Appendix I
Effects of the Environment on the Project

Appendix I.1
Terrain Stability Report

Stantec Consulting Ltd.
500 - 4730 Kingsway, Burnaby BC V5H 0C6

September 28, 2014
File: 123220020

Attention: Mike Lambert
Pacific NorthWest LNG Limited Partnership
Oceanic Plaza, Suite 1900 – 1066 West Hastings Street
Vancouver, BC V6E 3X1

Dear Mr. Lambert,

Reference: Terrain Stability Mapping for Lelu Island, Smith Island and Port Edward Area

1 INTRODUCTION

Pacific NorthWest LNG Limited Partnership (PNW LNG) is proposing to construct and operate a liquefied natural gas (LNG) facility within the District of Port Edward, British Columbia (BC). The Government of Canada has submitted an request for Outstanding Information for terrain stability mapping for Lelu Island and areas on the mainland and Smith Island with high relief ridges (Effects of the Environment on the Project – IR #1). The request for Outstanding Information states:

- Provide the results of terrain mapping at an appropriate scale (i.e., at least 1:20,000) and the derivation of a terrain stability map at an approximate scale (e.g., scale of 1:20,000) based on the results of terrain/surficial map efforts.

This report includes the results of detailed terrain stability mapping and identifies areas of unstable and potentially unstable terrain for the area of interest.

2 METHODS

Terrain stability mapping was completed according to provincial standards in *Mapping and Assessing Terrain Stability Guidebook in British Columbia* (BC Forest Service and BC Environment 1999) and the *Terrain Classification System for British Columbia (Version 2)* (Howes and Kenk 1997). Mapping was completed using recent stereo imagery and 3D mapping techniques.

A five-class terrain stability classification system was developed for the Project to reflect the local terrain conditions based on existing field data and project experience. The terrain stability classification descriptions and definitions were developed from existing terrain mapping, image interpretation, and field data collected during the soil acidification field program conducted for the Project (Stantec 2014) and are outlined in Table 1.

Reference: Terrain Stability Mapping for Lelu Island, Smith Island and Port Edward Area

Table 1: Terrain Stability Classification Definitions and Descriptions

Terrain Stability Class	Definition	Description for Study Area
I	No stability concerns exist.	Organic surficial materials and level glaciomarine sediments, very poorly to poorly drained, slope gradients range from 0 to 26%.
II	Low likelihood of landslides following timber harvesting or road construction.	Sloping wetlands and bog forests, sloping glaciomarine, organic and colluvial forested slopes. Poorly to moderately well-drained. Slope gradients range from 0 to 49%.
III	Minor stability problems can develop after timber harvesting and/or road construction. Vegetation clearing should not significantly reduce terrain stability and there is a low likelihood of landslide initiation following timber harvesting.	Moderately sloping to moderately steep terrain with organic, colluvial and glaciomarine surficial materials. Slope gradients range from 26% - 70%.
IV	Expected to contain areas with a moderate likelihood of landslide initiation following vegetation clearing or road construction. Shows evidence of historic instability and is potentially unstable.	Moderately steep terrain with colluvial and glaciomarine surficial materials. Slope gradients range from 15% to over 70%. Historic instability observed in the form of gullying and vegetated landslide scars.
V	Expected to contain areas with a high likelihood of landslide initiation. Shows evidence of active and/or recent instability and is considered unstable.	Moderately steep terrain with colluvial and glaciomarine surficial materials. Slope gradients range from 50% to over 70%. Recent and/or active instability observed in the form of gullying and un-vegetated landslide scars.

SOURCE: Adapted from Mapping and Assessing Terrain Stability Guidebook in British Columbia 1999

This terrain stability classification system was applied to terrain mapping completed for the Project (Figures 1 and 2). The terrain mapping was developed from a combination of BC Government Terrestrial Ecosystem Mapping (TEM) (BCMOE 2013) and vegetation mapping completed for the Environmental Impact Statement and Environmental Assessment Certificate Application (Stantec 2014). The mapping ranges from approximately 1:5,000 on Lelu Island to 1:10,000 for the slopes above Port Edward and Smith Island. The terrain mapping was reviewed against field data and observations and updated.

3 RESULTS AND DISCUSSION

The terrain mapping on Lelu Island indicates that the terrain ranges from level very poorly drained to poorly drained organic wetlands to undulating organic and glaciomarine deposits with areas of broken and steep bedrock bluffs (Figures 1 and 2; Appendix B). Some sections of the coastline of Lelu Island are steep with organic and colluvial veneers overlying bedrock bluffs (notably along

Reference: Terrain Stability Mapping for Lelu Island, Smith Island and Port Edward Area

the southeastern shoreline) while other areas of Lelu Island are gently undulating. Areas of Lelu Island have an overall low slope gradient but exhibit broken uneven terrain with locally steep slopes on bedrock and poorly drained depressional landforms.

The terrain on Smith Island ranges from level very poorly to poorly drained organic wetlands north of Tsum Tsadai Inlet to undulating organic and glaciomarine deposits with areas of broken and steep bedrock bluffs in the northern portion of the study area, with steep colluvial mantled slopes in the southern portion of the study area (Figure 1; Appendix B). The terrain on the Port Edward mainland ranges from low gradient marine and glaciomarine deposits on lower slopes with steep, bedrock bluffs at higher elevations above mid-slope colluvial slopes and gullies (Figure 1; Appendix B).

