	UNITS	**WET-02**	**RDL**	**QC Batch**	**WET-02 Lab-Dup**	**RDL**	**QC Batch**	**WET-06**	**RDL**	**QC Batch**
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	8443218				<0.50	0.50	8443218
Dissolved Copper (Cu)	ug/L	4.5	0.90	8443218				2.1	0.90	8443218
Dissolved Iron (Fe)	ug/L	<100	100	8443218				<100	100	8443218
Dissolved Lead (Pb)	ug/L	<0.50	0.50	8443218				<0.50	0.50	8443218
Dissolved Magnesium (Mg)	ug/L	10000	50	8443218				6600	50	8443218
Dissolved Manganese (Mn)	ug/L	14	2.0	8443218				12	2.0	8443218
Dissolved Molybdenum (Mo)	ug/L	2.0	0.50	8443218				<0.50	0.50	8443218
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	8443218				<1.0	1.0	8443218
Dissolved Phosphorus (P)	ug/L	1400	100	8443218				240	100	8443218
Dissolved Potassium (K)	ug/L	9300	200	8443218				6600	200	8443218
Dissolved Selenium (Se)	ug/L	<2.0	2.0	8443218				<2.0	2.0	8443218
Dissolved Silicon (Si)	ug/L	3400	50	8443218				1600	50	8443218
Dissolved Silver (Ag)	ug/L	<0.090	0.090	8443218				<0.090	0.090	8443218
Dissolved Sodium (Na)	ug/L	1600	100	8443218				2400	100	8443218
Dissolved Strontium (Sr)	ug/L	33	1.0	8443218				22	1.0	8443218
Dissolved Thallium (Tl)	ug/L	<0.050	0.050	8443218				<0.050	0.050	8443218
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	8443218				<5.0	5.0	8443218
Dissolved Uranium (U)	ug/L	<0.10	0.10	8443218				<0.10	0.10	8443218
Dissolved Vanadium (V)	ug/L	<0.50	0.50	8443218				<0.50	0.50	8443218
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	8443218				<5.0	5.0	8443218

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		UTP936		
Sampling Date		2023/01/06 12:27		
COC Number		740605-01-01		
	UNITS	**WET-06 Lab-Dup**	**RDL**	**QC Batch**
Inorganics				
Dissolved Organic Carbon	mg/L	8.7	0.40	8442749

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

TEST SUMMARY

Bureau Veritas ID: UTP935
Sample ID: WET-02
Matrix: Water

Collected: 2023/01/06
Shipped:
Received: 2023/01/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8443876	N/A	2023/01/11	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8441265	N/A	2023/01/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	8443842	N/A	2023/01/12	Samuel Law
Conductivity	AT	8443881	N/A	2023/01/11	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8442749	N/A	2023/01/12	Gyulshen Idriz
Hardness (calculated as CaCO3)		8441267	N/A	2023/01/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8443218	N/A	2023/01/13	Prempal Bhatti
Ion Balance (% Difference)	CALC	8441268	N/A	2023/01/13	Automated Statchk
Anion and Cation Sum	CALC	8441269	N/A	2023/01/13	Automated Statchk
Total Ammonia-N	LACH/NH4	8443439	N/A	2023/01/12	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8442755	N/A	2023/01/12	Chandra Nandlal
pH	AT	8443870	2023/01/11	2023/01/11	Surinder Rai
Orthophosphate	KONE	8442992	N/A	2023/01/12	Massarat Jan
Sat. pH and Langelier Index (@ 20C)	CALC	8441259	N/A	2023/01/13	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	8441260	N/A	2023/01/13	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8443839	N/A	2023/01/11	Samuel Law
Total Dissolved Solids (TDS calc)	CALC	8441261	N/A	2023/01/13	Automated Statchk

Bureau Veritas ID: UTP935 Dup
Sample ID: WET-02
Matrix: Water

Collected: 2023/01/06
Shipped:
Received: 2023/01/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	8443842	N/A	2023/01/12	Samuel Law
Nitrate & Nitrite as Nitrogen in Water	LACH	8442755	N/A	2023/01/12	Chandra Nandlal
Orthophosphate	KONE	8442992	N/A	2023/01/12	Massarat Jan
Sulphate by Automated Colourimetry	KONE	8443839	N/A	2023/01/11	Samuel Law

Bureau Veritas ID: UTP936
Sample ID: WET-06
Matrix: Water

Collected: 2023/01/06
Shipped:
Received: 2023/01/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8443876	N/A	2023/01/11	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8441265	N/A	2023/01/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	8443842	N/A	2023/01/12	Samuel Law
Conductivity	AT	8443881	N/A	2023/01/11	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8442749	N/A	2023/01/12	Gyulshen Idriz
Hardness (calculated as CaCO3)		8441267	N/A	2023/01/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8443218	N/A	2023/01/13	Prempal Bhatti
Ion Balance (% Difference)	CALC	8441268	N/A	2023/01/13	Automated Statchk
Anion and Cation Sum	CALC	8441269	N/A	2023/01/13	Automated Statchk
Total Ammonia-N	LACH/NH4	8443439	N/A	2023/01/12	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8442755	N/A	2023/01/12	Chandra Nandlal
pH	AT	8443870	2023/01/11	2023/01/11	Surinder Rai

TEST SUMMARY

Bureau Veritas ID: UTP936
Sample ID: WET-06
Matrix: Water

Collected: 2023/01/06
Shipped:
Received: 2023/01/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Orthophosphate	KONE	8442992	N/A	2023/01/12	Massarat Jan
Sat. pH and Langelier Index (@ 20C)	CALC	8441259	N/A	2023/01/13	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	8441260	N/A	2023/01/13	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8443839	N/A	2023/01/11	Samuel Law
Total Dissolved Solids (TDS calc)	CALC	8441261	N/A	2023/01/13	Automated Statchk

Bureau Veritas ID: UTP936 Dup
Sample ID: WET-06
Matrix: Water

Collected: 2023/01/06
Shipped:
Received: 2023/01/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8442749	N/A	2023/01/12	Gyulshen Idriz

GENERAL COMMENTS

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
8442749	Dissolved Organic Carbon	2023/01/12	87	80 - 120	96	80 - 120	<0.40	mg/L	2.5	20
8442755	Nitrate (N)	2023/01/12	100	80 - 120	102	80 - 120	<0.10	mg/L	2.9	20
8442755	Nitrite (N)	2023/01/12	101	80 - 120	106	80 - 120	<0.010	mg/L	2.3	20
8442992	Orthophosphate (P)	2023/01/12	N/C	75 - 125	91	80 - 120	<0.010	mg/L	1.7	20
8443218	Dissolved Aluminum (Al)	2023/01/13	101	80 - 120	99	80 - 120	<4.9	ug/L		
8443218	Dissolved Antimony (Sb)	2023/01/13	107	80 - 120	103	80 - 120	<0.50	ug/L	NC	20
8443218	Dissolved Arsenic (As)	2023/01/13	104	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
8443218	Dissolved Barium (Ba)	2023/01/13	100	80 - 120	97	80 - 120	<2.0	ug/L	0.46	20
8443218	Dissolved Beryllium (Be)	2023/01/13	102	80 - 120	99	80 - 120	<0.40	ug/L	NC	20
8443218	Dissolved Boron (B)	2023/01/13	100	80 - 120	98	80 - 120	<10	ug/L	0.44	20
8443218	Dissolved Cadmium (Cd)	2023/01/13	104	80 - 120	100	80 - 120	<0.090	ug/L	NC	20
8443218	Dissolved Calcium (Ca)	2023/01/13	NC	80 - 120	96	80 - 120	<200	ug/L		
8443218	Dissolved Chromium (Cr)	2023/01/13	101	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
8443218	Dissolved Cobalt (Co)	2023/01/13	100	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
8443218	Dissolved Copper (Cu)	2023/01/13	101	80 - 120	100	80 - 120	<0.90	ug/L	14	20
8443218	Dissolved Iron (Fe)	2023/01/13	103	80 - 120	100	80 - 120	<100	ug/L		
8443218	Dissolved Lead (Pb)	2023/01/13	99	80 - 120	97	80 - 120	<0.50	ug/L	NC	20
8443218	Dissolved Magnesium (Mg)	2023/01/13	103	80 - 120	99	80 - 120	<50	ug/L		
8443218	Dissolved Manganese (Mn)	2023/01/13	102	80 - 120	99	80 - 120	<2.0	ug/L		
8443218	Dissolved Molybdenum (Mo)	2023/01/13	107	80 - 120	103	80 - 120	<0.50	ug/L	NC	20
8443218	Dissolved Nickel (Ni)	2023/01/13	102	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
8443218	Dissolved Phosphorus (P)	2023/01/13	106	80 - 120	114	80 - 120	<100	ug/L		
8443218	Dissolved Potassium (K)	2023/01/13	103	80 - 120	100	80 - 120	<200	ug/L		
8443218	Dissolved Selenium (Se)	2023/01/13	102	80 - 120	101	80 - 120	<2.0	ug/L	NC	20
8443218	Dissolved Silicon (Si)	2023/01/13	100	80 - 120	98	80 - 120	<50	ug/L		
8443218	Dissolved Silver (Ag)	2023/01/13	105	80 - 120	101	80 - 120	<0.090	ug/L	NC	20
8443218	Dissolved Sodium (Na)	2023/01/13	103	80 - 120	98	80 - 120	<100	ug/L	0.022	20
8443218	Dissolved Strontium (Sr)	2023/01/13	104	80 - 120	100	80 - 120	<1.0	ug/L		
8443218	Dissolved Thallium (Tl)	2023/01/13	102	80 - 120	99	80 - 120	<0.050	ug/L	NC	20
8443218	Dissolved Titanium (Ti)	2023/01/13	100	80 - 120	98	80 - 120	<5.0	ug/L		
8443218	Dissolved Uranium (U)	2023/01/13	104	80 - 120	99	80 - 120	<0.10	ug/L	2.2	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
8443218	Dissolved Vanadium (V)	2023/01/13	104	80 - 120	101	80 - 120	<0.50	ug/L	NC	20
8443218	Dissolved Zinc (Zn)	2023/01/13	102	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
8443439	Total Ammonia-N	2023/01/12	99	75 - 125	99	80 - 120	<0.050	mg/L	4.8	20
8443839	Dissolved Sulphate (SO4)	2023/01/11	NC	75 - 125	99	80 - 120	<1.0	mg/L	1.2	20
8443842	Dissolved Chloride (Cl-)	2023/01/12	113	80 - 120	106	80 - 120	<1.0	mg/L	1.5	20
8443870	pH	2023/01/11			101	98 - 103			0.24	N/A
8443876	Alkalinity (Total as CaCO3)	2023/01/11			97	85 - 115	<1.0	mg/L	0.70	20
8443881	Conductivity	2023/01/11			101	85 - 115	<1.0	umho/cm	0.30	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas Laboratories
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-563-6266 Fax:(905) 817-5777 www.bvlabs.com

CHAIN OF

Page 1 of 1

10-Jan-23 15:50
Ashton Gibson
C307788
<SS ENV-1147
C#740605-01-01
Ashton Gibson

INVOICE TO:

Company Name: ~~#1067~~ GM BluePlan Engineering Limited
Attention: ~~Grant Parkinson~~ Kim Wilkinson
Address: 650 Woodlawn Rd W Block C, Unit 2
Guelph ON N1K 1B8
Tel: (519) 824-8150 ~~Ext. 231~~ Fax: ~~(519) 824-8089~~
Email: ~~grant.parkinson@gmblueplan.ca~~ info@gmblueplan.ca

REPORT TO:

Company Name:
Attention: Mark Ongarato / Matt Long
Address:
Tel: Fax:
Email: mark.ongarato@gmblueplan.ca

PROJECT INFORMATION:

Quotation #: ~~B47885~~
P.O. #:
Project: ~~145864~~ 121123
Project Name:
Site #:
Sampled By: MO

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ **For RSC**
☐ Table ____

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ____
☒ PWQO
☐ Other ____

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ____

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ____ Time Required: ____ ☐
Rush Confirmation Number: ____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): [✓ Metals] / Hg / Cr VI	RCAP										# of Bottles	Comments
1		WET-02	23/01/06	10:22	water		X										5	
2		WET-06	23/01/06	12:27	Water		X										5	
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

MO

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
[redacted]	~~23/01/09~~ 23/01/10	8:30	Z VITRINH	2023/01/10	15:50	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	3/2/7	Present	/	
		Intact		

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

APPENDIX F3:
LABORATORY CERTIFICATES OF ANALYSIS
OFF-SITE PRIVATE WATER WELLS

Your Project #: 121123
Your C.O.C. #: n/a

Attention: Mark Ongarato

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/12/07
Report #: R7420844
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2Z3556
Received: 2022/12/01, 13:30

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	3	N/A	2022/12/05	CAM SOP-00448	SM 23 2320 B m
Conductivity	3	N/A	2022/12/05	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	3	N/A	2022/12/05	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	3	N/A	2022/12/06	CAM SOP 00102/00408/00447	SM 2340 B
Metals Analysis by ICPMS (as received) (2)	3	N/A	2022/12/05	CAM SOP-00447	EPA 6020B m
Total Coliforms/ E. coli, CFU/100mL	3	N/A	2022/12/02	CAM SOP-00551	
Fecal coliform, (CFU/100mL)	3	N/A	2022/12/02	CAM SOP-00552	
Total Ammonia-N	3	N/A	2022/12/05	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (3)	3	N/A	2022/12/06	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	3	2022/12/02	2022/12/05	CAM SOP-00413	SM 4500H+ B m
Total Suspended Solids	3	2022/12/06	2022/12/07	CAM SOP-00428	SM 23 2540D m
Turbidity	3	N/A	2022/12/02	CAM SOP-00417	SM 23 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Your Project #: 121123
Your C.O.C. #: n/a

Attention: Mark Ongarato

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/12/07
Report #: R7420844
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2Z3556
Received: 2022/12/01, 13:30

