March 17, 2022
Our File: 221435

David Rogers
99 Saffron Street
Markham ON L6E 1Y7

Via E-mail

Re: Preliminary Hydrogeological Feasibility Assessment for Private Servicing of Lot Severance: Southgate Road 26, Lot 4, Concession 22 Township of Egremont

Dear Mr. Rogers,

GM BluePlan Engineering Limited (GMBP) have been retained by yourselves (the "Client") to provide hydrogeological services to support the arrangement of municipal approvals for a potential rural residential lot severance in the community of Southgate.

This hydrogeological study is intended to determine the feasibility of private servicing (i.e., private water well and private on-site sewage system) for the lots proposed to be severed.

The property under consideration (the Site) is located on the north side of Southgate Road 26 and forms the majority of Lot 4, Concession 22, Geographic Township of Egremont. The Site is also identified by fire number 263597 Southgate Road 26. Figure 1 shows the location of the Site in relation to its surroundings at a subregional scale.

PROPOSED SEVERANCE

The parcel that is proposed to be severed is approximately 42.6 hectares in size. Figure 2 shows an aerial view of the Site.

The severance is proposed to result in 4 lots (i.e., 3 severed lots plus the retained lot) for single detached residential use, with approximate sizes as follows:

- Lot 1 (severed): 0.43 ha
- Lot 2 (severed): 0.46 ha
- Lot 3 (severed): 0.46 ha
- Retained Lot: 41.2 ha

Each of the lots will have frontage onto Southgate Road 26. Enclosure B shows a potential severance plan, provided by Cuesta Planning.

GEOLOGICAL SETTING

Physiographic mapping (Chapman & Putnam, 2007) indicates that the Site lies within the physiographic region known as the Horseshoe Moraines, which is characterized as having drumlinized till plains, kame moraines, and spillways (Chapman & Putnam, 1984). The spillways are often characterized by lacustrine clay and till plains. The Site is mainly within an area identified as a spillway, with a small northerly portion within an area identified as a kame moraine.

The surficial geology of the site is understood to be predominantly coarse (i.e., gravelly, sandy soils), with the Site lying on a deposit of ice-contact stratified drift. Figure 3 shows the distribution of surficial geological materials.

Soil survey mapping (Gillespie & Richards, 1954) indicates that the soils of the Site are of the Pike Lake Loam series, which is a loam soil that has developed on calcareous gravelly outwash material containing pockets of till. It typically has good to excessive drainage and can be well-sorted or stony.

The bedrock in the vicinity of the Site is that of the Guelph formation (NDMNRF, 2011). The Guelph formation is a sedimentary formation composed of sandstone, shale, dolostone, and siltstone with an approximate elevation of 200 metres above sea level. This formation is well-known in the area to have high yield for groundwater supply. Nearby water well records indicate that the subcrop of the bedrock is in the range of 25 to 50 m below ground surface.

Topographically, the Site is situated in a region of irregular moderately sloping to irregular very steeply sloping topography. The Site appears to be highest in the middle with low-lying areas in the north portion and south portion. The south portion of the site appears to drain to a low-lying area in the southwest of the site and then south towards Wilder Lake which is approximately 100 metres to the south and west of the site. The north portion of the site appears to drain through a series of wetlands to a tributary of Camp Creek to the west.

The interpreted direction of groundwater flow is generally split between southward toward Wilder Lake in the south half of the property and westward toward Camp Creek in the north half of the property. It is noted that groundwater flow directions may vary depending on local differences in soil type, slope and the presence of preferential pathways (e.g. in-ground services).

SERVICING CONSIDERATIONS

On-Site Sewage Systems: Nitrogen Attenuation

The primary concern related to on-site sewage systems for residential development is the effect that these systems may have on the concentration of nitrate in local groundwater. The proposed development must ensure that its sewage management does not negatively impact groundwater quality and preclude its use for other purposes or by other (i.e., off-site) users. The most prevalent use for groundwater use is domestic consumption and so typically this means that a given development must not result in nitrate concentrations of 10 mg/L (per Ontario Drinking Water Standards) in the groundwater going off Site.

The attenuated nitrogen concentration may be computed as per the method given in MOE Procedure D-5-4 (1996) using the formula below.

$$C = \frac{N\Delta t}{(P-E)(1-r)A + Q\Delta t}$$

Where:

C is the attenuated nitrogen concentration (mg/L)
N is the daily nitrogen loading for a residential lot (40,000 mg/d, set by Procedure D-5-4)
Δt is the number of days in a year (365 d/yr)
P is the annual precipitation (1,119 mm/yr, Environment Canada Climate Normals for Durham, ON)
E is the annual evapotranspiration (304 mm/yr, MODIS Global Evapotranspiration Dataset)
r is the runoff coefficient (0.3, from MTO Drainage Management Manual Chart 1.07 for suburban residential)
A is the proposed lot size (4,300 m^2)
Q is the sewage effluent discharge rate (1,000 L/d, specified by Procedure D-5-4)

Calculating through, the estimated attenuated nitrogen concentration is 5.7 mg/L, which is less than the maximum allowable 10 mg/L Therefore, on the basis of nitrogen attenuation it is interpreted that the proposed severance would be supported by the hydrogeological conditions of the Site.

A review of water well records within 500 m of the Site indicates that local water supply is generally obtained from the overburden. A summary of information from these water well records is provided in Enclosure C. Within the 500 m search area, there were 22 drinking water wells identified, with four (4) being completed in the bedrock and the remaining 18 being completed in the overburden. Overburden wells ranged from 15 to 50 metres deep, and bedrock wells ranged from 25 to 53 meters deep. The nearest overburden well to the proposed severed lots is 82 m away in a cross-gradient direction to the south-west. In addition, there is an overburden well approximately 108 m south of the severed lots in a downgradient direction, and another two overburden wells approximately 125-150 m west of the severed lots in a cross-gradient direction. Based on the relative locations, the development of the Site is not expected to cause impacts to the water quality in any of the nearby wells.

