

December 12, 2024 Project No. 2408176

VIA EMAIL:

Mr. Ron Taylor and Ms. Denise Bannerman 156 Mountain Lake Drive, Georgian Bluffs, ON, NOH 2TO, Canada Phone: 519-353-8778

Re: Engineering Support for Lot Severance Karst Assessment and Letter of Opinion for Bedrock Resource Extraction 156 Mountain Lake Drive, Georgian Bluffs, ON, NOH 2TO, Canada

Dear Mr. Taylor and Ms. Bannerman,

This letter provides the findings of the Karst Topography Assessment (or Karst Study) and letter of opinion regarding the feasibility for bedrock resource extraction to occur on the property located at 156 Mountain Lake Drive, Georgian Bluffs, ON, NOH 2TO, Canada, County of Grey, roll number 420362000506003. The location of the Site is shown on Figure 1. This letter report has been conducted in support of two proposed lot severances in the northwest portion of the property.

The subject property encompasses approximately 50.91 acres and is located approximately 7 km southeast of Wiarton, Ontario. The property is located on the northeast shore of Mountain Lake, with access achieved from the south side of Mountain Lake Drive which is situated along the northern property boundary. The Site has a single dwelling located on the northeastern portion of the property and will remain on the retained portion of land. The western-most lot being proposed for severance will be approximately 58m by 136m for a total of 1.98 acres, with the eastern lot planned for 60m by 136m with for a total of 2 acres. Both proposed lots are vacant with no municipal sanitary sewer or water services provided to it.

The subject property falls partially within the Karst Area, as outlined in Appendix "A" of the Grey County Official Plan. Due to the potential for karst features at the Site, a review of the subsurface is conducted herein to assess risks involved with Site development.

In some areas across the Grey County there is potential for the extraction of sedimentary bedrock to produce dimension stone or other aggregate products. The Site is located within the areas identified to have less than 8 meters of drift thickness as outlined in the 'Bedrock Drift Thickness' of Appendix 'E' of the County Official Plan. This letter report will assess the potential of the Site for aggregate extraction.

The scope of this review includes:

- Review of geologic and physiographic mapping,
- Review of aerial photography,
- A site visit and reconnaissance of the study area on November 20, 2024,
- The documentation of the nature of soil and bedrock in seven excavated test pits,
- Review of nearby well records using the MECP water well database.

The scope of work described herein relies on surface and subsurface exploration via excavated testholes that are 1 meter x 1 meter in diameter, down to bedrock or a maximum of 2 metres depth. No detailed subsurface exploration (such as drilling) or geophysical work was conducted as part of this Assessment.

Karst – Background

Karst topography is generally found in areas where carbonate rock, such as limestone or dolostone, are exposed at surface or lie beneath shallow surficial sediment or overburden. Karst is created through the chemical weathering (i.e., dissolution) of carbonate bedrock, subsequently forming a network of voids beneath the surface. At the surface, evidence of this type of weathering can be seen as irregular or hummocky rock outcrops, crevasses, or sinkhole patterns in the land topography.

The nature of the karst (i.e., how large, abundant, and connected the voids are) and the site setting (i.e., if the voids are part of an active surface water or groundwater system with significant dissolution) will determine the potential for interference with proposed development.

Bedrock Resource Extraction – Background

The Amabel Formation, being the bedrock encountered on the majority of the subject property, forms part of the upper bedrock sequence defining the Niagara Escarpment, and is a common component of aggregate resources in the Grey County. It is a provincially significant resource that is used for a wide variety of high quality aggregate products including stone, granular, asphalt, lime, and concrete.

The Guelph formation is another lithological unit of importance. While it is not used for stone and concrete products like the Amabel Formation, it contains a high chemical purity which is ideal when producing aggregate products including dolomitic lime, quicklime, and high quality hydrated lime. Geologically speaking, the Guelph Formation lies above the Amabel Formation (and subsequently the Eramosa Member) and only occurs proximally to the southwest portion of the property limit (as shown in Figure 2).

Geologic Setting

The Site is located within the physiographic region known as the "Bruce Peninsula" (Chapman and Putnam, 1984). The region is characterized by generally flat topography with shallow overburden, primarily as fine-textured till, scattered on grey limestone, dolostone or shale to the east and in the vicinity of Georgian Bay. In some areas, bedrock is exposed at ground surface.

