February 7, 2020
Our File: 220009

Mr. Elo Martin
072025 Sideroad 7
R.R. #3
Southgate, ON N0G 1N0

Re: Subsurface Investigation & Impact Assessment
Proposed Cemetery
Part Lot 25, Concession 13
Township of Southgate

Dear Mr. Martin,

This letter provides the findings of the Subsurface Investigation and Impact Assessment that was conducted on the property located at Part Lot 25, Concession 13 within the Township of Southgate, County of Grey. The Site is located adjacent to the southwest corner of the intersection of Southgate Road 14 and Southgate Sideroad 61. The location of the Site is shown on the attached Figure 1. The study area consists of a proposed severance parcel consisting of approximately 1.0 ha (2.5 acres) located on the northeastern portion of the parent property. The parent property consists of a 12.2 ha (30.2 acre) lot that is used for agricultural purposes and contains no onsite structures. No municipal sanitary sewer or water services are provided to the property.

We understand that this Subsurface Investigation and Impact Assessment is being completed in support of the licensing required to support the proposed use of the northeastern portion of the property as a Cemetery. Based on consultation with the client, the primary scope of the assessment is to investigate the nature of the onsite soils and groundwater (if encountered), and to assess potential sensitive receptors in the vicinity of the study area.

The Study Area is focused on the area of the proposed severance, as shown in Figures 2 and 3. The scope of this review includes:

- Review of geologic, physiographic, and County mapping;
- Review of Ministry of Environment, Conservation and Parks (MECP) well records;
- A site visit and reconnaissance of the Site and surrounding area on January 28, 2020;
- The documentation of the nature of soil and bedrock in a series of four (4) excavated testholes; and
- Impact analysis for potential impacts to groundwater, surface water, and local sensitive receptors.

GEOLOGIC SETTING

The site is located on the eastern margin of the physiographic region known as the "Horseshoe Moraines" (Chapman and Putnam, 1984). The region is characterized by gently undulating topography with primarily kame moraines and outwash deposits with till moraines and drumlinized till moraines.

Based on Soil Survey Report No. 17 (Soils of Grey County), the surface soil in the Study Area is generally comprised of the silt loam of the Listowel series. Similarly, the soils observed in the testholes that were completed in the Study Area primarily consisted of organic soil overlying a sandy silt with some clay with trace boulder content. A consistent layer of light brown, dry fine-to-medium sand was observed to underly the Listowel series onsite. These observations are consistent with the available Soils mapping.

Based on a review of the area and geologic setting, the study area is situated on an elevated portion of a till moraine. Dolostone of the Guelph formation is reported underly the soils in the area.

The shallow groundwater flow is expected to be in a northerly direction following the topography toward the low-lying wetland areas and watercourse located north of the study area.

SITE SETTING AND RECONNAISSANCE

The study area is situated in an area dominated by agricultural/rural land use. As discussed, the study area is located on an elevated portion of a till moraine. The Site is located approximately 6.2 km southwest of Hopeville and 11.6 km east of Holstein.

The Site visit was conducted by GM BluePlan Engineering (GMBP) personnel on January 28, 2020. During the Site visit, the study area and surrounding lands were inspected for potential evidence of shallow groundwater, surface water, or other potential sensitive receptors. Based on the location of the study area on one of the most elevated portions of the moraine in the area, no surface water features or evidence of saturation was encountered at the surface.

The property located to the north and across the Right-Of-Way of Southgate Road 14 (i.e. 144605 Southgate Road 14) contains a residential dwelling, three secondary buildings, a domestic well (MECP Well ID: 2500941), and a pond. Based on the inferred northerly direction of groundwater flow and the presence of a domestic well and pond on this property, this property is considered to be the most likely to be impacted by the cemetery operations. The domestic well on the northerly property is reported to be located approximately 95 metres north of the proposed cemetery boundary and the pond is situated approximately 145 metres north of the boundary. This pond is situated at an elevation that is approximately 13 metres lower than the average ground surface elevation on the study area.

Three other properties were reported to, or are inferred to, contain a domestic well within 300 metres of the proposed cemetery area:

- It is inferred that a domestic well is located on 144576 Southgate Road 14 has an inferred well, which is situated approximately 260 metres west of the study area,
- It is reported that a domestic well (MECP Well ID: 2502836) is located on 144642 Southgate Road 14, which is situated approximately 230 metres east of the study area, and
- It is inferred that a domestic well is located on 612176 Southgate Sideroad 61, which is situated approximately 220 metres south of the study area.

