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DESKTOP HYDROGEOLOGICAL REVIEW

6490 First Line, Fergus, ON

Project #: 24-0727
Prepared for: RBS & EJS Fergus Limited Partnership
Date: January 20, 2025

Report Version: 1

6415 Northwest Drive
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envisionconsultants.ca

January 20, 2025

RBS & EJS Fergus Limited Partnership
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Attention: Herthana Siva
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SUBJECT: DESKTOP HYDROGEOLOGICAL REVIEW, 6490 FIRST LINE, FERGUS, ON

EnVision Consultants Ltd. is pleased to present the enclosed Desktop Hydrogeological Review report for the above-noted property.

We thank you for utilizing EnVision for this assignment. If there are any questions regarding the enclosed report, please do not hesitate to contact us.

Yours sincerely,

Draft
2025-01-20 3:02:55 PM

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QUALITY MANAGEMENT

ISSUE	FIRST ISSUE	REVISION 1	REVISION 2
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SIGNATURE	DRAFT		
REVIEWED BY	Robin Byers		
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1. INTRODUCTION

EnVision Consultants Ltd. (EnVision) was retained by RBS & EJS Fergus Limited Partnership (the 'Client') to conduct a hydrogeological review of conditions at the property located at 6490 First Line, Fergus, ON (the 'Site'). It is our understanding that this assessment has been requested in support of the proposed Official Plan Amendment (OPA) at the Site.

The Site is rectangular in shape and occupies an area of approximately 40 hectares (99 acres). It is located just east of the Urban Centre of Fergus, bounded by First Line to the east, Highway 19 to the south, a residential subdivision known as "Summerfields" to the west and both urban and rural developments to the north. Overall, the Site is primarily comprised of farmstead and agricultural crop field, with naturalized areas (i.e., woodlands and wetlands) within the western half of the Site. The Moffitt Drain, which is a tributary of the Grand River, transacts through the western half of the Site.

The location and orientation of the Site is depicted on Figure 1, which includes a 500-m buffer extending from the edges of the property fabric that represents the "Study Area".

1.1. METHODOLOGY AND REVIEWED RESOURCES

The background review of local geological and hydrogeological conditions was developed based on information contained within the following sources:

- Geological information maintained by the Ontario Geological Survey (OGS) in the form of surficial geological and bedrock mapping, overburden thickness interpretations, and physiographic information.
- Ministry of Natural Resources information, including natural heritage mapping and topographical data.
- Ministry of the Environment, Conservation and Parks (MECP) Well Record database.
- Available environmental, geotechnical and hydrogeological reports, including:
    - Terraprobe Limited, Geotechnical Investigation Report (2007) for Proposed Residential Subdivision at Garafraxa St and Gartshore St, Fergus, ON
    - R.J. Burnside & Associates Ltd., 2017 Foundation Drainage Analysis Eastwood (Summerfields), Fergus, ON
    - R.J. Burnside & Associates Ltd., 2023 Monitoring Report Eastwood (Summerfields), Fergus, ON
    - Stantec, New Well Exploration Program Feasibility Assessment Report (2024)
    - Golder Member of WSP, Hydrogeological Investigation (2022) for Proposed Residential Redevelopment at 8243 and 8282 Wellington Road 19, Fergus, ON
    - SCS Consulting Group Ltd., Functional Servicing and Stormwater Management Brief (2024), 6490 First Line, Fergus, ON

2. SITE SETTING

2.1. TOPOGRAPHY AND DRAINAGE

Based on the Ontario Digital Elevation Model (DEM), the ground surface profile along First Line adjacent to the Site rises to the north to 431 m above sea level (m ASL), dipping along the north-northeast boundary of the property to 425 m ASL, before rising again to 430 m ASL to the southeast. Along Garafraxa St. E., the topography steadily climbs towards the north-northeast, rising from 415 m ASL near Tom Street, to above 430 m ASL where it intersects First Line.

The Site is relatively flat lying, sitting at approximate elevation of 430 m ASL. The ground dips away towards the wetland feature that is situated along the western boundary of the property.

Based on the preliminary stormwater management brief, prepared by SCS Consulting Group Ltd., the existing drainage on the Site is directed towards the southwestern corner of the Property at Garafraxa Street E. An existing tributary of the Grand River traverses the western portion of the Site, which conveys the stormwater runoff southwest through the adjacent property, connecting to an existing storm sewer.

2.2. GEOLOGY

2.2.1. Overburden Geology

The surficial overburden geology in the area of the Site (Ontario Geological Survey, 1997) is shown on Figure 3, with parts of the Site extending over land surfaces mapped as ice-contact stratified deposits, or as sand rich glaciofluvial deposits. The overburden thickness isopach has been plotted on Figure 1, and is inferred to range from 15 to 30 m beneath the Site.

2.2.2. Bedrock Geology

The bedrock surface elevation is generally around 400 masl and consists of limestone, dolostone and shale. Bedrock is not anticipated to outcrop at the Site, or Study Area. The bedrock formations underlying the Site comprise one of the most extensive bedrock aquifers in Ontario and are the main source of drinking water supplies for a number of nearby municipalities. The Ontario Geological Survey (OGS) has mapped the Silurian carbonate strata along the Niagara Escarpment region and has revised the framework for stratigraphy of this area. Based on the revised stratigraphic framework described by the OGS (Brunton, 2008, 2009), a brief description of the bedrock formations estimated to be present is provided below (from oldest to youngest).

- Gasport Formation: The Gasport Formation is a cross-bedded crinoidal grainstone-packstone with sequences of reef mound and coquina (shell bed) lithofacies (Brunton, 2008, 2009). This unit has commonly been referred to as the Amabel Formation in previous studies in the area;
- Goat Island Formation: The Goat Island Formation consists of two members; the lower Niagara Falls Member and the upper Ancaster Member. The Niagara Falls Member is a finely

crystalline and crosslaminated crinoidal grainstone with small reef mounds while the Ancaster Member is a chert rich, finely crystalline dolostone that is medium to ash grey in colour;

- Eramosa Formation: The Eramosa Formation consists of three members including, from oldest to youngest, the Vinemount Member, the Reformatory Quarry Member and the Stone Road Member. It is unknown whether all of the members of the Eramosa Formation are present at the Site; and
- Guelph Formation: The Guelph Formation consists of medium to thickly bedded crinoidal grainstones and wackestones and reefal complexes (Brunton, 2008, 2009). The Guelph Formation is cream coloured and is the uppermost bedrock unit.

2.3. HYDROGEOLOGICAL SETTING

2.3.1. Study Area Review of MECP Well Records

EnVision reviewed the online MECP Water Well Record (Ministry of the Environment, 2018) database to determine the number and reported use of water wells present within the Study Area.

The MECP WWR database indicated that there are 167 water wells in the Study Area (Figure 1). The well records included classification of the final use as per the statistics summarised below:

- Water Supply - 112
- Observation Wells – 17
- Test Hole – 5
- Abandoned – Supply/Quality/Other – 22
- No reported use - 11

A summary table of the water supply wells has been prepared and presented in Table A-1, Appendix A. Based on a review, the water supply wells water usage was reported with the following breakdown; 112 domestic, 5 commercial/industrial, 2 municipal/public, and 3 non reported.

The depth of the water supply wells ranged from 3.0 to 129.5 m BGS, with an average depth of 60.3 m. The recorded static water levels ranged from 2.1 to 42.7 m BGS, with an average depth of 19.9 m BGS The date of construction ranged from 1955 to 2016, with over 80% completed prior to 2000. There have been no new constructed wells reported with a date after January 1, 2020. Only 2 of the 112 reported wells are considered overburden wells, with the majority (98%) drawing water from the bedrock aquifer.

2.3.2. Source Water Protection Policy Areas

Wellhead Protection Area for the nearby municipal well, F4, extends just west of the Site, with parts of the WHPA-B intersecting lands associated with the development, as highlighted in Figure 4. WHPA-B represents the zone delineated at ground surface at which water will reach a supply well within two years of travel time. The vulnerability score of 8 indicates that parts of the Site are at increased risk of contamination to the water supply system. This may result in prohibitions on select activities (storage of fuels, etc.) for areas intersecting the WHPA-B area.

Figure 5 highlights areas that have been delineated as Significant Groundwater Recharge Areas (SGRA). The Site is situated within an SGRA, and will require a water balance assessment to assess the pre-to post-development infiltration volumes to mitigate any negative impacts to the groundwater quantity.

2.3.3. Hydrostratigraphy

Geological and hydrogeological conditions throughout the Study Area and surrounding region have been documented in previous studies, including in work completed by Stantec for the New Well Exploration Feasibility Assessment Report, published in February of 2024 (Stantec, 2024). A copy of Stantec's conceptual hydrogeological model that includes portions of the Study Area, has been attached as Figure 6.

The groundwater system has been interpreted to be made up of a shallow water-table overburden aquifer, which recharges the bedrock (Guelph Formation) aquifer, with some shallow flow directed towards local creeks (Irvine Creek) as discharge. Beneath the Guelph Formation, the Ancaster Member acts as a regional aquitard, with some leakage serving to recharge the deep groundwater flow system (Niagara Falls/Gasport/Cabot Head Formations).

Municipal supply well F4 is located approximately 400 m west of the property at 730 Gartshore Street, Fergus, and pumps water from the Guelph Formation.

2.4. SURFACE WATER FEATURES

The Site contains an evaluated wetland along the southwestern boundary, which includes an unnamed watercourse identified as a warmwater system (EnVision Consultants Ltd., 2024) that drains south to the Grand River. The evaluated wetland is composed of a combination of woodland and wetland features.