Based on geologic mapping, the surface soil in the Study Area is comprised of the Osprey Loam and Muck type soils. The Osprey series is described as a light buff colored stony till with a dolomitic source origin. The overburden may contain the stony rock fragments within the soils itself but can also be found at the surface. It is a fairly well drained soil containing organic matter, black, reddish brown, to yellow loam, with varying amounts of clay and/or rock fragments depending on the location. Muck soil types are those derived from organic type deposits. These organic rich soils are commonly found near streams or other watercourses. They can vary in composition and may include dark grey-brown soils with organic rich material, wood, sticky decomposed soil, as well as till containing clay and/or sand. Bedrock, as previously mentioned, is the Guelph and Amabel Formations which are a Silurian aged dolostone that stretches from the Bruce Peninsula, down towards the Niagara Escarpment.

Site Setting and Reconnaissance

A site visit conducted by GEI Consultants Canada was conducted on November 20, 2024. The subject property is situated on the south side of Mountain Lake Road and is located approximately 7 km east of Wiarton, Ontario. The property falls within the zones of Known Karst from the publication Karst of Southern Ontario and Manitoulin Island, publication #GRS005.

Regionally, the area is gently sloping toward the west with escarpments located to the north and east towards Georgian Bay. Locally, the property is flat with a gentle slope to the south towards Mountain Lake. A small creek is located adjacent to the western property boundary. To the south towards Mountain Lake, and west towards the creek, Grey-Sauble Conservation Authority (GSCA) has mapped a wide area as Provincially Significant Wetlands. Subsequently, some overlap exists between the GSCA wetlands and areas identified as Wetland and Hazard Lands according to the County Official Plan Schedule "A". The neighboring properties are a mix of vacant land, farmland, and residential lots.

A review of the Ministry of Environment, Conservation and Parks (MECP) water well database was also completed as part of this investigation. No wells currently exist on the proposed severed lots. The dwelling located on the retained lot is serviced with a private water well (ID 7368949). This well record reported stoney, brown, clay rich soils with competent bedrock is situated 1.8 meters below ground surface (mbgs), with water intercepted at 11.6 mbgs. Another well located approximately 100m north-northeast (Well ID 2508745) also reported stony, clay rich soils down to 1.8 mbgs before reaching bedrock with water intercepted 9.75 mbgs. Based on the ground elevations and expected bedrock topography in the area, the groundwater system is expected to flow generally west to southwest in this area.

Based on the topography and surficial features observed at the time of the site visit, the results of the field assessment completed by GEI suggest that there is no evidence of hydraulically active karstic features, such as areas of subsidence or springs that would be expected to limit development. No evidence of streams, pooled water, running water, seeps, or sinks were identified.

Testhole Investigation Findings

As part of the field investigations, seven testholes (TH-01 to TH-07) were excavated on November 20, 2024. The testhole locations were chosen to assess both severed lots as whole but were also chosen to assess the bedrock underneath the locations of the proposed developments (as shown in Figure 3). It should be noted that the location of the developments are still early in the planning stages and are subject to change.

The client was responsible for arranging a contractor and completing the testholes using an excavator at the discretion of GEI staff. Each of the seven testhole locations were selected in order to provide spatial coverage of the property. The location of each of the testholes is provided in Figure 3 and the testhole logs and locations are noted in Table 1. Five of seven testholes were advanced to the bedrock and all seven testholes intercepted the water table in some capacity.

In general, the results can be summarized as follows:

- In TH01, TH02, TH05, and TH06, bedrock was encountered at depths of 0.57 mbgs, 1.32 mbgs, 1.40 mbgs, and 1.40 mbgs, respectively. The water table was intercepted in all four testholes just above the bedrock / soil contact with the shallowest water table intercepted at 0.50 mbgs in TH01. All four testholes had a similar black organic rich and damp topsoil layer containing silt and clay. A yellow to tan coloured loam followed, containing dominantly silt and clay with minor components of sand and the occasional cobble up to 30cm in diameter. Bedrock was only clearly visible in TH06 due to the slower infiltration rate, and a tan to grey dolostone was identified with no fissile textures, fissures, or major karst features evident.
- 2. IN TH03, TH04, and TH07, similar black organic rich topsoil and yellow-tan loam soils to the testholes noted above, but intercepted an additional hard, grey clay layer. TH04 intercepted bedrock, and TH03 and TH07 were halted due to reaching the 2.0 mbgs threshold.
 - (a) In TH04, bedrock was encountered at depths of 1.95 mbgs. TH-04 had similar black organic rich topsoil and yellow-tan loam soils to the testholes noted above, but intercepted a hard clay layer at 1.40 mbgs. The clay unit was grey in colour, damp, and contained some interfingering layers of the loam unit above. Water seemed to enter through the thin units of interbedded loam.
 - (b) In TH03 and TH07, bedrock was not encountered and the testholes were advanced to 2.10 mbgs and 2.20 mbgs, respectively. Soil encountered were similar to that of TH04 for both testholes. TH07 had water seeping in through the loam/clay soil interbeds similarly to TH04. TH03 had no loam interbeds within the clay unit, and was massively bedded (homogenous). Initially, TH03 showed no evidence of the water table. However, it was left open during the course of the site visit and was re-visited before leaving Site. During that time, some slumping occurred and water had seeped through the clay unit at approximately 1.85 mbgs, suggesting the soils are in fact saturated but contain a very low hydraulic conductivity.