It is noted that each of the three properties noted above are located hydraulically upgradient or cross-gradient from the study area. The available MECP well records are attached for reference.

A review of the Ministry of Environment, Conservation and Parks (MECP) water well database was completed as part of this investigation. Area MECP well records indicate that bedrock is situated in the range of 30 metres below the ground surface. It is also reported that a consistent layer of approximately 5 to 10 metres of clay till is situated between the shallow soils and the bedrock surface, which is expected to limit the potential for impacts to groundwater resources from surface or shallow subsurface activities.

TESTHOLE INVESTIGATION FINDINGS

As part of the field investigations, a series of four (4) testholes (TH-1 to TH-4) were excavated across the study area on January 28, 2020. The testholes were advanced through the use of a rubber tire backhoe provided by the client. The location of each of the testholes is provided in Figure 3. Each testhole was extended to a depth between 2.5 and 2.9 metres below ground surface (mbgs). The testhole logs and photographs from the investigation are enclosed for reference.

The soils in each testhole were generally consistent across the Site with a layer of topsoil between 0.3 to 0.4 metres deep overlying a layer of sand and silt loam with an approximate thickness of 1.4 to 1.8 metres. Underlying the sand and silt loam in each testhole was a dry, light brown fine-to-medium sand. The soils in each testhole were moist-to-dry and no evidence of groundwater infiltration or seasonal saturation were observed. Therefore, the high groundwater table is expected to be at a depth of greater than 2.9 mbgs, which is assumed to be less than 482.2 metres above sea level.

CONCLUSIONS AND RECOMMENDATIONS

A cemetery is proposed to be situated within a portion of a 1.0 hectare (2.5 acre) parcel. The cemetery is expected to be relatively small, on the scale of 0.3 ha (1 acre).

Based on the findings of this investigation, no evidence of soil saturation has been observed in the area of the proposed cemetery. Additionally, the proposed cemetery Site is situated on an elevated portion of the moraine, with the closest surface water feature (i.e. the pond on the northerly adjacent property) located approximately 145 metres north of the property boundary. The pond to the north of the subject property is expected to be coincident with the local shallow groundwater table. This pond is situated at an elevation approximately 13 metres lower than the ground surface of the proposed cemetery. Therefore, the water table is expected to be significantly lower than 3.0 metres below ground surface across the study area, which is expected to limit the migration of any effluent from cemetery activities.

Although a domestic well is situated approximately 95 metres north of the proposed cemetery boundary (i.e. Well ID: 2500941), available MECP water well records indicate that a consistent layer of approximately 5 to 10 metres of clay till is situated between the shallow soils and the bedrock surface, which is expected to further limit the potential for impacts to groundwater resources from surface or shallow subsurface activities. Most importantly, this well is reported to be installed in the deep bedrock with the casing extending to an approximate depth of 30 metres into the bedrock surface and the well extending to a depth of approximately 60 metres.

Therefore, the potential for the proposed relatively small cemetery development to affect local surface water features or groundwater resources in the area is expected to be low. The property is considered to be adequate for use as a cemetery from the environmental perspective.

LIMITATIONS

The information in this report is intended for the sole use of Mr. Elo Martin. 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.

The conclusions and recommendations in this report are based on information gathered at the testhole locations and on available geological information. Subsurface conditions between and beyond the testholes may differ from those encountered at the testhole locations and conditions may become apparent during development which may not have been detected or anticipated at the time of the investigation.

The conclusions pertaining to the condition of soils identified at the site are based on the visual observations at the locations of the investigative testholes. GM BluePlan Engineering Limited cannot guarantee the condition of soil that may be encountered at the site in locations that were not specifically investigated.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED

Per:

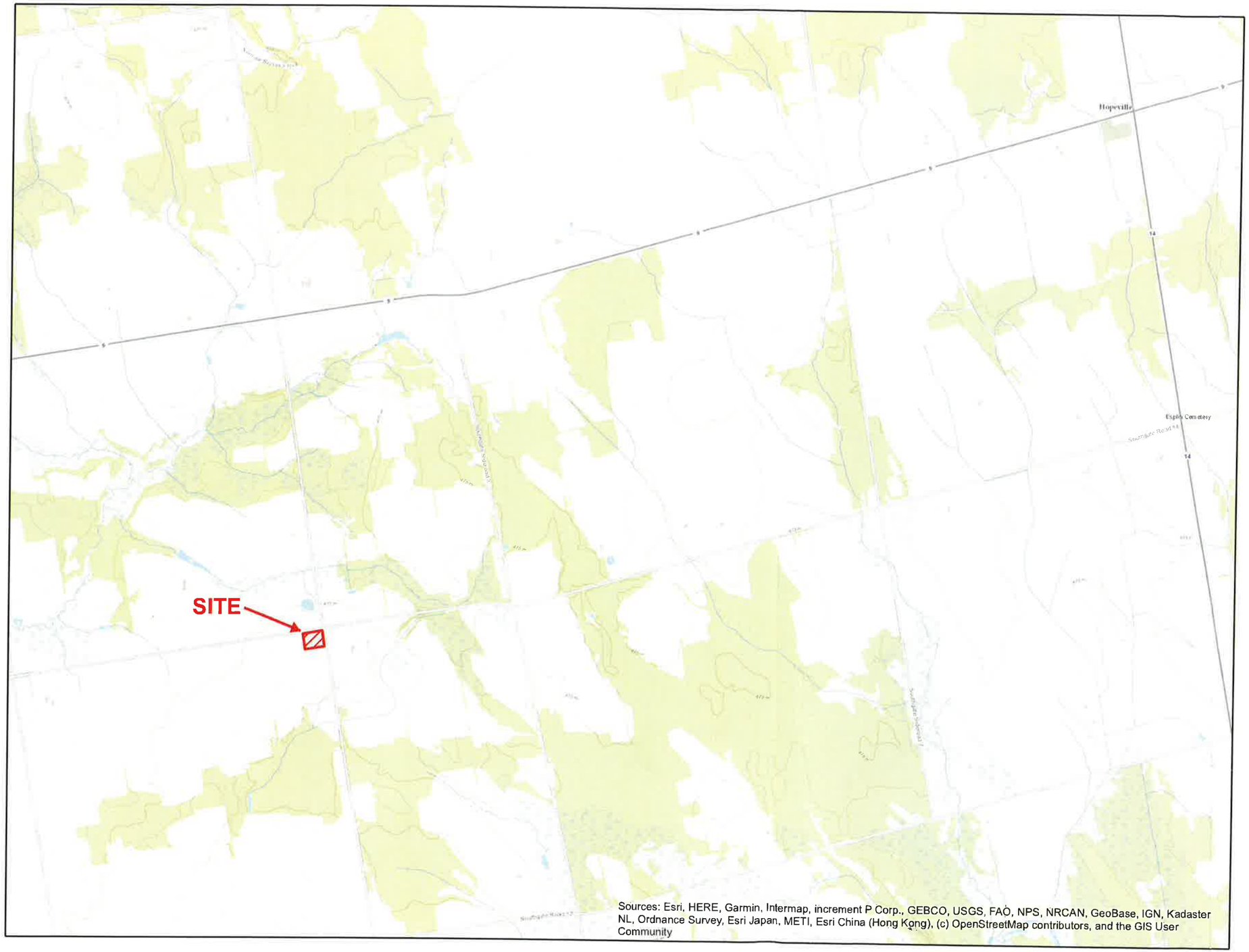
Corbin Sweet, H.B.Sc., G.I.T.
CJS/kd

Per:

Matthew Nelson, P.Eng., P.Geo.

Encl. Figure 1 – Site Location Map
Figure 2 – Area Layout
Figure 3 – Testhole Location Plan
Testhole Logs
Site Photographs
MECP Well Records