3. BACKGROUND REPORT REVIEW

3.1. GEOTECHNICAL INVESTIGATION PROPOSED RESIDENTIAL SUBDIVISION GARAFRAXA ST & GARTSHORE ST, FERGUS, ON

Terraprobe Limited conducted a geotechnical investigation for proposed redevelopment of Part of Lot 8, Concession 1, Township of Centre Wellington. This property is identified as the Eastwoods subdivision, and is situated directly southwest of the subject lands.

The field level investigation was completed in 2007, and included the advancement of twelve (12) boreholes across the property, with depth of investigation ranging from 3.0 to 8.1 meters. Piezometers were installed in each of the boreholes for short-term groundwater level measurements. *Table 3-1* below highlights the reported depths to groundwater as measured by Terraprobe in September of 2007.

Table 3-1: Summary of Groundwater Levels at Adjacent Site (2007)

BH	DEPTH (m)	WATER LEVEL (SEP 2007) (m bgs) / (m asl)	BH	DEPTH (m)	WATER LEVEL (SEP 2007) (m bgs) / (m asl)
1	4.3	2.7 / 421.7	7	6.6	1.0 / 420.2
2	8.1	1.9 / 421.2	8	4.3	2.8 / 421.4
3	4.3	2.8 / 421.8	9	6.6	3.5 / 420.2
4	4.3	3.6 / 421.3	10	6.3	1.8 / 419.6
5	8.1	1.7 / 421.3	11	3.0	1.6 / 416.8
6	3..0	1.2 / 419.9	12	6.2	2.3 / 416.1

The general soil profile was described as a sequence consisting of the following:

- Topsoil
- Fill (assume this was reworked soils, tilled soils)
- Silt to Sandy Silt Till was noted in four boreholes
- Sand, Sand and Silt to Silty Sand underlying the fill/till material at all locations
- Silt and Sandy Silt at all locations interbedded with the sand/silty sand extending beyond the depth of investigation

Bedrock was not confirmed during the field investigation. Copy of the borehole logs are presented in Appendix B. The site soil conditions align with the surficial geological mapping, and interpretation from the MECP Water Well records.

3.2. 2013 Eastwood Fergus Foundation Drain Analysis

R.J.Burnside prepared a foundation drainage analysis as part of Draft Plan conditions for the subdivision development of the adjacent lands identified as the Eastwoods (Summerfields) subdivision. The work included monitoring of seasonal groundwater level conditions to understand the impact of residential basements on the shallow groundwater system.

The 2013 Site investigation included additional work, consisting of additional drilling and monitoring well installation and seasonal groundwater level monitoring. Burnside prepared groundwater contouring maps, stratigraphic interpretation of the property, and completed an impact assessment for permanent groundwater control through a foundation drainage collector (FDC) system.

The soil conditions at the property were noted to be comprised of a shallow layer of sand, reaching about 11 m in thickness along the northern boundary, and thinning to approximately 2 m along the southern limits. This sand layer is inferred to be hydraulically connected to the wetland feature that borders the eastern limits of the Eastwood lands (which is directly southwest of the Site). Shallow groundwater flow is interpreted to flow towards the east, with some component of flow towards the wetland.

Seasonal groundwater monitoring by Burnside concluded that the variability across the annual period ranges from 1 to 2 m and that high groundwater elevations at the property ranged from 417 m asl to 424 m asl, exceeding the levels reported by Terraprobe from the 2007 work program.

Residential homes with basements typically require separation from the seasonal high groundwater levels. High groundwater levels at the site were mitigated through the construction of foundation drainage collector (FDC) pipe that allowed shallow groundwater control to maintain dry basements without the need of individual sump and pumps.

3.3. 2023 MONITORING REPORT (EASTWOODS)

R.J. Burnside has prepared a monitoring report for the adjacent lands identified as the Eastwoods (Summerfields) subdivision. This property was the subject of the geotechnical investigation referenced in Section 4.1. The monitoring program was completed as part of the site development, and included mult-year groundwater/surface water monitoring to support permit to take water / construction activities. The following general summary is provided as highlighted in the monitoring report:

- Beginning in 2013, monitoring of groundwater levels at several monitoring wells (MW1, MW4, MW6s, and MW6d) was completed on the subject lands for purposes of assessing the baseline groundwater conditions, prior to development.
- Beginning in 2014, surface water/wetland monitoring was incorporated into the program at two piezometer locations (PZ-01s and PZ-01d).
- Offsite monitoring at two private property (595 St. Patrick St. E. and 455 Tom Street) water supply wells was initiated for construction monitoring purposes beginning in July of 2014 and extending to July 2021.

- Replacement of MW4, MW5, MW6s and MW6s with MW2 and MW3 was completed in summer of 2017 due to construction progress.
- Two new wells (MW7-19 and MW1d-19) were installed outside of the construction footprint for continued water level monitoring.
- All monitoring of groundwater levels was terminated in November 2023 and wells were decommissioned.

On-site groundwater elevations were monitored across the well network using data loggers and manual site visits between 2014 and 2023. The water elevations ranged between 417 and 424 m asl, with seasonal variation estimated from 1 to 2 m.

4. DISCUSSION AND ANALYSIS

4.1. CONSTRUCTION BELOW THE WATER TABLE

It is expected that several excavations may be required that extend below the shallow water table resulting in a need for temporary and possibly long-term groundwater control activities. Water takings above 50,000 L/day will be regulated by the MECP through the Environmental Activity and Sector Registry (EASR) process, or through the Permit to Take Water (PTTW) process. This will require a detailed dewatering assessment to understand the potential impacts due to groundwater control, including development of the radius of influence, daily extraction volumes, discharge management options, impact to nearby water users and environmental features, and other conditions.

Development of the shallow water table position and depth will be critical through a field investigation that includes installation and monitoring of shallow groundwater wells. The wells should be monitored through an annual period to develop the water table fluctuation, precipitation influence, and recharge capability of the soils.

Below grade structures that are to be constructed will have to be reviewed to understand the nature of any long-term (permanent) dewatering related to foundation/underdrainage systems that would typically accompany such sub-structures. Permanent dewatering will further impact the Site post-development conditions and a detailed impact assessment to protect the hydrogeological setting will be required with mitigation measures that may include:

- Recommendations to waterproof basements, where feasible;
- Recommendations to direct groundwater to the environment to maintain recharge to hydrogeological/hydrological receptors;

Any Site groundwater control activities will require the development of a monitoring and mitigation plan, as per the applicable regulation for the water taking. This will typically include monitoring of the groundwater conditions during construction with contingency actions developed to prevent negative impacts to nearby stakeholders and environmental functions. Discharge quality management will need to be reviewed for dewatering effluent handling, which could include consideration for discharge to the environment, or nearby municipal sewer works.

4.2. WATER BALANCE CONSIDERATIONS

Currently, the Site area is predominantly vacant land (agricultural cultivate land, farmhouse and landscaped areas, and natural heritage features). The proposed plan for development of the Site is expected to convert pervious land to impervious cover and as such a reduction in groundwater infiltration without mitigation would be expected. As the property is located within a SGRA, it is expected that mitigation measures will be required in the form of Low Impact Development (LID) to reduce any infiltration deficits. This must be confirmed by the Grand River Conservation Authority. A future pre-to post-development site specific climate based water balance assessment should be undertaken to

quantify the potential impacts (runoff/infiltration), with consideration of natural heritage features and source water protection.

Mitigation measures to consider include disconnecting roof runoff for redirection to infiltration galleries, bioretention systems, grass swales, and other LID strategies.

4.3. WATER QUALITY

The Site is currently vacant. As such, there are no activities present that could potentially impact groundwater quality at this time.

The proposed Post-Development conditions include new driveway and roadway areas. These areas may be a future source of contamination to groundwater infiltration or surface water runoff by winter road de-icing agents. The most effective method of reducing potential impacts from salt or other winter road de-icing agents is to minimize the mass/volume of material applied through the use of Best Management Practices (BMPs). Any pervious areas used for winter snow storage may also become potential sources of contamination from winter road de-icing agents. BMPs recommend storing snow on impervious surfaces.

The driveway and roadway areas may also be potential sources of petroleum hydrocarbons. These are typically contained in vehicles. These potential releases could result in impairment of water quality by infiltrating into the groundwater. The risk of significant impact from spills at the Site is low considering the only traffic will be the residents who occupy the building.

In pervious areas, soil-enrichment agents (i.e. fertilizers) and/or herbicides may also be a source of contamination. Application of these products should be minimized to reduce potential contamination.

4.4. IMPACTS ON GROUNDWATER / WELL USERS

Changes to land cover and short/long-term dewatering could result in unacceptable interference to nearby water well users. As part of detailed design work and dewatering impact assessment, it is expected that all private wells within about 500m of the Site be inventoried through a well survey to understand the current conditions (water quality/quantity) of near site groundwater use. Well monitoring may be required, based on the findings from the survey work. Conservation Authorities typically require that land development activities do not harm or degrade private well supply and that a pro-active mitigation and contingency plan be in place to address public complaints over water quality/quantity issues. The MECP further regulates private well protection through regulatory oversight.

Based on a review of the well records surrounding the Site, the use of sensitive, shallow, overburden wells are considered low, reducing the risk of unacceptable impacts from Site development. However, due to the SGRA delineation at the Site, a detailed water balance study with mitigation recommendations will be required at a future design stage.

5. CLOSING

5.1. QUALIFICATION OF THE ASSESSORS

Robin Byers, P.Geo., B.Sc. is a Senior Hydrogeologist and is a practicing member of the Professional Geoscientists of Ontario with over 11 years of hydrogeological experience working in the Greater Toronto Area and Southern Ontario. He has experience in physical and chemical hydrogeology with foundational knowledge of well construction and design, groundwater modeling, pumping test analysis, and construction dewatering. Rob is also a qualified person as defined by O.Reg 63/16 for purposes of preparing water taking and discharge plans.

