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Date: September 27, 2023

From: Jennifer Clarke, M.Sc., P.Geo.

CGL Project Number: 23-0106

Subject: McDougall Creek Post-Wildfire Natural Hazard Risk Analysis - Preliminary Results of Priority Sites

Introduction and Study Objectives:

The 2023 McDougall Creek post-wildfire natural hazard risk analysis is currently underway by Clarke Geoscience Ltd. on behalf of the Ministry of Forests – Wildfire Service.

The overall purpose of the investigation is to estimate the likelihood for post-fire natural hazards such as landslides, debris flows, debris floods and elevated peak flows, and to estimate the potential to affect elements at risk, such as private property and public infrastructure. The following memo provides a summary of initial findings and preliminary results of the partial risk analysis. Early identification of potential risks may be used to identify the need for risk mitigation.

A helicopter overview flight was completed on Sept. 19, 2023, and ground-based field work was conducted for the upland portions of the fire-affected area between Sept. 19 and 23, 2023.

Preliminary Results:

Post-wildfire natural hazard risks are associated with:

- hydrologic effects, such as faster runoff, lower infiltration, higher peak flows, and
- geomorphic effects, such as increased soil erosion, landslides and debris flow, and sediment transport.

In larger catchments, including McDougall Creek and Lambly (Bear) Creek, the risk scenario is dominated by hydrologic effects, while smaller, steeper catchments are more likely to be affected by geomorphic effects. Properties located on fan areas are also subject to risk where there is a potential for debris flow runout and upstream flow diversion.

The field investigation found that vegetation burn severity mapping prepared by the Province is relatively accurate, both spatially and with respect to severity ratings. In limited areas, the moderate vegetation burn severity mapping was found to underestimate losses. Based on the results of numerous soil test sites, vegetation burn severity mapping was found to be generally well correlated with soil burn severity. It was observed that the development of water repellent (hydrophobic) soils varies and is not always strongly developed in areas mapped as high burn severity.

Locations identified as having a high to very high level of partial risk associated with post-wildfire natural hazards include slopes and gullies upslope and downslope of Bear Creek Road North, areas downstream along McDougall Creek, slopes adjacent to the Rose Valley Reservoir, and select slopes and gullies along Westside Road. A summary list of these areas, the identified elements at risk, and the identified natural hazards, is provided in Table 1 and are identified on the enclosed Figure 1.

Table 1: Priority Areas with High to Very High Partial Risk Associated with Post-Wildfire Natural Hazards

General Location (Jurisdiction)	Elements at Risk	Post-Wildfire Natural Hazards ²
Bear Creek Road North (RDCO, CWK)	Private properties, Bear Creek Road North, CWK water distribution pipeline along toe of slope (buried but with at least one potential at-risk site)	High likelihood of elevated peak flows and debris flood events on Cedar Creek (loc.), which is a tributary to Lambly Creek. High likelihood for debris flows on small gullies above Bear Creek Road N. High likelihood for small-scale raveling and shallow debris slides on steep (>50%) slopes above and below Bear Creek Road N.
McDougall Creek (CWK, WFN)	Private properties, Public roads and infrastructure, WFN Lands and resources along McDougall Creek	High likelihood for elevated peak flows on McDougall Creek. High likelihood for sediment and debris loading into McDougall Creek.
Rose Valley Reservoir (CWK)	Domestic water quality	High likelihood for increased sediment delivery to the Reservoir.
Gullies and Slopes along Westside Road (RDCO) Jennie Creek Oldman Creek (loc.) Wilson Creek (loc.) ¹ Cedar Gulch (loc.)	Public roads, Wilson’s Landing Fire Hall, Private properties	Rockfall hazard along exposed section of Westside Road and rolling rock hazard along Westside Road where steep (>50%) burned slopes are directly connected to the road. High likelihood for debris flow and debris flood on steep gullies above Westside Road where there is a moderate to high spatial likelihood of impact to downstream elements at risk.

RDCO – Regional District of Central Okanagan; CWK – City of West Kelowna; WFN – Westbank First Nation

loc. – refers to a local name for a stream as referenced from RDCO-Sensitive Habitat Inventory and Mapping (SHIM)

¹ – past debris flow assessment work has been completed for Wilson Creek (loc.) at the Wilson’s Landing Fire Hall site.

² – post-wildfire hazard ratings defined in Land Management Handbook No. 69 (Hope, et al, 2015)

Climate Conditions Associated with High Hazard Scenarios:

Climate conditions associated with an elevated likelihood of occurrence will vary depending on the site and the identified hazards. Conditions that trigger debris flow/debris flood hazards are different from those that generate elevated peak flows on larger watersheds. To address immediate (short-term) hazards identified at the above-listed priority areas, short-duration intense rainstorms are considered most relevant.