On-Site Sewage Systems: Septic System Sizing

Another aspect of sewage servicing that must be considered is whether the lots are of sufficient size to accommodate the required septic systems.

Assuming that each of the lots created by the severance will host a four-bedroom house, the design sewage flow is chosen to be 2,000 L/d, per Part 8 of the *Ontario Building Code*.

The three lots to be severed, as shown in the preliminary site plan provided by Cuesta Planning (see Enclosure B), have a frontage of 50 m onto Southgate Road 26 and are between 96.4 and 116.6 m deep. The width of the lot (i.e., perpendicular distance between the side lot lines) is approximately 40 m.

Due to the large size of these proposed lots, it is expected that it will be feasible to construct a Class 4 on-site sewage system that is compliant with the *Ontario Building Code* even in challenging soil or groundwater conditions.

For example, if “tight” soils with a “T”-time of 50 min/cm exist on-site, the footprint of a tile bed constructed as absorption trenches (*Ontario Building Code* section 8.7.3) could be sized approximately 30 m by 26 m. A bed of this size could be accommodated on-Site while still respecting the clearance distances from property line, structures, and other features as required by the *Ontario Building Code*.

Similarly, if high groundwater levels (i.e., groundwater levels within 1.5 m of ground surface) are encountered, the dimensions of the lots are sufficient to accommodate a tile bed constructed as fill-based absorption trenches (*Ontario Building Code* section 8.7.4). For example, if leaching bed fill with a “T”-time of 12 min/cm is used, potential bed

dimensions could be 20 m long by 9 m wide and there would be sufficient space to accommodate the increased clearance distances incurred by raising the bed as well as a mantle 15 m in width (if required).

Though this assessment indicates that the proposed lots to be severed have dimensions suitable to accommodate an *OBC*-compliant septic system, the actual size and design of a septic system should be determined following a site-specific investigation to confirm soil and groundwater conditions.

Private Well and Water Supply

The local Guelph Formation (bedrock) aquifer has been well-studied and is understood to generally be a high yield formation for water production in southern Ontario. It is largely composed of sandstones and calcareous rocks (limestone and dolostone).

Gravelly overburden materials are likely to be present on the Site and these materials are likely to provide adequate water supply to support domestic usage. Shallower overburden wells are more susceptible to groundwater impacts and may provide lower peak flow rates. It is therefore recommended that groundwater supply wells be installed deep in the overburden or into the bedrock aquifer.

A search of water well records within 500 m of the Site was completed and a summary of the information from those well records is provided in Enclosure C. The majority of the well records in the 500 m search area are installed in the overburden, with four of the 22 domestic supply wells installed in the bedrock. One shallow monitoring well was identified.

Minimum pumping rates are provided by MECP Procedure D-5-5. Assuming that each of the lots created by the severance will host a four-bedroom house, the local hydrogeology must be capable of meeting a peak water demand rate of 18.75 L/min (i.e.,3.75 L/min/person extended by five persons in a four-bedroom house) for a period of 120 minutes for each of the houses.

Inspection of the water well search summary (Enclosure C) indicates that 20 wells in the vicinity of the Site were subject to pumping tests at the time of installation and the pumping test data was provided on the well record. Of those, 16 pumping tests were identified in which the pumping rates exceeded 18.75 L/min for a duration of at least 120 minutes. The majority of the other wells were pumped for shorter durations at rates such that the total volume pumped during the short test exceeded the peak demand volume (i.e., 18.75 L/min times 120 minutes, or 2,250 L).

Based on these values it is reasonable to expect that new wells installed for the proposed lots would be capable of achieving similar pumping rates as other wells in the area, therefore meeting the Procedure D-5-5 requirements.

Due to the proposed size of the severed properties, it is expected that the private water wells will not cause water quantity impacts to or interference with nearby wells.

It is recommended that the new water wells be installed (in respect of the separation requirements set forth in the *Ontario Building Code*) at least 15 m away from existing or proposed sewage treatment systems, including those on neighboring properties. It is recommended that the wells target the overburden or dolostone bedrock aquifer system (approximately 25 to 50 m below ground surface) and be constructed as per requirements of Ontario Regulation 903.

It is recommended that the aesthetic water treatment requirements be established by the property owner via direct samples from the well on their specific lot. Regardless of water quality results, it is recommended that water supply systems be fitted with a disinfection treatment component, such as ultra-violet (UV) light or chlorination.

This preliminary assessment has not included review of the condition, type of construction, supply or water quality of any existing well on-Site.

CONCLUSION

A preliminary hydrogeological assessment has been completed for the proposed severances of three lots for residential usage at a property located within Lot 4, Concession 22, Geographic Township of Egremont. The assessment addresses the feasibility for the Site to support the proposed lots, which are to be serviced by private water wells and private on-site sewage.

The findings of the assessment indicate that:

- the proposed size of the severed lots (i.e., 4,300 m^2 and larger) would be sufficient to achieve the required nitrogen attenuation;
- sewage servicing through the use of on-site sewage systems is considered feasible for the proposed development;
- on-site sewage systems may be conventional Class 4 systems (i.e. septic tank and tile bed), though the type of tile bed constructed may depend on the soil and groundwater conditions encountered at the location of installation;
- sufficient groundwater supply is expected to be available from either the overburden aquifer or the bedrock aquifer below the Site;
- the hydrogeological conditions generally support the proposed severance and servicing scheme; and
- the proposed severance is feasible from a hydrogeological perspective.

