October 28, 2026 Project 1358014

Squamish-Lillooet Regional District
1350 Aster Street
Pemberton, BC

Attention: Mark Phillips, General Manager of Protective & Emergency Services

Devastator Creek Landslide Response

1.0 INTRODUCTION

Reports were received on September 3, 2026, of turbid flow observed in Meager Creek at its confluence with the Lillooet River, suspected to originate from a landslide west of Mount Meager. The Squamish-Lillooet Regional District (SLRD) contacted BGC Engineering Inc. (BGC) to support with an emergency assessment of the landslide with respect to public safety concerns. The SLRD has coordinated with the Lil'wat First Nation (Lil'wat) and the Pemberton Valley Diking District (PVDD) during the response to this event.

The Mount Meager volcanic complex is approximately 60 km northwest of the Village of Pemberton, within Electoral Area C of the SLRD (Figure 1). The traditional Lil'wat territory name for the area is Qw'elqw'elústen (personal communication, Tammie Jenkins, September 29, 2026). The area is bound to the south by Meager Creek, and the east by the Lillooet River. The Mount Meager volcanic complex is formed by multiple coalesced volcanoes and consists of weak, highly fractured and hydrothermally altered rock (Read, 1990). Past work has highlighted the geohazard risk associated with the area (Friele et al., 2008).

The purpose of this document is to characterize the cause of the observed sediment in the Lillooet River and to provide recommendations on public safety as well as concerns from the Lil'wat and PVDD. Work was carried out under the terms of the Emergency Response Service Agreement between the Squamish-Lillooet Regional District and BGC Engineering Inc., dated October 28, 2026.

2.0 DATA COLLECTION AND OBSERVATIONS

2.1 Helicopter Reconnaissance

Two helicopter reconnaissance flights were completed for this assessment. The first was conducted on September 4, 2026, by Andrew Mitchell and Zac Sala of BGC, and Tammie Jenkins of Lil'wat. Weather conditions were marginal at the time of the assessment, with rain

and clouds obscuring higher elevations. The flight followed the Lillooet River valley from Pemberton upstream to the confluence with Meager Creek, and then upstream along Meager Creek. The sediment-rich water was found to be originating from Devastator Creek. During the flight, an extensive debris field was found consisting of fragmented volcanic rock with some glacier ice intermixed (Photo 1), along with sediment-rich water flowing off the deposit within the Devastator Creek watershed. Downslope of the source area, there was evidence of the debris moving extremely rapidly downslope, super-elevating around bends. Evidence of extremely rapid, flow-like movement are consistent with the landslide being classified as a rock avalanche (Hungr et al., 2014). The flow appeared to have transitioned to a saturated debris flow within the Devastator Creek drainage (Photo 2 shows the downstream extent). The upper elevations were cloud covered, and as such the landslide source and the slope above could not be clearly observed.

The focus of the follow-up flight was to look at potential hazards near the source zone (Photo 3) which could not be clearly observed during the September 4, 2026 flight due to cloud cover. The follow up flight was completed on September 18, 2026, by Andrew Mitchell and Gemma Ferland (BGC), Kevin Clark (PVDD), Tammie Jenkins (Lil'wat) and Ankita Ghoke[1] (Simon Fraser University, SFU). Cracking was visible on the west margin of the scarp (Photo 4). The cracking extends approximately 50 m back from the scarp face. If this material failed, it would represent a much smaller volume than the original failure; however, it is indicative of ongoing instability in the vicinity of the source zone.

Cracking and deformation features were also observed on the western side of the valley downstream of the scarp (Photo 5). Another area of cracking which could indicate slope deformation was observed on the eastern valley wall (Photo 6). Further information on these zones has been obtained from remote sensing data (Section 2.2) aiding in estimates of potential event volumes (Section 3.0).

The landslide material contains a wide range of grain sizes, ranging from large boulders to fine, highly erodible particles. Water draining over the landslide has cut channels into the deposit (Photo 7), which is contributing to the downstream sediment observed in the Lillooet River. Approximate photograph locations are indicated on Figure 2.

2.2 Remote Sensing

Additional information on the landslide area was obtained through satellite images, satellite radar sensors and lidar topographic data, collectively referred to as remote sensing.

