



April 2, 2024

Larry MacDonell
Hillstreet Developments Ltd.
2015 Altona Road
Pickering, ON
L1V 2B9

Via email: lmacdonell@rogers.com

**Re: Erosion Hazard Assessment
County Road 65, Osaca, Ontario
D.M. Wills Associates Project No. 22-11056**

PARTNERS IN
ENGINEERING, PLANNING &
ENVIRONMENTAL SERVICES

D.M. Wills Associates Limited (Wills) was retained by Hillstreet Developments Ltd. c/o Larry MacDonell (Client) to complete an Erosion Hazard Assessment (Assessment) at the property located on Part Lot 27, Concession 5, County Road 65, in the Village of Osaca, Ontario (Subject Property). The Assessment was requested by the Ganaraska Region Conservation Authority (GRCA) to establish hazard limits associated with valley slopes (Subject Slopes) located on the Subject Property. The Subject Property and Subject Slopes area are shown on **Figure 1**.

The purpose of the Assessment was to establish the erosion hazard setbacks applicable to the Client's proposed development on the Subject Property. The proposed development is shown on the October 15, 2023, Draft Plan prepared by D.G. Biddle & Associates Limited, included in **Appendix A**.

Wills' Assessment was conducted on the basis of Ontario Ministry of Natural Resources (MNRF) Technical Guide for River & Stream Systems: Erosion Hazard Limit (2002) (Technical Guideline), and included a site reconnaissance, topographic survey, and erosion hazard analysis.

The Subject Slopes are part of a confined valley system, with north and south facing valley walls that are less than 15 metres from an ephemeral stream. The east flowing stream is fed by a wetland in the northwest portion of the Subject Property, is conveyed through a culvert beneath County Road 65, and discharges into a wetland system to the east. At the time of Wills' Assessment, the stream was observed to be dry with the exception of an isolated area of surface water proximal to the culvert inlet west of County Road 65.



1.0 Slope Inspection

An inspection of the Subject Slopes was conducted on December 5 and December 12, 2023, on the basis of the Technical Guideline Table 4.1 – Slope Inspection Record (Table 4.1), included in **Appendix B**. The inspection included:

- A visual inspection of the bankfull characteristics of the watercourse, the top of slope, toe of slope, and slope face areas.
- A survey of the Subject Slopes to inform the erosion hazard setbacks.

No major disturbances in the form of slumping, tension cracking, or erosion were observed along the Subject Slopes at the time of the investigation. Additionally, no signs of active erosion associated with the ephemeral watercourse were observed. Observations made during the inspection and through a review of historical aerial imagery indicate that the Subject Slopes and valley floor are well vegetated with mature coniferous tree growth. Vegetation typical of wetland areas was observed west and east of the Subject Slopes and within the valley lands.

Due to the dense vegetation, the bankfull characteristics of the watercourse could not be determined. As a conservative measure, the bankfull width was taken as the distance between the north and south toe of slopes. The bankfull width ranged from to 4.5 m in the central portion of the valley system to 28 m in proximity to County Road 65.

Hand auger holes were advanced along the top of slopes, slope faces, and toe of slope areas. Hand auger holes were advanced to a maximum depth of 1.2 metres below ground (mbg) at the top of slopes, and 0.6 mbg at the toe of slopes. Shallow soil composition was described as sand with trace amounts of silt along the top of slopes, and sand with varying amounts of silt and clay at the toe of slopes. Groundwater was encountered at 0.4 mbg in proximity to County Road 65 within the wetland area.

The Subject Slopes were evaluated using Table 4.2 – Slope Stability Rating Chart (Table 4.2) in the Technical Guideline. Wills determined a slope instability rating of 16. The completed Table 4.2 is included in **Appendix B**. A photographic log showing the Subject Slopes and surrounding areas is included in **Appendix C**.

2.0 Erosion Hazard Analysis

Topographic contours for the Subject Slopes are shown on **Figure 2**, as determined through Wills' survey.

Eight slope profiles (four per slope) were assessed, and the respective section lines are shown on **Figure 2**. The following is provided with respect to the slope profiles:

- The Subject Slopes are considered stable and maintain slope gradients that range from 5H:1V (Horizontal: Vertical) to 18H:1V.
 - Stable slopes are considered to have gradients equal to or shallower than 3H:1V.