It is further recommended that:

- wells shall be installed with a watertight casing as per the requirements of Ontario Regulation 903. It is recommended that the annular seal of suitable sealant (per O.Reg. 903) be provided for the full length of the well casing, especially for overburden well installations.

- the proposed wells be tested for water quality upon installation.

- the type of treatment system be based on the results of the water quality analysis of the groundwater at each well and the homeowner requirements/preferences for general/aesthetic groundwater parameters. Regardless of water quality results, the treatment system is recommended to include a disinfection component, such as UV light or chlorination.

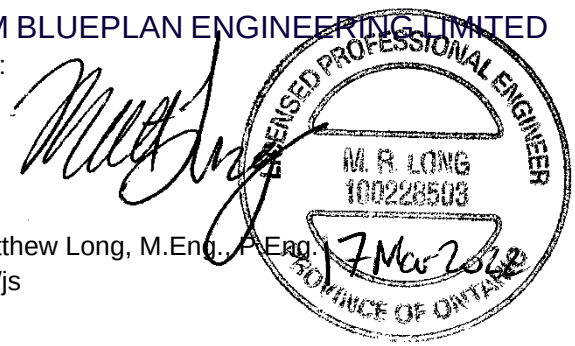
- the new on-site sewage systems be constructed per the *Ontario Building Code* and in respect of all offsets from any existing or proposed well as specified therein.

- prior to construction, a site-specific soils investigation be completed in the area of the proposed septic beds to confirm leaching bed design.

- agricultural field tile, if any, shall be removed from the tile bed area before sewage system installation.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:



Matthew Long, M.Eng., P.Eng.
ML/js

Enclosures:

- Enclosure A: Figures
  - Figure 1: Site Location
  - Figure 2: Site Layout
  - Figure 3: Surficial Geology
  - Figure 4: Water Well Records
- Enclosure B: Conceptual Severance Plan
- Enclosure C: Water Well Data Summary

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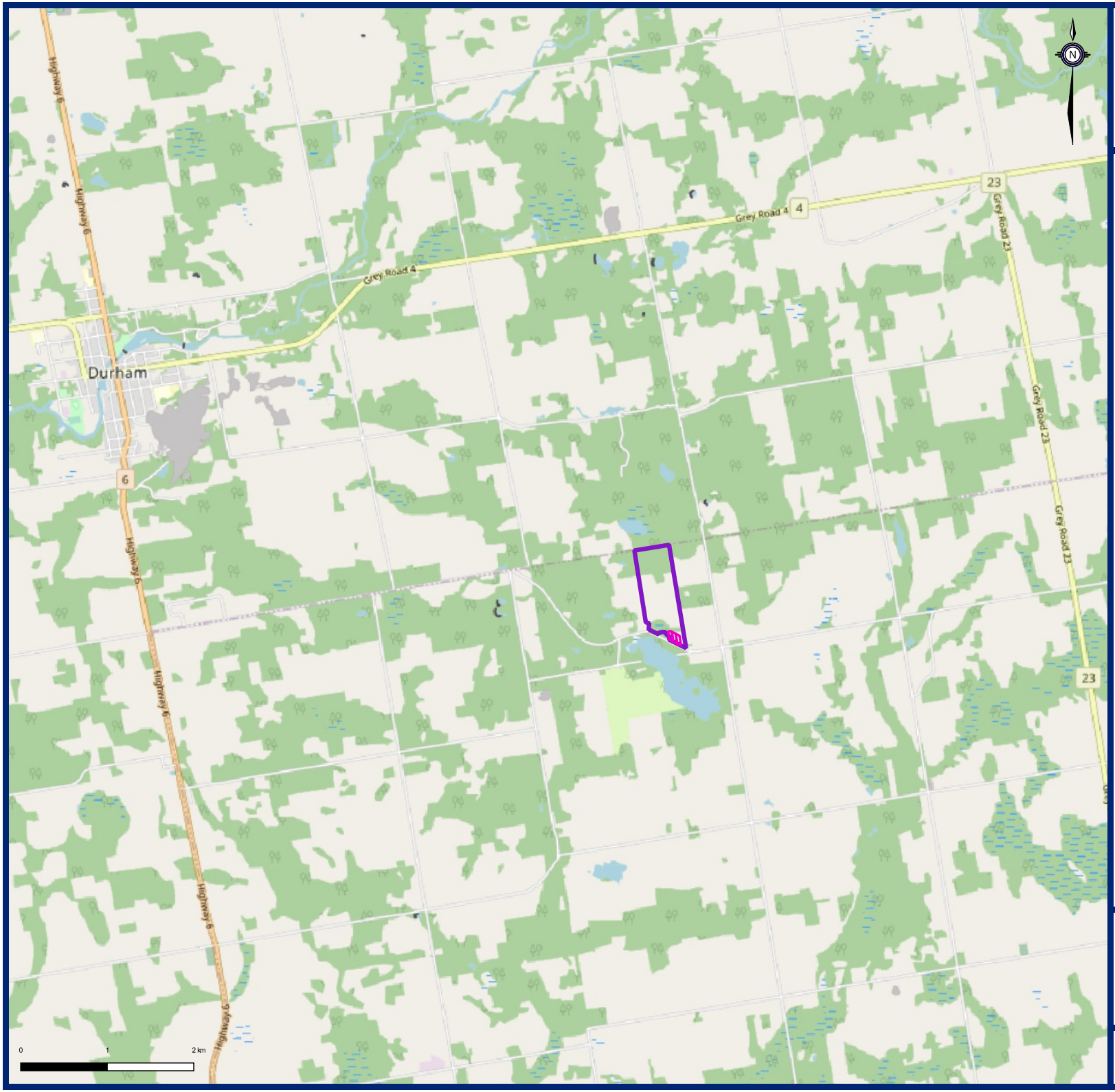
ENCLOSURE A:
FIGURES