A pre-event satellite optical image of the source area collected on August 25, 2025 was obtained by BGC. The headscarp of the failure source is clearly visible in this image (Figure 3). A pre-event bare-earth lidar derived digital elevation model which is a composite of multiple surveys completed in 2015 and 2016 was provided by SFU (Glyn Williams-Jones, personal

[1] SFU has been conducting research in the Mount Meager area, and their research is not directly related to the current assessment being conducted on behalf of the SLRD.

communication, September 28, 2026). The backscarp of the failure zone was also clearly identifiable in the pre-event topography (Figure 4). A post-event optical satellite image collected on August 5, 2026 was obtained by BGC in which the runout path of the event is visible, delineated on Figure 5. The runout distance, measured from the crest of the landslide scarp to the distal end of the deposit, is approximately 6.4 km, with an elevation change of 1,130 m between those points (Figure 6). Additional satellite imagery was reviewed by researchers at SFU, which indicated the failure occurred between July 30 and August 3, 2026 (Glyn Williams-Jones, personal communication, September 8, 2026). The cracking and deformation features that were noted downstream of the scarp on the west and east valley walls (Photos 5 and 6) are also visible in the lidar topography (Figure 4) and the post-event satellite imagery (Figure 7).

Satellite interferometric synthetic aperture radar (InSAR) is a technique to measure surface displacement by analyzing the reflected signal of SAR images. InSAR techniques can measure displacement magnitudes ranging from millimeters to hundreds of centimeters with millimeter precision. Data were obtained from the Sentinel-1 satellite operated by the European Space Agency to assess displacement on the rock slopes around the source area. Displacement was estimated between July 30 and August 11, 2026, and between August 2 and September 7, 2026 (Figure 8). No displacement data is available in the source area as the displacement exceeded what can be measured by InSAR. An area of deformation upslope of the scarp on the eastern margin of the landslide source is visible in the results. The areas on the west and east valley walls identified as having signs of deformation can also be seen in the InSAR analysis, indicating the slope movement in these areas is an ongoing process.

2.3 River Flow Data

Discharge data for the Lillooet River was examined for the period following July 30, 2026 (earliest potential date for the landslide occurrence) at the hydrometric gauge approximately 32 km downstream of the Meager Creek and Lillooet River confluence. Precipitation data from the Ministry of Forests Meager Creek climate station, near the Meager Creek and Lillooet River confluence, was also reviewed over the same period. Time series for both datasets are shown on Figure 9.

There was a spike in the Lillooet River discharge within the range of potential landslide occurrence; however, this was also associated with a precipitation event, so it may be unrelated to the landslide occurrence. Increased turbidity was noted in the Lillooet River and Meager Creek on September 3, which corresponds with a rise in discharge observed between September 2 and 4 (Figure 10), which was not associated with a rain event. This period of increased discharge is interpreted to be related to a release of water from the landslide area.

2.4 Previous Events

The Mount Meager volcanic complex is known as an area with large landslides occurring in historic and pre-historic times (Friele et al., 2008). Previous events within the Devastator Creek watershed have been identified as early as 2170 years before present (BP), and in 1931, 1947

and 1975. The event in 1975 resulted in four fatalities. The volumes of these events are estimated between 10,000 m^3 (1947) and 12 million m^3 (2170 years BP and 1975) (Friele et al., 2008). A landslide with a volume of approximately 48.5 million m^3 occurred on August 6, 2010, descending the Capricorn Creek valley, Meager Creek, and temporarily damming the Lillooet River (Guthrie et al., 2012). The deposits of many other landslides have been identified in the area, indicating a wide-spread local landslide hazard.

3.0 INTERPRETATIONS

Clear signs of slope distress were evident in the pre-event satellite images and lidar topography of the source area ahead of the landslide. There is a potential for additional material to fail from the landslide headscarp, with visual signs of deformation noted on the western flank of the headscarp (Photo 4), and InSAR deformation noted on the eastern flank of the headscarp (Figure 7). Two additional areas of ongoing slope deformation have been identified on the west and east valley walls downstream of the recent landslide from visual observations and satellite InSAR.

The volume of the 2026 event was estimated using empirical relationships between the plan view area of a source zone with the event volume (Larsen et al., 2010; Massey et al., 2020). The source zone was mapped by comparing the pre- and post-event satellite imagery, yielding an area of approximately 420,000 m^2, corresponding to a volume of approximately 7,500,000 m^3 (averaging both estimates). Similarly, the areas of observed deformation downstream on the west and east valley walls were mapped to obtain estimates of potential failure volumes. The estimated volumes of the 2026 source and potential future source volumes are summarized in Table 3-1.