The results of the terrain stability mapping indicate that the terrain on Lelu Island is stable. The terrain on Smith Island and Port Edward mainland is mainly stable with areas of potentially unstable and unstable terrain on steep slopes on Smith Island and the Port Edward mainland (Table 2; Figure 3).

Table 2: Terrain Stability Classification – Area Summary

Terrain Stability Classification	Total Area (hectares)	Lelu Island	Smith Island	Port Edward Mainland
Stable (I,II,III)	579.7	Present	Present - mainly north of Tsum Tsadai Inlet	Present on gently sloping lower slopes
Potentially Unstable (IV)	203.2	Absent	Present – mainly south of Tsum Tsadai Inlet with a minor area north of Tsum Tsadai Inlet	Present on bedrock slopes, gullies and steep middle slopes southeast of Port Edward
Unstable (V)	190.5	Absent	Present south of Tsum Tsadai Inlet	Present on mainly on bedrock slopes and steep middle slopes southeast of Port Edward

The potentially unstable and unstable terrain on Smith Island and Port Edward mainland are associated with two geomorphologic process regimes:

- Rockfall, rockslides and debris slides from steep, unstable bedrock bluffs developing into open-slope slides or debris flows in gullies
- Landslides on steep slopes mantled in colluvium with thick organic surface horizons (both harvested and unharvested).

Rockfall and debris slides were observed south of Port Edward. There are debris flow gullies located downslope of the bluffs, and with debris flow likely developing from accumulations of rockfall debris. The slides in Port Edward include the following sizes:

- 1.5 hectare open slope slide (Polygon 204)
- 2 hectare large channelized slide in a gully originating upslope of field plot KH13024 (Polygon 204)
- 9 hectare slide originating from the bedrock bluffs (Polygon 270)
- 12 hectare slide (Polygon 203)
- 12.4 hectare open slope slide originating on steep terrain (now overgrown with deciduous trees).

The slides near Port Edward appear to have deposited on lower-gradient terrain above Skeena Drive and the CN Rail Line. It is difficult to determine if any deposits reached the marine environment as highway / rail maintenance would have removed any indications of deposits below Skeena Drive. The unstable areas and existing deposits are not located upslope of the proposed Project features.

There are steep, unstable slopes located on Smith Island southeast of Lelu Island that show indications of instability in the form of bare landslide scars with areas of seepage, high organic content in surficial materials on steep slopes, eroded gullies and landslide tracks. The slides on Smith Island within the study area range in size from approximately 2 to 16.5 hectares. Some of the slide deposits appear to have reached the marine environment in Tsum Tsadai Inlet, which is connected to the open coast near Lelu Island through a narrow channel (Figure 3).

Potential triggers of slope instability include:

- <u>High precipitation</u>: The study area receives greater than 2,500 mm of precipitation per year (Environment Canada 2014) which can saturate surficial materials, resulting in elevated pore-water pressures and increased slope instability. High precipitation levels in the study area results in thick organic surface accumulations throughout the study area. Macropore development and soil pipes are common in these organic surface horizons which can act to concentrate and conduct run-off rapidly downslope (Banner et al. 2005) which can help lower the hazards of slope failure associated with soil saturation. However, high precipitation storm cells can overwhelm the subsurface drainage networks and result in high pore- water pressures and subsequent landslides. Debris flows developing from colluvial materials in gullies or open slopes during periods of high precipitation and/or rain-on-snow events may also occur in the study area.
- <u>Strong winds</u>: High winds often associated with rainstorms can also cause windthrow of large trees triggering landslides as a result of disturbance of saturated surficial materials on steep slopes (Banner et al. 2005).

Reference: Terrain Stability Mapping for Lelu Island, Smith Island and Port Edward Area

- Freeze-thaw cycles: can initiate rockfall events.

Overall, the potential instability, existing instability and existing slide deposits within the study area are not located adjacent to or upslope of Project features, and there is a low likelihood of a slide impacting Project features.

4 CONCLUSION

Terrain stability assessment and mapping completed for the study area indicates that there is potentially unstable and unstable terrain on steep, bedrock bluffs located north of the proposed LNG facility (Project), colluvial slopes southeast of Port Edward, and unstable slopes located on Smith Island southeast of the proposed Project. These unstable slopes are not located adjacent to or within the Project footprint. Existing instability and landslide deposits indicate that there is a low likelihood that slides will reach the Project features or the marine environment near the Project features. The existing slide deposits near Port Edward appear to be depositing on low-gradient terrain above Skeena Drive. Some of the deposits from the slides on Smith Island have reached the marine environment in Tsum Tsadai Inlet, but not the marine environment near Lelu Island. There is a low likelihood that a failure from these unstable slopes would impact the Project.

5 CLOSURE

If you have any questions or require additional information, please contact Andrea Pomeroy (andrea.pomeroy@stantec.com).

Regards,

STANTEC CONSULTING LTD.