Preliminary Hydrogeological Feasibility Assessment - Pt Lot 4 Con 22, Egremont

Approximate Property Location

Existing Property

Proposed Severance

Map Data Copyright Open Street Maps Contributors

Figure 1

Site Location

BluePlan ENGINEERING

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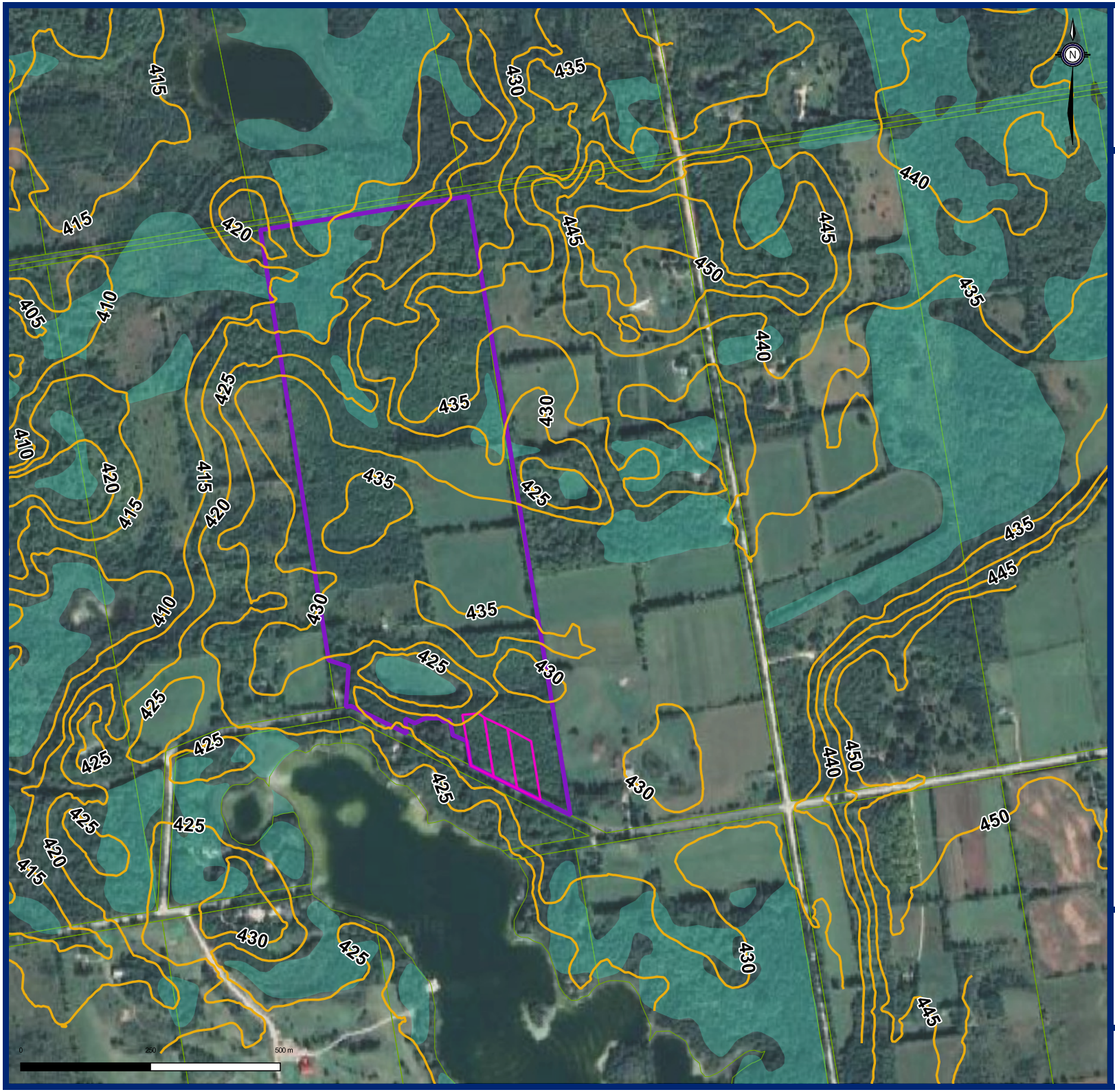

Preliminary Hydrogeological Feasibility Assessment - Pt Lot 4 Con 22, Egremont

Contours (Meters ASL)