In view of the stable slope conditions and observations made during Wills' Assessment, the following is provided with respect to the applicable erosion hazard setbacks.

- A conservative Toe Erosion Allowance of 15 m was applied based on the Technical Guideline.
 - If using Table 3 of the Technical Guideline, the Toe Erosion allowance could be reduced to 5 m based on a bankfull width between 5-30 m, no evidence of active erosion, and loose granular soils (sand).
- A 3H:1V stable slope allowance was applied from the Toe Erosion Allowance (projected into the shallower existing slope profiles).
 - In view of the existing stable slopes (5H:1V to 18H:1V), the stable slope allowance daylights along the existing slope faces and does not project beyond the physical top of slope.
- An Erosion Access Allowance of 6 m was applied beyond the stable slope allowance.
- In view of the stable slope conditions, all erosion hazard limits are contained within the gently sloping valley walls.

Figure 3 shows the erosion hazard limits, including the physical top of slope, toe of slope, and applicable hazard limits.

It should be noted that both the physical top of slopes and the erosion hazard limits are contained within the proposed 30 m wetland setbacks determined through Wills' Environmental Impact Study (EIS), provided under separate cover. The wetland setbacks are shown on **Figure 3**.

3.0 Conclusions and Recommendations

Based on Wills' Assessment, the following conclusion and recommendations are provided:

- Wills Assessment considered the north and south slopes (Subject Slopes) of the confined valley system on the Subject Property.
- The valley system is heavily vegetated and contains an ephemeral stream that was dry during Wills' site investigations.
- The Subject Slopes are considered stable and maintain gradients between 5H:1V to 18H:1V.
- No major disturbances in the form of slumping, tension cracking, or erosion were observed, including any sign of active erosion associated with the ephemeral watercourse.
- Erosion hazard limits including a 15 m Toe Erosion Allowance, a stable 3H:1V slope allowance (daylighting on the Subject Slope faces), and a 6 m erosion access allowance were applied.
- Wills considers the erosion hazard limits conservative in view of the existing stable slope conditions, heavily vegetated valley floor and walls, and ephemeral nature of the watercourse.
- The applied erosion hazard limits, including the physical top of slopes, are contained within the 30 m wetland buffer conveyed in Wills' EIS report.
- The proposed development is required to stay outside of the identified erosion hazard limits identified in this report.
- It is Wills' professional opinion that this Erosion Hazard Assessment supports the Client's application for development under Ontario Regulation 159/06.



11056, Osaca Hillstreet Slope Assessment
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We trust that the information contained in and attached to this report meets your needs at this time. The following Statement of Limitations should be read carefully and is an integral part of this report. Do not hesitate to contact the undersigned if you have any questions or concerns.

Respectfully Submitted,

Prepared By:

A handwritten signature in blue ink that reads 'L. Tuters'.

Lynsey Tuters, B.A., C. Tech.
Environmental Project Technologist

Reviewed By:

A handwritten signature in blue ink that reads 'I. Ames'.

Ian Ames, M.Sc., P.Geo.
Environmental Monitoring and Management Team Lead

LT/IA/ck

Enclosure: Figures
 Appendices

Statement of Limitations

This report is intended solely for Hillstreet Developments Ltd. c/o Larry MacDonell (Client) in assessing erosion hazards on the property located on Part Lot 27, Concession 5, County Road 65, in the Village of Osaca, Ontario, and is prohibited for use by others without D.M. Wills Associates Limited's (Wills) prior written consent. This report is considered Wills' professional work product and shall remain the sole property of Wills. Any unauthorized reuse, redistribution of or reliance on this report shall be at the Client and recipient's sole risk, without liability to Wills. The Client shall defend, indemnify and hold Wills harmless from any liability arising from or related to the Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include supporting drawings and appendices.

The recommendations made in this report are based on Wills' present understanding of the project, the current and proposed site use, ground and subsurface conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with the level of care and skill ordinarily exercised by members of geoscience or engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the sole responsibility of such third parties.

The recommendations and comments made in this report are based on Wills' investigations and resulting understanding of the project, as defined at the time of the assignment. Wills should be retained to review our recommendations when the final or any modified design drawings and specifications are complete. Without this review, Wills shall not be liable for any misunderstanding of our recommendations or their application and adaptation.

