

July 26, 2022
Our File: 222042

Via Email: gcooper@cfcrozier.ca

Don McCullough
53 Georgian Meadows Drive
Collingwood, ON L9Y 5H4

C/o George Cooper – Crozier Consulting Engineers

Re: Slope Review
Proposed Severances
343019 Side Road 23
Municipality of Meaford

Dear Mr. McCullough,

GM BluePlan Engineering previously conducted a site investigation, with a letter report providing recommendations with regards to the soil conditions for septic and infiltration features and the roadway construction and general comments on the foundation construction for the proposed residential development.

It is understood that the peer reviewer for the Municipality of Meaford has identified that a geotechnical review of the slope that exists along the border of the property along Bayshore Road should be conducted. This review of the slope was not included in the original scope of work for the site investigation performed.

This follow-up letter report provides a review of the current slope conditions, comments on some preliminary modelling, and comments with respect to the proposed development.

Site Setting

The site is located along Bayshore Road and will be accessed from Sideroad 23. An existing easement from Sideroad 23 exists and runs along the east side of 343011 Sideroad 23. Bayshore Road is considered to run in a north-south direction. Currently, the site is undeveloped and features a rolling terrain within the development area. Generally, the site slopes from east to west, from the open fields upgradient down towards Bayshore Road. The west side of the property is bordered with a treed area between the proposed development and Bayshore Road. Within the treed area there is a "bluff" and the grade changes rapidly towards Bayshore Road. There are four (4) existing drainage features that drain surface water from the upgradient lands to the east, through the site and west to the ditch that runs along the east side of Bayshore Road. Flows along the ditch are directed to road crossing culverts.

The "bluff" area and the existing drainage features are identified as Hazard Lands and are reviewed by GSCA for under Ontario Regulation 151/06 – Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.

In general, the subsurface consists of a surficial layer of topsoil and organic material, underlain by clayey silt till with some gravel. Some of the testholes intercepted a hard grey clay layer. From nearby well records, the overburden thickness is 6 m for the table lands and closer to 2 m below the bluff. At these depths, a clay and shale formation is encountered.

Slope Review

The initial site investigation plan focused on the subsurface stratigraphy of the upper table lands. A subsequent site visit to review the current condition of the slope was conducted on June 21, 2022. The slope was reviewed along Bayshore Road and the ditch. The slope is well treed with mainly mature trees and both deciduous and coniferous growth. At the time of the site visit, no evidence of sloughing on the slope was apparent.

The existing drainage channels that extend down the slope are covered with rip rap within the channels. It was noted that some washouts of the smaller rip rap were evident in the Bayshore Road ditch. The drainage features are intermittent, with Drainage Feature #2 exhibiting some flow at the time of the site visit.

From the contouring on the Crozier plan, the top of the slope is near elevation 208.00m on the north end of the site and is closer to elevation 204.00m towards the south end. The bottom of the slope is considered to be along the Bayshore Road ditch and is between elevation 191.50m to 191.00m. The overall height of the slope is then approximately 17m to 11.5m. Towards the south end lots, 4 and 5, the upper table lands slope towards Drainage Feature #2 to form a partial valley. The upper table lands are tilted at an inclination of 3° to 5° and the slope along the "bluff" is inclined at approximately 27° to 25° or approximately 2 to 1.

The subsurface information gathered from the previous site investigation in combination with the topographical survey information provided from Crozier was used to conduct preliminary slope stability modelling. The cross-section locations are identified on Figure No. 1 and the cross-sections are shown on Figure No. 2.

Slope Model

Two cross-sections were established within the development area in order to perform some modeling of the slope. The two cross-sections of the slope from Lot 2 and 5 were analyzed with a computer program based on the limiting forces equilibrium (Janbu Simplified Method). The following soil parameters for long-term slope conditions were utilized:

Clayey Silt Till:	Unit Weight:	19 kN/m ³
	Friction Angle:	$\phi' = 28^\circ$
	Cohesion:	$c = 0$
Clay and Shale:	Unit Weight:	20 kN/m ³
	Friction Angle:	$\phi' = 28^\circ$
	Cohesion:	$c = 0$

The groundwater table was modelled at the interface of the clayey silt till and the underlying clay and shale. Through the various iterations of the modelling, it was determined that if slippage were to occur, it would likely be near the surface and towards the bottom of the slope. The lowest Factor of Safety produced in analysis was 1.04 and 1.11 at Lot 2 and Lot 5 respectively. Given the vegetative growth on the slope, the slope is considered to be stable. For the larger deep-seated failures of the slope, the initial modelling identified Factors of Safety in the order of 1.4 to 1.5 which are considered acceptable for long-term development.

Proposed Development

The proposed development features five separate lots with individual septic systems located to the rear of the lots. The septic systems are proposed outside of the theoretical 3 to 1 influence zone that is drawn from the toe of the slope. Typically, the Grey Sauble conservation Authority doesn't require detailed slope stability analysis if development is limited to outside of this zone. The proposed building envelopes as indicated on the Crozier plan would fall outside of a 5 to 1 influence zone.