Approximate Property Location

Existing Property

Proposed Severance

Wetland

Lot Fabric Improved

Map Data Copyright Google

Figure 2

Site Layout

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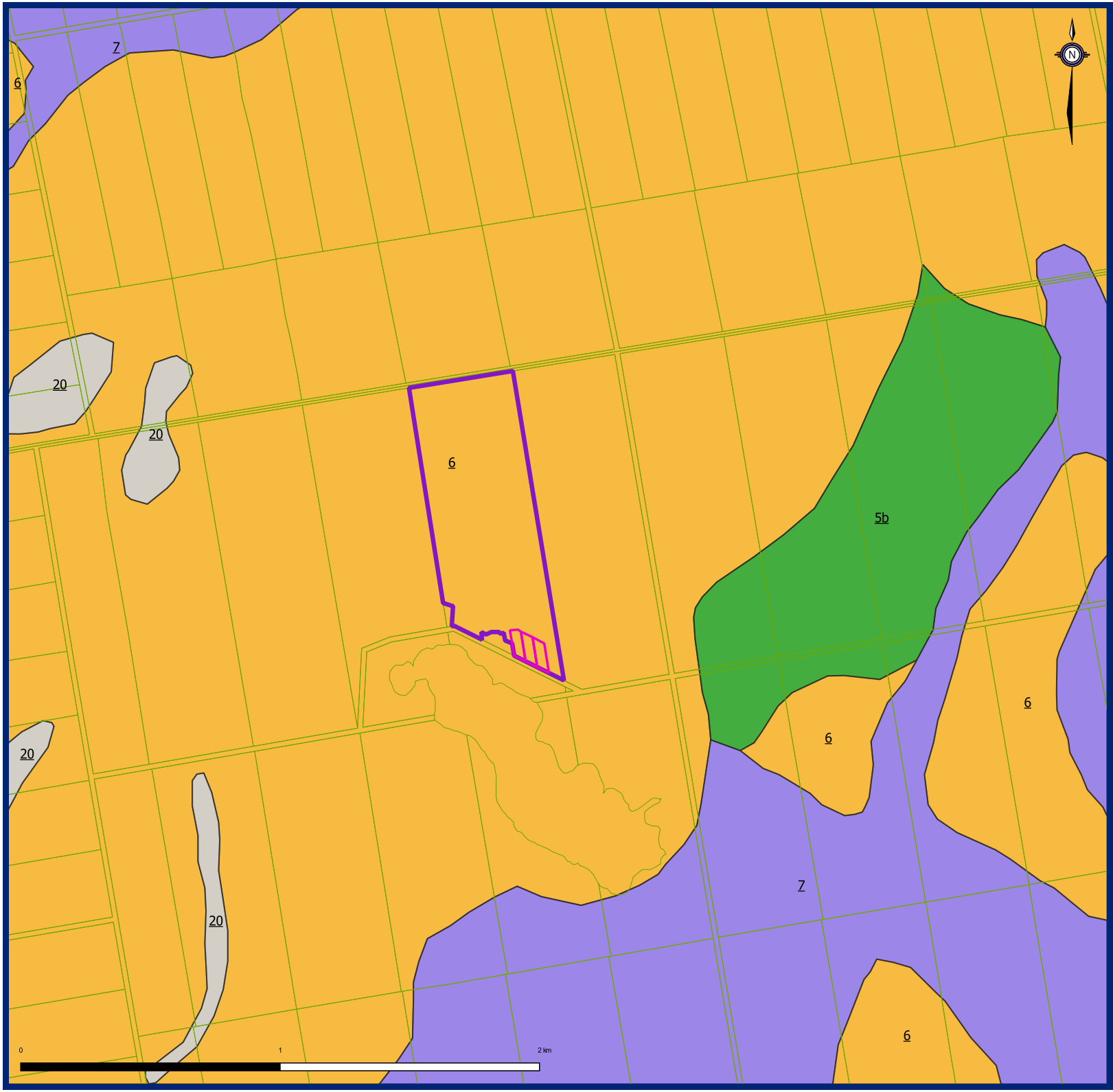

Preliminary Hydrogeological Feasibility Assessment - Pt Lot 4 Con 22, Egremont

Approximate Property Location

- Existing Property
- Proposed Severance
- Lot Fabric Improved

Surficial Geology

- 20 - Organic Deposits
- 5b - Till
- 6 - Ice-contact stratified deposits
- 7 - Glaciofluvial deposits

Figure 3

Surficial Geology

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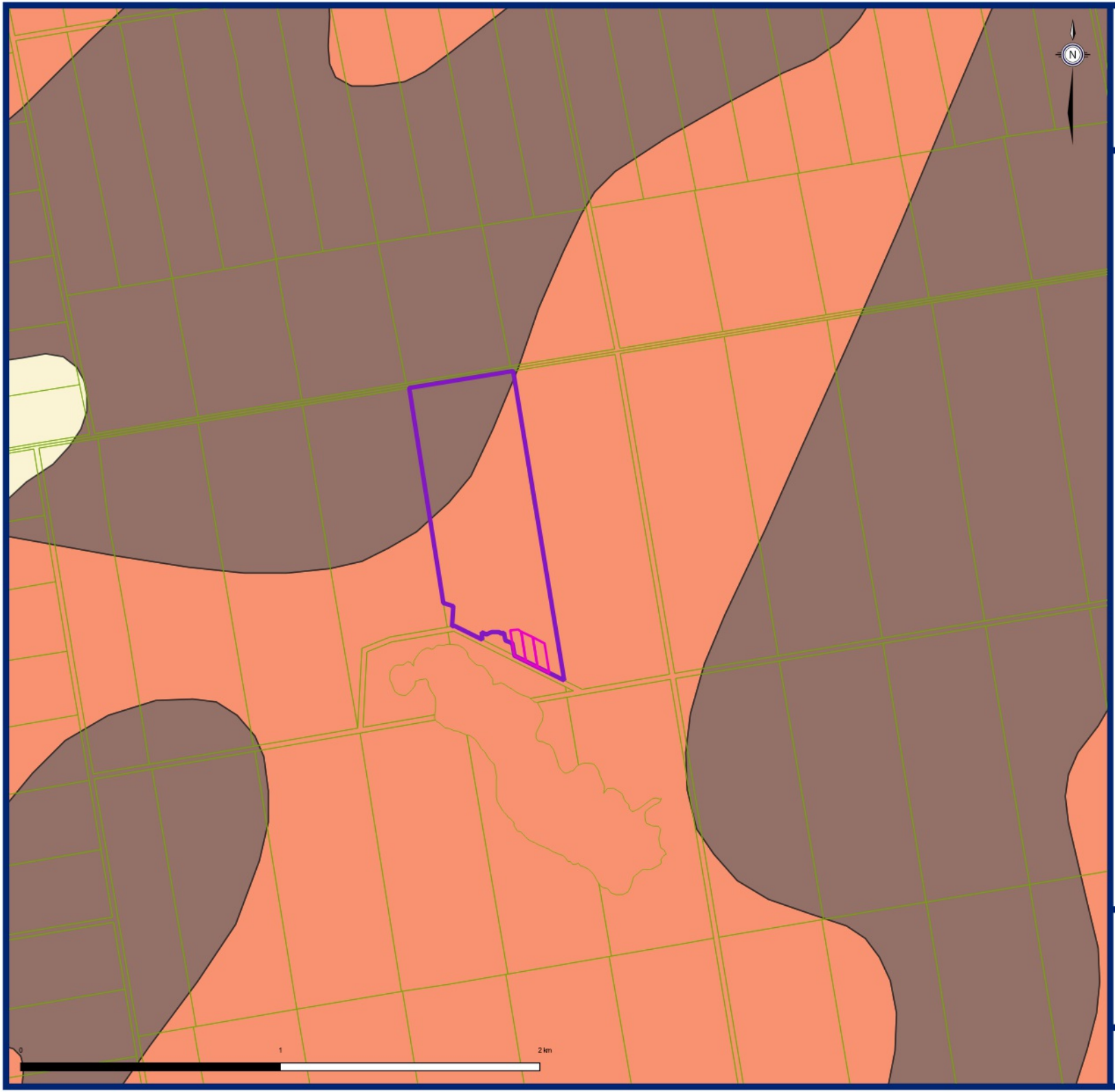