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Attachments Appendix A
Figure 1
Figure 2
Figure 3

VS/AP/nlb

Reference: Terrain Stability Mapping for Lelu Island, Smith Island and Port Edward Area

6 REFERENCES

Banner, A., P. LePage, J. Moran and A. de Groot (editors). 2005. The HyP3 Project: pattern, process, and productivity in hypermaritime forests of coastal British Columbia – a synthesis of 7-year results. B.C. Min. For., Res. Br., Victoria, B.C. Spec. Rep. 10. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/Srs10.htm>

BC Forest Service and BC Environment. 1999. Mapping and Assessing Terrain Stability Guidebook in British Columbia. Second Ed. Forest Practices Code of British Columbia.

Environment Canada. 2014. Canadian Climate Normals. http://climate.weather.gc.ca/climate_normals/index_e.html

Howes, D.E. and Kenk, E. (1997).Terrain classification system for British Columbia, Version 2.Ministry of Environment, Lands and Parks. Victoria, BC. 102 pp.

APPENDIX A – Terrain and Surficial Mapping

Terms (From Terrain Classification System for British Columbia (1997) – Howes and Kenk):

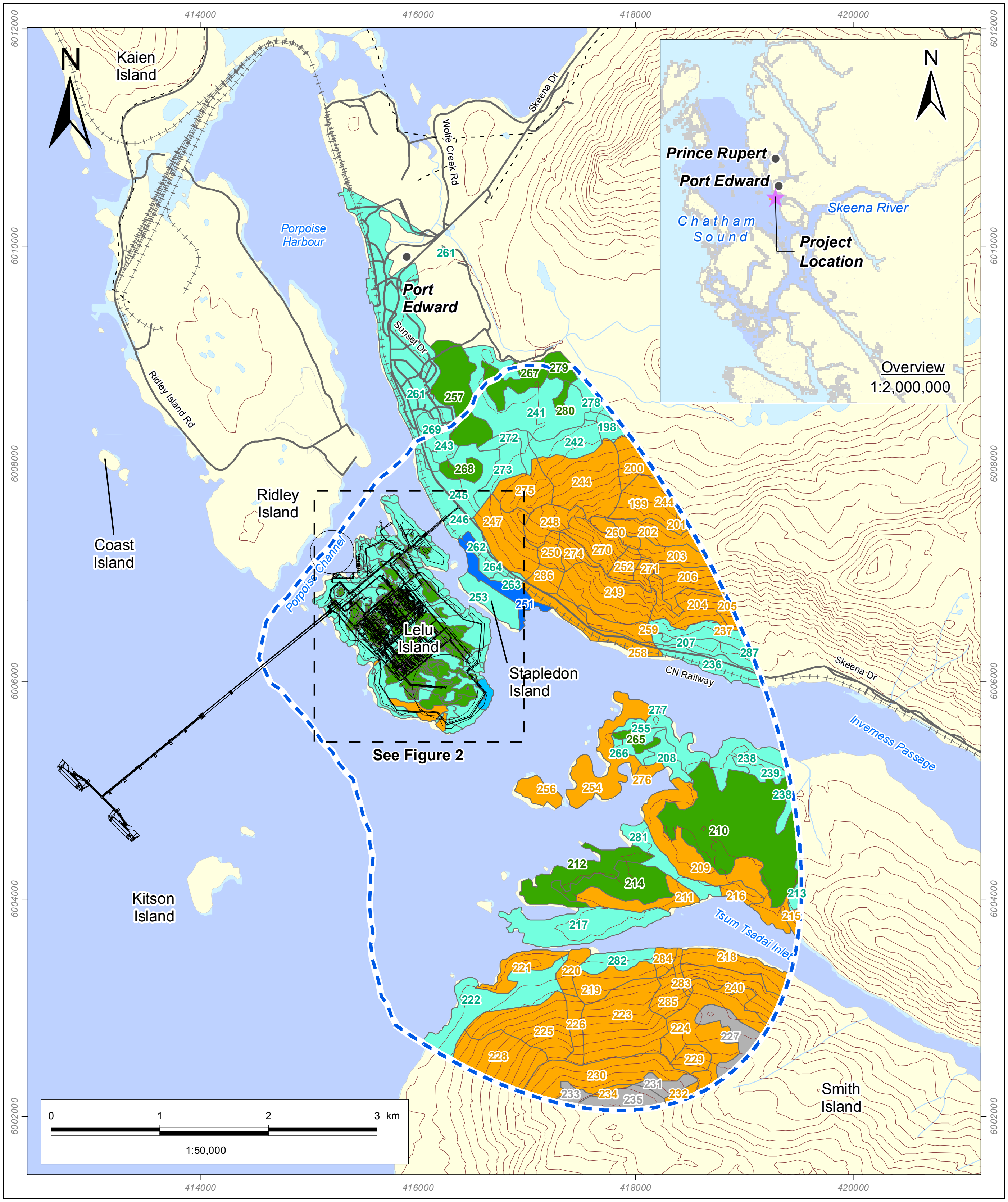
Surficial Material	**Texture**
C - Colluvium	r – rubble
O - Organic	s – sand
WA - Active Marine	z - silt
WG - Glaciomarine	c - clay
N - open water	h – humic
	e - fibric

Surface Expression
a - moderate slope- slopes between 27% - 49%
b - blanket - thickness of surface material is greater than a metre
c - cone - a fan shaped landform with a longitudinal gradient more than 26%
f - fan - a fan shaped landform with a longitudinal gradient less than 26%
h - hummocks - non-linear rises and hollows with many slopes steeper than 26%
m - rolling topography - elongate rises and hollows with slopes generally less than 26%
p - plain - slopes are between 0-5%
r - ridges - elongate rises with many slopes steeper than 26%
u - undulating topography - non-linear rises and hollows with slopes generally less than 26%
v - veneer - thickness of the surface material is less than about 1m
x - thin veneer - thickness of the surface material is less than about 20cm

Geomorphological Processes
R - Rapid Mass Movement
V - Gullying
L – Seepage
U – Inundation

Geomorphological Process Qualifiers
s - debris slide - sliding of disintegrating mass of surficial material
d - debris flow - rapid flow of saturated debris
" - Initiation Zone polygon includes sites or zone of instability

Terrain Stability Classification
I - No stability issues
II - Low likelihood of landsliding following timber harvesting or road construction
III - Minor stability problems can develop after timber harvesting and/or road construction
IV - Expected to contain areas with a moderate likelihood of landslide initiation following vegetation clearing or road construction
V - Expected to contain areas with a high likelihood of landslide initiation following vegetation clearing or road construction



City or Town	Watercourse	Glaciomarine
Contour (m)	Skeena Estuary	Marine
Electrical Power Transmission Line	Waterbody	Open Water
Major Road	**Surficial Material**	Organic
Project Component	Active Marine	Weathered Bedrock
Railway	Colluvial	
Secondary Road		

Refer to Appendix A for terrain classification according to polygon numbers indicated on figure

Pacific NorthWest LNG

Terrain and Surficial Materials in the Vicinity of the Proposed Project

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

DATE: 12-DEC-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-787	DATUM: NAD 83
DRAWN BY: T. CARDINAL	CHECKED BY: V. STEVENS

FIGURE NO: **1**

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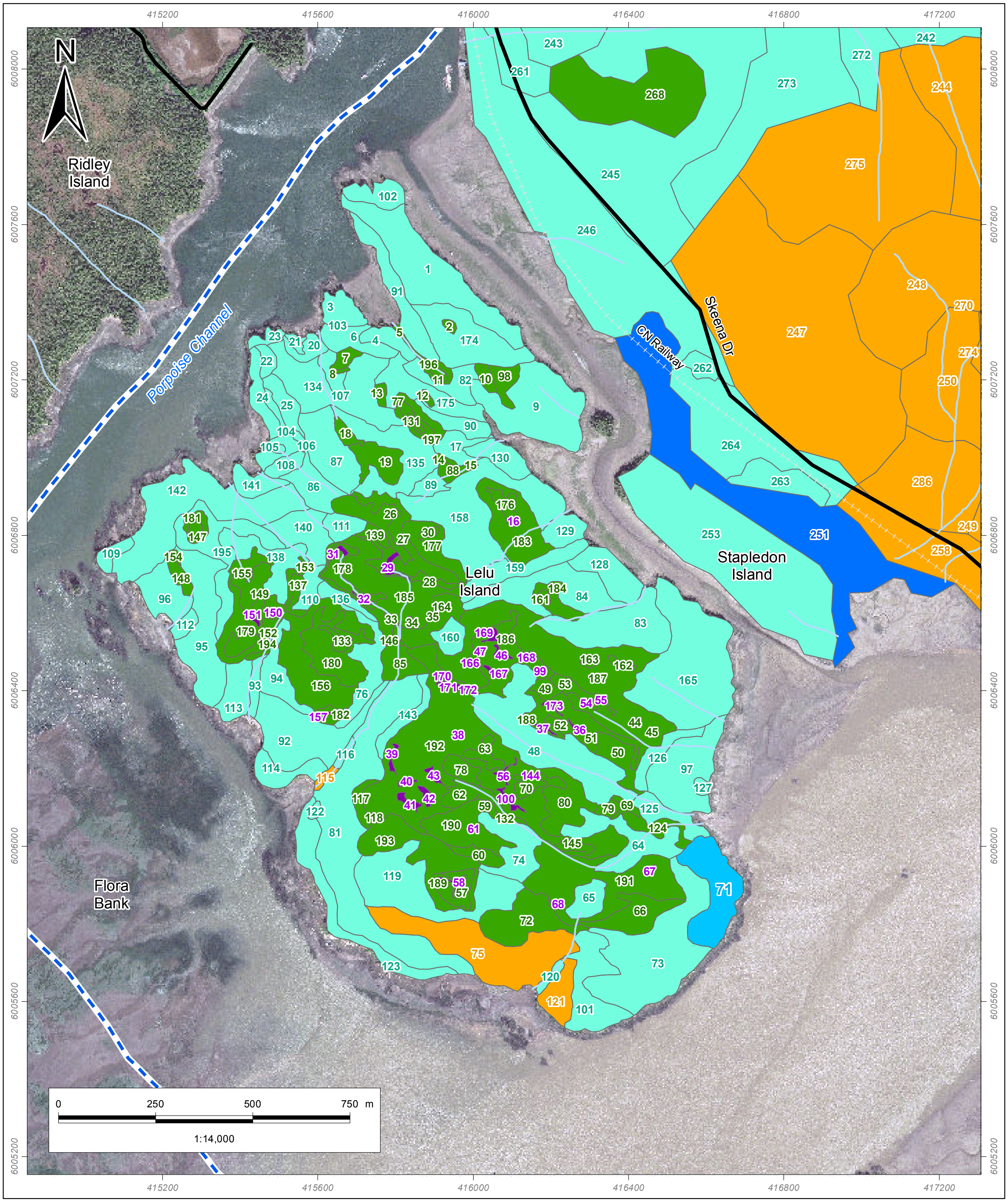