Table 3-1 Estimated landslide volume and potential landslide volumes of downstream deformation areas.

	Source Area (m^2)	Potential Landslide Volume (m^3)	
		Larsen et al., 2010 (rock)	Massey et al., 2020 (slide and rotational)
Landslide Source	420,000	7,300,000	7,800,000
West Valley Wall	550,000	10,500,000	11,500,000
East Valley Wall	940,000	21,600,000	25,200,000

The potential volumes of the west and east valley wall deformation zones exceed the estimated volume of the recent landslide. While it is uncertain when and if these zones would fail catastrophically, and if the entire deforming zones would fail at one time, the volumes are plausible based on past events within the Devastator Creek drainage and more generally on the Mount Meager volcanic complex.

A delay of approximately one month was noted between the landslide event and the pulse of sediment being observed in Meager Creek and the Lillooet River. No impounded water was

visible on the surface of the landslide deposit in satellite imagery, and the slope of the deposit is steep enough (13% grade on average) to prevent a significant impoundment of surface water. Rock avalanches typically have a void ratio between 20% and 30%, meaning on the order of 1.5 to 2 million m^3 of water could be present within the void space of a 7.5 million m^3 deposit. The presence of glacier ice within the deposit could also contribute to a delayed release of trapped water, as melting ice could increase drainage paths over time. While the exact cause of the delayed sediment and water discharge following the landslide is highly uncertain, it is informative that there can be a delay between a primary hazard (the landslide) and secondary effects (downstream discharge and sedimentation).

Based on the information gathered in this assessment, the remaining landslide deposit and source area do not pose an immediate public safety threat. However, sediment has been transported downstream, and the landslide debris may be mobilized in future precipitation and snow melt events. This sediment is expected to contribute to aggradation within the Lillooet River, which could have impacts to the freeboard on the PVDD diking system, which would reduce the river flow needed to overtop the dike, and it could affect fish habitat and migration routes within the Lillooet River.

4.0 REMAINING HAZARD ASSESSMENT

Hazards remain within the Devastator Creek watershed, evidenced by deformation on the flanks of the headscarp, as well as the areas of deformation identified on the east and west valley walls downstream of the landslide source. Any or all of these areas could be the source of future, highly mobile landslides. The west and east valley wall sources have potential volumes greater than what is estimated to have failed in this landslide event, which could result in them exhibiting a further travel distance than this event. The extensive loose, and potentially saturated, slide debris along Devastator Creek could also be remobilized and entrained in future landslide events. The Devastator Creek drainage is remote and not easily accessed, and as such direct impacts to members of the public by future events is unlikely, but as shown by the 1975 event, fatalities are possible.

The increased flow and turbidity observed in the Lillooet River approximately one month after the landslide is indicative of potential secondary hazards associated with future instabilities. The increased flow is interpreted to be related to this event happened during a time of year with low river flows, but if something similar were to occur when river levels are high it could result in an overtopping of the downstream dikes with little warning.

Ongoing landslide activity is also a source of sediment within the Lillooet River. The coarse sediment will only be mobilized in periods of high flow, which means it could take many years for the sediment sourced from this event to deposit near downstream dikes or other infrastructure. Sediment deposition raises the bed level of the river, which can result in overland flooding at lower river flows than they otherwise would have occurred. Increased sediment can also affect fish habitat and migration routes, and high concentrations of fine sediment within the water can be harmful to migrating fish.

5.0 RECOMMENDATIONS

The current landslide event has not been identified as a public safety threat at this time, however, there are other areas of concern that have been identified which could develop into future, rapid and highly mobile landslides. The following recommendations are provided to increase the situational awareness of the SLRD and other parties within the area.

1. Collect up to date lidar of the Mount Meager volcanic complex and the Lillooet River valley and make it publicly available. This will allow for all parties with interest in the area to have accurate information of the topography and would assist with the identification of other potential areas of concern.
2. Contingent on the completion of Recommendation #1, a topographic change detection analysis could be completed to identify areas of deformation on the slopes, as well as within the Lillooet River (i.e., areas of sediment aggradation).
3. Coordinate with Natural Resources Canada (NRCAN) to examine the possibility of extending the existing volcano monitoring program using the RadarSat Constellation Mission satellites to include slope deformation monitoring.

Recommendations #1 through #3 are related to gathering more information on the movement of the slopes and resulting sediment transport downstream. