

## ***Maritime Pacific Engineering***

August 8, 2004  
File No.: BLR-04-7

Buttle Lake Resources Limited  
1355 Evergreen Road  
Campbell River, BC  
V9W 3S3

**Attention: Nigel Ross RPF, Woodlot Forester**

**RE: TERRAIN STABILITY FIELD ASSESSMENT FOR CUTBLOCKS JH1 JOHN HART LAKE AREA, & UC1 UPPER CAMPBELL LAKE AREA**

### **1 INTRODUCTION**

At the request of Nigel Ross, RPF of Buttle Lake Resources Limited, Maritime Pacific Engineering (MPE) carried out a terrain stability field assessment for cutblock JH1 (and surrounding area) located in Woodlot W1640 in the John Hart Lake area and cutblock UC1 located in Woodlot W1898 in the Upper Campbell Lake area (Figure 1).

This report identifies potential terrain stability hazards with respect to harvesting within the assessed areas, and provides recommendations with the objective of minimizing the potential for harvesting-related slope instability. This investigation takes the form of a reconnaissance-level field assessment and involves the observation of topographic maps and surface conditions, as well as the examination of soil exposures and natural soil disturbances. Otherwise, no subsurface investigation was done. These procedures are accepted methodology for terrain stability assessments.

### **2 BACKGROUND**

The field assessment of cutblocks JH1 and UC1 was performed on July 5, 2004 by Jamie Alguire accompanied by Nigel Ross. At the time of the field traverse, surface run-off water was at low levels, with clear weather & good visibility. Cutblock JH1 is located within the Campbell River District Community Watershed and is planned for a ground based harvest system, accessed by John Hart Road. Cutblock UC1 is located above Highway 28 and Upper Campbell Lake. A water intake supplying local water users is located on Cedar Creek within this woodlot. Areas of potential terrain instability were previously identified by Nigel Ross, which partially formed the scope of this assessment.

#### **2.1 TOPOGRAPHY AND GEOMORPHOLOGY**

Cutblock JH1 is located on a peninsula on John Hart Lake (class L1) at an average elevation of 200m, with straight slopes approaching 65% on terrace edges surrounding the peninsula with gentle benches of 20-30%, and gently sloping terrain on the center top of the peninsula. Rapidly drained, loose, gravelly sand till, with a very thin duff layer exists throughout, with bedrock outcrops and some rubble in the southern portion. No streams are associated with this setting.

Cutblock UC1 is located on rapidly drained, rubbly colluvium talus deposits with frequent boulders above Highway 28 and Cedar Creek (S3). Slopes range from to 55-75% in the lower elevations to vertical bedrock bluffs in the higher elevations.

The bedrock geology in the areas has been classified as weathered volcanics of the Karmutsen Formation, Vancouver Group<sup>1</sup>.

### 3 OBSERVATIONS & DISCUSSION *(In conjunction with Appendix A)*

Cutblock JH1 contains dry gravelly sand till which is easily eroded. Exposed, raveling soils are frequent. A saddle feature is located on the peninsula arm which would provide good road access to the gentle terrain in the center portion. A 50m reserve zone has been established along John Hart Lake. Slopes approaching 65% exist below John Hart Road, with a bench of 20-30% at the toe of the slope adjacent to John Hart Lake. The eastern and southern portions contain slopes of 60-80% immediately adjacent to John Hart Lake. No significant windfall was observed associated with this setting; however windfall from endemic southeast winds is anticipated.

Cutblock UC1 contains talus rubble colluvium with frequent perched boulders and talus movement within the portions above Highway 28 and Cedar Creek, with moderately steep slopes approaching 70-80%. Cedar Creek (S3) is considered a high transport potential stream with a water intake for local water users located immediately upstream of the Cedar Creek ML bridge. No significant windfall was observed associated with this setting.

### 4 STABILITY ASSESSMENT & RECOMMENDATIONS

The proximity of John Hart Lake, Upper Campbell Lake and Highway 28, with associated resource values, would result in a judgement of **high** consequence rating for landslides or significant sedimentation events associated with cutblocks JH1 and UC1.

Highly erosive soils in cutblock JH1 would result in a **moderate** harvesting-related hazard rating potential for landslides & excessive sedimentation. Potential windfall occurrence can be expected from southeast winds in cutblock JH1, which may increase the potential for soil erosion by soil exposure but is not anticipated to significantly affect terrain stability.

Rubble talus colluvium slopes in cutblock UC1 would result in a **high** harvesting related hazard associated with conventional ground based harvesting methods. Potential windfall occurrence can be expected from winds paralleling Upper Campbell Lake, but is not anticipated to significantly affect terrain stability.

Cutblock JH1 is judged to have an overall harvesting-related risk rating of **low**, provided the following recommendations in section 4.1 are implemented, which are intended to mitigate the above assessed hazard and associated risks to provide the lowest possible risk for terrain instability.