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Metals analysis was performed on the sample 'as received'.
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Ashton Gibson, Project Manager
Email: Ashton.Gibson@bureauveritas.com
Phone# (905)817-5765
==
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		ULU965	ULU966			ULU966			ULU967		
Sampling Date		2022/12/01 10:15	2022/12/01 10:45			2022/12/01 10:45			2022/12/01 11:45		
COC Number		n/a	n/a			n/a			n/a		
	UNITS	**519 MALTBY**	**4646 S.R.20**	**RDL**	**QC Batch**	**4646 S.R.20 Lab-Dup**	**RDL**	**QC Batch**	**192 MALTBY**	**RDL**	**QC Batch**
Calculated Parameters											
Hardness (CaCO3)	mg/L	330	230	1.0	8377806				330	1.0	8377806
Inorganics											
Total Ammonia-N	mg/L	<0.050	0.10	0.050	8384210				<0.050	0.050	8384210
Conductivity	umho/cm	610	430	1.0	8382034				650	1.0	8382034
Dissolved Organic Carbon	mg/L	0.78	0.52	0.40	8382348	0.49	0.40	8382348	0.58	0.40	8382348
pH	pH	7.94	8.12		8382007				8.01		8382007
Total Suspended Solids	mg/L	<10	<10	10	8385572				<10	10	8385572
Turbidity	NTU	0.3	2.4	0.1	8381773				0.3	0.1	8381773
Alkalinity (Total as CaCO3)	mg/L	280	210	1.0	8381994				270	1.0	8381994
Nitrite (N)	mg/L	0.012	0.019	0.010	8381518				0.010	0.010	8381518
Nitrate (N)	mg/L	4.58	<0.10	0.10	8381518				2.73	0.10	8381518
Nitrate + Nitrite (N)	mg/L	4.59	<0.10	0.10	8381518				2.74	0.10	8381518

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		ULU967		
Sampling Date		2022/12/01 11:45		
COC Number		n/a		
	UNITS	**192 MALTBY Lab-Dup**	**RDL**	**QC Batch**
Inorganics				
Total Suspended Solids	mg/L	<10	10	8385572

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		ULU965	ULU965	ULU966	ULU967		
Sampling Date		2022/12/01 10:15	2022/12/01 10:15	2022/12/01 10:45	2022/12/01 11:45		
COC Number		n/a	n/a	n/a	n/a		
	UNITS	**519 MALTBY**	**519 MALTBY Lab-Dup**	**4646 S.R.20**	**192 MALTBY**	**RDL**	**QC Batch**
Metals							
Calcium (Ca)	ug/L	88000	87000	46000	88000	200	8383419
Iron (Fe)	ug/L	<100	<100	350	<100	100	8383419
Magnesium (Mg)	ug/L	27000	26000	27000	28000	50	8383419
Manganese (Mn)	ug/L	<2.0	<2.0	8.5	<2.0	2.0	8383419
Sodium (Na)	ug/L	6000	6000	5700	10000	100	8383419

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

MICROBIOLOGY (WATER)

Bureau Veritas ID		ULU965	ULU966	ULU967	
Sampling Date		2022/12/01 10:15	2022/12/01 10:45	2022/12/01 11:45	
COC Number		n/a	n/a	n/a	
	UNITS	**519 MALTBY**	**4646 S.R.20**	**192 MALTBY**	**QC Batch**
Microbiological					
Fecal coliform	CFU/100mL	0	0	0	8381536
Background	CFU/100mL	19	6	79	8381530
Total Coliforms	CFU/100mL	0	0	1	8381530
Escherichia coli	CFU/100mL	0	0	0	8381530

QC Batch = Quality Control Batch

TEST SUMMARY

Bureau Veritas ID: ULU965
Sample ID: 519 MALTBY
Matrix: Water

Collected: 2022/12/01
Shipped:
Received: 2022/12/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8381994	N/A	2022/12/05	Kien Tran
Conductivity	AT	8382034	N/A	2022/12/05	Kien Tran
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8382348	N/A	2022/12/05	Gyulshen Idriz
Hardness (calculated as CaCO3)		8377806	N/A	2022/12/06	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	8383419	N/A	2022/12/05	Prempal Bhatti
Total Coliforms/ E. coli, CFU/100mL	PL	8381530	N/A	2022/12/02	Sirimathie Aluthwala
Fecal coliform, (CFU/100mL)	PL	8381536	N/A	2022/12/02	Rayane Gama Santos
Total Ammonia-N	LACH/NH4	8384210	N/A	2022/12/05	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8381518	N/A	2022/12/06	Chandra Nandlal
pH	AT	8382007	2022/12/02	2022/12/05	Kien Tran
Total Suspended Solids	BAL	8385572	2022/12/06	2022/12/07	Masood Siddiqui
Turbidity	AT	8381773	N/A	2022/12/02	Surinder Rai

Bureau Veritas ID: ULU965 Dup
Sample ID: 519 MALTBY
Matrix: Water

Collected: 2022/12/01
Shipped:
Received: 2022/12/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals Analysis by ICPMS (as received)	ICP/MS	8383419	N/A	2022/12/05	Prempal Bhatti

Bureau Veritas ID: ULU966
Sample ID: 4646 S.R.20
Matrix: Water

Collected: 2022/12/01
Shipped:
Received: 2022/12/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8381994	N/A	2022/12/05	Kien Tran
Conductivity	AT	8382034	N/A	2022/12/05	Kien Tran
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8382348	N/A	2022/12/05	Gyulshen Idriz
Hardness (calculated as CaCO3)		8377806	N/A	2022/12/06	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	8383419	N/A	2022/12/05	Prempal Bhatti
Total Coliforms/ E. coli, CFU/100mL	PL	8381530	N/A	2022/12/02	Sirimathie Aluthwala
Fecal coliform, (CFU/100mL)	PL	8381536	N/A	2022/12/02	Rayane Gama Santos
Total Ammonia-N	LACH/NH4	8384210	N/A	2022/12/05	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8381518	N/A	2022/12/06	Chandra Nandlal
pH	AT	8382007	2022/12/02	2022/12/05	Kien Tran
Total Suspended Solids	BAL	8385572	2022/12/06	2022/12/07	Masood Siddiqui
Turbidity	AT	8381773	N/A	2022/12/02	Surinder Rai

Bureau Veritas ID: ULU966 Dup
Sample ID: 4646 S.R.20
Matrix: Water

Collected: 2022/12/01
Shipped:
Received: 2022/12/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8382348	N/A	2022/12/05	Gyulshen Idriz

TEST SUMMARY

Bureau Veritas ID: ULU967
Sample ID: 192 MALTBY
Matrix: Water

Collected: 2022/12/01
Shipped:
Received: 2022/12/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8381994	N/A	2022/12/05	Kien Tran
Conductivity	AT	8382034	N/A	2022/12/05	Kien Tran
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8382348	N/A	2022/12/05	Gyulshen Idriz
Hardness (calculated as CaCO3)		8377806	N/A	2022/12/06	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	8383419	N/A	2022/12/05	Prempal Bhatti
Total Coliforms/ E. coli, CFU/100mL	PL	8381530	N/A	2022/12/02	Sirimathie Aluthwala
Fecal coliform, (CFU/100mL)	PL	8381536	N/A	2022/12/02	Rayane Gama Santos
Total Ammonia-N	LACH/NH4	8384210	N/A	2022/12/05	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8381518	N/A	2022/12/06	Chandra Nandlal
pH	AT	8382007	2022/12/02	2022/12/05	Kien Tran
Total Suspended Solids	BAL	8385572	2022/12/06	2022/12/07	Masood Siddiqui
Turbidity	AT	8381773	N/A	2022/12/02	Surinder Rai

Bureau Veritas ID: ULU967 Dup
Sample ID: 192 MALTBY
Matrix: Water

Collected: 2022/12/01
Shipped:
Received: 2022/12/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Suspended Solids	BAL	8385572	2022/12/06	2022/12/07	Masood Siddiqui

GENERAL COMMENTS

Results relate only to the items tested.

Bureau Veritas Job #: C2Z3556
Report Date: 2022/12/07

QUALITY ASSURANCE REPORT

GM BluePlan Engineering Limited
Client Project #: 121123
Sampler Initials: MO

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**	**% Recovery**	**QC Limits**
8381518	Nitrate (N)	2022/12/06	100	80 - 120	101	80 - 120	<0.10	mg/L	NC	20		
8381518	Nitrite (N)	2022/12/06	112	80 - 120	109	80 - 120	<0.010	mg/L	NC	20		
8381773	Turbidity	2022/12/02			116 (1)	85 - 115	<0.1	NTU	2.3	20		
8381994	Alkalinity (Total as CaCO3)	2022/12/05			98	85 - 115	<1.0	mg/L	3.5	20		
8382007	pH	2022/12/05			102	98 - 103			0.35	N/A		
8382034	Conductivity	2022/12/05			99	85 - 115	<1.0	umho/cm	0	25		
8382348	Dissolved Organic Carbon	2022/12/05	96	80 - 120	96	80 - 120	<0.40	mg/L	5.2	20		
8383419	Calcium (Ca)	2022/12/05	NC	80 - 120	105	80 - 120	<200	ug/L	1.5	20		
8383419	Iron (Fe)	2022/12/05	104	80 - 120	104	80 - 120	<100	ug/L	NC	20		
8383419	Magnesium (Mg)	2022/12/05	NC	80 - 120	101	80 - 120	<50	ug/L	1.7	20		
8383419	Manganese (Mn)	2022/12/05	101	80 - 120	99	80 - 120	<2.0	ug/L	NC	20		
8383419	Sodium (Na)	2022/12/05	102	80 - 120	102	80 - 120	<100	ug/L	0.75	20		
8384210	Total Ammonia-N	2022/12/05	103	75 - 125	105	80 - 120	<0.050	mg/L	NC	20		
8385572	Total Suspended Solids	2022/12/07					<10	mg/L	NC	20	96	85 - 115

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

[redacted]

Rayane Gama Santos, Lab Technician

[redacted]

Sirimathie Aluthwala, Team Lead

PAGE 1 OF 1

MICRO BUREAU VERITAS

DRINKING WATER CHAIN OF CUSTODY RECORD

6660 & 6740 Campobello Rd, Mississauga, Ontario L5N 2L8 www.bvna.com
Tel: 905-817-5700 Fax: 905-817-5779 Toll Free: 1-800-563-6266

Please indicate which regulation applies to the samples being submitted:
☐ 170 ☐ 318/319 ☐ 243 ☐ 170 Pb
☒ Not regulated (however water is for human consumption)

Invoice To:
Company Name: GM BluePlan Engineering
Attention: Kim Wilkinson
Address: 650 Woodlawn Rd W, Guelph, Block C, Unit 2
Tel: 519 824 8150 Project: 121123
Fax: P.O.#:
Email: info@gmblueplan.ca

Report To:
Same as Invoice To ☐
Company Name: GM BluePlan
Attention: Mark Ongarato
Address:
Tel: Fax:
Email: mark.ongarato@gmblueplan.ca

***DRINKING WATER TYPE LEGEND: [R=Raw Water] [T=Treated/POE] [D=Distribution] [P=Plumbing] [S=Standing] [F=Flushed]**

ANALYSIS REQUESTED

	Sample Identification/Location	Date Sampled	Time Sampled	*Water Type ([✓ R],T,D,P,S,F)	MOE/MOH Adverse Notification Required?		Field Chlorine		Field Turbidity	Field pH	Watertrax SPL#	Resample Y/[✓ N]	# of Bottles	[✓ Coliform] [✓ Ecoli] Background Total coliforms & fecal coliforms	~~Heterotrophic Plate Count~~ pH	~~Schedule 23 + Schedule 24~~ Alkalinity	Nitrate /Nitrite	~~Trihalomethanes~~ Hardness	~~Lead~~ Metals (Sodium Calcium Magnesium, Iron, Manganese)	Ammonia	TSS and Turbidity	Electrical conductivity	DOC
					YES	NO	Free	Total															
1	519 Maltby	2022/12/01	10:15	Raw		X							7	X	X	X	X	X	X	X	X	X	X
2	4646 S.R.20	" " "	10:45	Raw		X							7	X	X	X	X	X	X	X	X	X	X
3	192 Maltby	" " "	11:45	Raw		X							7	X	X	X	X	X	X	X	X	X	X
4																							
5																							
6																							
7																							
8																							
9																							
10																							

01-Dec-22 13:30
Ashton Gibson
C2Z3556
SWP ENV-1214

REC'D IN WATERLOO

It is mandatory that all notification information below be completed prior to analysis for regulated drinking water submissions.