It should be noted that while less water was encountered in the testholes that contained the hard grey clay layer (TH03, TH04, and TH07), it does not suggest that a significant karst feature may exist underneath the testhole(s). Upon visual inspection, it was apparent that the clay layer was very stiff and hard packed and would presumably have a significantly lower hydraulic conductivity compared to the loam soil unit above and would result in a much slower flow through the soils.

Bedrock Resource Potential

The Aggregate Resources Act R.S.O. 1990, c. A.8 (ARA), is a regulation that governs the management of the aggregate resources of Ontario. It controls the approval and operations through a system of licenses and permits.

According to the ARA, the purposes of the Act are to:

- 1. to provide for the management of the aggregate resources of Ontario;
- 2. to control and regulate aggregate operations on Crown and private lands;
- 3. to require the rehabilitation of land from which aggregate has been excavated; and
- 4. to minimize adverse impact on the environment in respect of aggregate operations.

In addition to the ARA, there are other regulatory bodies that may impact the placement and operations of future potential pit and quarries. The Grey Sauble Conservation Authority (GSCA) is one of many conservation authorities that regulate certain natural features to ensure environmental protections are in place to prevent developments that may adversely affect ecologic areas of interest, the quality and character of natural streams and wetlands, and the protected natural scenery in the area - as per O. Reg 151/06 under the Ontario Conservation Authorities Act (1990). Under this regulation, development may not proceed if the control of flooding, erosion, pollution, or conservation of the land will be affected as a result.

In the southern and western portion of the property, Provincially Significant Wetlands are mapped under the GSCA. Provincially Significant Wetlands provide restriction on what developments and activities are permitted on or close-by to these areas. The GSCA regulations prohibit developments where the potential exists to interfere with the hydrologic function of a wetland. These areas are further designated as Hazard Lands according to Schedule A of the GCOP, which states:

These [Hazard Lands] lands can be impacted by flooding, erosion, and/or dynamic beach hazards or have poor drainage, or any other physical condition that is severe enough to pose a risk for the occupant, property damage, or social disruption if developed. While these lands are intended to be regulated so as to avoid natural hazards, they also contribute to the natural environment within the County. Permitted uses in the Hazard Lands land use type are forestry and uses connected within the conservation of water, soil, wildlife, and other natural resources.

Furthermore, the ARA provides certain setbacks that are designed to provide distance between quarrying operations and surrounding anthropogenic and/or environmental features. As an example, the ARA does not permit excavation within 30 metres from any part of the boundary of the site that is adjacent to:

- (a) the highway,
- (b) land that is used for residential purposes at the time the license or permit is issued, or
- (c) land that is restricted to residential use by a zoning by-law in place when the license or permit is issued.

In addition to this 30-metre setback, and as part of the regulated areas noted above, Provincially Significant Wetlands require a 120-metre setback from potential extraction areas. When combining these two setbacks and comparing them with the original property footprint, an estimated 11% of land would remain as potentially extractable (as shown in Figure 4).

Other important considerations when analyzing the feasibility of a property for bedrock extraction is the thickness of overburden, the thickness of bedrock that lies above the water table, and the depth to the water table. Under the ARA regulations, a quarry with an "above the water table" license requires a 2 m separation from the "high" water table. When the extractable bedrock is situated below this 2 m separation, or is located below the water table, a "below the water table" license would be required. This type of license is not only more complicated, but there is additional risk to the natural environment if de-watering is required in order to operate.