Soil, bedrock, and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations. Should any conditions at the Subject Property be encountered which differ from those found at the test locations, Wills must be notified immediately in order to permit a reassessment of our recommendations. If different conditions are identified, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by Wills is completed.

Figures





Legend	
	Subject Property
	Subject Slope Area

Subject Property Plan
 Erosion Hazard Assessment
 County Road 65
 Osaca, Ontario



Source(s):
 - Ontario Ministry of Natural Resources and Forestry, Make A Topographic Map



D.M. Wills Associates Limited
 150 Jameson Drive
 Peterborough, Ontario
 K9J 0B9

 P. 705.742.2297
 F. 705.748.9944
 E. wills@dmwills.com

Drawn by:	L. TUTERS
Checked:	I. AMES
Project No.:	22-11056

Scale:	1:6 000 on 8.5"x11" (US Letter)
Date:	December 15, 2023
Drawing file No.:	Figure 1



Legend

- Limit of Topographic Survey
- 160.0— Contour Line
- Section Line
- 18:1 Existing Slope Gradient

**Subject Slope
Topographic Map**

Erosion Hazard Assessment
County Road 65
Osaca, Ontario



D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
Canada K9J 0B9

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DRAWN BY M.G.
CHECKED L.T.
ENGINEER —
PROJECT No. 11056

SCALE Horz. 1:1250 Vert. —
PLOT DATE Dec 21, 2023
DWG. FILE Figure 2

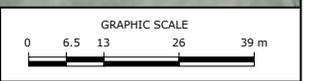


Legend	
	Toe of Slope
	Physical Top of Slope
	15 m Toe Erosion Allowance (TEA)
	3:1 Slope Projection from TEA
	6 m Erosion Access Allowance
	Wetland Buffer (30 m)
	Slope
	Contour Line

Erosion Hazard Limits
Erosion Hazard Assessment
County Road 65
Osaca, Ontario



Source(s):
- Ontario Ministry of Natural Resources and Forestry, Make A Topographic Map

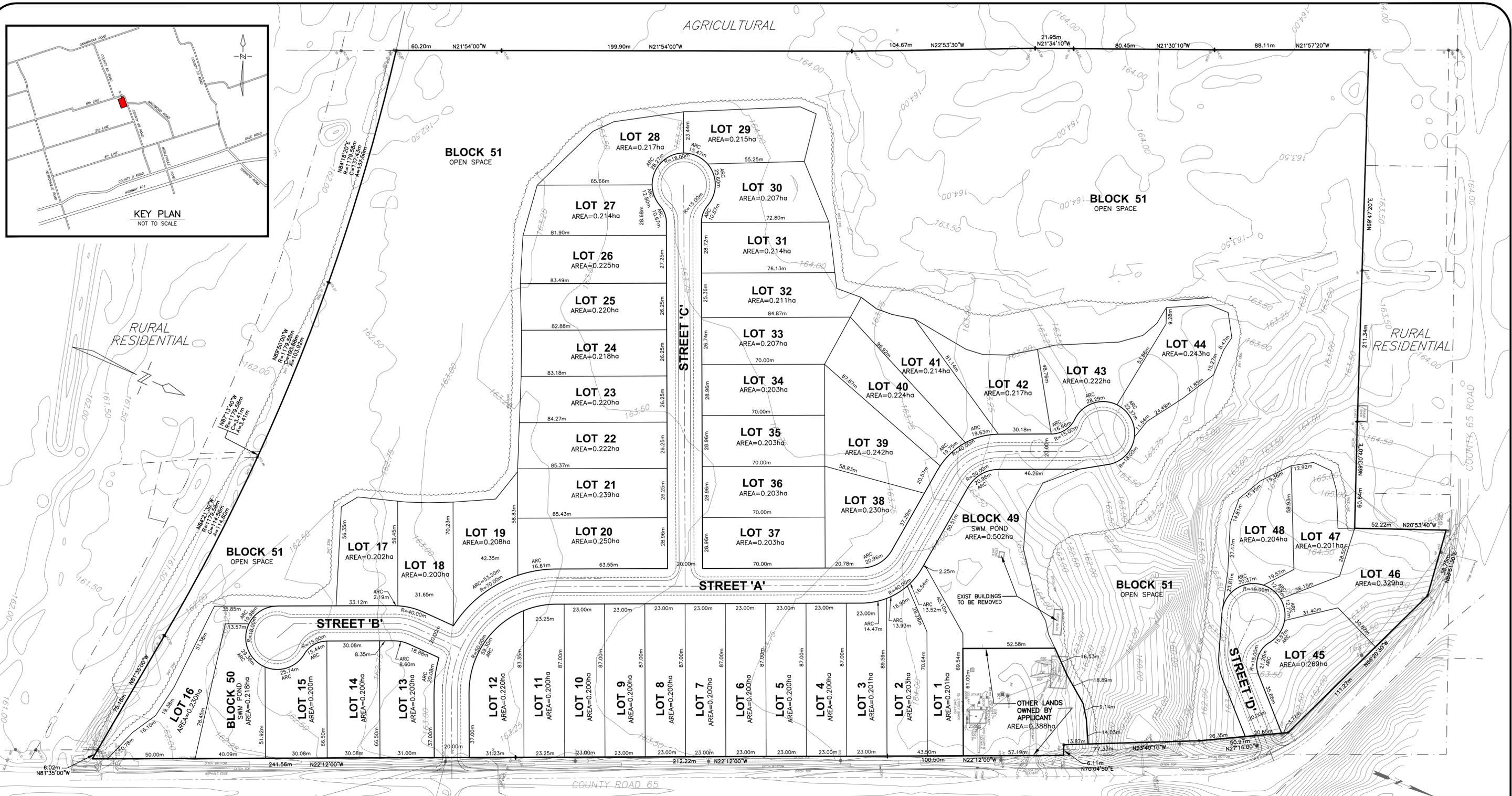


D.M. Wills Associates Limited 150 Jameson Drive Peterborough, Ontario K9J 0B9 P. 705.742.2297 F. 705.748.9944 E. wills@dmwills.com	Drawn by: L. TUTERS	Scale: 1:1 300 on 8.5"x11" (US Letter)
	Checked by: I. AMES	Date: January 08, 2023
Project No.: 11056	Drawing file No.: Figure 3	

Appendix A

Draft Plan





LAND USE SCHEDULE				
PROPOSED USE	LOT/BLK #	# OF LOTS/BLKS	# OF UNITS	AREA (ha)
LOW DENSITY RESIDENTIAL SINGLE DETACHED	LOTS 1 - 48	48	48	10.349
NON RESIDENTIAL				
SWM PONDS	BLOCK 49.50 BLOCK 51	2		0.720
OPEN SPACE		1		11.520
ROADS	20.0m ROW			2.034
TOTALS		51	48	24.623

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT				
a) AS SHOWN ON THE DRAFT PLAN	g) AS SHOWN ON THE DRAFT PLAN			
b) AS SHOWN ON THE DRAFT PLAN	h) WELL AND SEPTIC			
c) AS SHOWN ON THE DRAFT PLAN	i) SAND AND SANDY SILT			
d) SEE LAND USE SCHEDULE	j) AS SHOWN ON THE DRAFT PLAN			
e) AS SHOWN ON THE DRAFT PLAN	k) PRIVATE WELL			
f) AS SHOWN ON THE DRAFT PLAN	l) AS SHOWN ON THE DRAFT PLAN			
f.1) NOT APPLICABLE				
No.	REVISION	DATE	BY	APPROVED

OWNER'S AUTHORIZATION
I/WE LAND OWNER BEING THE REGISTERED OWNER OF THE SUBJECT LANDS HEREBY AUTHORIZE D.G.BIDDLE AND ASSOC. LTD. TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL
SIGNED _____ TITLE _____ DATE _____

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARY OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN
ONTARIO LAND SURVEYOR ONTARIO LAND SURVEYORS
SIGNED _____ O.L.S. DATE _____

PRELIMINARY
DRAFT PLAN
PART OF LOT 27, CONCESSION 5
FORMERLY IN THE TOWNSHIP OF HOPE
NOW IN THE
MUNICIPALITY OF PORT HOPE
COUNTY OF NORTHUMBERLAND

SCALE: 1:1000

DRAWN BY: B.B.

DESIGN BY: M.F.

CHECKED BY: M.F.