5.2. CERTIFICATION AND SIGNATURES

EnVision confirms the conclusions and findings of the Hydrogeological Investigation.

Prepared by

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2025-01-20 3:03:13 PM

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5.3. QUALIFIER

EnVision prepared this report solely for the use of the intended recipient in accordance with the professional services agreement. In the event a contract has not been executed, the parties agree that the EnVision General Terms and Conditions, which were provided prior to the preparation of this report, shall govern their business relationship.

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The content and opinions contained in the report are based on the observations and/or information available to EnVision at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by EnVision and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

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In preparing this report, EnVision has relied in good faith on information provided by others, as noted in the report. EnVision has reasonably assumed that the information provided is correct and EnVision is not responsible for the accuracy or completeness of such information.

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6. REFERENCES

EnVision Consultants Ltd. (2024). *Ecological Assessment, 6490 First Line, Fergus, ON.*

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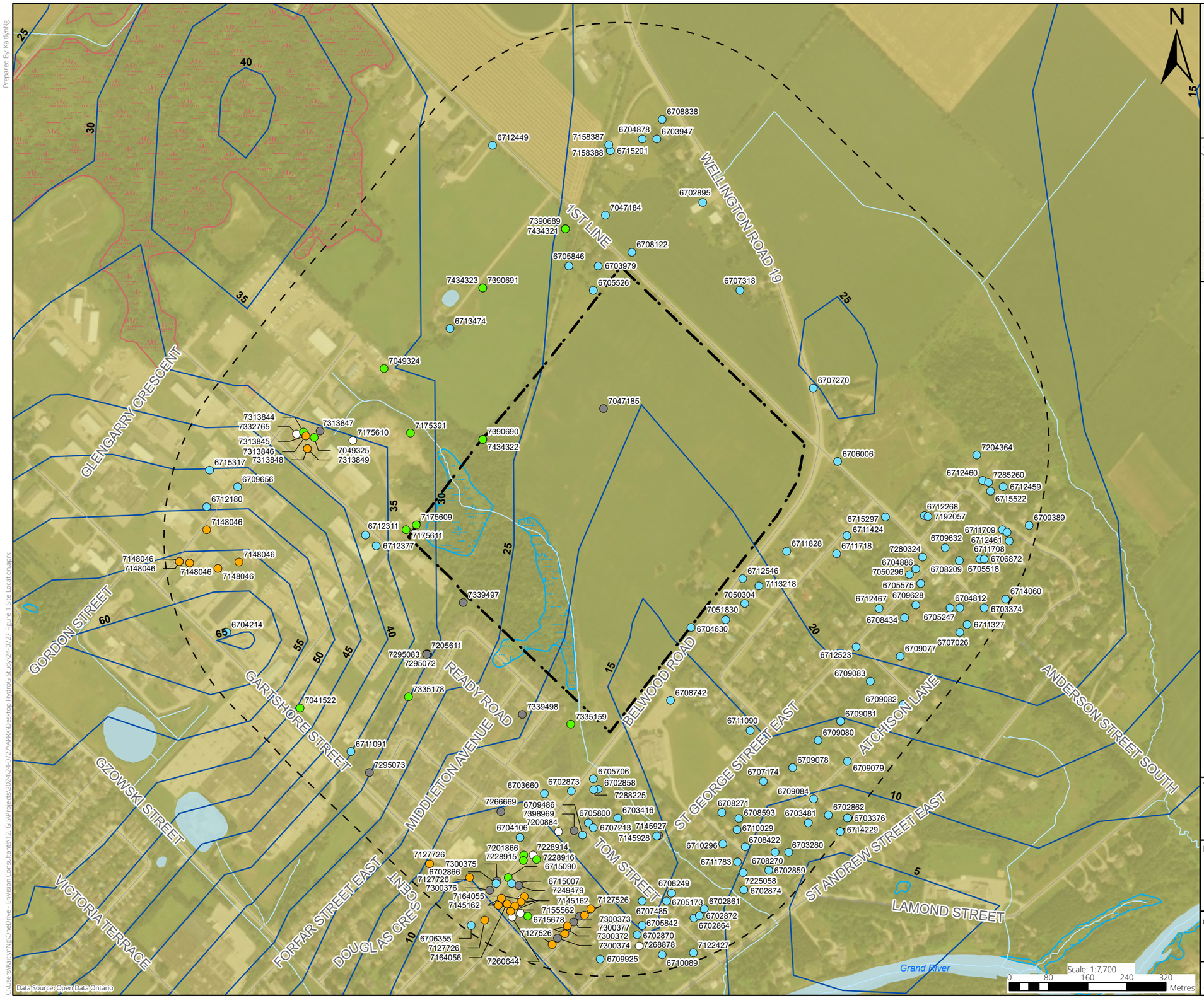
Stantec. (2024). *New Well Exploration Program Feasibility Assessment Report.*

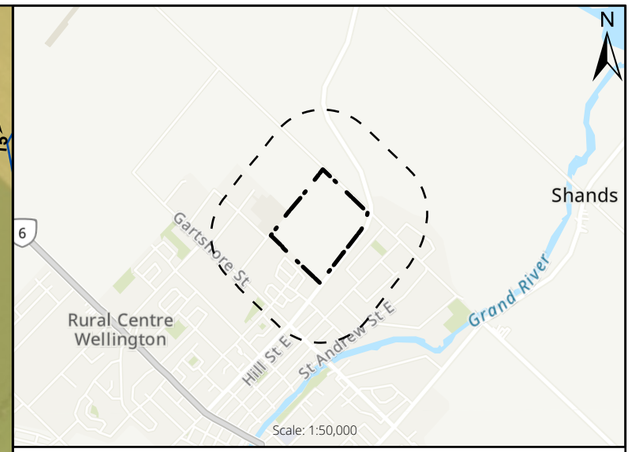
FIGURES

Prepared By: KaitlynNg

C:\Users\KaitlynNg\OneDrive - EnVision Consultants\12 - GIS\Projects\2024\24-0727\APRX\Desktop HydroG Study\24-0727 Figure 1 Site Location.aprx

Data Source: Open Data Ontario





LEGEND

- SITE LOCATION
- 500 M STUDY AREA
- WATERCOURSE
- WATERBODY
- OVERBURDEN THICKNESS (M)
- GUELPH FORMATION
- UNEVALUATED WETLAND
- PROVINCIALLY SIGNIFICANT WETLAND

MECP WATER WELL RECORD

- UNKNOWN
- ABANDONED
- OBSERVATION WELLS
- TEST HOLE
- WATER SUPPLY

TITLE

SITE LOCATION

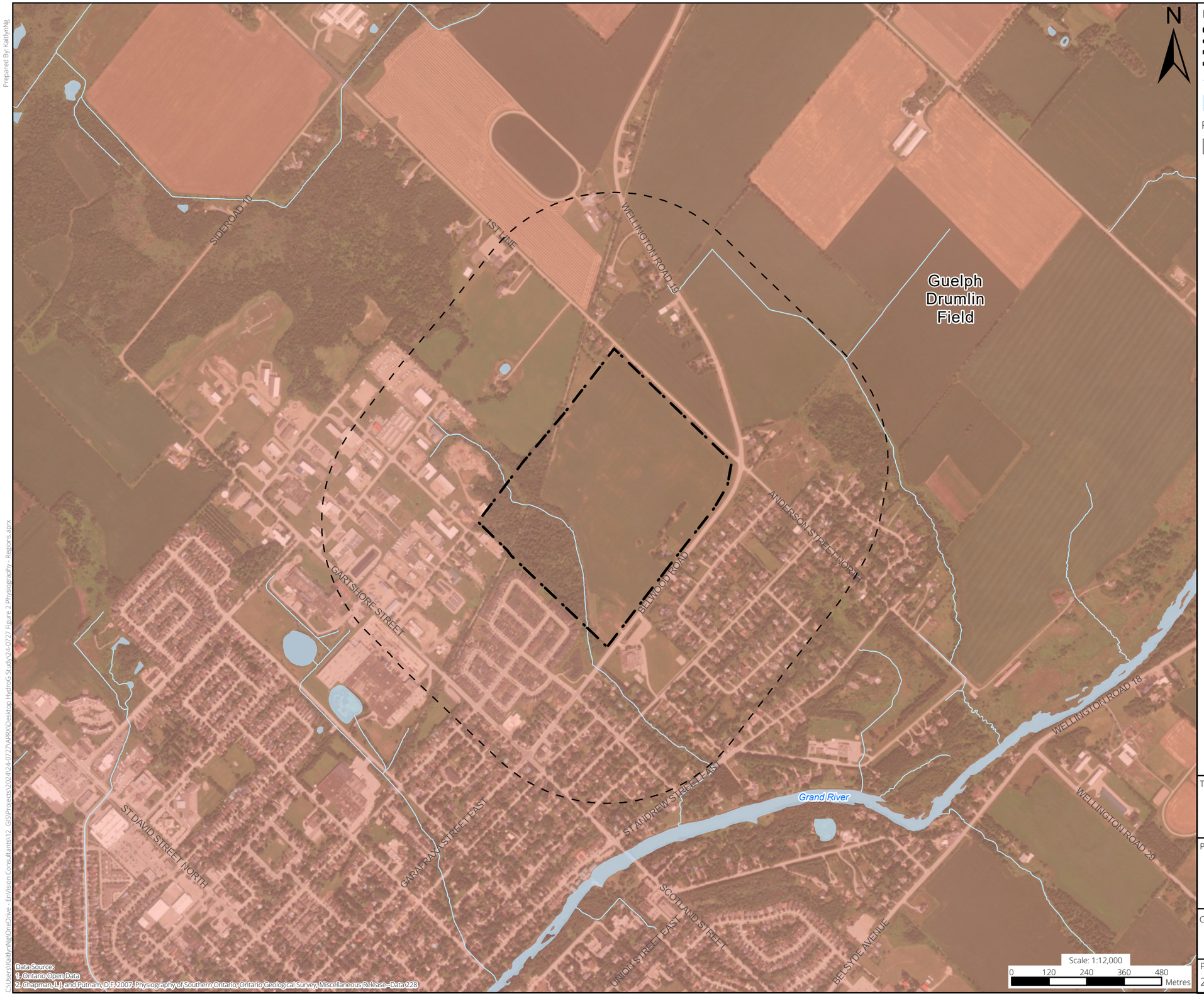
PROJECT

HYDROGEOLOGICAL DESKTOP STUDY
6490 FIRST LINE
FERGUS, ONTARIO

CLIENT

RBS & EJS FERGUS LIMITED PARTNERSHIP

PROJECT NO.	DATE	PREPARED BY	APPROVED BY	FIGURE
24-0727	JANUARY 2025	KN	RB	1



LEGEND

- SITE LOCATION
- 500 m STUDY AREA
- WATERCOURSE
- WATERBODY

PHYSIOGRAPHIC REGION:

- GUELPH DRUMLIN FIELD

TITLE

PHYSIOGRAPHIC REGIONS OF THE STUDY AREA

PROJECT

HYDROGEOLOGICAL DESKTOP STUDY
6490 FIRST LINE
FERGUS, ONTARIO

CLIENT

RBS & EJS FERGUS LIMITED PARTNERSHIP

PROJECT NO.	DATE	PREPARED BY	APPROVED BY	FIGURE
24-0727	JANUARY 2025	KN	RB	2

Prepared By: KaitlynNg

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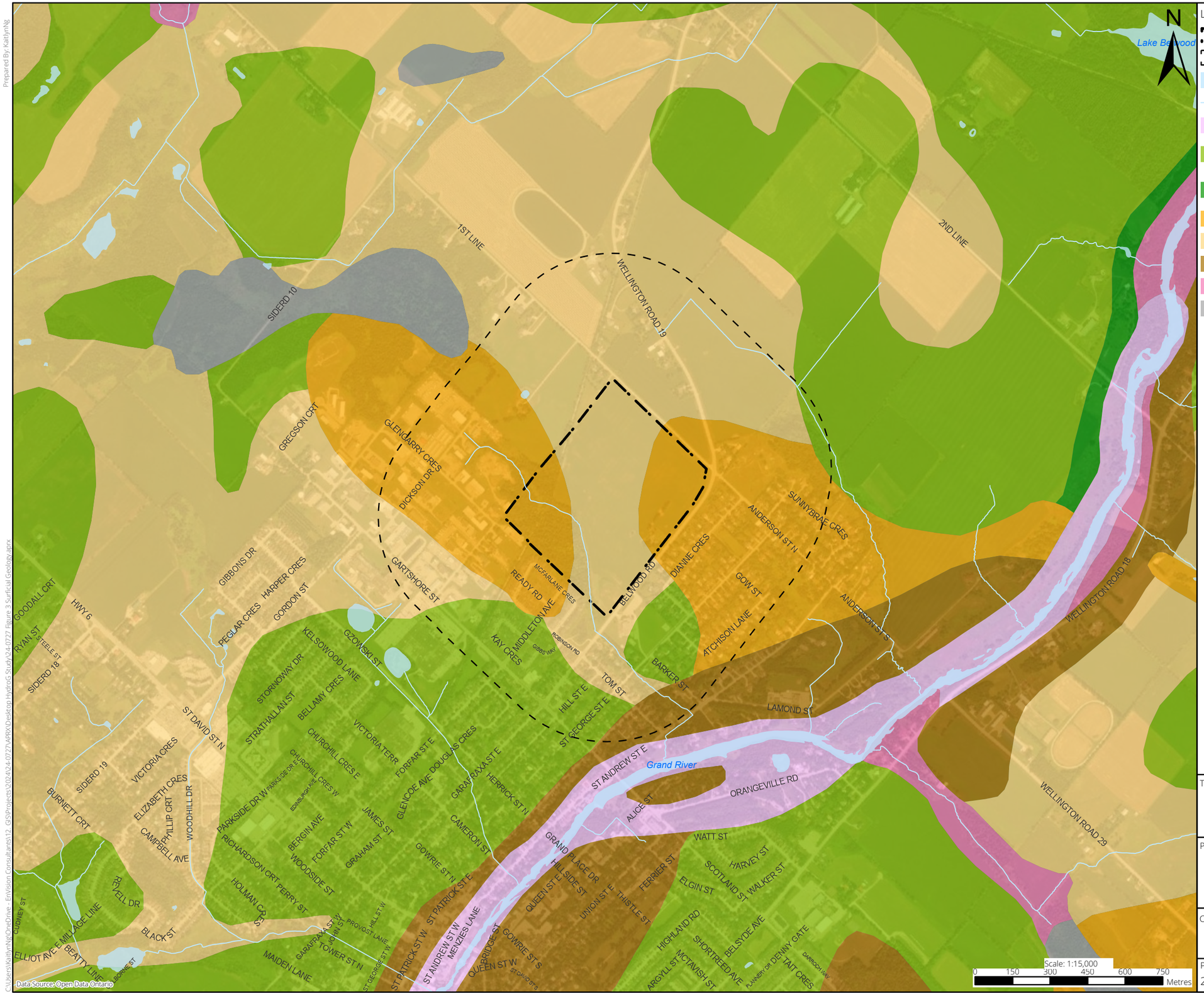
Prepared By: KaitlynNg

C:\Users\KaitlynNg\OneDrive - EnVision Consultants\12. GIS\Projects\2024\24-0727\ARR\Desktop HydroG Study\24-0727 Figure 3 Surficial Geology.aprx



LEGEND

- SITE LOCATION
- 500 M STUDY AREA
- WATERBODY
- WATERCOURSE
- 3: PALEOZOIC BEDROCK
- 5B: STONE-POOR, CARBONATE-DERIVED SILTY TO SANDY TILL
- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 6: ICE-CONTACT STRATIFIED DEPOSITS
- 7A: GLACIOFLUVIAL DEPOSITS - SANDY
- 7B: GLACIOFLUVIAL DEPOSITS - GRAVELLY
- 19: MODERN ALLUVIAL DEPOSITS
- 20: ORGANIC DEPOSITS

TITLE

SURFICIAL GEOLOGY

PROJECT

HYDROGEOLOGICAL DESKTOP STUDY
6490 FIRST LINE
FERGUS, ONTARIO

CLIENT

RBS & EJS FERGUS LIMITED PARTNERSHIP

PROJECT NO.	DATE	PREPARED BY	APPROVED BY	FIGURE
24-0727	JANUARY 2025	KN	RB	3

Prepared By: KaitlynNg

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LEGEND

- SITE BOUNDARY
- 500 m BUFFER
- WATERBODY
- WATERCOURSE
- WHPA A
- WHPA B
- WHPA C
- WHPA D

SIDEROAD 10
1ST LINE
WELLINGTON ROAD 19
GREGSON COURT
GLENGARRY CRESCENT
DICKSON DRIVE
GORDON STREET
MCFARLANE CRESCENT
READY ROAD
BELWOOD ROAD
DIANNE CRESCENT
ANDERSON STREET NORTH
SUNNYBRAE CRESCENT
GOW STREET
ANDERSON STREET SOUTH
GZOWSKI STREET
KELSOWOOD LANE
STRATHALLAN STREET
BELLAMY CRESCENT
VICTORIA TERRACE
PARKSIDE DRIVE EAST
MIDDLETON AVENUE
ROBINSON ROAD
GIBBS WAY
FINDLAY WAY
KAY CRESCENT
GARTSHORE STREET
TOM STREET
ST GEORGE STREET EAST
ATCHISON LANE
BARKER STREET
ST ANDREW STREET EAST
LAMOND STREET
FORFAR STREET EAST
DOUGLAS CRESCENT
GARAFRAXA STREET EAST
HILL STREET EAST
ST PATRICK STREET EAST
Grand River

Scale: 1:8,000
0 80 160 240 320 Metres

Data Source: Open Data Ontario, GRCA

C:\Users\KaitlynNg\OneDrive - EnVision Consultants12 GIS\Projects\2024\24-0727\APRX\Desktop Hydro\G Study\24-0727 Figure 4 WHPA.aprx

TITLE

WELLHEAD PROTECTION AREAS

PROJECT

HYDROGEOLOGICAL DESKTOP STUDY
6490 FIRST LINE
FERGUS, ONTARIO

CLIENT

RBS & EJS FERGUS LIMITED PARTNERSHIP

PROJECT NO.	DATE	PREPARED BY	APPROVED BY	FIGURE
24-0727	JANUARY 2025	KN	RB	4

Prepared By: KaitlynNg

N

LEGEND

- SITE BOUNDARY
- 500 m BUFFER
- WATERBODY
- WATERCOURSE
- SIGNIFICANT GROUNDWATER RECHARGE AREA (SGRA)

SIDEROAD 10
1ST LINE
WELLINGTON ROAD 19
GREGSON COURT
GLENGARRY CRESCENT
DICKSON DRIVE
GORDON STREET
MCFARLANE CRESCENT
READY ROAD
BELLWOOD ROAD
DIANNE CRESCENT
ANDERSON STREET NORTH
SUNNYBRAE CRESCENT
GOW STREET
ANDERSON STREET SOUTH
GZOWSKI STREET
KELSOWOOD LANE
STRATHALLAN STREET
BELLAMY CRESCENT
VICTORIA TERRACE
PARKSIDE DRIVE EAST
FORFAR STREET EAST
DOUGLAS CRESCENT
GARAFRAXA STREET EAST
HILL STREET EAST
ST PATRICK STREET EAST
GARTSHORE STREET
KAY CRESCENT
MIDDLETON AVENUE
ROBINSON ROAD
GIBBS WAY
FINDLAY WAY
TOM STREET
ST GEORGE STREET EAST
BARKER STREET
ATCHISON LANE
ST ANDREW STREET EAST
LAMOND STREET
Grand River