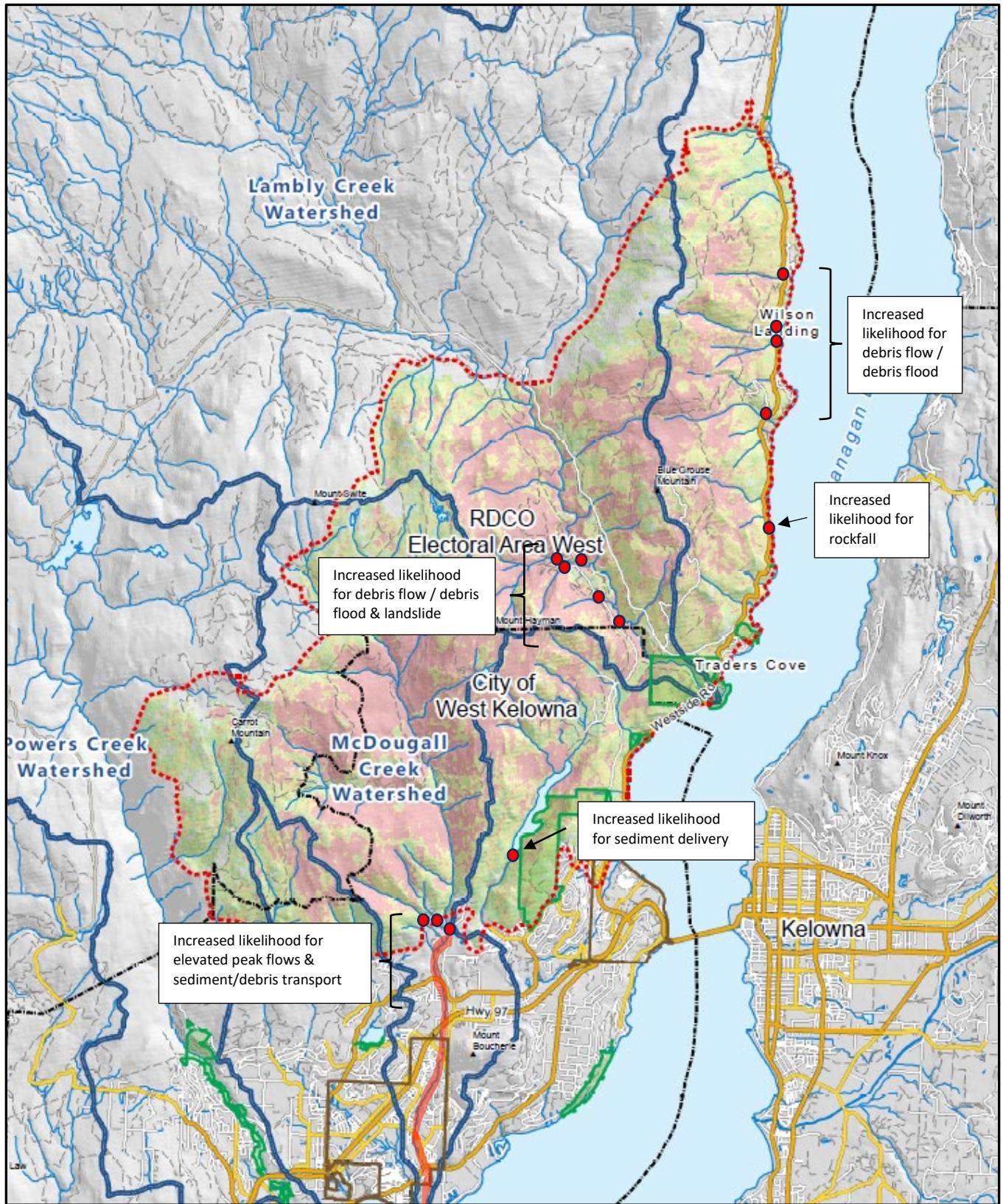
Further work is being completed to develop local rainfall intensity thresholds for debris flow initiation. In the interim, rainfall intensities as low as 10 mm/hr for ~1-hour duration may be considered.

Recommended Mitigation Measures:

For the areas identified as having a high to very high partial risk for post-wildfire natural hazards, mitigation measures begin with increased awareness, monitoring, and emergency preparedness activities. In the short-term, downstream drainage structures and soil conditions in the identified areas should be inspected and maintained to ensure clear passage for sediment-laden water and debris.

These results are draft and preliminary and do not necessarily report on all natural hazards occurring within the study area. There are likely additional high to very high risk sites that are not included within this preliminary summary. The results are also subject to change once the analysis has been refined. Professional judgment has been applied in the analysis and in developing the recommendations.

If you have any questions or comments, please do not hesitate to contact me at jen@clarkegeoscience.com.



Burn Severity (Source: BC Data Catalogue)

- High
- Medium
- Low



Project: 2023 McDougall Creek Wildfire Natural Hazard Risk Analysis

Title: Preliminary Results –Priority Sites with Elevated Partial Risk

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