TAT (TURNAROUND TIME)

RUSH TAT MUST HAVE PRIOR APPROVAL
☒ Regular (5-15 Working Days)
☐ RUSH (Specify Below)
Date Due: Dec 6, 2022
RUSH #

ADVERSE NOTIFICATION INFORMATION

Waterworks Name:
Waterworks Number:
Address:
Contact:
Tel: Fax:
Cell :
Email : [redacted]

Medical Officer of Health/Public Health Unit
Name/Region:
Contact :
Address:
Tel
Fax #
After hours #:

LABORATORY USE ONLY

Received By (Print): [redacted]
Received By (Sign):
Date: 2022/12/1 Time: 13:30
Comments: ON seal / ON ICE
KP
Receiving Temp: 8/8/8 °C
Cooling Media Present [✓ Y]/N? Y
Metals Preservation Check Y/N? N

Sampled By (Print): Mark Ongarato Sampled By (Sign): Date: Time:
Relinquished By (Print): Mark Ongarato Relinquished By (Sign): Date: Time:

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Bureau Veritas' standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgement and acceptance of our terms available at https://www.bvna.com/coc-terms-and-conditions

CAM FCD-01101/5

1/2/2

BV - 421480 [redacted] 2022/12/01, 18:01

Your Project #: 121123
Your C.O.C. #: NA

Attention: Abdi Faarah
GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/12/09
Report #: R7424206
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2Z6673
Received: 2022/12/05, 11:47

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2022/12/07	CAM SOP-00448	SM 23 2320 B m
Conductivity	2	N/A	2022/12/07	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	2	N/A	2022/12/07	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	2	N/A	2022/12/07	CAM SOP 00102/00408/00447	SM 2340 B
Metals Analysis by ICPMS (as received) (2)	2	N/A	2022/12/07	CAM SOP-00447	EPA 6020B m
Total Coliforms/ E. coli, CFU/100mL	2	N/A	2022/12/05	CAM SOP-00551	
Fecal coliform, (CFU/100mL)	2	N/A	2022/12/05	CAM SOP-00552	
Total Ammonia-N	2	N/A	2022/12/09	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (3)	2	N/A	2022/12/07	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	2	2022/12/06	2022/12/07	CAM SOP-00413	SM 4500H+ B m
Total Suspended Solids	2	2022/12/08	2022/12/09	CAM SOP-00428	SM 23 2540D m
Turbidity	2	N/A	2022/12/06	CAM SOP-00417	SM 23 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Your Project #: 121123
Your C.O.C. #: NA

Attention: Abdi Faarah

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2022/12/09
Report #: R7424206
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2Z6673
Received: 2022/12/05, 11:47

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Metals analysis was performed on the sample 'as received'.
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Ashton Gibson, Project Manager
Email: Ashton.Gibson@bureauveritas.com
Phone# (905)817-5765
==
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Total Cover Pages : 2

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UMN410	UMN411			UMN411		
Sampling Date		2022/12/05 09:30	2022/12/05 10:25			2022/12/05 10:25		
COC Number		NA	NA			NA		
	UNITS	**110 MALTBY**	**104 MALTBY**	**RDL**	**QC Batch**	**104 MALTBY Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters								
Hardness (CaCO3)	mg/L	250	350	1.0	8385129			
Inorganics								
Total Ammonia-N	mg/L	0.20	<0.050	0.050	8387302			
Conductivity	umho/cm	480	840	1.0	8386788			
Dissolved Organic Carbon	mg/L	0.79	0.81	0.40	8385777			
pH	pH	8.13	8.00		8386779			
Total Suspended Solids	mg/L	<10	<10	10	8390785	<10	10	8390785
Turbidity	NTU	2.1	<0.1	0.1	8386723	<0.1	0.1	8386723
Alkalinity (Total as CaCO3)	mg/L	230	300	1.0	8386755			
Nitrite (N)	mg/L	<0.010	<0.010	0.010	8386816			
Nitrate (N)	mg/L	<0.10	5.90	0.10	8386816			
Nitrate + Nitrite (N)	mg/L	<0.10	5.90	0.10	8386816			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		UMN410	UMN411		
Sampling Date		2022/12/05 09:30	2022/12/05 10:25		
COC Number		NA	NA		
	UNITS	**110 MALTBY**	**104 MALTBY**	**RDL**	**QC Batch**
Metals					
Calcium (Ca)	ug/L	56000	94000	200	8387300
Iron (Fe)	ug/L	260	<100	100	8387300
Magnesium (Mg)	ug/L	28000	27000	50	8387300
Manganese (Mn)	ug/L	29	<2.0	2.0	8387300
Sodium (Na)	ug/L	7200	41000	100	8387300

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

MICROBIOLOGY (WATER)

Bureau Veritas ID		UMN410	UMN411	
Sampling Date		2022/12/05 09:30	2022/12/05 10:25	
COC Number		NA	NA	
	UNITS	**110 MALTBY**	**104 MALTBY**	**QC Batch**
Microbiological				
Fecal coliform	CFU/100mL	0	0	8385993
Background	CFU/100mL	0	0	8385989
Total Coliforms	CFU/100mL	0	0	8385989
Escherichia coli	CFU/100mL	0	0	8385989

QC Batch = Quality Control Batch

TEST SUMMARY

Bureau Veritas ID: UMN410
Sample ID: 110 MALTBY
Matrix: Water

Collected: 2022/12/05
Shipped:
Received: 2022/12/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8386755	N/A	2022/12/07	Kien Tran
Conductivity	AT	8386788	N/A	2022/12/07	Kien Tran
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8385777	N/A	2022/12/07	Gyulshen Idriz
Hardness (calculated as CaCO3)		8385129	N/A	2022/12/07	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	8387300	N/A	2022/12/07	Arefa Dabhad
Total Coliforms/ E. coli, CFU/100mL	PL	8385989	N/A	2022/12/05	Sonja Elavinamannil
Fecal coliform, (CFU/100mL)	PL	8385993	N/A	2022/12/05	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8387302	N/A	2022/12/09	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8386816	N/A	2022/12/07	Chandra Nandlal
pH	AT	8386779	2022/12/06	2022/12/07	Kien Tran
Total Suspended Solids	BAL	8390785	2022/12/08	2022/12/09	Darshan Patel
Turbidity	AT	8386723	N/A	2022/12/06	Gurparteek KAUR

Bureau Veritas ID: UMN411
Sample ID: 104 MALTBY
Matrix: Water

Collected: 2022/12/05
Shipped:
Received: 2022/12/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8386755	N/A	2022/12/07	Kien Tran
Conductivity	AT	8386788	N/A	2022/12/07	Kien Tran
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8385777	N/A	2022/12/07	Gyulshen Idriz
Hardness (calculated as CaCO3)		8385129	N/A	2022/12/07	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	8387300	N/A	2022/12/07	Arefa Dabhad
Total Coliforms/ E. coli, CFU/100mL	PL	8385989	N/A	2022/12/05	Sonja Elavinamannil
Fecal coliform, (CFU/100mL)	PL	8385993	N/A	2022/12/05	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8387302	N/A	2022/12/09	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8386816	N/A	2022/12/07	Chandra Nandlal
pH	AT	8386779	2022/12/06	2022/12/07	Kien Tran
Total Suspended Solids	BAL	8390785	2022/12/08	2022/12/09	Darshan Patel
Turbidity	AT	8386723	N/A	2022/12/06	Gurparteek KAUR

Bureau Veritas ID: UMN411 Dup
Sample ID: 104 MALTBY
Matrix: Water

Collected: 2022/12/05
Shipped:
Received: 2022/12/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Suspended Solids	BAL	8390785	2022/12/08	2022/12/09	Darshan Patel
Turbidity	AT	8386723	N/A	2022/12/06	Gurparteek KAUR

GENERAL COMMENTS

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8385777	Dissolved Organic Carbon	2022/12/06	94	80 - 120	94	80 - 120	<0.40	mg/L	1.7	20		
8386723	Turbidity	2022/12/06			115	85 - 115	<0.1	NTU	NC	20		
8386755	Alkalinity (Total as CaCO3)	2022/12/07			96	85 - 115	<1.0	mg/L	1.5	20		
8386779	pH	2022/12/07			102	98 - 103			0.41	N/A		
8386788	Conductivity	2022/12/07			101	85 - 115	<1.0	umho/cm	0	25		
8386816	Nitrate (N)	2022/12/07	95	80 - 120	96	80 - 120	<0.10	mg/L	0.21	20		
8386816	Nitrite (N)	2022/12/07	104	80 - 120	112	80 - 120	<0.010	mg/L	0.42	20		
8387300	Calcium (Ca)	2022/12/07	NC	80 - 120	103	80 - 120	<200	ug/L				
8387300	Iron (Fe)	2022/12/07	103	80 - 120	103	80 - 120	<100	ug/L				
8387300	Magnesium (Mg)	2022/12/07	NC	80 - 120	102	80 - 120	<50	ug/L				
8387300	Manganese (Mn)	2022/12/07	100	80 - 120	99	80 - 120	<2.0	ug/L				
8387300	Sodium (Na)	2022/12/07	NC	80 - 120	98	80 - 120	<100	ug/L	0.42	20		
8387302	Total Ammonia-N	2022/12/09	95	75 - 125	95	80 - 120	<0.050	mg/L	NC	20		
8390785	Total Suspended Solids	2022/12/09					<10	mg/L	NC	20	95	85 - 115

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]

Anastassia Hamanov, Scientific Specialist

[redacted]

Sonja Elavinamannil, Master of Biochemistry, Team Lead

05-Dec-22 11:47
Ashton Gibson
C2Z6673

WATER CHAIN OF CUSTODY RECORD

bello Rd, Mississauga, Ontario L5N 2L8 www.bvna.com
Fax: 905-817-5779 Toll Free: 1-800-563-6266

PAGE 1 OF 1

Please indicate which regulation applies to the samples being submitted:
☐ 170 ☐ 318/319 ☐ 243 ☐ 170 Pb
☒ Not regulated (however water is for human consumption)

Invoi MUM ENV-868
Company Name: GM BluePlan Engineering Ltd.
Attention: Kim W.
Address:
Tel: Project: 12123
Fax: P.O.#:
Email: info@gmblueplan.ca

Report To:
Same as Invoice To ☐
Company Name:
Attention: Abdi Faarah; Matt Long; Mark Ongarto
Address:
Tel: Fax:
Email: abdi.faarah@gmblueplan.ca

***DRINKING WATER TYPE LEGEND: [R=Raw Water] [T=Treated/POE] [D=Distribution] [P=Plumbing] [S=Standing] [F=Flushed]**

fecal coliforms

ANALYSIS REQUESTED

	Sample Identification/Location	Date Sampled	Time Sampled	*Water Type (R,T,D,P,S,F)	MOE/MOH Adverse Notification Required?		Field Chlorine		Field Turbidity	Field pH	Watertrax SPL#	Resample Y/N?	# of Bottles	Coliform / Ecoli /Background/fecal	pH	~~Schedule~~ Hardness	Nitrate /Nitrite	Electrical Conductivity	Metals: sodium, calcium, magnesium, iron, manganese	Ammonia	Total Suspended Solids	Turbidity	Alkalinity	Dissolved Organic Carbon
					YES	NO	Free	Total																
1	110 Maltby	2022/12/05	9:30	R		✗							7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	104 Maltby	2022/12/05	10:25	R		✗							7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								

MICRO

REC'D IN WATERLOO

It is mandatory that all notification information below be completed prior to analysis for regulated drinking water submissions.

TAT (TURNAROUND TIME)
RUSH TAT MUST HAVE PRIOR APPROVAL
☒ Regular (5-15 Working Days)
☐ RUSH (Specify Below)
Date Due:
RUSH #

ADVERSE NOTIFICATION INFORMATION
Waterworks Name:
Waterworks Number:
Address:
Contact:
Tel: Fax:
Cell :
Email :

Medical Officer of Health/Public Health Unit
Name/Region:
Contact :
Address:
Tel
Fax #
After hours #:

LABORATORY USE ONLY
Received By (Print): [redacted]
Received By (Sign)
Date: 2022/12/05 Time: 11:47
Comments:
Nofecal/ON ICE
Receiving Temp: 10/11/10°C
Cooling Media Present [✓ Y]/N? Y
Metals Preservation Check Y/N? Y

Sampled By (Print): Abdi Faarah
Sampled By (Sign): [redacted]
Relinquished By (Print): Abdi Faarah
Relinquished By (Sign):
Date: 12/05/2022 Time: 11:45
Date: 12/05/2022 Time: 11:45

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Bureau Veritas' standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms available at https://www.bvna.com/coc-terms-and-conditions

CAM FCD-01101/5

A770 19 [redacted] 6/6/8 2022/12/05 16:02

APPENDIX G:
CATCHMENT AREA PLANS

Project Management Initials: Designer: AA Checked:AA Approved:AA ARCH D 24" x 36"

Last saved by: WADIS(2022-09-30) Last Plotted: 2022-10-04
Filename: \\NA.AECOMNET.COM\LFS\AMER\MARKHAM-CATRT4\DCS\PROJECTS\BDL\60682143_NEWCOLD\900_CAD_GIS\911_CIVIL\911_3_PUBLISHED\60682143 NEWCOLD - PRE-CATCHMENT AREA.DWG

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AECOM

PROJECT

NEWCOLD GUELPH
- TO01
GUELPH, ONTARIO

CLIENT

CONSULTANT

AECOM Canada Ltd.
50 Sportsworld Crossing Road, Suite 290
Kitchener, Ontario, N2P 0A4
519 650 5313 tel 519 650 3424 fax
www.aecom.com

NOTE:

IT IS THE RESPONSIBILITY OF THE CONTRACTORS TO INFORM THEMSELVES OF THE EXACT LOCATION OF, AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES, SERVICES AND STRUCTURES WHETHER ABOVE GROUND OR BELOW GRADE BEFORE COMMENCING THE WORK. SUCH INFORMATION IS NOT NECESSARILY SHOWN ON THE DRAWING, AND WHERE SHOWN, THE ACCURACY CANNOT BE GUARANTEED.

