Technical Memorandum

DATE: May 20, 2017

TO: Ministry of Forests Lands and Natural Resource Operations

CC: Darcy Mooney, Phaedra Turner
     Shuswap Emergency Program

FROM: Jason Miller, P.Eng.

RE: NEWSOME CREEK ADJACENT TO CAEN ROAD
     Emergency Site Assessment of Newsome Creek
     Our File 3234.009-200

1. Introduction

The Provincial Ministry of Forests Lands and Natural Resource Operations and the Shuswap Emergency Program retained Kerr Wood Leidal Associates Ltd. (KWL) to complete an emergency assessment of Newsome Creek in the ravine between Highway 1 and Dieppe Road following reports from local property owners of creek bank erosion and large trees falling into the ravine. The assessment documents the current state of the creek and presents potential follow up actions. Figure 1 provides the overview map of the area.

Figure 1: Overview Map
2. Site Observations

On May 19, 2017, Jason Miller, P.Eng. of KWL traversed Newsome Creek from Highway 1 to Dieppe Road. A meeting with the property owner at 2809 Caen Road followed to discuss their concerns.

In general terms, the creek has recently experienced a significant high water event which has destabilized the Newsome Creek within the ravine. It appears a large block of material on the left bank (looking downstream), immediately downstream of the Highway 1 culvert outlet, fell into the channel, most likely a result of toe erosion due to high flows in Newsome Creek. The material appears to have temporarily dammed the creek, backing up the water and subsequently releasing, causing a flood wave to propagate down the channel. The destabilization includes channel migration fully contained within the ravine, significant erosion, bank sloughing, and vegetation losses.

The creek channel has recently scoured about 0.3 m to 1 m downstream of the Highway 1 crossing. The banks through most of the reach downstream of the Highway have eroded and are near vertical with exposed root systems hanging into the channel. The creek channel ranges in width from about 1.5 m to 2.5 m wide.

Table 1 provides a summary of specific observations within the ravine and along the creek.

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<th>Observation</th>
<th>Interpretation and Recommended Action</th>
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<tbody>
<tr>
<td>1</td>
<td>The inlet of the 1200 mm diameter CSP culvert under Highway 1 may have been submerged at the peak of a flood event (possibly around May 5 to 7). At the outlet of the Highway 1 culvert, there is about a 2 m drop from the culvert invert to the channel bed. <em>Photo 1</em> Significant flows through the culvert appear to further scour the culvert outlet and there may be future implications with significant debris accumulating at the culvert and sediment volumes which may comprise the culvert crossing. This culvert should be regularly reviewed during high water events and maintained as necessary.</td>
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<td>2</td>
<td>Immediately downstream of the Highway 1 Culvert outlet on the left bank (looking downstream), erosion along the toe caused a large block of material and several trees to fall into the channel, leaving a vertical bank about 8 m high (approximately across from Caen Rd properties 2803, 2805 2807). The creek has eroded a channel through the fallen material. <em>Photo 2</em> Some areas of the left bank toe where the large block of material fell has further erosion and is under cut by about 1 m or more. <em>Photo 3</em> It appears the large block of material fell from the bank, temporarily dammed the creek, backed up the water and subsequently released causing a flood wave to propagate down the channel. The undercut bank will cause additional slope failure and loss of further vegetation. Due to the proximity to the development at the top of the slope (1185 Passchedaele Rd), a geotechnical engineer should be retained to complete a slope stability assessment of banks and potential remedial actions.</td>
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### TECHNICAL MEMORANDUM
Emergency Site Assessment of Newsome Creek
May 20, 2017

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<td>3</td>
<td>On the right bank, adjacent to 2809 Caen Rd, erosion at the slope toe/ creek interface has occurred resulting in a vertical slope about 5 m high and 4 m long. Tree debris and sediment remain in the channel and is deflecting about 50% of the flow into the right bank. The creek steps down over the debris and sediment, cascading about 1.5 m vertically over about an 8 m length. At the time of the visit, immediately downstream of the debris, the channel is about 2.5 m wide with a water depth of 0.5 m. Total bank height is about 8 to 10 m. Photos 4, 5 and 6</td>
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<td>4</td>
<td>Erosion and sloughing has occurred on the right bank adjacent to 2819 Caen Road. There is a 4 m high vertical bank that extends about 8 m along the channel. The slope above the vertical cut is about 1H:1V. The creek is flowing against the right bank at the toe of the cut for about the first 3 m of its length. There is a building (understood to be workshop) located at the top edge of the slope. There is significant sediment and debris over about a 30 m length of the creek in this area. The creek steps down over the debris and sediment, dropping about 2.5 m over about a 12 to 15 m length. Total bank height is about 7 to 8 m. Photos 7 and Photo 8</td>
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<td>5</td>
<td>There has been some recent excavation from the inlet and outlet areas of the Dieppe Road crossing culverts. Material appears to be mostly sand and gravel. Photo 10</td>
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As above, the sediment and large fallen trees continue to redirect flows into unprotected areas of the ravine banks. This process will continue. The fallen trees may be removed to reduce the debris from directing flow to the right bank. It may be possible to move sediment using hand tools from the centre of the channel to the side to direct flow away from the bank. Sand bags may be required to help direct the flow to the middle of the channel. Significant work would be required to get heavy equipment into the ravine.

As above, the instability within the creek will continue to erode and slough the bank. With current creek flowing at the toe of the cut bank, this building may be compromised in the foreseeable future. The type of building should be confirmed and the property owner may engage a geotechnical engineer to complete a slope stability assessment and determine potential remedial actions.

The creek culvert crossing will need regular monitoring and maintenance through any high water events (storms and freshet).

In addition to the ravine, a review of the top of slope at 2809 Caen Road was conducted. An elevated deck is positioned at the top of slope that has been intermittently sloughing down the slope along with small cedar trees. The bank is very steep in this location (>1H:1V). The property owner of 2809 Caen Road confirmed that some material sloughs from the top of bank near the deck every spring when the ground thaws. However, the owner has observed more sloughing than usual this year. The owner has tied small rope to the cedars to reduce their sliding and allow them to further establish. It appears the top of bank has sloughed back towards the deck about 0.3 m along a length of about 3 m in recent weeks. The owner has been placing tarps on the top of slope when precipitation is observed to limit further wetting of the slope in an attempt to reduce erosion. At the downstream end of the property (above the newly eroded bank), there is overhanging material at the top of slope over a very steep section of bank. It appears vegetation is holding the overhang in place. At the time of the visit, the property owner was in the process of moving their small shed further from the overhanging bank.
3. Closure

Caution should be used when entering the ravine and working in the area. There are several danger trees and unstable slopes that pose safety hazards to anyone in the area. Safety hazards should be addressed prior to working in the area.

The immediate actions listed above will reduce the erosion and bank sloughing caused by the creek redirections of failed banks and fallen trees in the select areas. However, the destabilized creek will continue to erode and slough the banks until stability returns to the creek. The residents along the creek corridor are encouraged to seek professional advice to develop a long term plan.

We trust this assessment provides sufficient information to make decisions for emergency response works. Please contact the undersigned with any questions.

KERR WOOD LEIDAL ASSOCIATES LTD.

Prepared by:

Jason Miller, P.Eng.
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Reviewed by:

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Emergency Management Specialist

Encl.: Photographs – May 19, 2017

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Revision History

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<td>May 20, 2017</td>
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Photographs – May 19, 2017

Photo 1: Newsome Creek flowing out of 1200 mm dia. CSP culvert under Highway 1.

Photo 2: Looking downstream from outlet of Highway 1 culvert. Left bank has eroded and fallen into the creek. Vertical slope is up to about 8 m high.
Photographs – May 19, 2017

Photo 3: Looking downstream at vertical slope with creek flowing at toe. The creek is undercutting the bank adjacent to 1185 Passchedaele Road.

Photo 4: Debris and sediment build up adjacent to property at 2809 Caen Road.
Photographs – May 19, 2017

Photo 5 and 6: Photo on left is looking upstream at debris and erosion (adjacent to property at 2809 Caen Road). The photo on the right is the same site looking across the channel at the debris and erosion.
Photographs – May 19, 2017

Photo 7: Failure on right bank due to toe erosion from the creek adjacent to 2819 Caen Road.

Photo 8: Closer look at bank failure with tree and sediment debris in the channel adjacent to property 2819 Caen Road.
Photographs – May 19, 2017

Photo 9: Looking upstream on Newsome Creek adjacent to 2823 Caen Road.

Photo 10: Inlet headwall of culverts at Dieppe Road.