Scale: 1:8,000
0 80 160 240 320 Metres

Data Source: Open Data Ontario, GRCA

C:\Users\KaitlynNg\OneDrive - EnVision Consultants\12. GIS\Projects\2024\24-0727\ARR\Desktop Hydro\G Study\24-0727 Figure 5 SGRA.aprx

TITLE

SIGNIFICANT GROUNDWATER RECHARGE AREA

PROJECT

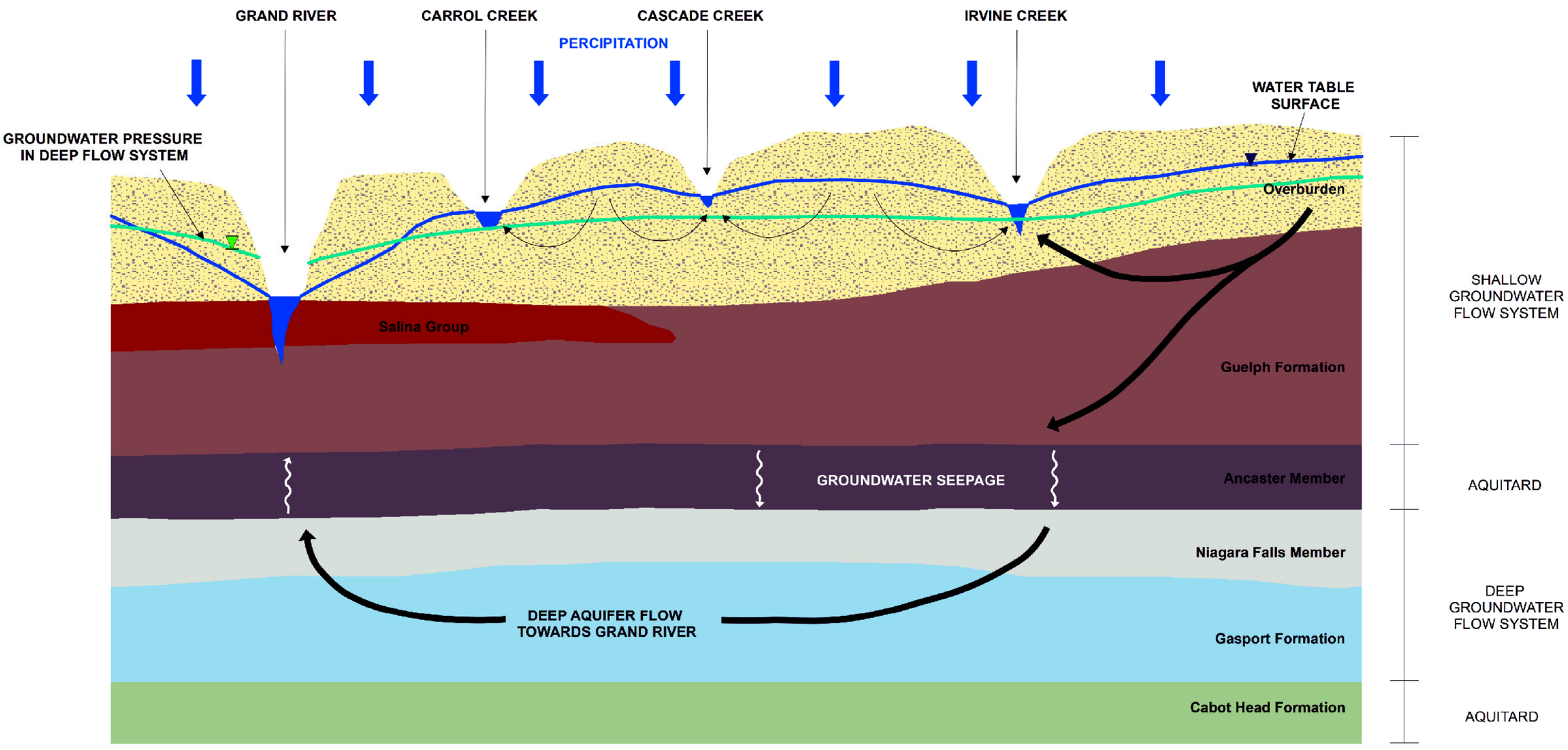
HYDROGEOLOGICAL DESKTOP STUDY
6490 FIRST LINE
FERGUS, ONTARIO

CLIENT

RBS & EJS FERGUS LIMITED PARTNERSHIP

PROJECT NO.	DATE	PREPARED BY	APPROVED BY	FIGURE
24-0727	JANUARY 2025	KN	RB	5

Prepared By:TanyaPeterson



Legend

Existing Groundwater Pressure/Elevation in Deep Aquifer

Water Table Surface in Shallow Aquifer

CLIENT
RBS &EJS FERGUS LIMITED PARTNERSHIP

PROJECT
DESKTOP LEVEL HYDROGEOLOGICAL REVIEW
6490 FIRST LINE, FERGUS
TOWNSHIP OF CENTRE WELLINGTON, ONTARIO

TITLE
STANTEC CONCEPTUAL HYDROGEOLOGICAL MODEL

PROJECT NO.	DATE	PREPARED BY	APPROVED BY	FIGURE
24-0727	DECEMBER 2024	TP	RB	6

C:\Users\TanyaPeterson\OneDrive - EnVision Consultants\Documents\12_GIS\Projects\2024\24-0837\APRX\Hydro\Q24-0837 Figure 5 Concept.aprx

APPENDIX A:

MECP Well Record Summary Tables

Table A-1: Summary of MECP Well Records within 500m

6490 First Line, Fergus, Ontario

Project Number: 24-0727

January 2025

Well ID	Date Completed	Final Status	Water Use	Well Depth (m)	Static Water Level (m)	UTM Zone 17		Water Depth (mbgs)	Diameter	Units
						Easting (m E)	Northing (m N)			
6702858	1955-04-24	Water Supply	Domestic	41.1	12.2	550724.2	4840552	39.6	4.00	inch
6702859	1955-07-27	Water Supply	Domestic	38.1	23.5	551073.2	4840386	38.1	4.00	inch
6702861	1957-08-16	Water Supply	Domestic	21.3	4.6	550941.2	4840307	21.3	4.00	inch
6702862	1958-06-04	Water Supply	Domestic	36.6	12.2	551195.2	4840499	36.6	4.00	inch
6702864	1960-05-23	Water Supply	Domestic	21.0	12.5	550920.2	4840288	21.0	4.00	inch
6702866	1960-08-15	Water Supply	Commerical	22.9	9.1	550515.2	4840359	22.9	4.00	inch
6702870	1963-10-28	Water Supply	Domestic	30.5	19.2	550804.2	4840254	30.5	4.00	inch
6702872	1967-01-16	Water Supply	Domestic	16.2	2.7	550931.2	4840293	16.2	4.00	inch
6702873	1967-06-12	Water Supply	Domestic	32.0	4.6	550669.2	4840548	22.9	7.00	inch
6702874	1967-11-02	Water Supply	Domestic	26.8	13.7	551022.2	4840346	26.8	4.00	inch
6702895	1964-10-19	Water Supply	Domestic	44.8	5.2	550938.2	4841753	44.8	4.00	inch
6703280	1968-07-20	Water Supply	Domestic	45.7	18.3	551114.2	4840423	45.7	4.00	inch
6703374	1969-05-19	Water Supply	Domestic	18.3	11.6	551514.2	4840923	18.3	4.00	inch
6703376	1969-05-06	Water Supply	Domestic	37.8	11.0	551234.2	4840493	37.8	4.00	inch
6703416	1969-08-05	Water Supply	Domestic	38.7	21.3	550764.2	4840493	38.7	4.00	inch
6703481	1969-11-27	Water Supply	Domestic	25.6	13.7	551154.2	4840483	24.4	4.00	inch
6703660	1970-04-25	Water Supply	Domestic	35.1	2.4	550614.2	4840543	35.1	4.00	inch
6703947	1971-06-21	Water Supply	Domestic	22.9	2.1	550844.2	4841883	3.7	4.00	inch
6703979	1971-07-02	Water Supply	Domestic	47.2	5.2	550724.2	4841623	45.7	4.00	inch
6704106	1971-12-22	Water Supply	Domestic	54.6	30.5	550564.2	4840453	54.6	4.00	inch
6704214	1972-03-08	Water Supply	Municipal	129.5	19.2	549964.2	4840873	80.8	12.00	inch
6704630	1973-05-31	Water Supply	Domestic	39.6	9.1	550914.2	4840883	39.6	4.00	inch
6704812	1973-08-20	Water Supply	Domestic	34.4	9.1	551464.2	4840923	34.4	4.00	inch
6704878	1973-10-15	Water Supply	Domestic	30.5	4.6	550814.2	4841883	30.5	4.00	inch
6704886	1973-08-15	Water Supply	Domestic	76.2	18.3	551374.2	4841003	42.7	5.00	inch
6705173	1974-05-31	Water Supply	Domestic	50.3	16.5	550864.2	4840323	45.7	4.00	inch
6705247	1974-08-15	Water Supply	Domestic	54.9	11.9	551444.2	4840923	54.6	5.00	inch
6705518	1975-04-07	Water Supply	Domestic	61.6	15.2	551505.2	4841023	61.6	4.00	inch
6705526	1975-05-18	Water Supply	Domestic	45.7	7.3	550714.2	4841573	45.7	4.00	inch
6705575	1975-06-27	Water Supply	Domestic	65.5	13.1	551384.2	4840973	64.6	4.00	inch