Cutblock UC1 is judged to have an overall harvesting-related risk rating of **low**, provided the following recommendations in section 4.1 are implemented, which are intended to mitigate the above assessed hazard and associated risks to provide the lowest possible risk for terrain instability.

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<sup>1</sup> Wheeler and McFeely, 1991. Geological Survey of Canada, Map 1712A.

#### 4.1 HARVESTING RECOMMENDATIONS

The planned harvesting system is not expected to increase the probability of slope instability, provided natural watercourse drainage is maintained.

Block JH1:

- Soils in JH1 are highly erosive. A cable yarding harvest system would result in minimal disturbance to steep slopes above John Hart Lake (Figure 1). Crews should be aware that ground disturbance should be minimized.
- The new access road John Hart Road should be located on gently sloping higher ground on the peninsula; less disturbance would be caused in this location than a midslope road located on moderately steep terrain.
- Windfall from endemic southeast winds can be expected; southeast facing boundaries should be located with this in mind ie. leave expendable trees on southeast-facing boundaries to act as a wind buffer (feathering), or windfirm treat these boundaries.

Block UC1:

- Conventional ground-based harvest systems may cause loose talus, boulders and timber to dislodge and become hazards to safety, downstream water users and terrain stability. An alternative helicopter selective harvesting system will minimize this potential hazard.
- Crews should be aware that rubble & boulders throughout the block could dislodge and become potentially hazardous.

#### 5 CLOSURE & SURVEY LIMITATIONS

This report was prepared for Buttle Lake Resources Limited, for use in planning the operational harvesting of cutblocks JH1 and UC1 as per regulations under the Forest Practices Code of British Columbia Act.

Because terrain evaluation has a limited exposure to subsurface conditions, failure potential ratings are achieved through a highly interpretative summation. Ratings are not intended as a definitive calibration, but rather a statement of probability. It is possible that conditions are different from those interpreted under this assessment, and subsequently this could affect the recommendations presented in this report.

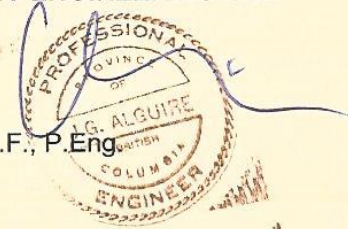
Respectfully submitted,

**MARITIME PACIFIC ENGINEERING LTD.**

Reviewed by:

Jamie Alguire, R.P.F., P.Eng  
Forest Engineer  
Jga

N/A





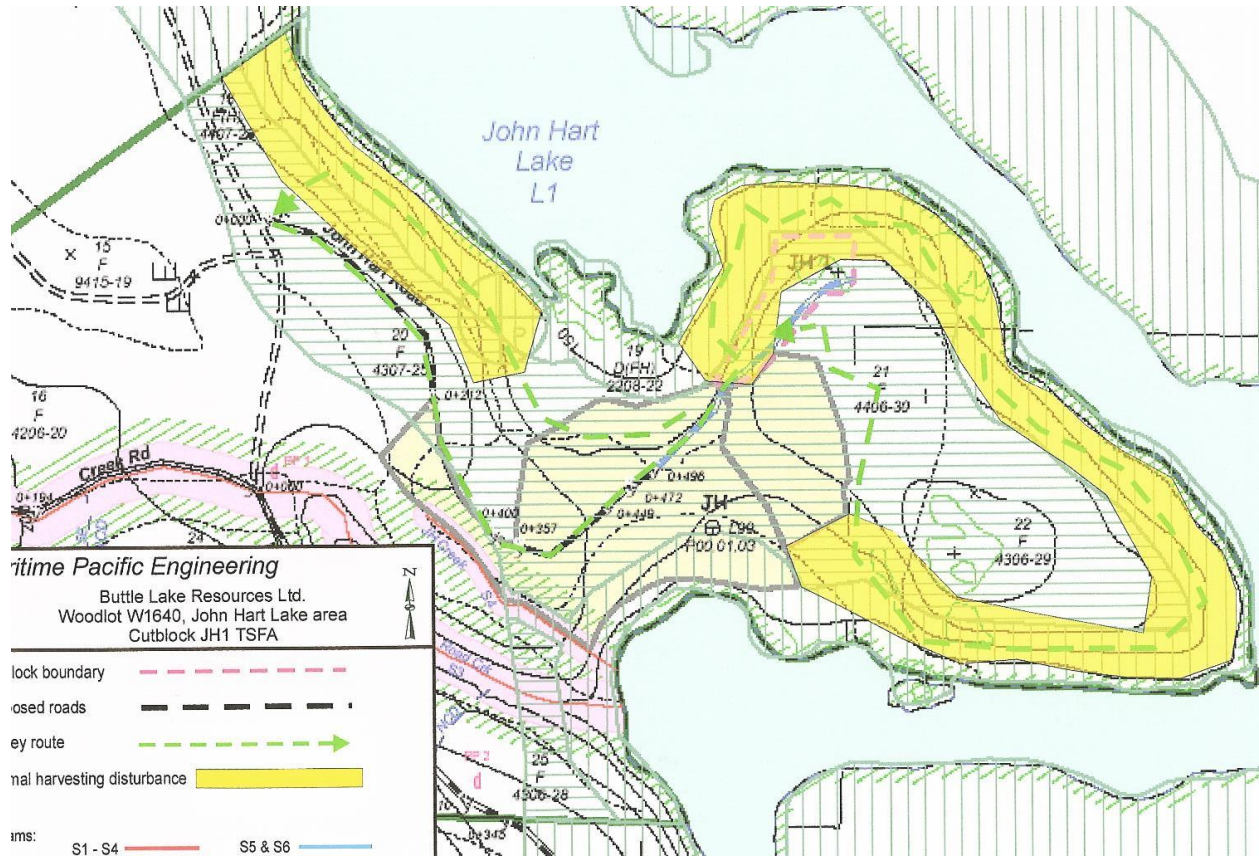
Terrain Stability Field Assessment Upper Campbell Lake Area Cutblock UC 1