When looking at the water table intercepted at Site, it varied between 0.50 mbgs and 1.85 mbgs. It can be inferred that the groundwater level in the area would be comparable, or shallower, to the elevation of surface water features in the area. While only an observation, the elevation of the streambed appeared to have some correlation to the depth of the water table. This would suggest the need for a "below the water table quarry".

Based on the information above, it is unlikely that the use of the subject property would be feasible to operate as a quarry (i.e., for bedrock extraction). The primary reason is related to the limited extent of extractable bedrock once the setbacks from the wetlands and neighboring residential properties are taken into consideration, in addition to requiring a "below the water table" license.

Conclusions and Recommendations

Based on the findings of this investigation, no evidence of significant karst features, or hydraulically active karst were identified across the proposed severed property. Additionally, no evidence of active karst features was encountered in any of the testholes completed as part of this investigation. Karst features are not expected to affect or compromise future proposed onsite development, nor should the proposed development negatively affect local water resources due to karst.

Based on the findings of this report, the following recommendations are made:

- That at the time of construction when bedrock is encountered, that the bedrock surface be inspected in areas where it is exposed and in the locations of the proposed footings in order to confirm the nature of the bedrock and the presence or absence of any fractures or dissolution features that may pose structural limitations or potential for mass wasting under sewage systems.
- 2. The thickness of overburden be confirmed where sewage systems are constructed to ensure that the requirements of the Ontario Building Code are met. Should excavations encounter significant fractures or karst features, a qualified person should be retained for further inspection.

With respect to the bedrock resource extraction potential of the Site, the culmination of factors listed in this report suggest that a quarry operation at this property would be difficult, and likely uneconomical. Although stone and mineral aggregate resources derived from crushed stone can be sourced from dolostone bedrock of the Amabel and Guelph formations, this property would be expected to have significant challenges and/or limitations with respect to a potential quarry operation. Due to the requirement of requiring a below the water table license, further, financial and logistical challenges associated with required dewatering and discharge are expected to reduce the potential for the bedrock extraction on this Site to be profitable.

Additionally, environmental protection/mitigation measures may pose additional limitations due to the presence of GSCA regulated Wetlands located on the south and western portions of the property. The Natural Environment features and associated setbacks result in approximately 11% of extractable land. When combined with no 'dry' bedrock above the water table, it results in a limited area/volume for bedrock extraction.

Limitations

The information in this report is intended for the sole use of Mr. Ron Taylor and Ms. Denise Bannerman. GEI Consultants Canada accepts no liability for use of this information by third parties. Any decisions made by third parties based on this report are made at the sole risk of the third parties.

The conclusions and recommendations in this report are based on publicly available geological information. The conclusions pertaining to the condition of soils and/or bedrock at the site are based on the interpretations made using geological data. GEI cannot guarantee the condition of soil and/or bedrock that may be encountered at the site. Boundaries or property limits shown in the figures are approximations.

If you have any questions, please feel free to contact me at 519-369-4082.

Sincerely,

GEI Consultants Canada Ltd.

Gerhard Kiessling, P.Geo. Technical Specialist

Figures

	Figure 1	Property Location
	Figure 2	Map of Bedrock Geology
	Figure 3	Location of Testholes
	Figure 4	Visual Estimate of Potential Setbacks
Tables		
	Table 1	Testhole Logs and Locations
Append	dices	
	Appendix A	Site Photographs
	Appendix B	Parcel Report
	Appendix C	County Official Plan Maps









TABLE 1: Testhole Logs and Locations

Hole ID	Easting	Northing	From (mbgs)	To (mbgs)	Unit	Notes/Log
TH01	496899	4950903	0.00	0.20	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.20	1.27	LOAM	Yellow to tan coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			0.50	0.57	WATER	Shallow water table intercepted. Water pooling in from loam unit, hard surface below.
			0.57	N/A	BEDROCK	Bedrock. Hard, excavator could not advance. Seemed flat and competent from touching the rock, no visual assessment possible
						due to water.
TH02	496933	4950860	0.00	0.30	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.30	0.56	CLAY	Grey clay rich layer, stony.
			0.56	1.17	LOAM	Yellow to tan coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			1.17	1.32	WATER	Shallow water table intercepted. Water pooling in from loam unit, hard surface below.
			1.32	N/A	BEDROCK	Bedrock. Hard, excavator could not advance. Seemed flat and competent from touching the rock, no visual assessment possible
						due to water.
TH03	496890	4950828	0.00	0.25	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.25	1.65	LOAM	Yellow to tan coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			1.65	2.10	CLAY	Grey clay layer, hard, stiff, damp. Unit is fairly homogenous, massively bedded. Some water slowly seeping in near the upper soil
						contact. No bedrock encountered, testhole stopped at 2.10 mbgs.
TH04	496871	4950825	0.00	0.20	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.20	1.40	LOAM	Yellow to tan coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			1.40	1.85	CLAY	Grey clay layer, hard, stiff, damp. Unit is fairly homogenous with some interfingering between loam unit above and clay layer is
						present, with some water slowly seeping in through the loam unit.
			1.85	1.95	WATER	Water slowly seeping in through the loam/clay sections.
			1.95	N/A	BEDROCK	Bedrock. Hard, excavator could not advance. Seemed flat and competent from touching the rock, no visual assessment possible
						due to water.
TH05	496830	4950856	0.00	0.30	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.30	1.20	LOAM	Yellow to tan coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			1.20	1.40	WATER	Shallow water table intercepted. Water pooling in from loam unit, hard surface below.
			1.40	N/A	BEDROCK	Bedrock. Hard, excavator could not advance. Seemed flat and competent from touching the rock, no visual assessment possible
						due to water.
TH06	496870	4950897	0.00	0.25	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.25	1.40	LOAM	Yellow to an coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			1.40	N/A	BEDROCK/WATER	Bedrock, Hard, excavator could not advance. Water seeping in at soil/bedrock interface. Unot was a tan to grey dolostone, some
						minor surface undulations. No hummucky or significant karstic features evident.
TH07	496885	4950860	0.00	0.30	TOPSOIL	Black, organic rich topsoil. Major components are silt and clay, with no sand clearly evident. Damp.
			0.30	1.40	LOAM	Yellow to fan coloured. Loam, with major components of silt and clay, minor sand. Occassional large cobble up to 30cm in
						diameter. Damp.
			1.40	2.10	CLAY	Grey clay layer, nard, stiff, damp. Unit is fairly homogenous with some interfingering between loam unit above and clay layer is
						present, with some water slowly seeping in through the soil contact area.
			2.10	2.20	WATER	Water slowly seeping in through the loam unit sections. Bedrock not encountered, excavation stopped.

Notes:

1) mbgs = meters below ground surface

2) Co-ordinate system UTM NAD 83 17T, accuracy of +/- 4 meters.



Picture 1: TH-01 - Overhead view.



Picture 2: TH-01 – Close up view of testhole bottom.



Picture 3: TH-01 – Side view showing soil profile.



Picture 4: TH-02- Overhead view.



Picture 4: TH-02 – Close up view of testhole bottom.



Picture 6: TH-02 –Side view showing soil profile.



Picture 7: TH-03 – Overhead view.



Picture 8: TH-03 - Close up view of testhole bottom.



Picture 9: TH-03 – Side view showing soil profile.



Picture 10: TH-04 – Overhead view.



Picture 11: TH-04 - Close up view of testhole bottom.



Picture 12: TH-04 – Side view showing soil profile.



Picture 13: TH-05 – Overhead view.



Picture 14: TH-05 - Close up view of testhole bottom.



Picture 15: TH-05 – Side view showing soil profile.



Picture 16: TH-06 – Overhead view.



Picture 17: TH-06 - Close up view of testhole bottom.



Picture 18: TH-06 – Side view showing soil profile.



Picture 19: TH-07 – Overhead view.



Picture 20: TH-07 - Close up view of testhole bottom.



Picture 21: TH-07 – Side view showing soil profile.



Picture 22: Looking south from the north property boundary.



Picture 23: Showing the creek to the west of the property.



Data Sources: Grey County, Municipal Property Assessment Corporation, Teranet, King's Printer

Report Generated 12/09/2024 16:18:54

Roll Number	Address	Assessed Value	Acreage	
420362000506003	156 Mountain Lake Drive	\$667000	50.91	
		Notice: Assessed valu	e may not reflect current market value MPAC	
NEC Designation	Legal Description	Property Use		
Outside the Niagara Escarpment Plan Area	KEPPEL CON 18 PT LOT 20 RP;16R11429 PARTS 9 TO 15	Land owned by with a non-farm be	Land owned by a non-farmer improved with a non-farm residence with a portion being farmed	

Zoning*

Rural, Environmental Protection

* Zoning may not be accurate. Confirm with local municipal zoning bylaw.



This is a user generated static output. The information provided in this report may be inaccurate, out of date, or purposefully modified.