Surficial Material

- Colluvial
- Open Water
- Organic
- Marine
- Active Marine
- Glaciomarine

- Railway
- Road
- Watercourse
- Terrain Stability Mapping Study Area

Refer to Appendix A for terrain classification according to polygon numbers indicated on figure

Pacific NorthWest LNG

Terrain and Surficial Materials in the Vicinity of the Proposed Project

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; WorldView-2 Imagery. Imagery date: 2011.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 12-DEC-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-794	DATUM: NAD 83
DRAWN BY: A. BOONE	CHECKED BY: V. STEVENS

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **2**

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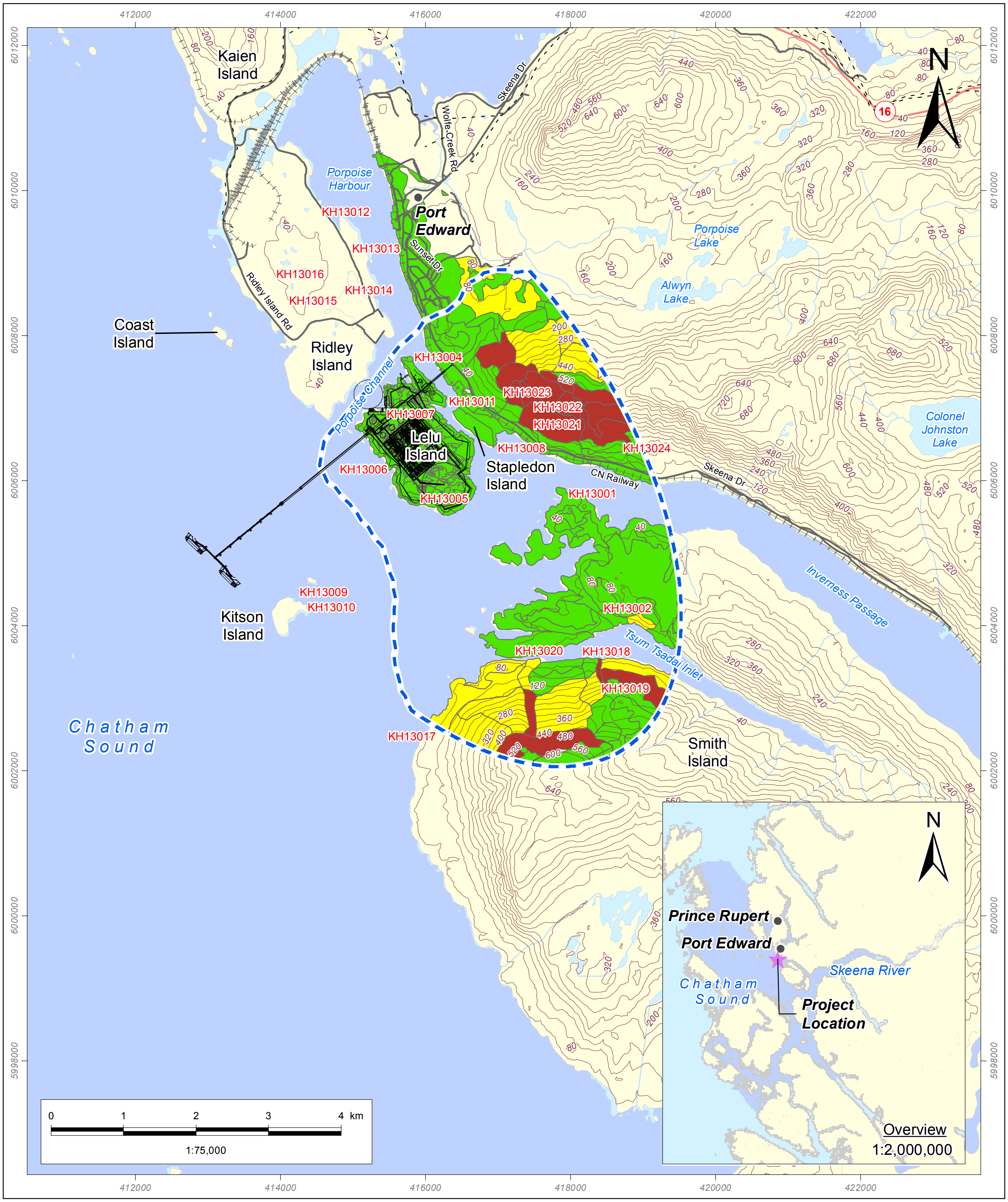

- City or Town
- Contour (m)
- Electrical Power Transmission Line
- Major Road
- Project Component
- Railway
- Secondary Road
- Watercourse
- Skeena Estuary

Slope Stability Class

- Stable
- Potentially Unstable
- Unstable
- Waterbody

Pacific NorthWest LNG

Terrain Stability Assessment Mapping in the Vicinity of the Proposed Project

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 12-DEC-14
FIGURE ID: 123110537-787
DRAWN BY: T. CARDINAL
PROJECTION: UTM - ZONE 9
DATUM: NAD 83
CHECKED BY: V. STEVENS