WITH THE SOLE EXCEPTION OF THE BENCHMARK(S) SPECIFICALLY DESCRIBED FOR THIS PROJECT, NO ELEVATION INDICATED OR ASSUMED HEREON IS TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

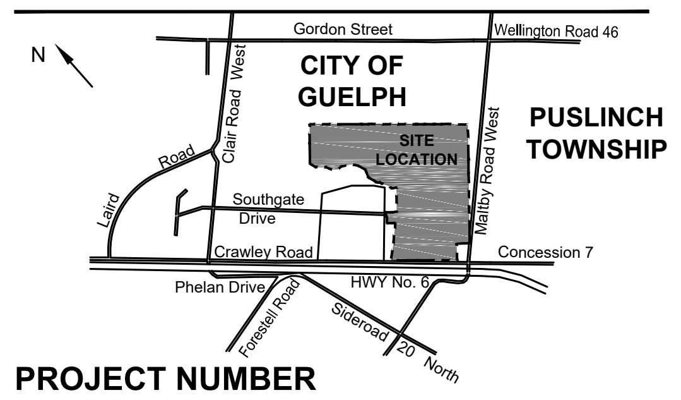
CULVERT BEDDING PER ROP STD DWG 5-2-18

REGISTRATION

ISSUE/REVISION

6		
5		
4		
3		
2		
1	2022-10-07	ISSUED FOR DRAFT PLAN APPROVAL
I/R	DATE	DESCRIPTION

KEY PLAN



PROJECT NUMBER

60682143

SHEET TITLE

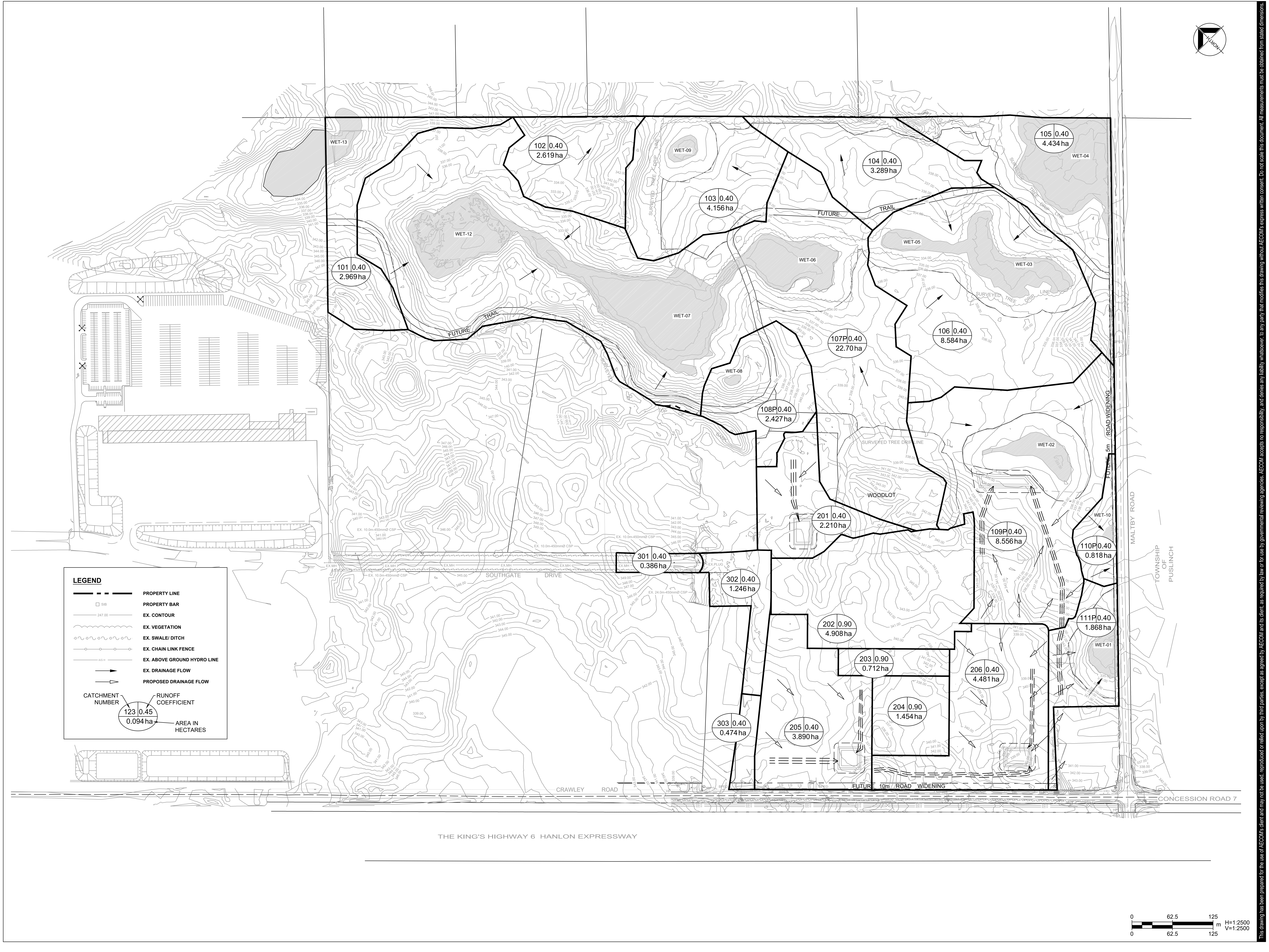
PRE-DEVELOPMENT CATCHMENT AREA

SHEET NUMBER

C102

Last saved by: WADIS(2023-02-15)   Last Plotted: 2023-02-15
Filename: \\NA.AECOMNET.COM\LFS\AMER\MARKHAM-CATRT4\DCS\PROJECTS\BDL\60682143_NEWCOLD\900_CAD_GIS\911_CIVIL\911_3_PUBLISHED\PHASE I\60682143 NEWCOLD - POST-CATCHMENT AREA - PHASE I.DWG

Project Management Initials: Designer:AA   Checked:AA   Approved:AA   ARCH D 24" x 36"



AECOM

PROJECT

NEWCOLD GUELPH
- TO01
GUELPH, ONTARIO

CLIENT

CONSULTANT

AECOM Canada Ltd.
50 Sportsworld Crossing Road, Suite 290
Kitchener, Ontario, N2P 0A4
519 650 5313 tel   519 650 3424 fax
www.aecom.com

NOTE:

IT IS THE RESPONSIBILITY OF THE CONTRACTORS TO INFORM THEMSELVES OF THE EXACT LOCATION OF, AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES, SERVICES AND STRUCTURES WHETHER ABOVE GROUND OR BELOW GRADE BEFORE COMMENCING THE WORK. SUCH INFORMATION IS NOT NECESSARILY SHOWN ON THE DRAWING, AND WHERE SHOWN, THE ACCURACY CANNOT BE GUARANTEED.

WITH THE SOLE EXCEPTION OF THE BENCHMARK(S) SPECIFICALLY DESCRIBED FOR THIS PROJECT, NO ELEVATION INDICATED OR ASSUMED HEREON IS TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

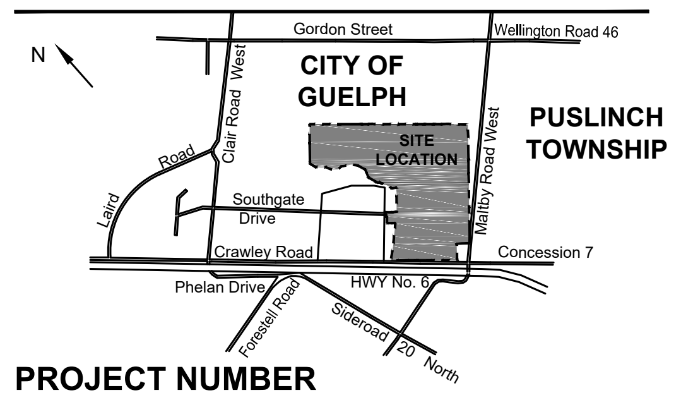
CULVERT BEDDING PER ROP STD DWG 5-2-18

REGISTRATION

ISSUE/REVISION

6		
5		
4		
3		
2		
1	2022-10-07	ISSUED FOR DRAFT PLAN APPROVAL
I/R	DATE	DESCRIPTION

KEY PLAN



PROJECT NUMBER

60682143

SHEET TITLE

POST-DEVELOPMENT CATCHMENT AREA

SHEET NUMBER

FIGURE 4

APPENDIX H1:
WATER BALANCE CALCULATIONS – PRE-DEVELOPMENT

384 Crawley Road - Site Plan Approval Application (Phase 1)
City of Guelph
Date: February 2023

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments:	111 (WET-01) - Upland Area	Soil Type:	Sand
		Vegetation:	Shallow-Rooted
Contributing Area =	1.11 ha	Root Zone Depth (m) =	0.50
Percent Impervious =	0.0%	Soil Moisture Retention Capacity (mm) =	50
Weather Station :	Fergus Shand Dam		

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.6
Runoff Factor (Corrected for Imperviousness) = 0.40

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature (^{o}C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	4.8	53	80
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	2.4	27	40
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.8	0.2	3.0	1.2	13	20
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	19.5	216	325
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.1	113.4	130.5	52.2	581	871
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	26.1	290	435
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	13.0	145	218
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	6.5	73	109
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	3.3	36	54
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	4.1	45	68
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	19.2	214	320
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	9.6	107	160
Total		**35.1**				**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**161.8**	**1,801**	**2,701**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 111 (WET-01) - Forest/Wooded Area
Contributing Area = 0.13 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	2.6	3	8
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	1.3	2	4
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	1	2
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	19	45
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	52	122
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	223.6	-26.4	110.2	110.2	0.0	2.0	0.0	8.4	56.7	65.1	19.5	26	61
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-36.4	125.6	125.6	0.0	7.0	0.0	4.2	28.4	32.6	9.8	13	30
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	4.9	7	15
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	3	8
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	2	4
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	10.3	14	32
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	5.2	7	16
Total		**35.1**				**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**111.3**	**149**	**348**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 109 (WET-02) - Upland Area
Contributing Area = 7.84 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.6
Runoff Factor (Corrected for Imperviousness) = 0.40

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	4.8	377	565
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	2.4	188	282
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.8	0.2	3.0	1.2	94	141
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	19.5	1,526	2,289
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.1	113.4	130.5	52.2	4,094	6,140
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	26.1	2,047	3,070
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	13.0	1,023	1,535
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	6.5	512	768
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	3.3	256	384
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	4.1	320	480
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	19.2	1,506	2,259
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	9.6	753	1,130
Total		**35.1**				**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**161.8**	**12,695**	**19,043**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 109 (WET-02) - Forest/Wooded Area
Contributing Area = 0.63 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Fine Sandy Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 300

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		436.5	0.0		0.0	0.0	0.0	0.0	7.9	0.4	8.3	2.5	16	37
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		492.4	0.0		0.0	0.0	0.0	0.0	3.9	0.2	4.2	1.2	8	18
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		552.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	4	10
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		300.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	91	213
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		300.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	246	575
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	272.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	123	288
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	236.0	-36.6	125.8	125.8	0.0	6.8	0.0	4.2	28.4	32.6	9.8	62	144
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	221.5	-14.5	111.1	111.1	0.0	4.1	0.0	2.1	14.2	16.3	4.9	31	72
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		236.6	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	15	36
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		276.8	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	8	18
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		300.0	23.3	7.2	7.2	0.0	0.0	62.6	31.5	1.8	33.3	10.0	63	147
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		368.6	0.0		0.0	0.0	0.0	0.0	15.8	0.9	16.7	5.0	32	74
Total		**35.1**				**945.9**	**357.2**				**576.8**	**576.8**	**0.0**	**11.9**	**117.1**	**117.1**	**252.0**	**369.1**	**110.7**	**699**	**1,630**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 106 (WET-03/-05) - Upland Area
Contributing Area = 6.90 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.5
Runoff Factor (Corrected for Imperviousness) = 0.50
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	5.0	344	344
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	2.5	172	172
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.3	90	90
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	24.2	1,666	1,666
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	65.2	4,493	4,493
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	32.6	2,246	2,246
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	16.3	1,123	1,123
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	8.1	562	562
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.1	281	281
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	140	140
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	19.9	1,374	1,374
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	10.0	687	687
Total		**35.1**				**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**191.1**	**13,177**	**13,177**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 106 (WET-03/-05) - Forest/Wooded Area
Contributing Area = 0.48 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.8
Runoff Factor (Corrected for Imperviousness) = 0.20
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	1.7	8	33
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	0.9	4	17
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.4	2	9
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	9.6	47	186
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	26.0	126	503
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	13.0	63	252
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	6.5	31	126
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	3.3	16	63
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	1.6	8	31
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	0.8	4	16
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	6.9	33	133
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	3.4	17	66
Total		**35.1**				**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**74.2**	**359**	**1,435**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 105 (WET-04/-11) - Upland Area
Contributing Area = 1.77 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.5
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	5.0	88	88
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	2.5	44	44
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.3	23	23
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	24.2	428	428
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	65.2	1,155	1,155
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	32.6	577	577
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	16.3	289	289
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	8.1	144	144
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.1	72	72
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	36	36
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	19.9	353	353
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	10.0	177	177
Total		**35.1**				**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**191.1**	**3,387**	**3,387**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 105 (WET-04/-11) - Forest/Wooded Area
Contributing Area = 1.01 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	($^{\circ}$C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	2.4	24	56
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	1.2	12	28
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	0.6	6	15
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	145	339
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	394	918
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	197	459
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	9.8	98	230
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	4.9	49	115
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	2.4	25	57
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	12	29
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	9.6	96	225
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	4.8	48	112
Total		**35.1**				**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**109.9**	**1,107**	**2,583**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 107 (WET-06/-07/-12) - Upland Area (Shrub)
Contributing Area = 7.36 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	10.1	0.4	10.6	3.2	234	545
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	5.1	0.2	5.3	1.6	117	273
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	2.5	0.2	2.7	0.8	60	141
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	30.2	0.0	0.0	43.9	23.2	25.2	48.4	14.5	1,068	2,492
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	39.1	2,877	6,712
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	109.2	0.0	3.0	0.0	8.5	56.7	65.2	19.6	1,438	3,356
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	115.8	0.0	16.8	0.0	4.2	28.4	32.6	9.8	719	1,678
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	105.0	0.0	10.2	0.0	2.1	14.2	16.3	4.9	360	839
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	180	420
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	90	210
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	7.2	0.0	0.0	80.7	40.6	1.8	42.4	12.7	935	2,182
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	20.3	0.9	21.2	6.4	467	1,091
Total		**35.1**				**945.9**	**357.2**				**558.7**	**558.7**	**0.0**	**30.0**	**135.2**	**135.2**	**252.0**	**387.2**	**116.1**	**8,545**	**19,938**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 107 (WET-06/-07/-12) - Upland Area (Crop)
Contributing Area = 6.25 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	3.6	225	525
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	1.8	112	262
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	0.9	58	135
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.2	25.2	48.4	14.5	907	2,116
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	39.1	2,444	5,702
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	19.6	1,222	2,851
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.2	28.4	32.6	9.8	611	1,425
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	4.9	305	713
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	153	356
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	3.1	191	446
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	14.4	900	2,100
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	7.2	450	1,050
Total		**35.1**				**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.2**	**252.0**	**404.2**	**121.3**	**7,578**	**17,682**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 107 (WET-06/-07/-12) - Forest/Wooded Area
Contributing Area = 4.42 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	($^{\circ}$C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	2.4	106	246
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	1.2	53	123
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	0.6	28	64
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	637	1,487
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	1,725	4,026
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	863	2,013
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	9.8	431	1,006
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	4.9	216	503
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	2.4	108	252
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	54	126
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	9.6	422	985
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	4.8	211	493
Total		**35.1**				**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**109.9**	**4,853**	**11,324**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 108 (WET-08) - Upland Area
Contributing Area = 2.48 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.6
Runoff Factor (Corrected for Imperviousness) = 0.40
Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	**Daily Average Temperature**	**Monthly Heat Index (I)**	**Unadjusted Daily Potential Evapotranspiration**	**Correction Factors**	**Adjusted Potential Evapotranspiration (PE)**	**Average Precipitation (P)**	**P-PE**	**Accum. Pot. Water Loss**	**Storage (ST)**	**ΔS**	**Pervious ET**	**Actual Evapotrans-piration (AE)**	**Pervious ET - Actual ET**	**Moisture Deficit (D)**	**Moisture Surplus (S)**	**Water Runoff (RO)**	**Snow Melt Runoff**	**Total Recharge and Runoff**	**Actual Runoff**	**Runoff Volume**	**Recharge Volume**
	(°C)		**(mm)**		**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	10.1	0.4	10.6	4.2	105	158
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	5.1	0.2	5.3	2.1	53	79
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	2.5	0.2	2.7	1.1	27	41
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	30.2	0.0	0.0	43.9	23.2	25.2	48.4	19.4	481	721
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	52.1	1,295	1,943
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	109.2	0.0	3.0	0.0	8.5	56.7	65.2	26.1	648	971
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	115.8	0.0	16.8	0.0	4.2	28.4	32.6	13.0	324	486
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	105.0	0.0	10.2	0.0	2.1	14.2	16.3	6.5	162	243
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	3.3	81	121
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.6	40	61
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	7.2	0.0	0.0	80.7	40.6	1.8	42.4	16.9	421	631
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	20.3	0.9	21.2	8.5	210	316
Total		**35.1**				**945.9**	**357.2**				**558.7**	**558.7**	**0.0**	**30.0**	**135.2**	**135.2**	**252.0**	**387.2**	**154.9**	**3,847**	**5,771**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 103 (WET-09) - Upland Area
Contributing Area = 3.02 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.4
Runoff Factor (Corrected for Imperviousness) = 0.60

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature ($^{\circ}$C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	6.0	180	120
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	3.0	90	60
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.5	47	31
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	29.0	875	584
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	78.2	2,360	1,573
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	39.1	1,180	787
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	19.5	590	393
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	9.8	295	197
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.9	148	98
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.4	74	49
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	23.9	722	481
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	12.0	361	241
Total		**35.1**				**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**229.3**	**6,922**	**4,615**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 103 (WET-09) - Forest/Wooded Area
Contributing Area = 1.00 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.5
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	40	40
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	20	20
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	10	10
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	241	241
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	653	653
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	326	326
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	163	163
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	82	82
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	41	41
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	20	20
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	160	160
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	80	80
Total		**35.1**				**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**1,836**	**1,836**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 110 (WET-10) - Upland Area
Contributing Area = 0.84 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Fine Sandy Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 75

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.5
Runoff Factor (Corrected for Imperviousness) = 0.50
Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature (^{o}C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		211.5	0.0		0.0	0.0	0.0	0.0	10.9	0.4	11.3	5.7	48	48
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		267.4	0.0		0.0	0.0	0.0	0.0	5.5	0.2	5.7	2.8	24	24
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		327.0	0.0		0.0	0.0	0.0	0.0	2.7	0.2	2.9	1.5	12	12
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		75.0	0.0	30.2	30.2	0.0	0.0	43.9	23.3	25.2	48.5	24.2	204	204
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		75.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	65.2	549	549
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	50.6	-24.4	108.2	108.2	0.0	4.0	0.0	8.5	56.7	65.2	32.6	275	275
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	28.0	-22.6	111.8	111.8	0.0	20.8	0.0	4.2	28.4	32.6	16.3	137	137
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	21.6	-6.4	103.0	103.0	0.0	12.2	0.0	2.1	14.2	16.3	8.1	69	69
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		36.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.1	34	34
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		75.0	38.3	37.1	37.1	0.0	0.0	1.8	1.5	3.5	5.0	2.5	21	21
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		75.0	0.0	7.2	7.2	0.0	0.0	85.8	43.6	1.8	45.4	22.7	191	191
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		143.6	0.0		0.0	0.0	0.0	0.0	21.8	0.9	22.7	11.3	96	96
Total		**35.1**				**945.9**	**357.2**				**551.7**	**551.7**	**0.0**	**37.0**	**142.2**	**142.2**	**252.0**	**394.2**	**197.1**	**1,661**	**1,661**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments:	101 (WET-13) - Upland Area	Soil Type:	Silt Loam
		Vegetation:	Deep-Rooted Crops (Shrubs, Pasture)
Contributing Area =	2.17 ha	Root Zone Depth (m) =	1.25
Percent Impervious =	0.0%	Soil Moisture Retention Capacity (mm) =	250
Weather Station :	Fergus Shand Dam		

Pervious Area Infiltration Factor (MECP Table 3.1) =	0.4
Runoff Factor (Corrected for Imperviousness) =	0.60
Evapotranspiration Factor for Impervious Surfaces =	0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	5.2	112	75
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	2.6	56	37
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	1.3	29	19
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	28.9	627	418
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	78.1	1,696	1,131
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	39.1	848	565
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	19.5	424	283
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	9.8	212	141
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.9	106	71
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.4	53	35
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	20.6	447	298
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	10.3	224	149
Total		**35.1**				**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**222.7**	**4,834**	**3,222**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 101 (WET-13) - Forested Area
Contributing Area = 0.55 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.5
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	22	22
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	11	11
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	6	6
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	132	132
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	357	357
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	179	179
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	89	89
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	45	45
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	22	22
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	11	11
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	87	87
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	44	44
Total		**35.1**				**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**1,005**	**1,005**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 102 - Forested Area East of WET-06
Contributing Area = 2.62 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.5
Runoff Factor (Corrected for Imperviousness)* = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	104	104
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	52	52
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	27	27
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	630	630
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	1,706	1,706
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	853	853
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	427	427
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	213	213
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	107	107
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	53	53
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	418	418
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	209	209
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**4,799**	**4,799**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 104 - Upland Area East of WET-05
Contributing Area = 3.29 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.40
Runoff Factor (Corrected for Imperviousness)* = 0.60

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	($^{\circ}$C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	6.0	197	131
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	3.0	98	66
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.5	51	34
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	29.1	959	640
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	78.3	2,576	1,717
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	39.1	1,288	859
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.3	28.4	32.6	19.6	644	429
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	9.8	322	215
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	4.9	161	107
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.4	80	54
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	23.9	787	525
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	12.0	394	262
Total		**35.1**			**588.7**	**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.7**	**252.0**	**382.7**	**229.6**	**7,558**	**5,038**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 112 - Upland Area, Western Part of Site
Contributing Area = 11.77 ha
Percent Impervious = 4.3%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness)* = 0.33
Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.8	0.4	12.2	4.0	476	965
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.9	0.2	6.1	2.0	238	483
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	3.0	0.2	3.2	1.0	123	248
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	29.4	0.9	0.9	44.7	23.8	25.2	49.0	16.2	1,906	3,863
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	74.0	2.2	2.2	12.9	18.4	113.4	131.8	43.5	5,123	10,384
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	103.1	3.1	9.1	3.1	10.7	56.7	67.4	22.3	2,621	5,312
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	102.8	3.0	29.8	3.0	6.9	28.4	35.2	11.6	1,370	2,776
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	97.7	2.9	17.5	2.9	4.9	14.2	19.1	6.3	741	1,502
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	75.8	2.2	2.2	2.2	3.6	7.1	10.6	3.5	414	839
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	36.0	1.1	1.1	13.3	8.4	3.5	12.0	4.0	466	944
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.0	0.2	0.2	86.0	47.2	1.8	49.0	16.2	1,905	3,861
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.6	0.9	24.5	8.1	953	1,931
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**525.7**	**15.6**	**63.0**	**168.2**	**168.1**	**252.0**	**420.1**	**138.8**	**16,336**	**33,108**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Pre-Development Conditions)

PRE-DEVELOPMENT CONDITIONS

Contributing Catchments: 112 - Forest Area, Western Part of Site
Contributing Area = 7.47 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.7
Runoff Factor (Corrected for Imperviousness)* = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature ($^{\circ}$C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	2.6	193	449
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	1.3	96	225
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	50	117
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	1,079	2,517
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	2,919	6,811
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	1,459	3,405
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	9.8	730	1,703
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	4.9	365	851
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	182	426
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	91	213
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	10.3	770	1,797
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	5.2	385	899
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**111.3**	**8,320**	**19,412**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

APPENDIX H2:
WATER BALANCE CALCULATIONS – POST-DEVELOPMENT

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 101P (WET-13) - Upland
Contributing Area = 2.17 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Deep-Rooted Crops (Shrubs, Pasture)
Root Zone Depth (m) = 1.25
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.40
Runoff Factor (Corrected for Imperviousness) = 0.60
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	5.2	112	75
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	2.6	56	37
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	1.3	29	19
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	28.9	627	418
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	78.1	1,695	1,130
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	39.1	848	565
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	19.5	424	283
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	9.8	212	141
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.9	106	71
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.4	53	35
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	20.6	447	298
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	10.3	224	149
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**222.7**	**4,832**	**3,222**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 101P (WET-13) - Forest
Contributing Area = 0.55 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	22	22
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	11	11
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	6	6
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	132	132
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	358	358
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	179	179
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	90	90
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	45	45
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	22	22
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	11	11
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	88	88
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	44	44
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**1,007**	**1,007**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 102P - Forest
Contributing Area = 2.62 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		**(mm)**		**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	104	104
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	52	52
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	27	27
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	630	630
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	1,705	1,705
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	853	853
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	426	426
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	213	213
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	107	107
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	53	53
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	417	417
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	209	209
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**4,797**	**4,797**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 103P (WET-09) - Forest
Contributing Area = 4.02 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	160	160
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	80	80
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	42	42
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	967	967
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	2,617	2,617
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	1,309	1,309
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	654	654
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	327	327
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	164	164
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	82	82
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	640	640
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	320	320
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**7,362**	**7,362**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 104P - Upland
Contributing Area = 2.16 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.40
Runoff Factor (Corrected for Imperviousness) = 0.60

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	6.0	129	86
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	3.0	65	43
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.5	34	22
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	29.0	628	418
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	78.2	1,692	1,128
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	39.1	846	564
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	19.5	423	282
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	9.8	212	141
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.9	106	71
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.4	53	35
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	23.9	518	345
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	12.0	259	173
Total		**35.1**			**588.7**	**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**229.3**	**4,964**	**3,309**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 104P - Forest
Contributing Area = 1.13 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature ($^\circ$C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	4.0	45	45
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	2.0	22	22
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	1.0	12	12
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	24.0	271	271
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	65.1	733	733
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	32.5	366	366
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	16.3	183	183
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	8.1	92	92
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	4.1	46	46
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	23	23
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	15.9	179	179
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	8.0	90	90
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**183.1**	**2,061**	**2,061**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed depressions and hummocky topography generally indicate no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 105P (WET-04/-11) - Upland
Contributing Area = 1.77 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	5.0	88	88
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	2.5	44	44
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.3	23	23
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	24.2	428	428
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	65.2	1,153	1,153
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	32.6	577	577
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	16.3	288	288
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	8.1	144	144
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.1	72	72
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	36	36
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	19.9	353	353
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	10.0	176	176
Total		**35.1**			**588.7**	**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**191.1**	**3,383**	**3,383**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 105P (WET-04/-11) - Forest
Contributing Area = 1.01 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	**Daily Average Temperature (°C)**	**Monthly Heat Index (I)**	**Unadjusted Daily Potential Evapotranspiration (mm)**	**Correction Factors**	**Adjusted Potential Evapotranspiration (PE) (mm)**	**Average Precipitation (P) (mm)**	**P-PE (mm)**	**Accum. Pot. Water Loss (mm)**	**Storage (ST) (mm)**	**ΔS (mm)**	**Pervious ET (mm)**	**Actual Evapotrans-piration (AE) (mm)**	**Pervious ET - Actual ET (mm)**	**Moisture Deficit (D) (mm)**	**Moisture Surplus (S) (mm)**	**Water Runoff (RO) (mm)**	**Snow Melt Runoff (mm)**	**Total Recharge and Runoff (mm)**	**Actual Runoff (mm)**	**Runoff Volume (m^3)**	**Recharge Volume (m^3)**
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	2.4	24	56
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	1.2	12	28
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	0.6	6	15
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	146	340
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	394	920
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	197	460
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	9.8	99	230
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	4.9	49	115
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	2.4	25	58
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	12	29
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	9.6	97	225
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	4.8	48	113
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**109.9**	**1,110**	**2,589**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 106P (WET-03/-05) - Upland
Contributing Area = 6.90 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	5.0	344	344
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	2.5	172	172
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.3	89	89
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	24.2	1,667	1,667
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	65.2	4,496	4,496
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	32.6	2,248	2,248
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	16.3	1,124	1,124
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	8.1	562	562
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.1	281	281
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	140	140
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	19.9	1,375	1,375
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	10.0	688	688
Total		**35.1**			**588.7**	**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**191.1**	**13,186**	**13,186**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 106P (WET-03/-05) - Forest
Contributing Area = 0.48 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.80
Runoff Factor (Corrected for Imperviousness) = 0.20

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	1.7	8	33
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	0.9	4	16
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.4	2	9
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	9.6	46	185
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	26.0	125	500
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	13.0	63	250
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	6.5	31	125
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	3.3	16	63
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	1.6	8	31
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	0.8	4	16
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	6.9	33	132
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	3.4	16	66
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**74.2**	**356**	**1,425**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 107P (WET-06/-07/-12) - Upland (Shrub)
Contributing Area = 7.36 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	10.1	0.4	10.6	3.2	234	546
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	5.1	0.2	5.3	1.6	117	273
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	2.5	0.2	2.7	0.8	60	141
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	30.2	0.0	0.0	43.9	23.2	25.2	48.4	14.5	1,068	2,493
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	39.1	2,878	6,715
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	109.2	0.0	3.0	0.0	8.5	56.7	65.2	19.6	1,439	3,358
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	115.8	0.0	16.8	0.0	4.2	28.4	32.6	9.8	719	1,679
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	105.0	0.0	10.2	0.0	2.1	14.2	16.3	4.9	360	839
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	180	420
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	90	210
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	7.2	0.0	0.0	80.7	40.6	1.8	42.4	12.7	935	2,182
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	20.3	0.9	21.2	6.4	468	1,091
Total		**35.1**			**588.7**	**945.9**	**357.2**				**558.7**	**558.7**	**0.0**	**30.0**	**135.2**	**135.2**	**252.0**	**387.2**	**116.1**	**8,548**	**19,946**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments:	107P (WET-06/-07/-12) - Upland (Crop)	Soil Type:	Sand
		Vegetation:	Shallow-Rooted
Contributing Area =	4.41 ha	Root Zone Depth (m) =	0.50
Percent Impervious =	0.0%	Soil Moisture Retention Capacity (mm) =	50
Weather Station :	Fergus Shand Dam		

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	3.6	159	370
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	1.8	79	185
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	0.9	41	95
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.2	25.2	48.4	14.5	640	1,493
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	39.1	1,724	4,024
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	19.6	862	2,012
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.2	28.4	32.6	9.8	431	1,006
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	4.9	216	503
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	108	251
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	3.1	135	315
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	14.4	635	1,482
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	7.2	318	741
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.2**	**252.0**	**404.2**	**121.3**	**5,348**	**12,478**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 107P (WET-06/-07/-12) - Forest
Contributing Area = 6.22 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Mature Forest
Root Zone Depth (m) = 2.00
Soil Moisture Retention Capacity (mm) = 400

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		536.5	0.0		0.0	0.0	0.0	0.0	7.5	0.4	8.0	2.4	149	347
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		592.4	0.0		0.0	0.0	0.0	0.0	3.8	0.2	4.0	1.2	74	173
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		652.0	0.0		0.0	0.0	0.0	0.0	1.9	0.2	2.1	0.6	39	91
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		400.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	897	2,093
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		400.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	2,429	5,667
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	372.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	1,214	2,833
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	334.2	-38.4	127.6	127.6	0.0	5.0	0.0	4.2	28.4	32.5	9.8	607	1,417
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	318.6	-15.6	112.2	112.2	0.0	3.0	0.0	2.1	14.2	16.3	4.9	304	708
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		333.7	15.1	78.0	78.0	0.0	0.0	0.0	1.0	7.1	8.1	2.4	152	354
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		373.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	76	177
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		400.0	26.2	7.2	7.2	0.0	0.0	59.7	30.1	1.8	31.9	9.6	594	1,387
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		468.6	0.0		0.0	0.0	0.0	0.0	15.0	0.9	15.9	4.8	297	693
Total		**35.1**			**588.7**	**945.9**	**357.2**				**579.7**	**579.7**	**0.0**	**9.0**	**114.2**	**114.2**	**252.0**	**366.2**	**109.9**	**6,831**	**15,940**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 108P (WET-08) - Upland
Contributing Area = 2.40 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.60
Runoff Factor (Corrected for Imperviousness) = 0.40
Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	($^{\circ}$C)		**(mm)**		**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	10.1	0.4	10.6	4.2	102	153
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	5.1	0.2	5.3	2.1	51	76
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	2.5	0.2	2.7	1.1	26	39
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	30.2	0.0	0.0	43.9	23.2	25.2	48.4	19.4	464	697
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	52.1	1,251	1,877
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	109.2	0.0	3.0	0.0	8.5	56.7	65.2	26.1	626	938
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	115.8	0.0	16.8	0.0	4.2	28.4	32.6	13.0	313	469
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	105.0	0.0	10.2	0.0	2.1	14.2	16.3	6.5	156	235
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	3.3	78	117
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.6	39	59
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	7.2	0.0	0.0	80.7	40.6	1.8	42.4	16.9	407	610
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	20.3	0.9	21.2	8.5	203	305
Total		**35.1**			**588.7**	**945.9**	**357.2**				**558.7**	**558.7**	**0.0**	**30.0**	**135.2**	**135.2**	**252.0**	**387.2**	**154.9**	**3,717**	**5,575**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 109P (WET-02) - Upland Portion Unaffected by Pre-Grade
Contributing Area = 3.59 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.60
Runoff Factor (Corrected for Imperviousness) = 0.40
Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	4.8	172	258
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	2.4	86	129
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	1.2	44	67
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	19.4	698	1,046
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	52.2	1,873	2,810
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	26.1	937	1,405
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	13.0	468	702
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	6.5	234	351
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	3.3	117	176
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	4.1	146	220
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	19.2	689	1,034
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	9.6	345	517
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**161.8**	**5,810**	**8,715**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 109P (WET-02) - Forest Portion Unaffected by Pre-Grade
Contributing Area = 0.17 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	2.6	4	10
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	1.3	2	5
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	1	3
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	25	57
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	66	155
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	33	77
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	9.8	17	39
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	4.9	8	19
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	4	10
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	2	5
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	10.3	18	41
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	5.2	9	20
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**111.3**	**189**	**442**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 109P (E&SC Pond) - Upland Portion Affected by Pre-Grade
Contributing Area = 1.34 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

This catchment will be graded such that runoff will flow to an Erosion and Sediment Control pond with no intended overflow to WET-02.

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.65
Runoff Factor (Corrected for Imperviousness) = 0.35
Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	4.2	56	105
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	2.1	28	52
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	1.1	14	27
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	17.0	228	423
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	45.7	612	1,136
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	22.8	306	568
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	11.4	153	284
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	5.7	76	142
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	2.9	38	71
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	3.6	48	89
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	16.8	225	418
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	8.4	113	209
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**141.6**	**1,898**	**3,524**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)
* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 109P (WET-02) - Upland Portion Affected by Pre-Grade
Contributing Area = 3.00 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

This catchment will be graded such that runoff will flow to WET-02 via a swale and spreader facilities.

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.65
Runoff Factor (Corrected for Imperviousness) = 0.35
Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	4.2	126	234
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	2.1	63	117
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	1.1	32	60
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	17.0	510	947
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	45.7	1,370	2,544
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	22.8	685	1,272
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	11.4	342	636
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	5.7	171	318
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	2.9	86	159
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	3.6	107	199
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	16.8	504	936
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	8.4	252	468
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**141.6**	**4,248**	**7,890**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments:	109P (E&SC Pond) - Forest Portion Affected by Pre-Grade	Soil Type:	Sand
		Vegetation:	Mature Forest
Contributing Area =	0.07 ha	Root Zone Depth (m) =	2.50
Percent Impervious =	0.0%	Soil Moisture Retention Capacity (mm) =	250
Weather Station :	Fergus Shand Dam		

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	2.6	2	4
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	1.3	1	2
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	0	1
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	22.9	25.2	48.1	14.4	10	24
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	27	64
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	14	32
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	9.8	7	16
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	4.9	3	8
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	2	4
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	1	2
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	10.3	7	17
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	5.2	4	8
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.2**	**252.0**	**371.2**	**111.3**	**78**	**182**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)
* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 110P (WET10) - Upland
Contributing Area = 0.78 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Silt Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.62
Soil Moisture Retention Capacity (mm) = 125

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.50
Runoff Factor (Corrected for Imperviousness) = 0.50

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		261.5	0.0		0.0	0.0	0.0	0.0	9.5	0.4	10.0	5.0	39	39
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		317.4	0.0		0.0	0.0	0.0	0.0	4.8	0.2	5.0	2.5	19	19
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		377.0	0.0		0.0	0.0	0.0	0.0	2.4	0.2	2.6	1.3	10	10
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		125.0	0.0	30.2	30.2	0.0	0.0	43.9	23.1	25.2	48.3	24.2	188	188
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		125.0	0.0	76.2	76.2	0.0	0.0	10.7	16.9	113.4	130.3	65.2	508	508
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	99.0	-26.0	109.8	109.8	0.0	2.4	0.0	8.5	56.7	65.2	32.6	254	254
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	69.2	-29.8	119.0	119.0	0.0	13.6	0.0	4.2	28.4	32.6	16.3	127	127
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	59.6	-9.6	106.2	106.2	0.0	9.0	0.0	2.1	14.2	16.3	8.1	64	64
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		74.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	4.1	32	32
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		114.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	2.0	16	16
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		125.0	10.2	7.2	7.2	0.0	0.0	75.7	38.1	1.8	39.9	19.9	155	155
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		193.6	0.0		0.0	0.0	0.0	0.0	19.0	0.9	19.9	10.0	78	78
Total		**35.1**			**588.7**	**945.9**	**357.2**				**563.7**	**563.7**	**0.0**	**25.0**	**130.2**	**130.2**	**252.0**	**382.2**	**191.1**	**1,491**	**1,491**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments:	111P (WET-01) - Upland	Soil Type:	Sand
		Vegetation:	Shallow-Rooted
Contributing Area =	1.40 ha	Root Zone Depth (m) =	0.50
Percent Impervious =	0.0%	Soil Moisture Retention Capacity (mm) =	50
Weather Station :	Fergus Shand Dam		

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.60
Runoff Factor (Corrected for Imperviousness) = 0.40

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	4.8	67	101
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	2.4	34	50
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	1.2	17	26
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	19.4	272	408
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	52.2	730	1,096
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	26.1	365	548
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	13.0	183	274
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	6.5	91	137
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	3.3	46	68
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	4.1	57	86
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	19.2	269	403
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	9.6	134	202
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**161.8**	**2,266**	**3,399**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 111P (WET-01) - Forest
Contributing Area = 0.19 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	2.6	5	11
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	1.3	2	6
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	1	3
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	23.0	25.2	48.2	14.5	27	64
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	74	173
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	223.6	-26.4	110.2	110.2	0.0	2.0	0.0	8.4	56.7	65.1	19.5	37	87
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-36.4	125.6	125.6	0.0	7.0	0.0	4.2	28.4	32.6	9.8	19	43
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	4.9	9	22
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	5	11
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	2	5
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	10.3	20	46
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	5.2	10	23
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.3**	**252.0**	**371.3**	**111.4**	**212**	**494**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

384 Crawley Road - Site Plan Approval Application (Phase 1)
City of Guelph
Date: February 2023

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 201 - Pre-Grade
Portion Affected by Pre-Grade
Contributing Area = 2.09 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Fine Sandy Loam
Vegetation: Shallow-Rooted Crops
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 75

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30
Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		211.5	0.0		0.0	0.0	0.0	0.0	10.9	0.4	11.4	3.4	71	166
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		267.4	0.0		0.0	0.0	0.0	0.0	5.5	0.2	5.7	1.7	36	83
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		327.0	0.0		0.0	0.0	0.0	0.0	2.7	0.2	2.9	0.9	18	43
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		75.0	0.0	30.2	30.2	0.0	0.0	43.9	23.7	25.2	48.9	14.7	306	715
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		75.0	0.0	76.2	76.2	0.0	0.0	10.7	17.2	113.4	130.6	39.2	819	1,911
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	50.6	-24.4	108.2	108.2	0.0	4.0	0.0	8.6	56.7	65.3	19.6	409	955
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	28.0	-22.6	111.8	111.8	0.0	20.8	0.0	4.3	28.4	32.6	9.8	205	478
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	21.6	-6.4	103.0	103.0	0.0	12.2	0.0	2.1	14.2	16.3	4.9	102	239
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		36.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	2.4	51	119
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		75.0	38.3	37.1	37.1	0.0	0.0	1.8	1.5	3.5	5.0	1.5	31	73
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		75.0	0.0	7.2	7.2	0.0	0.0	85.8	43.6	1.8	45.4	13.6	285	664
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		143.6	0.0		0.0	0.0	0.0	0.0	21.8	0.9	22.7	6.8	142	332
Total		**35.1**			**588.7**	**945.9**	**357.2**				**551.7**	**551.7**	**0.0**	**37.0**	**142.2**	**143.0**	**252.0**	**395.0**	**118.5**	**2,476**	**5,778**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 201 - Forest
Portion Unaffected by Pre-Grade
Contributing Area = 0.12 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Mature Forest
Root Zone Depth (m) = 2.50
Soil Moisture Retention Capacity (mm) = 250

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.32

Month	**Daily Average Temperature**	**Monthly Heat Index (I)**	**Unadjusted Daily Potential Evapotranspiration**	**Correction Factors**	**Adjusted Potential Evapotranspiration (PE)**	**Average Precipitation (P)**	**P-PE**	**Accum. Pot. Water Loss**	**Storage (ST)**	**ΔS**	**Pervious ET**	**Actual Evapotrans-piration (AE)**	**Pervious ET - Actual ET**	**Moisture Deficit (D)**	**Moisture Surplus (S)**	**Water Runoff (RO)**	**Snow Melt Runoff**	**Total Recharge and Runoff**	**Actual Runoff**	**Runoff Volume**	**Recharge Volume**
	(°C)		**(mm)**		**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		386.5	0.0		0.0	0.0	0.0	0.0	8.1	0.4	8.6	2.6	3	7
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		442.4	0.0		0.0	0.0	0.0	0.0	4.1	0.2	4.3	1.3	2	4
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		502.0	0.0		0.0	0.0	0.0	0.0	2.0	0.2	2.2	0.7	1	2
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		250.0	0.0	30.2	30.2	0.0	0.0	43.9	23.0	25.2	48.2	14.5	17	40
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		250.0	0.0	76.2	76.2	0.0	0.0	10.7	16.8	113.4	130.2	39.1	47	109
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	222.6	-27.4	111.2	111.2	0.0	1.0	0.0	8.4	56.7	65.1	19.5	23	55
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	187.2	-35.4	124.6	124.6	0.0	8.0	0.0	4.2	28.4	32.6	9.8	12	27
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	173.6	-13.6	110.2	110.2	0.0	5.0	0.0	2.1	14.2	16.3	4.9	6	14
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		188.7	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.1	2.4	3	7
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		228.9	40.2	37.1	37.1	0.0	0.0	0.0	0.5	3.5	4.1	1.2	1	3
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		250.0	21.2	7.2	7.2	0.0	0.0	64.7	32.6	1.8	34.4	10.3	12	29
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		318.6	0.0		0.0	0.0	0.0	0.0	16.3	0.9	17.2	5.2	6	14
Total		**35.1**			**588.7**	**945.9**	**357.2**				**574.7**	**574.7**	**0.0**	**14.0**	**119.2**	**119.3**	**252.0**	**371.3**	**111.4**	**134**	**312**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)
* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 202 - Developed Area (Parking)
Contributing Area = 4.91 ha
Percent Impervious = 100.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Runoff Factor (provided by AECOM) = 0.90

Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	**Daily Average Temperature**	**Monthly Heat Index (I)**	**Unadjusted Daily Potential Evapotranspiration**	**Correction Factors**	**Adjusted Potential Evapotranspiration (PE)**	**Average Precipitation (P)**	**P-PE**	**Accum. Pot. Water Loss**	**Storage (ST)**	**ΔS**	**Pervious ET**	**Actual Evapotrans-piration (AE)**	**Pervious ET - Actual ET**	**Moisture Deficit (D)**	**Moisture Surplus (S)**	**Water Runoff (RO)**	**Snow Melt Runoff**	**Total Recharge and Runoff**	**Actual Runoff**	**Runoff Volume**	**Recharge Volume**
	(°C)		**(mm)**		**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	16.1	0.4	16.5	14.9	730	81
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	8.0	0.2	8.3	7.4	365	41
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	4.0	0.2	4.2	3.8	186	21
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	9.9	20.3	20.3	64.2	34.1	25.2	59.3	53.4	2,620	291
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	25.0	51.2	51.2	61.9	48.0	113.4	161.4	145.3	7,133	793
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	35.8	73.4	76.5	73.4	60.7	56.7	117.4	105.7	5,189	577
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	37.9	77.9	94.7	77.9	69.3	28.4	97.6	87.9	4,315	479
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	34.4	70.6	80.8	70.6	70.0	14.2	84.1	75.7	3,718	413
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	25.5	52.5	52.5	52.5	61.2	7.1	68.3	61.5	3,018	335
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	12.1	24.9	24.9	24.9	43.1	3.5	46.6	41.9	2,059	229
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	2.4	4.8	4.8	85.5	64.3	1.8	66.0	59.4	2,919	324
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	32.1	0.9	33.0	29.7	1,459	162
Total		**35.1**			**588.7**	**945.9**	**357.2**				**558.7**	**183.0**	**375.7**	**405.7**	**510.9**	**510.9**	**252.0**	**762.9**	**686.6**	**33,711**	**3,746**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 203 - Developed Area (Warehouse)
Contributing Area = 0.71 ha
Percent Impervious = 100.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.90
Runoff Factor (Corrected for Imperviousness) = 1.00
Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	16.1	0.4	16.5	16.5	117	0
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	8.0	0.2	8.3	8.3	59	0
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	4.0	0.2	4.2	4.2	30	0
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	9.9	20.3	20.3	64.2	33.8	25.2	59.0	59.0	419	0
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	25.0	51.2	51.2	61.9	47.9	113.4	161.3	161.3	1,145	0
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	35.8	73.4	76.5	73.4	60.7	56.7	117.4	117.4	833	0
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	37.9	77.9	94.7	77.9	69.3	28.4	97.6	97.6	693	0
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	34.4	70.6	80.8	70.6	69.9	14.2	84.1	84.1	597	0
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	25.5	52.5	52.5	52.5	61.2	7.1	68.3	68.3	485	0
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	12.1	24.9	24.9	24.9	43.1	3.5	46.6	46.6	331	0
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	2.4	4.8	4.8	85.5	64.3	1.8	66.0	66.0	469	0
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	32.1	0.9	33.0	33.0	234	0
Total		**35.1**			**588.7**	**945.9**	**357.2**				**558.7**	**183.0**	**375.7**	**405.7**	**510.9**	**510.4**	**252.0**	**762.4**	**762.4**	**5,413**	**0**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 204 - Developed Area (Warehouse)
Contributing Area = 1.45 ha
Percent Impervious = 100.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Deep-Rooted (Pasture, Shrubs)
Root Zone Depth (m) = 1.00
Soil Moisture Retention Capacity (mm) = 100

Runoff Factor (provided by AECOM) = 0.90

Evapotranspiration Factor for Impervious Surfaces = 0.33

Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		236.5	0.0		0.0	0.0	0.0	0.0	16.1	0.4	16.5	14.9	215	24
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		292.4	0.0		0.0	0.0	0.0	0.0	8.0	0.2	8.3	7.4	108	12
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		352.0	0.0		0.0	0.0	0.0	0.0	4.0	0.2	4.2	3.8	55	6
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		100.0	0.0	30.2	9.9	20.3	20.3	64.2	33.7	25.2	58.9	53.1	769	85
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		100.0	0.0	76.2	25.0	51.2	51.2	61.9	47.8	113.4	161.2	145.1	2,104	234
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	74.6	-25.4	109.2	35.8	73.4	76.5	73.4	60.6	56.7	117.3	105.6	1,531	170
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	48.0	-26.6	115.8	37.9	77.9	94.7	77.9	69.3	28.4	97.6	87.8	1,274	142
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	39.6	-8.4	105.0	34.4	70.6	80.8	70.6	69.9	14.2	84.1	75.7	1,098	122
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		54.7	15.1	78.0	25.5	52.5	52.5	52.5	61.2	7.1	68.3	61.5	891	99
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		94.9	40.2	37.1	12.1	24.9	24.9	24.9	43.1	3.5	46.6	41.9	608	68
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		100.0	5.2	7.2	2.4	4.8	4.8	85.5	64.3	1.8	66.0	59.4	862	96
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		168.6	0.0		0.0	0.0	0.0	0.0	32.1	0.9	33.0	29.7	431	48
Total		**35.1**			**588.7**	**945.9**	**357.2**				**558.7**	**183.0**	**375.7**	**405.7**	**510.9**	**510.2**	**252.0**	**762.2**	**685.9**	**9,946**	**1,105**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 206 - Pre-Grade
Contributing Area = 4.48 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	3.6	161	376
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	1.8	81	188
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	0.9	42	97
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	14.6	653	1,523
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	39.1	1,753	4,091
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	19.6	877	2,045
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	9.8	438	1,023
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	4.9	219	511
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	2.4	110	256
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	3.1	137	320
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	14.4	645	1,505
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	7.2	323	753
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**121.4**	**5,438**	**12,688**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)
* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 205 - Pre-Grade
Contributing Area = 3.89 ha
Percent Impervious = 0.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Pervious Area Infiltration Factor (MECP Table 3.1) = 0.70
Runoff Factor (Corrected for Imperviousness) = 0.30

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	11.6	0.4	12.0	3.6	140	327
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	5.8	0.2	6.0	1.8	70	163
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	2.9	0.2	3.1	0.9	36	84
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	30.2	0.0	0.0	43.9	23.4	25.2	48.6	14.6	567	1,323
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	76.2	0.0	0.0	10.7	17.0	113.4	130.4	39.1	1,522	3,552
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	106.2	0.0	6.0	0.0	8.5	56.7	65.2	19.6	761	1,776
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	105.8	0.0	26.8	0.0	4.3	28.4	32.6	9.8	381	888
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	100.6	0.0	14.6	0.0	2.1	14.2	16.3	4.9	190	444
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	78.0	0.0	0.0	0.0	1.1	7.1	8.2	2.4	95	222
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	37.1	0.0	0.0	12.3	6.7	3.5	10.2	3.1	119	278
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	7.2	0.0	0.0	85.8	46.2	1.8	48.0	14.4	560	1,307
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	23.1	0.9	24.0	7.2	280	654
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**541.3**	**0.0**	**47.4**	**152.6**	**152.6**	**252.0**	**404.6**	**121.4**	**4,722**	**11,017**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

* Closed drainage indicates no runoff from this area. All moisture that is not taken up by evapotranspiration ultimately recharges: corrections have been made as explained on summary sheet.

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 301 - Southgate Extension
Contributing Area = 0.39 ha
Percent Impervious = 40.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Runoff Factor (provided by AECOM) = 0.40

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	13.8	0.4	14.3	5.7	22	33
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	6.9	0.2	7.1	2.9	11	17
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	3.5	0.2	3.7	1.5	6	9
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	22.2	8.0	8.0	51.9	27.7	25.2	52.9	21.2	82	124
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	56.0	20.2	20.2	30.9	29.3	113.4	142.7	57.1	223	334
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	78.1	28.1	34.1	28.1	28.7	56.7	85.4	34.2	133	200
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	77.8	28.0	54.8	28.0	28.4	28.4	56.7	22.7	88	133
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	74.0	26.6	41.2	26.6	27.5	14.2	41.7	16.7	65	98
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	57.3	20.7	20.7	20.7	24.1	7.1	31.2	12.5	49	73
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	27.2	9.8	9.8	22.1	23.1	3.5	26.6	10.6	42	62
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	5.3	1.9	1.9	87.7	55.4	1.8	57.2	22.9	89	134
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	27.7	0.9	28.6	11.4	45	67
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**398.0**	**143.3**	**190.7**	**295.9**	**296.0**	**252.0**	**547.9**	**219.2**	**855**	**1,282**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments:	302 - Southgate Extension	Soil Type:	Sand
		Vegetation:	Shallow-Rooted
Contributing Area =	1.25 ha	Root Zone Depth (m) =	0.50
Percent Impervious =	40.0%	Soil Moisture Retention Capacity (mm) =	50
Weather Station :	Fergus Shand Dam		

Runoff Factor (provided by AECOM) = 0.40

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration	Correction Factors	Adjusted Potential Evapotranspiration (PE)	Average Precipitation (P)	P-PE	Accum. Pot. Water Loss	Storage (ST)	ΔS	Pervious ET	Actual Evapotrans-piration (AE)	Pervious ET - Actual ET	Moisture Deficit (D)	Moisture Surplus (S)	Water Runoff (RO)	Snow Melt Runoff	Total Recharge and Runoff	Actual Runoff	Runoff Volume	Recharge Volume
	(°C)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	13.8	0.4	14.3	5.7	71	107
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	6.9	0.2	7.1	2.9	36	54
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	3.5	0.2	3.7	1.5	18	27
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	22.2	8.0	8.0	51.9	27.6	25.2	52.8	21.1	264	396
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	56.0	20.2	20.2	30.9	29.2	113.4	142.6	57.1	713	1,070
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	78.1	28.1	34.1	28.1	28.7	56.7	85.4	34.1	427	640
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	77.8	28.0	54.8	28.0	28.3	28.4	56.7	22.7	283	425
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	74.0	26.6	41.2	26.6	27.5	14.2	41.7	16.7	208	312
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	57.3	20.7	20.7	20.7	24.1	7.1	31.2	12.5	156	234
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	27.2	9.8	9.8	22.1	23.1	3.5	26.6	10.6	133	200
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	5.3	1.9	1.9	87.7	55.4	1.8	57.2	22.9	286	429
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	27.7	0.9	28.6	11.4	143	214
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**398.0**	**143.3**	**190.7**	**295.9**	**295.8**	**252.0**	**547.7**	**219.1**	**2,739**	**4,108**

Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

MONTHLY WATER BALANCE

Monthly Water Balance (Post-Development Conditions)

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 303 - Southgate Extension
Contributing Area = 0.47 ha
Percent Impervious = 40.0%
Weather Station : Fergus Shand Dam

Soil Type: Sand
Vegetation: Shallow-Rooted
Root Zone Depth (m) = 0.50
Soil Moisture Retention Capacity (mm) = 50

Runoff Factor (provided by AECOM) = 0.40

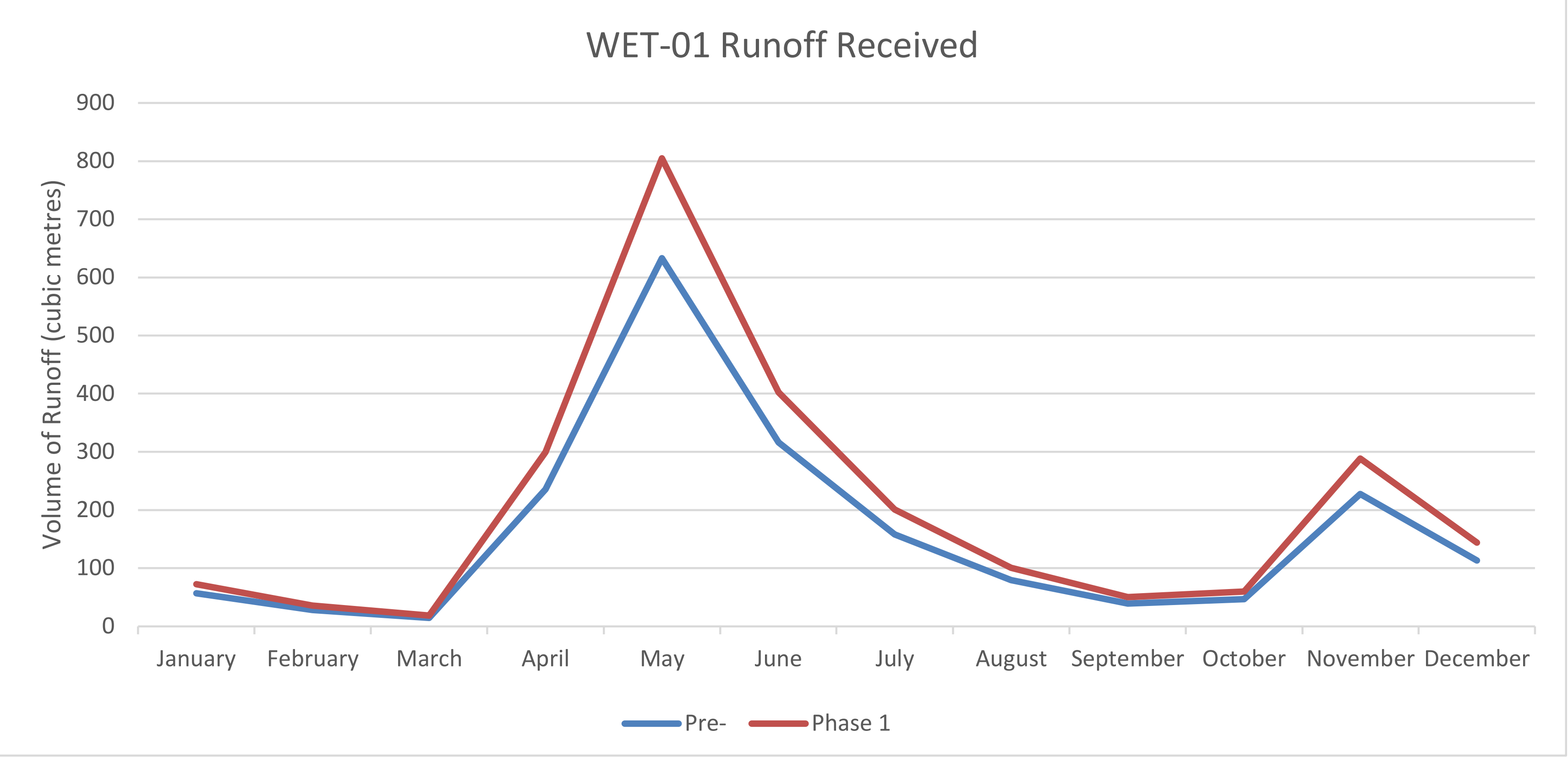
Evapotranspiration Factor for Impervious Surfaces = 0.34

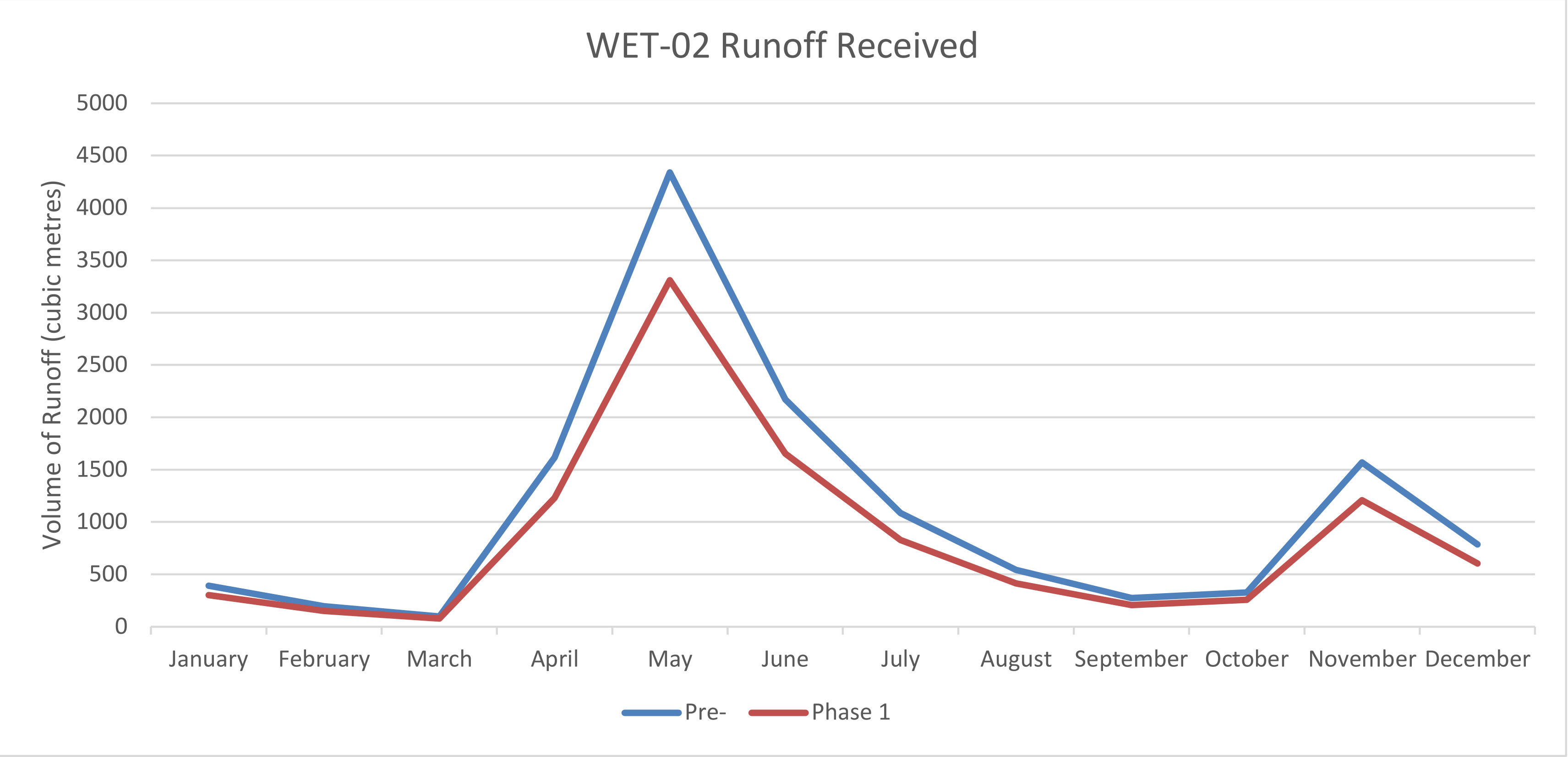
Month	Daily Average Temperature (°C)	Monthly Heat Index (I)	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (PE) (mm)	Average Precipitation (P) (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (ST) (mm)	ΔS (mm)	Pervious ET (mm)	Actual Evapotrans-piration (AE) (mm)	Pervious ET - Actual ET (mm)	Moisture Deficit (D) (mm)	Moisture Surplus (S) (mm)	Water Runoff (RO) (mm)	Snow Melt Runoff (mm)	Total Recharge and Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0		0.0	0.0	0.0	0.0	13.8	0.4	14.3	5.7	27	40
Feb	-6.3	0.0	0.0	24.3	0.0	55.9	55.9		242.4	0.0		0.0	0.0	0.0	0.0	6.9	0.2	7.1	2.9	13	20
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0		0.0	0.0	0.0	0.0	3.5	0.2	3.7	1.5	7	10
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	30.2	22.2	8.0	8.0	51.9	27.7	25.2	52.9	21.1	99	149
May	12.2	3.9	2.0	38.1	76.2	86.9	10.7		50.0	0.0	76.2	56.0	20.2	20.2	30.9	29.3	113.4	142.7	57.1	268	402
Jun	17.5	6.7	2.9	38.7	112.2	83.8	-28.4	-28.4	27.6	-22.4	106.2	78.1	28.1	34.1	28.1	28.7	56.7	85.4	34.2	161	241
Jul	20.0	8.2	3.4	39.0	132.6	89.2	-43.4	-71.8	11.0	-16.6	105.8	77.8	28.0	54.8	28.0	28.4	28.4	56.7	22.7	107	160
Aug	19.0	7.6	3.2	36.0	115.2	96.6	-18.6	-90.4	7.0	-4.0	100.6	74.0	26.6	41.2	26.6	27.5	14.2	41.7	16.7	78	118
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		22.1	15.1	78.0	57.3	20.7	20.7	20.7	24.1	7.1	31.2	12.5	59	88
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	27.9	37.1	27.2	9.8	9.8	22.1	23.1	3.5	26.6	10.6	50	75
Nov	2.1	0.3	0.3	24.0	7.2	93.0	85.8		50.0	0.0	7.2	5.3	1.9	1.9	87.7	55.4	1.8	57.2	22.9	107	161
Dec	-3.9	0.0	0.0	22.8	0.0	68.6	68.6		118.6	0.0		0.0	0.0	0.0	0.0	27.7	0.9	28.6	11.4	54	81
Total		**35.1**			**588.7**	**945.9**	**357.2**				**541.3**	**398.0**	**143.3**	**190.7**	**295.9**	**295.9**	**252.0**	**547.9**	**219.2**	**1,030**	**1,545**

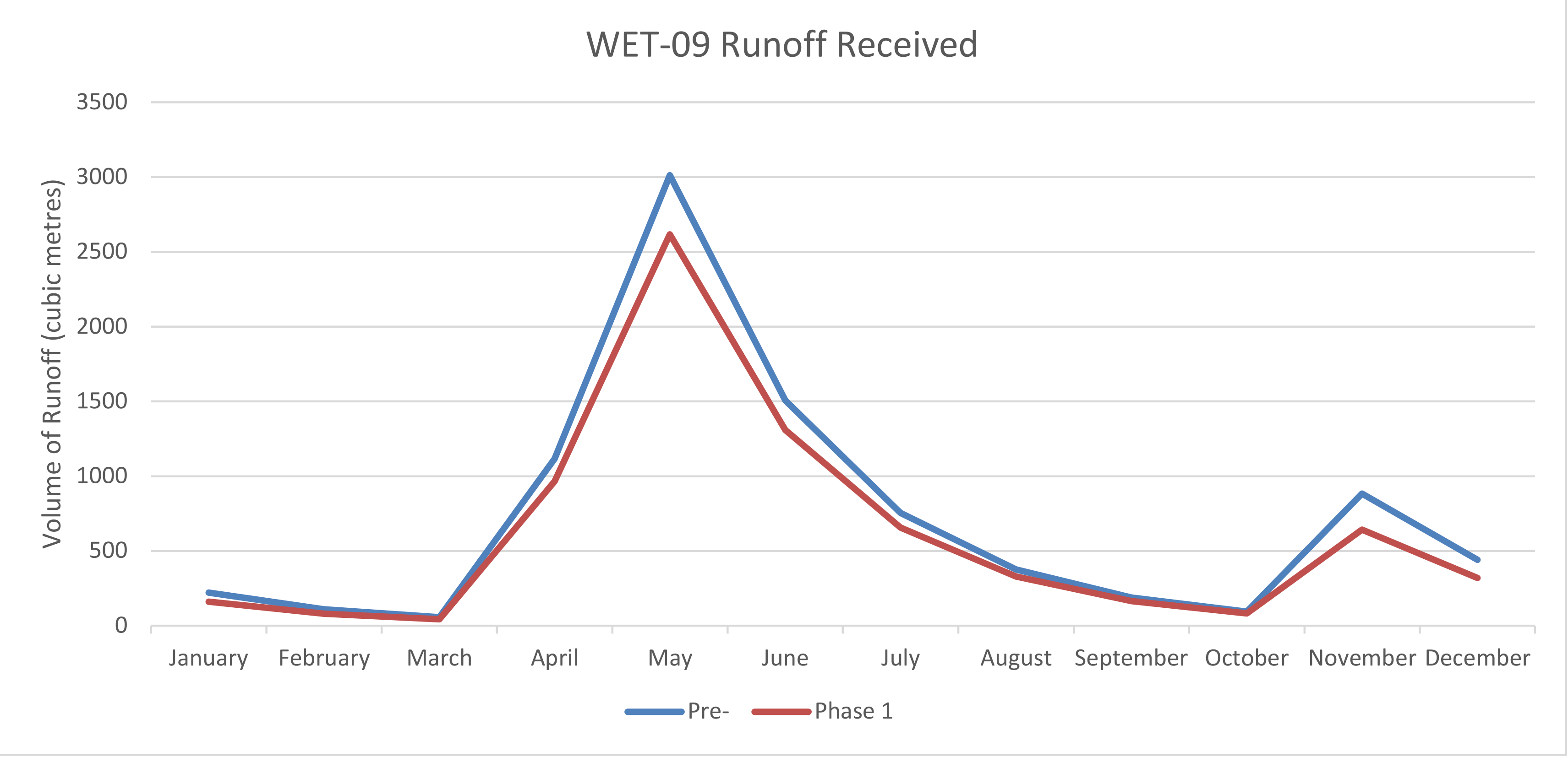
Daily Average Temperature from Fergus Shand Dam Station (Environment Canada, 1981 to 2010)

APPENDIX H3:

WATER BALANCE RESULTS – PLOTS OF MONTHLY VARIATION IN RUNOFF RECEIVED BY SELECT WETLANDS


WET-01 Runoff Received
Volume of Runoff (cubic metres)
900
800
700
600
500
400
300
200
100
0
January
February
March
April
May
June
July
August
September
October
November
December
Pre-
Phase 1


WET-02 Runoff Received
Volume of Runoff (cubic metres)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
January
February
March
April
May
June
July
August
September
October
November
December
Pre-
Phase 1


WET-09 Runoff Received
Volume of Runoff (cubic metres)
3500
3000
2500
2000
1500
1000
500
0
January
February
March
April
May
June
July
August
September
October
November
December
Pre-
Phase 1

APPENDIX I:
GROUNDWATER MOUNDING CALCULATIONS

GROUNDWATER MOUNDING CALCULATION
Hantush (1967)

Infiltration Basin CENTRAL SWMP - Using infiltration test data for fine sand and silt
Estimating peak rise at the edge of the wetland

Parameters

w =	0.018	m/d	Hydraulic Loading Rate over the rectangular area (see Section 6 of Report)
k =	0.432	m/d	Hydraulic Conductivity of the underlying soil (IFT1-4, 332.76 masl, k = 5e-6 m/s)
v =	5.184	m^2/d	Composite parameter
b-bar =	0.6	m	Linearization Parameter (roughly equal to the average of initial and maximum water table heights)
Sy =	0.05	--	Specific Yield of underlying soil (assumed fine sand)
l =	40	m	Half-length of loaded area
a =	7.5	m	Half-width of loaded area
t=	31	d	Time since start of loading (days in May, month of peak loading)
x=	0	m	Distance in x-direction to edge of wetland (from centroid of pond, set to zero)
y=	41.5	m	Distance in y-direction to edge of wetland (from centroid of pond)
hi =	0.5	m	Initial head (MW22-07: estimated max gwl 331.2 masl vs. Silty Sand Till 330.7 masl)

α1 =	1.58	--	l+x...
β1 =	1.93	--	a+y...
α1=α2 =	1.58	--	l-x...
β2 =	-1.34	--	a-y...

S*(α1,β1) =	0.991	--	Value from table in Hantush, 1967
S*(α1,β2) =	-0.976	--	Value from table in Hantush, 1967
S*(α2,β1) =	0.991	--	Value from table in Hantush, 1967
S*(α2,β2) =	-0.976	--	Value from table in Hantush, 1967

$\Delta h_{(x=l,y=a)}$= 0.09 m