PLOT DATE: 15/10/2023

122049

DP-1

X:\STAFF\JOB FILES\122049\122049 - 8500 - FAX (905)576-9730

Appendix B

Table 4.1 & Table 4.2



TABLE 4.1 - Slope Inspection Record

*APPLICABLE TO BOTH NORTH & SOUTH SLOPES

1. FILE NAME / NO. 11056

INSPECTION DATE (DDMMYY): Dec 5, 2023

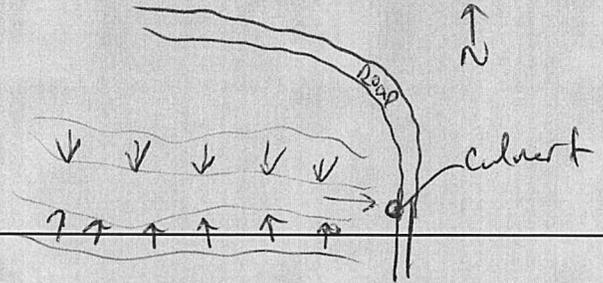
WEATHER (circle):

- sunny • partly cloudy **(cloudy)**
 - (calm)** • breeze • windy
 - clear • fog • rain • snow
 - cold **(cool)** • warm • hot
- estimated air temperature:
~5°C

INSPECTED BY (name): Chris Ostic

2. SITE LOCATION (describe main roads, features)

SKETCH



3. WATERSHED

4. PROPERTY OWNERSHIP (name, address, phone):

LEGAL DESCRIPTION

- Lot
- Concession
- Township
- County

CURRENT LAND USE (circle and describe)

- vacant - field, bush, woods, forest, wilderness, tundra, *- Field to the north, field/rural residential property to south*
- passive - recreational parks, golf courses, non-habitable structures, buried utilities, swimming pools,
- active - habitable structures, residential, commercial, industrial, warehousing and storage,
- infra-structure or public use - stadiums, hospitals, schools, bridges, high voltage power lines, waste management sites,

5. SLOPE DATA

HEIGHT **(3-6 m)** • 6 - 10 m • 10 - 15 m • 15 - 20 m
• 20 - 25 m • 25 - 30 m • > 30 m

estimated height (m): 2-3 m

INCLINATION AND SHAPE

- 4:1 or flatter
25 % 14°
- (up to 3:1
33 % 18°)**
- up to 2:1
50 % 26°
- up to 1:1
100 % 45°
- up to :1
200 % 63°
- steeper than :1
> 63°

6. SLOPE DRAINAGE (describe)

TOP

FACE

BOTTOM

no specific gullies or erosion features, lands to the north & south of subject slope(s) drain tend to drain towards the slope(s)
collected water stagnant, or slowly flowing East (slow trickle of water moving East at the culvert)

7. SLOPE SOIL STRATIGRAPHY (describe, positions, thicknesses, types)

TOP } 15-20cm sandy silt topsoil followed by ~100cm of brown sand. Advanced to
FACE } max depth of
BOTTOM = Brown sand/muck, varying levels of saturation

8. WATER COURSE FEATURES (circle and describe)

SWALE, CHANNEL

GULLY

STREAM, CREEK, RIVER } collected water slowly flowing Eastbound. Dries up completely to the west

POND, BAY, LAKE

SPRINGS

MARSHY GROUND } Region to the East most marshy, dries up as you head west and becomes a narrow stream

9. VEGETATION COVER (grasses, weeds, shrubs, saplings, trees)

TOP - trees + tall grasses

FACE - heavily treed

BOTTOM - reeds/wetland vegetation to the East, transitioning to leaf litter/damaged trees as you head west.

10. STRUCTURES (buildings, walls, fences, sewers, roads, stairs, decks, towers,)

TOP } N/A
FACE }

BOTTOM - culvert at east end with rip rap

11. EROSION FEATURES (scour, undercutting, bare areas, piping, rills, gully)

TOP } not observed
FACE }

BOTTOM - ~~no~~ scour/undercutting ~~observed~~ along North and South slope faces as evidence of bankfull width during high precipitation events