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: 3

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Appendix A

Polygon ID	First Decile	Surficial Material	Subsurface Material	Second Decile	Surficial Material	Subsurface Material	Third Decile	Surficial Material	Geomorphological Process	Drainage	Terrain Stability Classification
1	7	WGv	Ruh	3	hOv	Ruh	0			m-p	II
2	10	Ov		0			0			p	I
3	9	WGv	Ru	1	WGb		0			m	II
4	6	WGv		4	WGb		0			m	I
5	9	Ob		1	Fp		0			p-w	I
6	10	WGv	Ruh	0			0			m	II
7	10	Ob		0			0			p	I
8	10	Ov		0			0			p	I
9	8	WGv	Rmu	2	Ov	Ru	0			m-p	I
10	6	Ov	Ru	4	WGv	WGu	0			m-p	I
11	10	Ob		0			0			p	I
12	10	Ov	Ru	0			0			p	I
13	10	Ov	Ru	0			0			p	I
14	10	Ob		0			0			p	
15	10	Ob		0			0			p	
16	10	N		0			0				I
17	8	WGv	Rh	2	Ov	Ru	0			m//p	II
18	10	Ov	Ru	0			0			p	I
19	10	Ov	Ru	0			0			p-i	I
20	7	WGv	Ru	3	Ov	Ru	0			m-i	I
21	10	WGv		0			0			m	II
22	10	WGv		0			0			m	II
23	10	WGv		0			0			m	II
24	8	WGv	Ru	2	Ov	Ru	0			m//p	II
25	9	WGv	Ru	1	Ov	Ru	0			m,p	II
26	10	Ov		0			0			p-v	II
27	8	Ov	Ru	2	WGv	Ru	0			p-i	II
28	10	Ov	Ru	0			0			p	I
29	10	N		0			0				I
30	10	Ov	Ru	0			0			p	II
31	10	N		0			0				I
32	10	N		0			0				I
33	10	Ob		0			0			p	I
34	10	Ob		0			0			p	I
35	10	Ob		0			0			p	I
36	10	N		0			0				I
37	10	N		0			0				I
38	10	N		0			0				I
39	10	N		0			0				I
40	10	N		0			0				I
41	10	N		0			0				I
42	10	N		0			0				I
43	10	N		0			0				I
44	10	Ov		0			0			p	II
45	10	Ov		0			0			p	I
46	10	N		0			0				I
47	10	N		0			0				I
48	7	WGv	Ruh	2	WGb	Ru	1	Ov		m-p	II
49	7	Ov	Ru	3	WGv	Ru	0			p-m	I
50	7	Ov	Ru	3	WGv	Ru	0			p-m	II
51	7	Ov	Ru	3	WGv	Ru	0			p-m	II
52	7	Ov	Ru	3	WGv	Ru	0			p-m	I
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54	10	N		0			0				I
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57	10	Ov	Ru	0			0			p	I
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59	10	Ob		0			0			p	I
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61	10	N		0			0				I
62	8	Ov	Ru	2	WGv	Ru	0			p-m	I
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64	8	WGv	Ru	2	Ov	Ru	0			m//p	II
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66	9	Ov	Ruh	1	WGx	Rh	0			p-m	I
67	10	N		0			0				I
68	10	N		0			0				I
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70	8	Ov	Ru	2	WGv	Ru	0			p-m	I
71	7	zsWv		3	WGx		0			i	I
72	7	Ov	Ru	3	WGx	Rhu	0			p-w	I

Appendix A

Polygon ID	First Decile	Surficial Material	Subsurface Material	Second Decile	Surficial Material	Subsurface Material	Third Decile	Surficial Material	Geomorphological Process	Drainage	Terrain Stability Classification
73	6	WGv	Ru	4	WGx	Ruh	0			w-m	III
74	9	WGv	Ru	1	Ov	Ru	0			m-p	I
75	7	Cx	Rhu	3	WGv		0			i-w	III
76	7	WGv	Ru	3	WGx	Rh	0			m	II
77	10	Ov		0			0			p	I
78	10	Ov	Ru	0			0			p	I
79	8	Ov	Ru	2	WGv	Ru	0			p-m	I
80	8	Ov	Ru	2	WGv	Ru	0			p-m	I
81	8	WGv	Ruh	2	Ov	Ru	0			m//p	III
82	8	WGv	Ru	2	Ov	Ru	0			m-p	I
83	10	WGv	Rhu	0			0			m-w	II
84	6	WGv	Ru	4	Ov	Ru	0			p-m	II
85	8	Ov	Ru	2	WGv	Ru	0			p-m	I
86	7	WGv	Ru	3	Ov	Ru	0			m	II
87	8	WGv	Ruh	2	Ov	Ru	0			m	II
88	10	Ov	Ru	0			0			p	
89	8	WGv		2	Ov		0			m//p	II
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97	6	WGb	Ru	4	WGv	Rh	0			m	II
98	10	Ov		0			0			p	I
99	10	N		0			0				I
100	10	N		0			0				I
101	8	WGv	Rhu	2	Cx	Ruh	0			w-m	III
102	10	WGv		0			0			m	II
103	10	WGb		0			0			m	I
104	10	WGb		0			0			m	II
105	10	WGv	Ru	0			0			m	
106	10	WGb		0			0			m	I
107	7	WGv	Ru	3	Ov	Ru	0			m-i	II
108	10	WGb		0			0			m	I
109	10	WGv		0			0			m	II
110	10	WGv	Ru	0			0			m	II
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112	10	WGv	Ru	0			0			m	II
113	6	WGx	Rhu	4	WGv	Ru	0			w-m	III
114	10	WGv	Rua	0			0			m	III
115	10	Cv		0			0			w	II
116	10	WGv		0			0			m	II
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118	10	Ob		0			0			v	I
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127	10	WGb		0			0			m	II
128	10	WGv	Rhu	0			0			m	II
129	9	WGv		1	Ov		0			m,p	I
130	8	WGv	Ru	2	Ov	Ru	0			m//p	I
131	10	Ob		0			0			p-v	I
132	8	Ob		2	WGv		0			p-m	I
133	10	Ov		0			0			p	I
134	8	WGv	Ruh	2	Ov	Ru	0			m//p	II
135	7	WGv	Rhu	3	Ov	Ru	0			m-p	III
136	8	WGv	Ru	2	Ov	Ru	0			m-p	II
137	7	Ov	Ru	3	WGv	Ru	0			p-m	I
138	8	WGv	Ruh	2	Ov	Ru	0			m-p	I
139	7	Ov		3	WGv		0			p-m	I
140	7	WGv	Ru	3	WGb	Ru	0			m	I
141	10	WGv	Rhu	0			0			m	III
142	8	WGv		2	uhOv	Dvx	0			m-p	III
143	7	WGv		3	Ov		0			m-p	I
144	10	N		0			0				I