BluePlan Engineering

Preliminary Hydrogeological Feasibility Assessment - Pt Lot 4 Con 22, Egremont

Approximate Property Location

- Existing Property
- Proposed Severance
- Lot Fabric Improved

Physiography

- Kame Moraines
- Spillways
- Till Plains (Drumlinized)

Figure 4

Physiography

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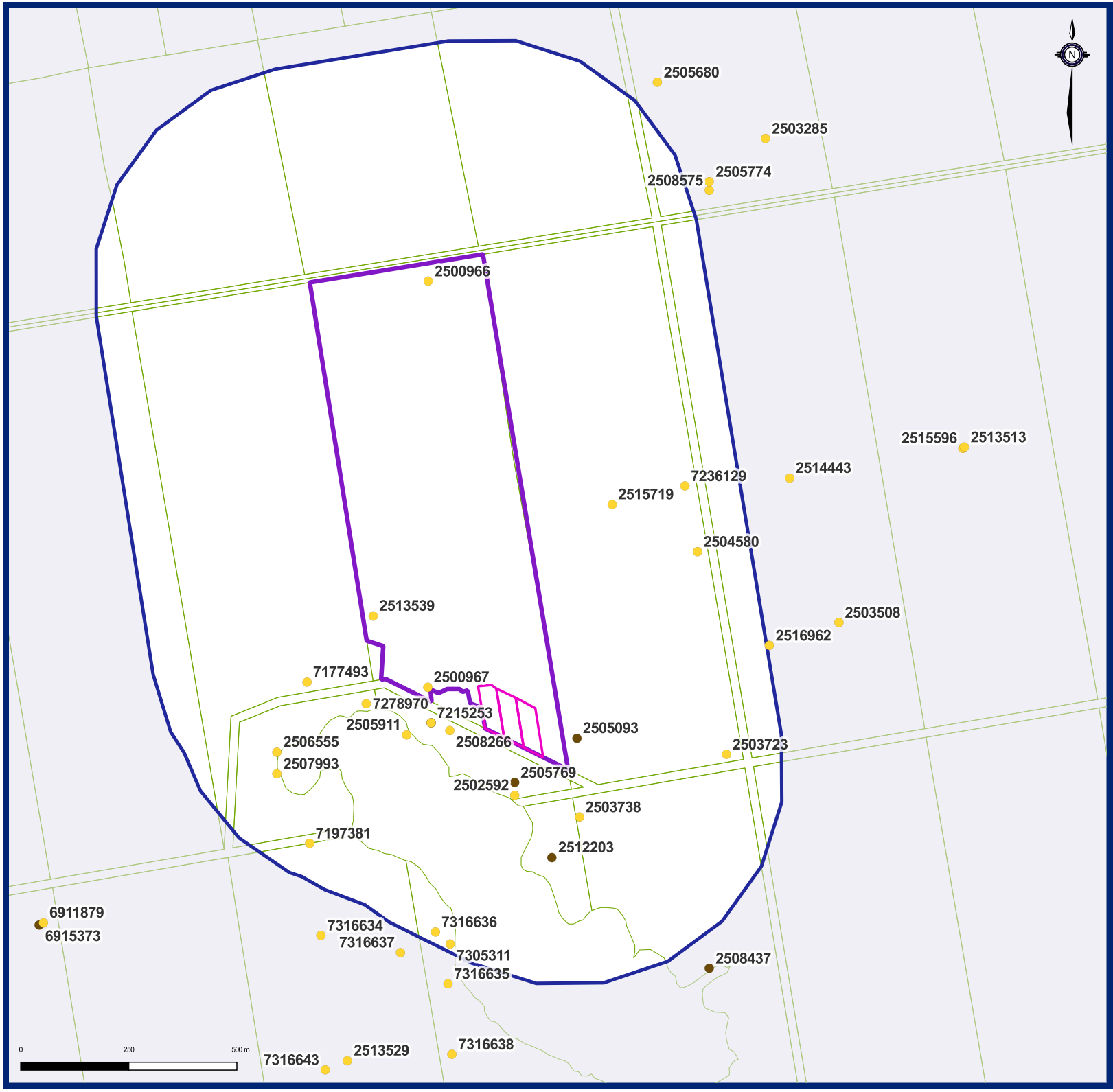

Preliminary Hydrogeological Feasibility Assessment - Pt Lot 4 Con 22, Egremont

Water Wells by Depth

- Overburden
- Bedrock
- 500 m Radius Well Search

Approximate Property Location

- Existing Property
- Proposed Severance
- Lot Fabric Improved

Figure 5

Well Record Search

Water Well Information System

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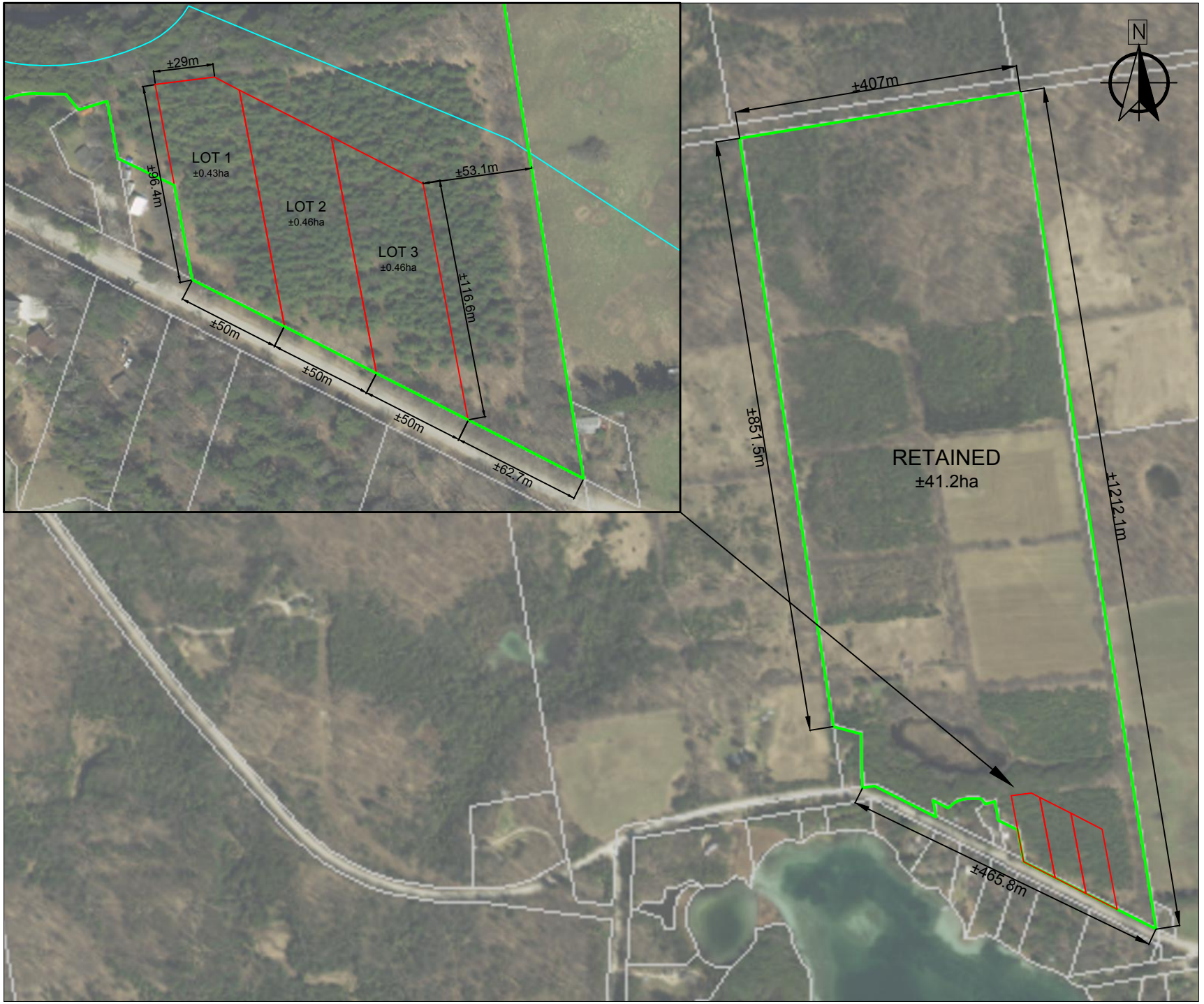
ENCLOSURE B:
CONCEPTUAL SEVERANCE PLAN



Site Plan
Consent to Sever

263597 Southgate Road 26, Wilder Lake,
Township of Southgate, County of Grey
Roll: 420706000121800
Legal Description: EGREMONT CON 22
PT LOT 4

LEGEND

- SUBJECT PROPERTY
- PROPOSED SEVERANCES
- EXISTING LOT LINES
- INLAND LAKES & SHORELINE
- DESIGNATION LIMIT (GCOP 2019)

*measurements and locations are approximate

Site Statistics				
Lot	1	2	3	Retained
Area (ha)	±0.43	±0.46	±0.46	±41.2
Frontage (m)	±50.0	±50.0	±50.0	±62.7
Max. Depth (m)	±116.6	±116.6	±116.6	±116.6

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Drawn by:	Date Printed:
M. Baker	November 2021
File No.:	Project Name:
221106	David Rogers