12. SLOPE SLIDE FEATURES (tension cracks, scarps, slumps, bulges, grabens, ridges, bent trees)

TOP - none noted

FACE } downed/bent trees
BOTTOM }

13. PLAN SKETCH OF SLOPE

14. PROFILE SKETCH OF SLOPE

TABLE 4.2 - SLOPE STABILITY RATING CHART

*APPLICABLE FOR NORTH-SOUTH FACES

Site Location: *OSHEA*
 Property Owner:
 Inspected By: *CO*

File No. *11056*
 Inspection Date: *Dec 5/23*
 Weather: *cloudy, 5°C*

1. SLOPE INCLINATION		
degrees	horiz. : vert.	
a) 18 or less	3 : 1 or flatter	0
b) 18 - 26	2 : 1 to more than 3 : 1	6
c) more than 26	steeper than 2 : 1	16
2. SOIL STRATIGRAPHY		
a) Shale, Limestone, Granite (Bedrock)		0
b) Sand, Gravel		6
c) Glacial Till		9
d) Clay, Silt		12
e) Fill		16
f) Leda Clay		24
3. SEEPAGE FROM SLOPE FACE		
a) None or Near bottom only		0
b) Near mid-slope only		6
c) Near crest only or, From several levels		12
4. SLOPE HEIGHT		
a) 2 m or less		0
b) 2.1 to 5 m		2
c) 5.1 to 10 m		4
d) more than 10 m		8
5. VEGETATION COVER ON SLOPE FACE		
a) Well vegetated; heavy shrubs or forested with mature trees		0
b) Light vegetation; Mostly grass, weeds, occasional trees, shrubs		4
c) No vegetation, bare		8
6. TABLE LAND DRAINAGE		
a) Table land flat, no apparent drainage over slope		0
b) Minor drainage over slope, no active erosion		2
c) Drainage over slope, active erosion, gullies		4
7. PROXIMITY OF WATERCOURSE TO SLOPE TOE		
a) 15 metres or more from slope toe		0
b) Less than 15 metres from slope toe		6
8. PREVIOUS LANDSLIDE ACTIVITY		
a) No		0
b) Yes		6
SLOPE INSTABILITY RATING VALUES INVESTIGATION RATING SUMMARY		16 TOTAL

Appendix C

Photolog



Site Reconnaissance Photographs

Client Name: Larry MacDonell

Site Location: Part Lot 27, Concession 5,
County Road 65, Village of Osaca, Ontario

Photograph No.: 1

Date:

December 05, 2023

Direction:

Southeast

Description:

Top of North Slope –
dense forest along
slope.



Photograph No.: 2

Date:

December 05, 2023

Direction:

South

Description:

North Slope top of
slope towards
bottom of slope and
stream.



Site Reconnaissance Photographs

Photograph No.: 3
Date: December 05, 2023
Direction: North
Description: Bottom of North Slope on east boundary of property. Mature trees visible. No signs of erosion.



Photograph No.: 4
Date: December 05, 2023
Direction: North
Description: Bottom of North Slope to top of slope. East side of slope proximal to County Road 65.



Site Reconnaissance Photographs

Photograph No.: 5
Date: December 05, 2023
Direction: North
Description: Bottom of North Slope, facing top of slope.



Photograph No.: 6
Date: December 05, 2023
Direction: Northwest
Description: Bottom of North Slope proximal to wetland area on Subject Property. Mature trees visible. Stream is dry. Slope has flattened in this area.



Site Reconnaissance Photographs

Photograph No.: 7
Date: December 05, 2023
Direction: Northwest
Description: Southern Slope profile. Stream is dry, slope diminishes as it approaches the wetland west of the stream.



Photograph No.: 8
Date: December 05, 2023
Direction: Southeast
Description: Top of South Slope, highly vegetated area on the left side of photograph is the location of the Subject Slope.



Site Reconnaissance Photographs

Photograph No.: 9
Date: December 05, 2023
Direction: East
Description: Top of South Slope proximal to County Road 65. Subject Slope flattens in this area towards an existing barn.



Photograph No.: 10
Date: December 05, 2023
Direction: South
Description: Bottom of South Slope in proximity to County Road 65 looking towards top of slope. Slope is heavily vegetated.



Site Reconnaissance Photographs

Photograph No.: 11
Date: December 12, 2023
Direction: East
Description: Photo of the stream area that contained surface water at the time of the inspection.



Photograph No.: 12
Date: December 05, 2023
Direction: East
Description: Photo of the inlet culvert on the Subject Property.