cc: File No. 220009



220009
Subsurface Investigation
Proposed Cemetery

N

LEGEND

Approximate Location of Proposed Cemetery Severance

Scale
1:25,000

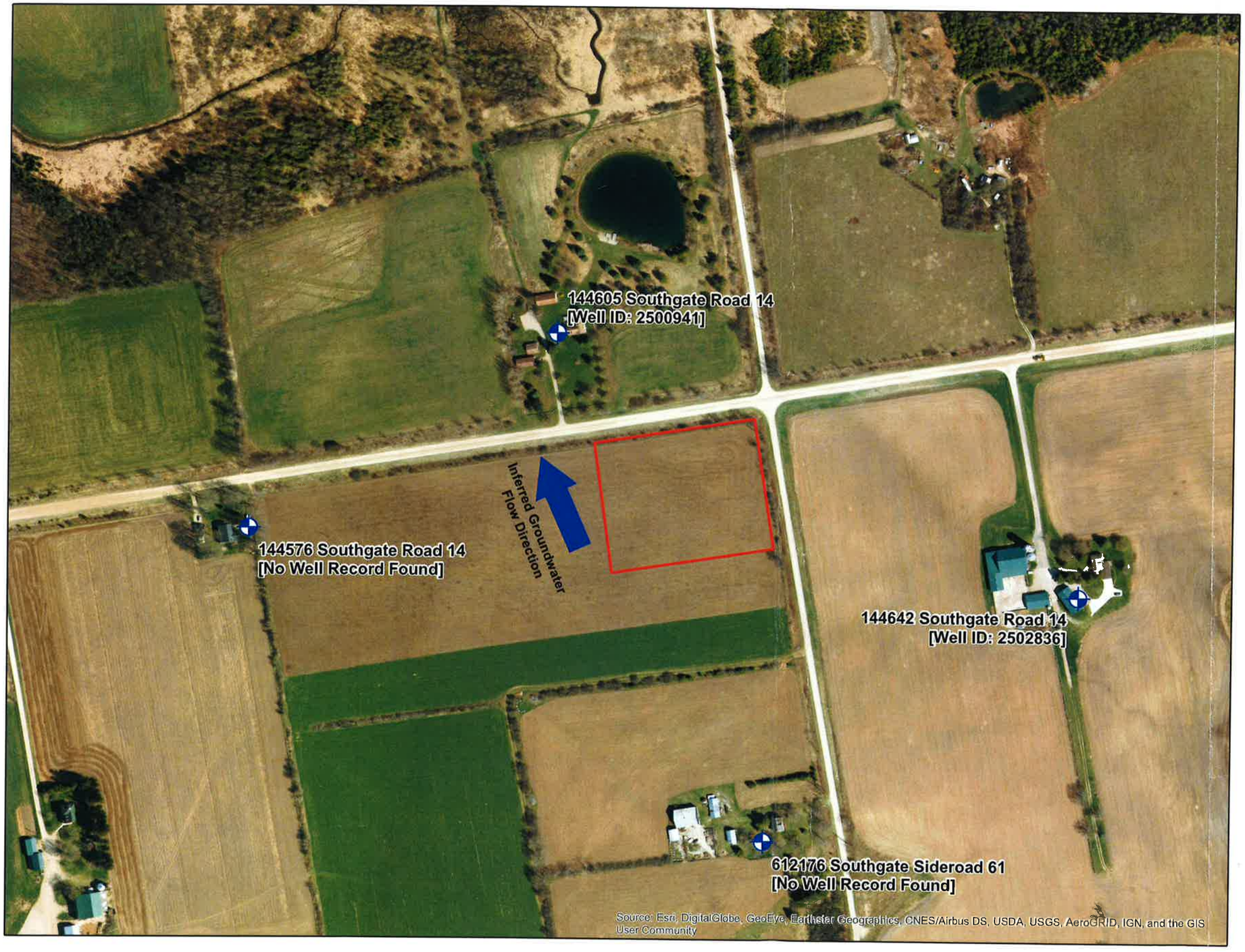
January 2020

SITE LOCATION MAP

Concession 13, Part Lot 25
RP 16R7575, Part 1

Figure No. 1

BluePlan ENGINEERING



220009
Subsurface Investigation
Proposed Cemetery

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LEGEND

Approximate Boundary of Proposed Cemetery Severance

Approximate Location of Domestic Well

Inferred Shallow Groundwater Flow Direction

Scale
1:3,000

January 2020

AREA LAYOUT

Concession 13, Part Lot 25
RP 16R7575, Part 1

Figure No. 2

BluePlan ENGINEERING

220009
Subsurface Investigation
Proposed Cemetery

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LEGEND

Approximate Boundary of Proposed Cemetery Severance

Approximate Testhole Location and ID
TH-1

Scale
1:1,000

January 2020

TESTHOLE LOCATION PLAN

Concession 13, Part Lot 25
RP 16R7575, Part 1

Figure No. 3

BluePlan ENGINEERING

BluePlan ENGINEERING

Testhole ID: TH-1

CLIENT Mr. Elo Martin
PROJECT NAME Subsurface Investigation - Proposed Cemetery
PROJECT NUMBER 220009
PROJECT LOCATION Con 13, Part Lot 25, RP 16R7575, Part 1
DATE COMPLETED 28-Jan-2020
CONTRACTOR Client
LOGGED BY Corbin Sweet
METHOD Backhoe
WELL CONSTRUCTION N/A
NOTES Elevations are approximate.

DEPTH (m)	DEPTH (ft)	ELEVATION (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	
					Ground Surface	
					0.00 TOPSOIL Dark Brown Colour Moist Loose	486.00
					0.40	485.60
0.5	1.5	485.5			SILT with CLAY and Fine SAND Brown Colour Moist Soft-to-Firm	
1.0	3.0	485.0			1.25	484.75
1.5	5.0	484.5			SILT with SAND and some CLAY and trace BOULDERS Brown Colour Moist Firm	
2.0	6.5	484.0			2.10	483.90
2.5	8.0	483.5			Fine-to-Medium SAND Light Brown Colour Dry Compact	

Borehole Terminated at 2.50 m.

BluePlan ENGINEERING

Testhole ID: TH-2

CLIENT Mr. Elo Martin
PROJECT NAME Subsurface Investigation - Proposed Cemetery
PROJECT NUMBER 220009
PROJECT LOCATION Con 13, Part Lot 25, RP 16R7575, Part 1
DATE COMPLETED 28-Jan-2020
CONTRACTOR Client
LOGGED BY Corbin Sweet
METHOD Backhoe
WELL CONSTRUCTION N/A
NOTES Elevations are approximate.

DEPTH (m)	DEPTH (ft)	ELEVATION (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	
					Ground Surface	
					0.00 TOPSOIL Dark Brown Colour Moist Loose	487.00
					0.32	486.68
					SILT with CLAY and Fine SAND Brown Colour Moist Soft-to-Firm	
					1.20	485.80
					Trace BOULDERS below 1.2 mbgs Increasing CLAY content with depth	
					2.10	484.90
					Fine-to-Medium SAND Light Brown Colour Dry Compact	

Depth scale: 0.5 m, 1.0 m, 1.5 m, 2.0 m, 2.5 m; 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5 (ft)

Elevation scale: 486.5, 486.0, 485.5, 485.0, 484.5 (m)

Borehole Terminated at 2.90 m.

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Testhole ID: TH-3

CLIENT Mr. Elo Martin
PROJECT NAME Subsurface Investigation - Proposed Cemetery
PROJECT NUMBER 220009
PROJECT LOCATION Con 13, Part Lot 25, RP 16R7575, Part 1
DATE COMPLETED 28-Jan-2020
CONTRACTOR Client
LOGGED BY Corbin Sweet
METHOD Backhoe
WELL CONSTRUCTION N/A
NOTES Elevations are approximate.

DEPTH (m)	DEPTH (ft)	ELEVATION (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION (Ground Surface)	
					0.00 TOPSOIL Dark Brown Colour Moist Loose	487.00
					0.29	486.71
0.5	1.5	486.5			SILT with SAND and some CLAY Brown Colour Moist Soft-to-Firm	
1.0	3.5	486.0				
					1.10	485.90
1.5	5.0	485.5			Trace BOULDERS below 1.1 mbgs Increasing CLAY content with depth	
					1.75	485.25
2.0	6.5	485.0			Fine-to-Medium SAND Light Brown Colour Dry Compact	
2.5	8.5	484.5				

Borehole Terminated at 2.60 m.

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Testhole ID: TH-4

CLIENT Mr. Elo Martin
PROJECT NAME Subsurface Investigation - Proposed Cemetery
PROJECT NUMBER 220009
PROJECT LOCATION Con 13, Part Lot 25, RP 16R7575, Part 1
DATE COMPLETED 28-Jan-2020
CONTRACTOR Client
LOGGED BY Corbin Sweet
METHOD Backhoe
WELL CONSTRUCTION N/A
NOTES Elevations are approximate.

DEPTH (m)	DEPTH (ft)	ELEVATION (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION (Ground Surface)	
					0.00 TOPSOIL Dark Brown Colour Moist Loose	485.00
					0.40	484.60
0.5		484.5			SILT with SAND and some CLAY Brown Colour Moist Soft-to-Firm	
1.0		484.0			1.00	484.00
					Trace BOULDERS below 1.0 mbgs Increasing CLAY content with depth	
1.5		483.5			1.75	483.25
					Fine-to-Medium SAND with trace SILT Light Brown Colour Dry Compact	
2.0		483.0				
2.5		482.5				

Borehole Terminated at 2.80 m.

Subsurface Investigation and Impact Assessment
Proposed Cemetery Development

Photo 1 – View of the study area, looking southeast at TH-3 from TH-1.