ENCLOSURE C:
WATER WELL DATA SUMMARY

Table 1: MECP Well Records Information

MOECC Well ID	Lot	Conc.	Easting	Northing	Township	County/ Municipality	Well Use	Bedrock/ Overburden	Depth to Bedrock (m)	Total Depth of Well (m)	Static Water Level (m)	Year Drilled	Notes
Wells on Neighbouring Properties													
2505769	4	22	520964	4888254	Egremont	Grey	Domestic	Bedrock	39.6	46.9	5.49	1976	
2505911	4	22	520714	4888364	Egremont	Grey	Domestic	Overburden	-	19.8	4.27	1976	
2506555	3	22	520400	4888100	Egremont	Grey	Domestic	Overburden	-	32.6	10.67	1977	
2507993	3	22	520414	4888273	Egremont	Grey	Domestic	Overburden	-	32.0	10.67	1983	
2512203	4	21	521050	4888079	Egremont	Grey	Domestic	Bedrock	39.3	52.7	4.27	1993	
7197381	3	21	520490	4888113	Egremont	Grey	Domestic	Bedrock	40.5	50.3	14.94	2012	
2502592	4	22	520950	4888000	Egremont	Grey	Domestic	Overburden	-	40.2	8.20	1968	
2500966	4	22	520750	4889190	Egremont	Grey	Domestic	Overburden	-	18.6	9.14	1950	
2500967	4	22	520749	4888250	Egremont	Grey	Domestic	Overburden	-	19.5	10.36	1963	
2503723	5	22	521454	4888095	Egremont	Grey	Domestic	Overburden	-	17.7	3.66	1971	
2503738	5	22	521114	4887950	Egremont	Grey	Domestic	Overburden	-	18.3	6.40	1971	
2504580	5	22	521387	4888564	Egremont	Grey	Domestic	Overburden	-	41.1	12.80	1974	
2505093	5	22	521108	4888132	Egremont	Grey	Domestic	Bedrock	36.6	43.3	7.62	1975	
2508266	4	22	520814	4888150	Egremont	Grey	Domestic	Overburden	-	36.0	13.72	1984	
2513539	3	22	520637	4888639	Egremont	Grey	Domestic	Overburden	-	41.5	14.94	1998	
2515719	5	22	521189	4888897	Egremont	Grey	Domestic	Overburden	-	15.8	10.97	2003	
2516213	4	22	520771	4888392	Egremont	Grey	Domestic	Overburden	-	25.0	9.14	2004	
7177493	3	22	520484	4888486	Egremont	Grey	Domestic	Overburden	-	27.4	10.67	2011	
7215253	4	22	520771	4888392	Egremont	Grey	Domestic	Overburden	-	41.1	15.24	2013	
7236129	5	22	521358	4888940	Egremont	Grey	Domestic	Overburden	-	30.5	13.11	2014	
7278970	3	22	520621	4888436	Egremont	Grey	Domestic	Overburden	-	35.1	3.66	2016	
7305311	3	21	520815	4887880	Egremont	Grey	Domestic	Overburden	-	17.7	1.22	2017	
7316636	3	21	520781	4887908	Egremont	Grey	Monitoring	Overburden	-	5.1	-	2018	Monitoring Well

Table 2: MECP Well Records Pumping Test Data

MOE Well No.	Easting	Northing	Township/ Village	Well Completion	Depth to Bottom of Well (m)	Static WL (m)	Saturated Thickness (m)	Pumping Rate (L/min)	Test Duration (hours)	End of Test Water Level (m)	Drawdown (m)
2505769	520964	4888254	Egremont	Bedrock	46.9	5.49	41.41	90.9	2.3	5.79	0.30
2505911	520714	4888364	Egremont	Overburden	19.8	4.27	15.53	90.9	6.0	9.14	4.87
2506555	520400	4888100	Egremont	Overburden	32.6	10.67	21.94	31.8	2.2	18.29	7.62
2507993	520414	4888273	Egremont	Overburden	32.0	10.67	21.33	27.3	4.0	22.86	12.19
2512203	521050	4888079	Egremont	Bedrock	52.7	4.27	48.46	54.6	1.5	13.72	9.45
7197381	520490	4888113	Egremont	Bedrock	50.3	14.94	35.35	54.6	3.8	30.48	15.54
2502592	520950	4888000	Egremont	Overburden	40.2	8.23	31.96	54.6	2.0	-	-
2500966	520750	4889190	Egremont	Overburden	18.6	9.1	9.45	36.4	4.0	10.06	0.91
2500967	520749	4888250	Egremont	Overburden	19.5	10.4	9.14	31.8	5.0	10.67	0.30
2503723	521454	4888095	Egremont	Overburden	17.7	3.7	14.02	54.6	2.0	18.29	14.63
2503738	521114	4887950	Egremont	Overburden	18.3	6.4	11.89	22.7	2.0	6.40	0.00
2504580	521387	4888564	Egremont	Overburden	41.1	12.8	28.35	27.3	3.0	21.34	8.53
2505093	521108	4888132	Egremont	Bedrock	43.3	7.6	35.66	45.5	1.0	12.19	4.57
2508266	520814	4888150	Egremont	Overburden	36.0	13.7	22.25	68.2	2.5	18.29	4.57
2513539	520637	4888639	Egremont	Overburden	41.5	14.9	26.52	136.4	1.5	17.37	2.44
2515719	521189	4888897	Egremont	Overburden	15.8	11.0	4.88	13.6	1.5	11.28	0.30
2516213	520771	4888392	Egremont	Overburden	25.0	9.1	15.85	36.4	12.0	15.24	6.10
7177493	520484	4888486	Egremont	Overburden	27.4	10.7	16.76	45.5	3.8	14.63	3.96
7215253	520771	4888392	Egremont	Overburden	41.1	15.2	25.91	22.7	6.0	21.34	6.10
7236129	521358	4888940	Egremont	Overburden	30.5	13.1	17.37	90.9	2.5	18.29	5.18
7278970	520621	4888436	Egremont	Overburden	35.1	3.7	31.39	45.5	60.0	12.80	9.14
7305311	520815	4887880	Egremont	Overburden	17.7	1.2	16.46	45.5	24.0	4.88	3.66
7316636	520781	4887908	Egremont	Overburden	5.1	-	-	-	-	-	-