Based on the interpreted soil conditions, slope geometry, initial modelling results and the proposed setbacks, it is our opinion that the proposed development will not impact the long-term stability of the slope. For long term protection and conservative development practices, within the 3 to 1 influence zone, only minimal grading should occur, and no landscaping or placement of fill should proceed within 10m of the top of the slope. The slope is to remain forested to minimize erosion.

Considerations

The proposed minimum setbacks for the lot development should be clearly indicated on the final design drawings for the development and on the subsequent individual lot grading plans for the residences. Should dwellings or septic systems be proposed to closer to the slope, a detailed review and assessment of the individual proposals will be required.

Based on the existing conditions of the drainage features, monitoring of the performance is recommended post construction. This is due to the evidence of some washouts of the existing rip rap in the channels. It is recommended to include the drainage features as part of access-drainage easements in order that access to the drainage features can be maintained for ongoing monitoring and maintenance by the landowners or Municipality if required.

It must be noted that ground movement along the edge of the slope due to erosion, long term soil creep or shallow surficial slippage is likely to occur over the long-term as part of the naturally evolving slope.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED

Per:

A handwritten signature in blue ink, appearing to read 'Ethan Webb'.

Ethan C.J. Webb, P.Eng.
EW/md

Encl.

cc: File No. 222042

Reviewed by:

A handwritten signature in blue ink, appearing to read 'Wm. E. Dubeau'.

Wm. E. Dubeau, P.Eng.

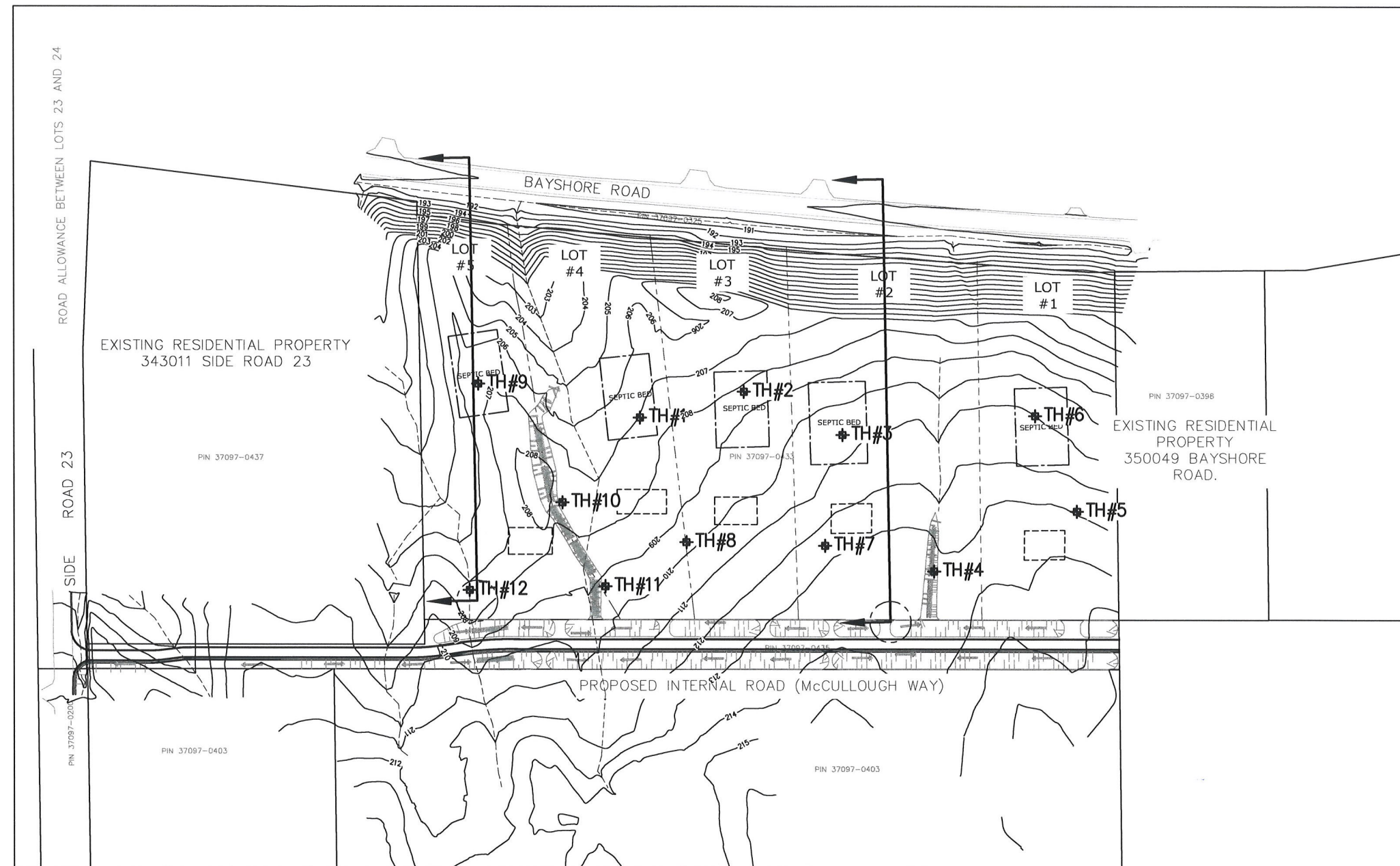


222042
SOILS INVESTIGATION
PROPOSED SEVERANCE
SIDEROAD 23, MEAFORD



LEGEND

- PROPOSED TESTHOLE
- CONCEPTUAL LOCATION OF RESIDENCE
- CONCEPTUAL LOCATION OF SEPTIC BED



SCALE = 1:2000
FEBRUARY 2022

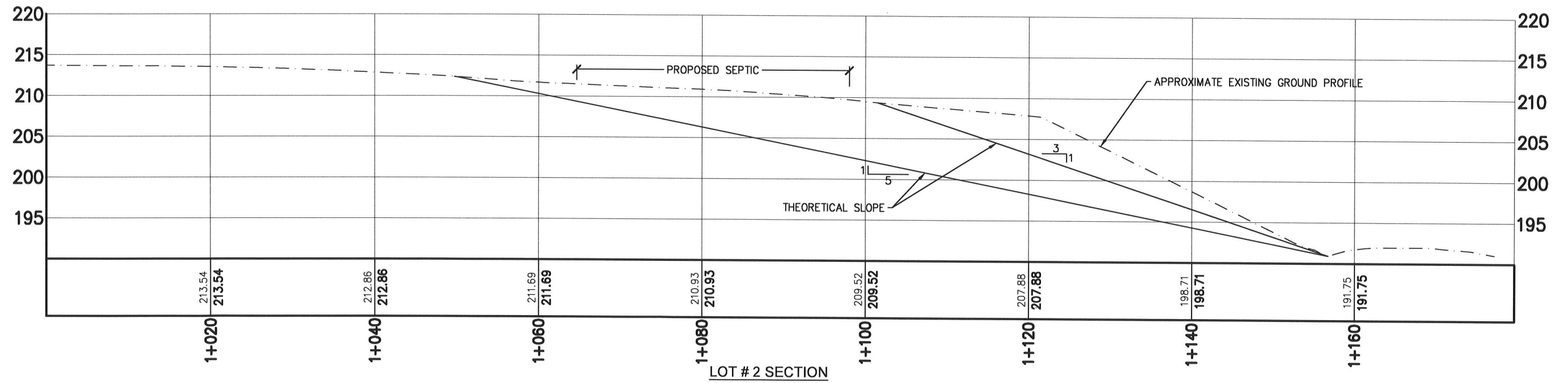
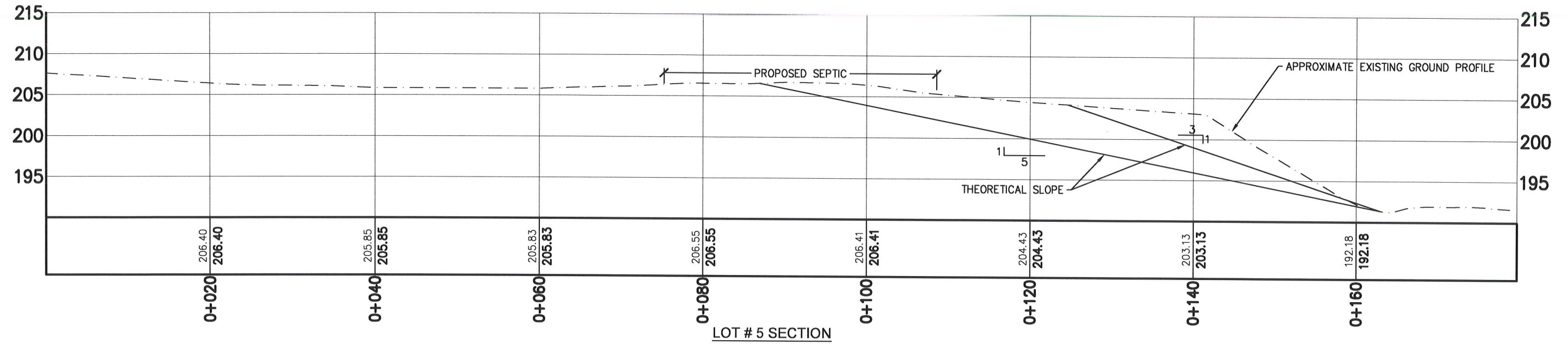
TESTHOLE LOCATIONS

Mr. Don McCullough
Municipality of Meaford

Figure No. 1



FILE: W:\OwenSound\22-2022\222042 Soils Investigation - Proposed Severance - Sideroad 23, Meaford\Drawings\222042b.dwg LAYOUT: 11X17 (2)
LAST SAVED BY: Tjahmke, 7/15/2022 11:09:50 AM PLOTTED BY: Tyler Jahnke - GM BluePlan 7/15/2022 11:10:41 AM



222042
SOILS INVESTIGATION
PROPOSED SEVERANCE
SIDEROAD 23, MEAFORD

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Figure No. 2

SCALE = 1:500
FEBRUARY 2022
SECTIONS