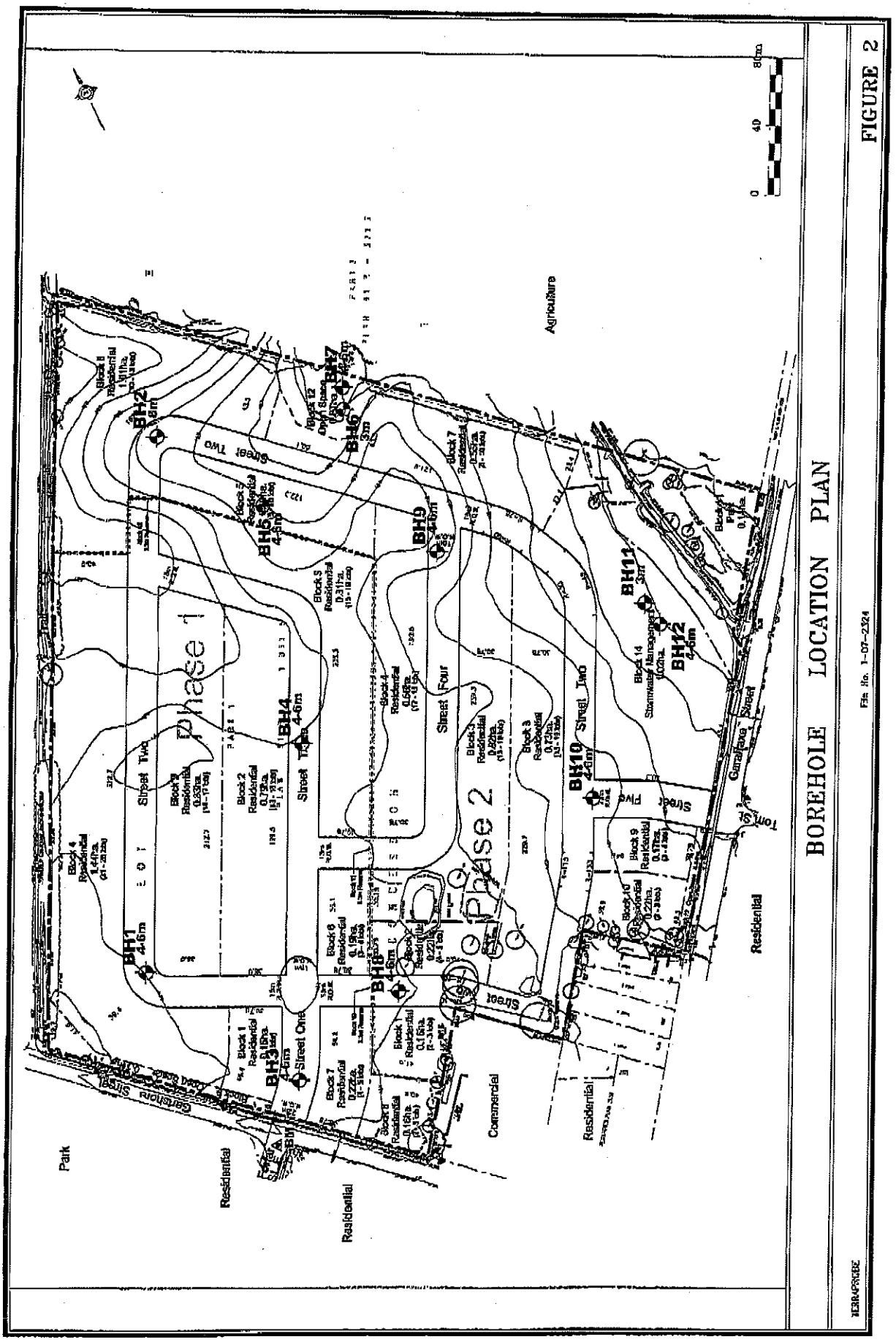
Well ID	Date Completed	Final Status	Water Use	Well Depth (m)	Static Water Level (m)	UTM Zone 17		Water Depth (mbgs)	Diameter	Units
						Easting (m E)	Northing (m N)			
6705706	1975-09-08	Water Supply	Domestic	57.9	26.5	550714.2	4840573	57.9	4.00	inch
6705800	1975-10-24	Water Supply	Domestic	48.5	13.7	550704.2	4840483	47.2	4.00	inch
6705842	1975-12-08	Water Supply	Domestic	75.6	22.9	550814.2	4840273	75.6	5.00	inch
6705846	1975-10-17	Water Supply	Domestic	36.6	12.2	550664.2	4841623	35.1	4.00	inch
6706006	1976-05-11	Water Supply	Domestic	69.2	24.4	551214.2	4841223	67.1	4.00	inch
6706355	1976-06-15	Water Supply	Domestic	45.7	10.1	550464.2	4840273	36.6	4.00	inch
6706872	1978-10-28	Water Supply	Domestic	58.8	16.8	551514.2	4841023	45.7	4.00	inch
6707026	1979-06-04	Water Supply	Domestic	40.2	15.8	551464.2	4840873	40.2	4.00	inch
6707174	1979-10-21	Water Supply	Domestic	53.0	18.9	551062.2	4840568	53.0	4.00	inch
6707213	1979-10-01	Water Supply	Domestic	35.7	5.5	550714.2	4840473	35.7	4.00	inch
6707270	1980-04-21	Water Supply	Domestic	75.9	27.1	551164.2	4841373	39.6	5.00	inch
6707318	1980-08-11	Water Supply	Domestic	76.2	8.5	551014.2	4841573	71.6	5.00	inch
6707485	1981-06-18	Water Supply	Domestic	42.7	26.5	550814.2	4840323	35.1	5.00	inch
6708122	1984-06-13	Water Supply	Domestic	52.7	20.1	550793	4841651	52.7	4.00	inch
6708209	1985-04-18	Water Supply	Domestic	52.4	29.0	551463.2	4841020	50.9	5.00	inch
6708249	1985-09-02	Water Supply	Domestic	65.8	25.9	550874.2	4840339	38.1	5.00	inch
6708270	1985-07-25	Water Supply	Domestic	55.8	22.9	551086.2	4840423	55.8	4.00	inch
6708271	1985-07-15	Water Supply	Domestic	65.8	28.0	550977.2	4840504	65.8	4.00	inch
6708422	1986-04-28	Water Supply	Domestic	68.6	23.8	551025.2	4840434	66.1	5.00	inch
6708434	1986-05-05	Water Supply	Domestic	70.1	11.9	551351.2	4840903	57.9	5.00	inch
6708593	1986-06-25	Water Supply	Domestic	76.2	29.6	551012.2	4840492	67.1	5.00	inch
6708742	1986-11-24	Water Supply	Public	38.1	9.1	550872.2	4840734	35.1	5.00	inch
6708838	1987-04-21	Water Supply	Domestic	70.1	15.2	550855.2	4841923	67.1	5.00	inch
6709077	1987-09-25	Water Supply	Domestic	114.3	19.8	551342.2	4840824		5.00	inch
6709078	1987-09-28	Water Supply	Domestic	101.2	29.6	551122.2	4840596	99.1	5.00	inch
6709079	1987-08-17	Water Supply	Domestic	89.9	24.4	551234.2	4840609	64.0	5.00	inch
6709080	1987-08-11	Water Supply	Domestic	89.9	28.0	551174.2	4840652	79.2	5.00	inch
6709081	1987-06-20	Water Supply	Domestic	53.3	15.2	551220.2	4840691	46.3	5.00	inch
6709082	1987-08-13	Water Supply	Domestic	121.9	19.8	551348.2	4840725	120.4	5.00	inch
6709083	1987-06-18	Water Supply	Domestic	126.5	22.9	551281.2	4840773	118.9	5.00	inch
6709084	1987-10-29	Water Supply	Domestic	71.6	26.5	551165.2	4840532	68.6	5.00	inch
6709389	1988-09-16	Water Supply	Domestic	64.9	22.9	551606.2	4841092	64.9	5.00	inch
6709486	1988-11-09	Water Supply	Domestic	24.4	12.5	550692.2	4840458	23.8	6.00	inch
6709628	1988-03-16	Water Supply	Domestic	67.1	23.5	551374.2	4840929	56.4	5.00	inch
6709632	1988-05-12	Water Supply	Domestic	66.4	24.4	551434.2	4841046	57.9	5.00	inch
6709656	1988-06-03	Water Supply	Domestic	37.8	12.2	549986.2	4841171	37.8	6.00	inch
6709925	1989-06-01	Water Supply	Domestic	50.9	21.3	550728.2	4840204	48.8	5.00	inch

Well ID	Date Completed	Final Status	Water Use	Well Depth (m)	Static Water Level (m)	UTM Zone 17		Water Depth (mbgs)	Diameter	Units
						Easting (m E)	Northing (m N)			
6710029	1989-10-27	Water Supply	Domestic	90.8	34.1	551008.2	4840469	90.8	5.00	inch
6710089	1989-10-25	Water Supply	Domestic	73.5	29.9	550855.2	4840213	30.5	6.00	inch
6710296	1990-04-02	Water Supply	Domestic	55.8	31.1	550979.2	4840440	48.8	5.00	inch
6711090	1992-12-06	Water Supply	Domestic	85.3	29.6	551035.2	4840672	85.3	6.00	inch
6711091	1991-12-11	Water Supply	Domestic	108.2	27.1	550218.2	4840629	70.1	6.00	inch
6711327	1993-09-24	Water Supply	Domestic	59.4	19.5	551479.2	4840889	24.4	6.00	inch
6711424	1994-02-04	Water Supply	Domestic	86.9	25.3	551233.2	4841071	86.9	6.00	inch
6711708	1995-04-12	Water Supply	Domestic	70.1	19.2	551565.2	4841060	65.5	5.00	inch
6711709	1995-04-19	Water Supply	Domestic	68.6	20.1	551551.2	4841083	65.5	6.00	inch
6711718	1995-05-16	Water Supply		85.3	21.0	551212.2	4841034	79.2	6.00	inch
6711783	1995-07-26	Water Supply	Domestic	76.2	25.9	551009.2	4840403	61.0	6.00	inch
6711828	1995-09-26	Water Supply	Domestic	103.6	26.5	551110	4841039	73.2	6.00	inch
6712180	1995-09-29	Water Supply	Commerical	34.7	17.4	549923	4841130	34.7	6.00	inch
6712268	1997-05-01	Water Supply	Domestic	74.7	20.1	551392	4841112	42.7	6.00	inch
6712311	1996-11-08	Water Supply	Industrial	51.2	22.9	550248	4841072	51.2	6.00	inch
6712377	1997-10-02	Water Supply	Industrial	57.0	41.8	550270	4841050	57.0	6.00	inch
6712449	1997-12-02	Water Supply	Domestic	83.5	39.6	550508	4841870	83.5	6.00	inch
6712459	1997-12-11	Water Supply	Domestic	58.5	16.8	551553	4841171	42.7	6.00	inch
6712460	1997-11-17	Water Supply	Domestic	59.4	18.9	551511	4841184	53.3	6.00	inch
6712461	1997-11-17	Water Supply	Domestic	59.1	16.8	551561	4841078	47.2	6.00	inch
6712467	1997-12-24	Water Supply		85.3	25.9	551299	4840922	42.7	6.00	inch
6712523	1998-04-06	Water Supply	Domestic	103.6	25.9	551252	4840843	79.2	6.00	inch
6712546	1998-05-07	Water Supply	Domestic	103.6	30.8	551020	4840983	74.7	6.00	inch
6713474	2000-09-06	Water Supply	Domestic	82.3	40.5	550421	4841495	82.3	6.00	inch
6714060	2002-04-22	Water Supply	Domestic	74.7	20.1	551558	4840941	61.0	6.00	inch
6714229	2002-08-12	Water Supply	Domestic	54.9	19.8	551219.3	4840465	54.9	6.00	inch
6715007	2004-06-07	Water Supply		3.0		550547	4840359		2.00	cm
6715201	2004-06-04	Water Supply	Domestic	73.2	29.0	550749	4841859	59.4	15.87	cm
6715297	2005-04-08	Water Supply	Domestic	37.2	9.4	551312	4841109	37.2	15.87	cm
6715317	2005-02-01	Water Supply	Industrial	70.1	42.7	549929	4841205	68.6	6.00	inch
6715522	2005-08-18	Water Supply	Domestic	47.3	24.9	551527	4841162	47.0	15.90	cm
7047184	2007-06-20	Water Supply	Domestic	65.5	26.2	550739	4841727	65.0	16.00	cm
7050296	2007-07-28	Water Supply	Domestic	56.7	21.2	551361	4840991	56.0	16.00	cm
7050304	2007-08-21	Water Supply	Domestic	58.0	28.5	551024	4840932	57.0	16.00	cm
7051830	2007-10-16	Water Supply	Domestic	36.6	17.7	550985	4840899	36.6		
7113218	2008-07-23	Water Supply	Domestic	60.4	29.1	551053	4840968	60.0	16.00	cm
7122427	2009-03-17	Water Supply	Domestic			550919	4840217			

Well ID	Date Completed	Final Status	Water Use	Well Depth (m)	Static Water Level (m)	UTM Zone 17		Water Depth (mbgs)	Diameter	Units
						Easting (m E)	Northing (m N)			
7145928	2010-05-24	Water Supply	Domestic	55.5	23.8	550844	4840456	42.1	6.25	inch
7158387	2010-06-30	Water Supply	Domestic	84.7	29.8	550746	4841871	60.0	15.90	cm
7192057	2012-11-12	Water Supply	Domestic			551399	4841110		6.00	inch
7204364	2013-05-02	Water Supply	Domestic	112.8	25.3	551499	4841236	64.6	6.25	inch
7225058	2014-07-24	Water Supply	Domestic	48.2	11.3	551021	4840381	34.0	15.90	cm
7280324	2016-09-21	Water Supply	Domestic	56.7	25.4	551388	4841027		15.90	cm
7285260	2016-12-13	Water Supply	Domestic	108.2	26.2	551523	4841180	105.5	6.25	inch
7288225	2016-05-15	Water Supply	Domestic		24.4	550715	4840551			

APPENDIX B:

Borehole Logs (Eastwood Subdivision)


BOREHOLE LOCATION PLAN
FIGURE 2
File No. 1-07-2324
TERRAPROBE
Phase 1
Phase 2
Street One
Street Two
Street Three
Street Four
Street Five
Street Six
Agriculture
Residential
Commercial
Park
BH1
BH2
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12

Terraprobe

LOG OF BOREHOLE 1

PROJECT: Eastwood Garafraxa St. & Gartshore St.
DATE: 19 September 2007
LOCATION: Fergus, Ontario
EQUIPMENT: Bombardier
CLIENT: Sorbara Development Group
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
424.4	Ground Surface				
0.0 / 424.2	175mm TOPSOIL				
0.2 / 423.6	FILL- Silty Sand, trace gravel, clay, with organic matter, rootlets loose, brown, moist		1	SS	9
0.8 / 422.9	SANDY SILT some clay, trace gravel compact, brown, very moist (GLACIAL TILL)		2	SS	17
1.8	SAND some silt to silty, compact, brown, moist		3	SS	24
	very moist		4	SS	27
	wet		5	SS	17
420.1			6	SS	10
4.3	End of Borehole				

ELEVATION SCALE: 424, 423, 422, 421

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED ● POCKET PEN. + FIELD VANE × LAB VANE; 20 40 60 80 100

GR.SA.SI.CL 0.88.12.0

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:
Borehole was caving at 2.7m and water level at 2.4m upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in piezometer at 2.7m (Elev. 421.7m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 2

PROJECT: Eastwood Garafraxa St. & Gartshore St.
DATE: 20 September 2007
LOCATION: Fergus, Ontario
EQUIPMENT: Bombardier
CLIENT: Sorbara Development Group
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES
423.2	Ground Surface				
0.0 / 422.9	260mm TOPSOIL		1	SS	5
0.3 / 422.4	FILL - Silty Sand, trace gravel, clay, with organic matter, rootlets loose, dark brown, moist		2	SS	14
0.8	SAND some silt to silty, compact, brown, very moist to wet		3	SS	14
			4	SS	26
			5	SS	23
418.7					
4.5	SANDY SILT loose to compact, greyish brown, wet		6	SS	8
			7	SS	14
415.6					
7.6 / 415.1	SILT - Dilatant, some clay, some sand, trace gravel very moist		8	SS	46
8.1	End of Borehole				

ELEVATION SCALE: 423, 422, 421, 420, 419, 418, 417, 416

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED ● POCKET PEN. ⊥ FIELD VANE × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

GR, SA, SI, CL
0, 34, 66, 0

DRAFT

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

NOTES:
Borehole was open and dry upon completion of drilling.
20 mm ID diameter pelzometer installed.
Water level in pelzometer at 1.95 m (Elev. 421.25m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 3

PROJECT: Eastwood Garafraxa St. & Gartshore St. DATE: 19 September 2007

LOCATION: Fergus, Ontario EQUIPMENT: Bombardier

CLIENT: Sorbara Development Group ELEVATION DATUM: Geodetic FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES
424.6 / 0.0	Ground Surface				
424.4 / 0.2	200mm TOPSOIL				
	FILL - Silty Sand, trace gravel, clay, organics, rootlets compact, brown, moist		1	SS	11
423.8 / 0.8	SAND some silt to silty, compact, light brown, moist		2	SS	17
			3	SS	11
	loose, brownish grey, wet below 2.3m				
422.1 / 2.6	SILT - Dilatant, some clay, some sand, trace gravel, loose, brown, wet		4	SS	8
	compact, brownish grey below 3.0m		5	SS	11
420.8 / 3.8	SANDY SILT some clay, trace gravel, very dense, grey, damp to moist (GLACIAL TILL)		6	SS	67
420.3 / 4.3	End of Borehole				

ELEVATION SCALE: 424, 423, 422, 421

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

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ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:
Borehole was open and dry upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in peizometer at 2.8m (Elev 421.8 m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 4

PROJECT: Eastwood Garafraxa St. & Gartshore St. DATE: 20 September 2007

LOCATION: Fergus, Ontario EQUIPMENT: Bombardier

CLIENT: Sorbara Development Group ELEVATION DATUM: Geodetic FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES
424.8	Ground Surface				
424.6	110mm TOPSOIL				
0.1	FILL - Sand, some silt, loose, brown, damp		1	SS	9
	moist below 0.75 m		2	SS	3
			3	SS	4
422.8					
2.3	SANDY SILT compact, brownish grey, wet		4	SS	15
			5	SS	16
	brownish grey below 4.0m		6	SS	10
420.6					
4.3	End of Borehole				

ELEVATION SCALE: 424, 423, 422, 421

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED ✣ FIELD VANE ● POCKET PEN. × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:
Borehole was caving at 3.5m and water level at 3.4m upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in peizometer at 3.6m (Elev. 421.3m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 5

PROJECT: Eastwood Garafraxa St. & Gartshore St. DATE: 20 September 2007

LOCATION: Fergus, Ontario EQUIPMENT: Bombardier

CLIENT: Sorbara Development Group ELEVATION DATUM: Geodetic FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES
422.8 / 0.0	Ground Surface				
422.8 / 0.0	170mm TOPSOIL				
422.2 / 0.2	FILL - Sand, trace gravel, silt, clay, organics, loose, brown, moist		1	SS	6
	SAND some silt to silty, compact, brownish grey, very moist		2	SS	12
	wet below 1.5m		3	SS	28
	dense below 2.3m		4	SS	36
419.8 / 3.0	SANDY SILT compact, brown, wet		5	SS	20
418.5 / 4.5	SILT - Dilatant, some clay, some sand, trace gravel, compact, grey, wet		6	SS	18
416.8 / 6.1	FINE SAND some silt to silty, loose to compact, brown, wet		7	SS	6
			8	SS	35
414.8 / 8.1	End of Borehole				

ELEVATION SCALE: 420, 422, 421, 420, 419, 418, 417, 416, 415

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ■ POCKET PEN. × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

NOTES:
Wet cave at 2.1m upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in peizometer at 1.7m (Elev. 421.3m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 6

PROJECT: Eastwood Garafraxa St. & Gartshore St. DATE: 20 September 2007

LOCATION: Fergus, Ontario EQUIPMENT: Bombardier

CLIENT: Sorbara Development Group ELEVATION DATUM: Geodetic FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
421.2	Ground Surface				
0.0 / 420.9	260mm TOPSOIL		1	SS	6
0.3 / 420.1	FILL - Silty Sand, trace gravel, clay, with organic matter, rootlets, loose, dark brown, moist				
0.8 / 419.7	SAND some silt to silty, compact, brown, wet		2	SS	23
1.5 / 419.9	SANDY SILT compact, brownish grey, wet		3	SS	22
2.3 / 419.2	SILT - Dilatant, trace to some clay, trace to some sand, trace gravel, compact, brown, very moist to wet		4	SS	21
3.0	End of Borehole				

ELEVATION SCALE: 421, 420, 419

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED ● POCKET PEN. + FIELD VANE × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:

Borehole was open and water level at 1.5m upon completion of drilling.
20 mm ID diameter pelzometer installed.
Water level in piezometer at 1.25m (Elev. 419.95m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 7

PROJECT: Eastwood Garafraxa St. & Gartshore St.
LOCATION: Fergus, Ontario
CLIENT: Sorbara Development Group

DATE: 20 September 2007
EQUIPMENT: Bombardier
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES
421.2	Ground Surface				
0.0 / 420.9	260mm TOPSOIL.		1	SS	6
0.3 / 420.1	FILL - Silty Sand, trace gravel, clay, with organic matter, rootlets, loose, dark brown, moist				
0.8 / 419.7	SAND some silt to silty, compact, brown, wet		2	SS	23
1.9 / 419.9	SANDY SILT compact, brownish grey, wet		3	SS	22
2.3 / 416.7	SILT - Dilatant, trace to some clay, trace to some sand, trace gravel, compact, brown, wet --- grey, wet below 3.0m		4	SS	21
			5	SS	21
4.5 / 414.6	SILTY FINE SAND compact, brownish grey, wet		6	SS	13
			7	SS	22
6.6	End of Borehole				

ELEVATION SCALE: 421, 420, 419, 418, 417, 416, 415

PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

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ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:
Borehole was caving at 4.0m and water level at 1.5m upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in piezometer at 1.0m (Elev. 420.2m) on Sept. 26, 2007.

Terraprobe

LOG OF BOREHOLE 8

PROJECT: Eastwood Garrafraxa St. & Gartshore St.
DATE: 19 September 2007
LOCATION: Fergus, Ontario
EQUIPMENT: Bombardier
CLIENT: Sorbara Development Group
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES
424.2	Ground Surface				
424.0 / 0.2	150mm TOPSOIL				
423.4 / 0.8	FILL - Sand, trace gravel, clay, with organic matter, rootlets, compact, brown, moist		1	SS	10
422.7 / 1.5	SANDY SILT compact, brownish grey, very moist		2	SS	24
421.9 / 2.3	SAND some silt to silty, dense, brownish grey, very moist		3	SS	31
420.4 / 3.8	SILT - Dilatant, trace to some clay, trace to some sand, trace gravel, compact, brown, wet		4	SS	16
			5	SS	14
419.9 / 4.3	SANDY SILT trace to some clay, trace gravel, dense, brownish grey, damp (GLACIAL TILL)		6	SS	47
	End of Borehole				

ELEVATION SCALE: 424, 423, 422, 421, 420

PENETRATION RESISTANCE PLOT
20 40 60 80 100
SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● POCKET PEN. × LAB VANE
20 40 60 80 100

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PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

NOTES:
Borehole was open and dry upon completion of drilling.
20 mm ID diameter pelzometer installed.
Water level in piezometer at 2.8m (Elev. 421.4m) on Sept. 26, 2007

Terraprobe

LOG OF BOREHOLE 9

PROJECT: Eastwood Garafraxa St. & Gartshore St.
DATE: 20 September 2007
LOCATION: Fergus, Ontario
EQUIPMENT: Bombardier
CLIENT: Sorbara Development Group
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES
423.5	Ground Surface				
423.4	120mm TOPSOIL				
0.1	FILL - Sand, some silt, loose, brown, moist		1	SS	6
	---- reddish brown, damp below 0.75m		2	SS	5
	---- moist below 1.5m		3	SS	5
421.5					
2.3	SAND compact, light brown, moist		4	SS	14
420.8					
3.0	SAND AND SILT TO SILTY SAND trace clay, compact, greyish brown, wet		5	SS	18
			6	SS	27
			7	SS	19
417.2					
6.6	End of Borehole				

ELEVATION SCALE: 423, 422, 421, 420, 419, 418

PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● POCKET PEN. × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:
Wet cave at 3.7m upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in piezometer at 3.55m (Elev. 420.25m) on Sept. 26, 2007

Terraprobe

LOG OF BOREHOLE 10

PROJECT: Eastwood Garafraxa St. & Gartshore St. DATE: 19 September 2007

LOCATION: Fergus, Ontario EQUIPMENT: Bombardier

CLIENT: Sorbara Development Group ELEVATION DATUM: Geodetic FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES
421.4 / 0.0	Ground Surface				
421.3 / 0.2	150mm TOPSOIL				
	FILL - Silty Sand, trace gravel, clay, loose, dark brown, moist		1	SS	7
420.6 / 0.8	SAND some silt to silty, compact, light brown, very moist to wet		2	SS	30
			3	SS	22
	saturated below 2.3m		4	SS	13
418.2 / 3.2	SILT - Dilatant, trace to some clay, trace to some sand, trace gravel, loose, brown, wet		5	SS	9
416.9 / 4.5	SAND some silt, compact, brown, wet		6	SS	14
415.3 / 6.1	SILT - some clay, sand, trace gravel, very dense, brown, damp (GLACIAL TILL)		7	SS	50/15cm
415.1 / 6.3	End of Borehole				

ELEVATION SCALE: 421, 420, 419, 418, 417, 416

PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

DRAFT

NOTES:
Wet cave at 1.8m upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in piezometer at 1.8m (Elev. 419.6m) on Sept. 26, 2007

Terraprobe

LOG OF BOREHOLE 11

PROJECT: Eastwood Garafraxa St. & Gartshore St.
DATE: 20 September 2007
LOCATION: Fergus, Ontario
EQUIPMENT: Bombardier
CLIENT: Sorbara Development Group
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

SOIL PROFILE			SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	ORGANIC VAPOUR	STANDPIPE INSTALLATION OR REMARKS
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20 40 60 80 100	w_P w w_L	(ppm)	
418.4	Ground Surface									
418.2 0.2	160mm TOPSOIL									
	FILL - Sandy Silt, trace gravel with organic matter, rootlets, compact, dark brown, moist		1	SS	13	418	○ UNCONFINED ● POCKET PEN. + FIELD VANE × LAB VANE	WATER CONTENT (%) 10 20 30		
417.6 0.8	SANDY SILT some clay, trace gravel, compact, brown, very moist (GLACIAL TILL)		2	SS	16					
	---- grey, wet below 1.5m		3	SS	22	417				
			4	SS	42	416				
415.4 3.0	End of Borehole									

DRAFT

NOTES:
Borehole was open and dry upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in piezometer at 1.6m (Elev. 416.8m) on Sept. 26, 2007

Terraprobe

LOG OF BOREHOLE 12

PROJECT: Eastwood Garafraxa St. & Gartshore St.
LOCATION: Fergus, Ontario
CLIENT: Sorbara Development Group

DATE: 20 September 2007
EQUIPMENT: Bombardier
ELEVATION DATUM: Geodetic
FILE: 1-07-2324

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES
418.4	Ground Surface				
0.0 / 418.2	160mm TOPSOIL		1	SS	13
0.2	FILL - Sandy Silt, trace gravel with organic matter, rootlets, compact, dark brown, moist				
417.6			2	SS	16
0.8	SANDY SILT some clay, trace gravel, compact, brown, moist to very moist (GLACIAL TILL)		3	SS	22
	grey		4	SS	42
			5	SS	32
	very dense below 4.5m		6	SS	50/10cm
412.2			7	SS	50/8cm
6.2	End of Borehole				

ELEVATION SCALE: 418, 417, 416, 415, 414, 413

PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● POCKET PEN. × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

NOTES:
Borehole was open and dry upon completion of drilling.
20 mm ID diameter peizometer installed.
Water level in piezometer at 2.3m (Elev. 416.1m) on Sept. 26, 2007