Polygon ID	First Decile	Surficial Material	Subsurface Material	Second Decile	Surficial Material	Subsurface Material	Third Decile	Surficial Material	Geomorphological Process	Drainage	Terrain Stability Classification
145	8	Ov	Ru	2	WGv	Ru	0			p-m	I
146	10	Ob		0			0			p	I
147	10	Ob		0			0			p-v	I
148	10	Ov		0			0			p	I
149	7	Ov	Ru	3	WGv	Ru	0			p-m	I
150	10	N		0			0				I
151	10	N		0			0				I
152	10	Ov		0			0			p	I
153	10	Ov		0			0			p	I
154	9	Ov		1	WGv		0			p	I
155	9	Ov	Ru	1	WGv	Ru	0			p-m	II
156	8	Ov	Ru	2	WGv	Ru	0			p-i	II
157	10	N		0			0				I
158	7	WGv	Rhu	3	Ov	Ru	0			m-p	II
159	10	WGv		0			0			m	II
160	10	WGv	Ru	0			0			m	II
161	10	Ov		0			0			p	I
162	10	Ov		0			0			p	I
163	10	Ov		0			0			p	I
164	8	Ov	Ru	2	WGv	Ru	0			p-m	II
165	6	WGv		4	WGb	Ru	0			m-w	II
166	10	N		0			0				I
167	10	N		0			0				I
168	10	N		0			0				I
169	10	N		0			0				I
170	10	N		0			0				I
171	10	N		0			0				I
172	10	N		0			0				I
173	10	N		0			0				I
174	8	WGv	Rmu	2	Ov	Ru	0			m-p	II
175	7	WGv	Ru	3	Ov	Ru	0			m	I
176	10	Ov		0			0			p	I
177	7	Ov	Ru	3	WGv	Ruh	0			p-m	II
178	6	Ob		4	Ov	Ru	0			p-v	I
179	10	Ov	Ru	0			0			p,v	II
180	10	Ov	Ru	0			0			p,v	II
181	10	Ov	Ru	0			0			p	I
182	10	Ov		0			0			p	I
183	8	Ov	Ru	2	WGv	Ru	0			p-i	I
184	10	Ov	Ru	0			0			p-i	I
185	8	Ov	Ru	2	WGv	Ru	0			p-i	II
186	10	Ov		0			0			p	I
187	10	Ov	Ru	0			0			p-i	II
188	10	Ov	Ru	0			0			p	II
189	10	Ob		0			0			p	I
190	10	Ov	Ru	0			0			p	I
191	8	Ov	Ru	2	Ob	Ru	0			p-v	I
192	10	Ov	Ru	0			0			v-i	II
193	8	Ov	Ru	2	WGv	Ru	0			p-m	I
194	7	Ov	Ru	3	WGv	Ru	0			p-m	II
195	10	WGv	Ruh	0			0			m	II
196	10	Ob		0			0			p	I
197	10	Ov		0			0			p-v	I
198	10	WGv		0			0			m	III
199	8	Mx		2	Cv		0			w//i	IV
200	7	Cv		3	Cb		0		V	w	IV
201	10	Cv		0			0		V	m	
202	8	Mx		2	Mv		0			w	II
203	6	Cv	Rhu	4	Cv	Rks	0			w	V
204	10	Cv		0			0		R"sd	w-r	V
205	10	Cv		0			0		R"sd	w	V
206	7	Cv		3	Cx		0		R"sd	w-r	V
207	6	WGv	Ru	4	Cv		0		Rd	w-i	III
208	6	WGv	Ruj	4	Ov	Ruj	0			m-p	III
209	8	Cxv	Rhk	2	WGv	Rhu	0			w,m	III
210	8	Ov	Rum	2	WGxv	Rum	0			p-i	I
211	6	czCv		4	czCx		0			w-m	III
212	10	hOvx	Dv	0		Dv	0			i,m	III
213	10	WGv	Rju	0			0			m	II
214	8	Ob		2	Ov		0			p	II
215	8	Cx		2	Cv		0			w-r	II
216	8	Cx		2	Cv		0			w-r	IV

Appendix A

Polygon ID	First Decile	Surficial Material	Subsurface Material	Second Decile	Surficial Material	Subsurface Material	Third Decile	Surficial Material	Geomorphological Process	Drainage	Terrain Stability Classification
217	7	WGv	Rur	3	Cvx		0			i,w	III
218	8	sCv		2	Cx		0		Rd	m-w	IV
219	6	Cv		4	WGv		0			m-w	II
220	10	Cb		0			0		Rd	w	IV
221	7	Cv		3	WGv		0			w-r	IV
222	8	cszWGv		2	Cv		0			m//w	IV
223	8	Cv		2	Cx		0		V	w-r	IV
224	6	Cvx		4	Dx		0			w-m	II
225	8	Cv		2	Cx		0		V	w-r	IV
226	7	Cv		3	Cb		0		R"d	r	V
227	8	Dx	Ruh	2	Ov	Ruh	0			m//i	II
228	8	Cv		2	Cx		0			w	IV
229	6	Cx		4	Cv		0			w-r	II
230	8	Cx		2	Cv		0		R"d	w-r	V
231	8	Dx	Rju	2	Oxv	Rju	0			w//i	III
232	8	Cx		2	Cv		0			w-r	II
233	8	Dx	Rju	2	Cv	Rju	0			w//i	II
234	10	Cx		0			0			r	
235	7	Dx	Ruj	3	Oxv	Ruj	0			w-i	III
236	8	WGv		2	Cv	Rh	0		Rd	m//w	II
237	10	Cv		0			0		Rd	w	III
238	8	WGv	Ruh	2	Ov	Ruh	0			w-i	II
239	7	WGvx		3	Ov		0			m-i	I
240	7	sCx		3	sCv		0		R"dV	w-r	V
241	9	WGv	Rmu	1	Ov	Rmu	0			m,i	IV
242	7	WGv	Ru	3	Cv	Rh	0		Rd	m	II
243	8	WGv	Rm	2	Ov	Ru	0			m//i	II
244	8	Cv		2	Cb		0		V	w	IV
245	9	WGv	Ru	1	Ov	Ru	0			m,p	II
246	10	WGv		0			0			m-i	II
247	7	Cv		3	WGb		0			w-m	III
248	8	Cv		2	Cx	Rh	0		R"s	w-r	V
249	8	rszCvx		2	gzCb		0		R"sdV	w-r	V
250	8	Cv		2	zsCx		0			m	V
251	10	WAp		0			0		U	p	I
252	6	Cv		4	Cx		0		R"ds	w	V
253	10	szcWGv	Rur	0			0			i-m	III
254	7	Cx	Rha	3	Cv	Rha	0			m-w	III
255	8	uWGv	Ru	2	hOb	Ru	0			p-i	II
256	10	Cx	Rh	0			0			w	II
257	8	Ov	Ru	2	WGv	Ru	0			p-i	II
258	10	Cf	WGv	0			0		Rd	m-i	II
259	8	Cc		2	Cv		0		Rd	w	II
260	10	Cx	Ruh	0			0			w	V
261	6	WGv	Rhu	2	WGb	Ruh	2	Ap		w-m	II
262	10	WGv	Ru	0			0			m	
263	10	WGv	Ru	0			0			m	II
264	8	WGv	Ru	2	Cv		0			m-w	II
265	10	Ob		0			0			p	I
266	7	WGv	Ru	3	Ov	Ru	0			m-i	II
267	8	Ov	Ru	2	WGv	Ru	0			p-i	II
268	6	Ov	Ru	4	WGv	Ru	0			m-p	II
269	10	WGv	Ru	0			0			m	II
270	7	Cv		3	Cx		0		R"s	w-r	V
271	10	Cv		0			0		R"ds	w	V
272	7	WGv	Rup	3	Cv		0		Rds	m-w	II
273	8	WGv	Ru	2	Cv	Ru	0		Rd	m//w	II
274	7	Cv		3	Cx		0		R"ds	w	V
275	8	Cv		2	Cb		0		VR"sd	w	V
276	10	Cv		0			0			w	III
277	8	WGv	Ruh	2	Cxv	Rh	0			w,m	II
278	10	WGv	Ru	0			0			m	II
279	9	Ov	Ru	1	WGv	Ru	0			p-i	
280	9	Ov	Ru	1	WGv	Ru	0			v-p	II
281	6	WGvx	Ruh	4	Cvx	Ruh	0			m-i	III
282	6	eWGv		4	WGb		0			m	III
283	8	Cv		2	Cb		0		R"rd	r-w	V
284	10	sCv		0			0			m-w	III
285	6	Cx		4	sCv		0			w-r	IV
286	10	Cb	WGv	0			0		LRd	m-i	II
287	7	zsWGv	Ruh	3	Cv		0		Rd	m-w	III