Appendix A – Cutblocks JH1 & UC1

Location	Slope (%)	Surface		Mantle Depth (m)	Terrain	Drainage	Remarks
		Type	Type				
<b>W1640 Cutblock JH1 area</b>							
NW portion	55-65/30-50m, 20-30	Gravelly sand till	Gravelly sand till	>1	Rolling terrace deposit	Rapid	Terrace slopes with very thin duff layer, flat terrain on top of knob, straight sandy till slopes on terrace edge, 20-30% on John Hart Lake (L1) edge below, 50m reserve imposed on lake, Community Watershed. Cable yarding would minimize disturbance to steeper slopes, could ground-based harvest flatter areas in eastern portion. Dry, sandy till is highly erosive, some exposed till is raveling, minimal disturbance when yarding. Trees affected by root rot have blown over from SE wind, 4-5 in sight. WF not high, but should locate boundary with this objective.
Eastern portion	20, 65/50m/Lk	Gravelly sand till	Gravelly sand till	>1	Rolling terrace deposit	Rapid	Bench above lake, OK, could hoe chuck, OK. Minimal disturbance. F/L will be on edge of bench, erosive soils. Trees affected by root rot have blown over from SE wind, 4-5 in sight.
Southern portion	45, 80/75m/Lk	Gravelly sand till, some rubble C	Gravelly sand till, some rubble C	≥1	BR o/c, benched	Rapid	BR o/c, some rubble, immature, no harvest planned on steep slopes. Flat above could be accessed by road, less disturbance.
Western portion	30-60	Gravelly sand till	Gravelly sand till	>1	Rolling terrace deposit	Rapid	Dry soils, access by road on flat top of knob. Saddle deposit can support road to access flat terrain on top of knob.
Below John Hart Road	65/60m 35/30m/Lk	Gravelly sand till	Gravelly sand till	>1	Terrace slope	Rapid	Straight slope, some exposed sandy till is raveling. Minimal disturbance when harvesting, could use selective harvesting to minimize disturbance.
<b>W1898 Cutblock UC1</b>							
SW corner	65-75	Sandy rubble C talus with boulders	Sandy rubble C talus with boulders	>1	Straight slope	Rapid	Highway 28 & Upper Campbell Lake below, local water users. Talus rubble & boulders, safety hazard to Highway 28 below. Selective helicopter logging (STS) would mitigate safety & terrain hazard.
Higher elevations	75-Vert BR	Bluffs, rubble & boulder C	Bluffs, rubble & boulder C	<1	Bluffs	Rapid	Bluffs, few merchantable trees, STS would mitigate hazard here.
Above pipeline road	55-75	Sandy rubble C talus with boulders	Sandy rubble C talus with boulders	>1	Straight slope	Rapid	Talus rubble & boulders, local water intake in Cedar Creek (S3) below, STS harvesting would mitigate hazards.
Cedar Creek ML bridge	65/50m 30	Sandy rubble C	Sandy rubble C	>1	Rolling	Rapid	Gravel deck Fd stringer bridge, possible to install jumpspan over existing span instead of pulling out wood stringer bridge. Water intake immediately upstream from bridge.

TP: Transport potential LWD: Large woody debris VR: Variable retention C: Colluvium WF: Windfall G: Gravel BR: Bedrock R: Rubble O/C: Outcrop HP: Hardpan

Terrain Stability Field Assessment Upper Campbell Lake Area Cutblock UC 1



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