Photo 2 — View of TH-1 Soil Profile

File No. 220009
Photos - January 28, 2020

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Subsurface Investigation and Impact Assessment
Proposed Cemetery Development

Photo 3 –View of TH-3 soil profile

Photo 4— View of TH-4 soil profile

File No. 220009
Photos - January 28, 2020

BluePlan ENGINEERING

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Co-ord 5 R 4838139 N
Elev. 5 R 25 1575

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WATER RESOURCES DIVISION
25 JUL 28 1964
No. 941
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 22
County or District Grey
Township, Village, Town or City Egremont
Con. XIV Lot 25
Date completed 12 (day) 3 (month) 64 (year)
[redacted]dress RR#1 Holstein

Casing and Screen Record

Inside diameter of casing 4"
Total length of casing 97'
Type of screen —
Length of screen —
Depth to top of screen —
Diameter of finished hole 4"

Pumping Test

Static level 35'
Test-pumping rate 4-7 G.P.M.
Pumping level 70'
Duration of test pumping 3 hrs
Water clear or cloudy at end of test clear
Recommended pumping rate 4-7 G.P.M.
with pump setting of 90' 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)
clay and stones	0'	36'		
red clay	36'	96'		
white limestone	96'	198'	106'	
			198'	fresh

For what purpose(s) is the water to be used? farm (P & S)
Is well on upland, in valley, or on hillside? hillside
Drilling or Boring Firm Pratt Bros
RR#4 Durham.
Address

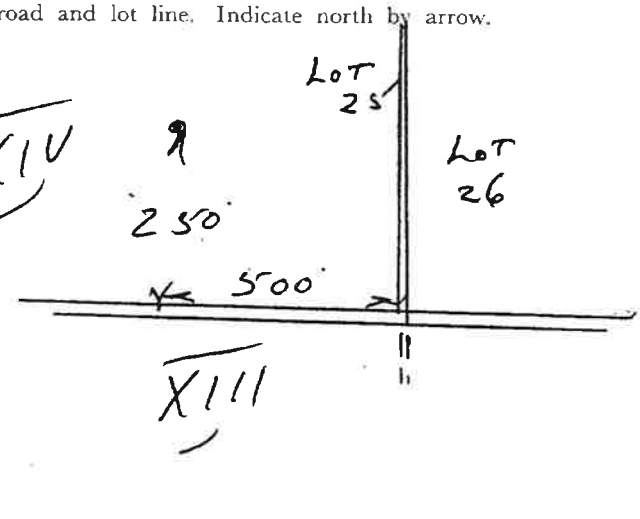
Licence Number 1326
Name of Driller or Borer Wallace Pratt
Address RR# 4 Durham
Date Mar 12 / 64
Pratt Bros Per Wallace Pratt
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



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TM 1 1 7 2 5 3 1 1 5 0 | Con X III Lot 26 CODED

4 R 4 8 8 1 2 0 1 0

Elev. 5 R 1 5 7 5 T

Elevation 2 2

41A2a

2502836

Water management in Ontario

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District GREY

Township, Village, Town or City EGREMONT

Con. 13 Lot 26

Date completed 14 (day) MAY (month) 69 (year)

[redacted]

Address HOLSTEIN R.R.1

DIVISION OF WATER RESOURCES

ONTARIO WATER RESOURCES COMMISSION

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 61

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 4"

Pumping Test

Static level 20'

Test-pumping rate 20 G.P.M.

Pumping level 23

Duration of test pumping 2 HRS

Water clear or cloudy at end of test CLEAR

Recommended pumping rate 15 G.P.M.

with pump setting of 55 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)
TOP SOIL	0	2		
SANDY CLAY	2	16	75 TO 88	FRESH
GRAVEL + BOULDERS	16	25		
HARD PAN	25	40		
FINE YELLOW SAND	40	61		
HARD GREY ROCK	61	88		

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

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

Drilling or Boring Firm DURHAM DRILLING + ENTERPRISES LTD

Address DURHAM ONT. BOX 299

Licence Number 3263

Name of Driller or Borer ED. HOTCHKISS

Address DURHAM ONT.

Date MAY 19 — 68

F. E. Johnston

(Signature of Licensed Drilling or Boring Contractor)

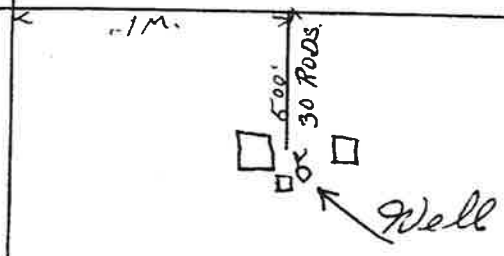
Form 7

OWRC COPY

Location of Well

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

N



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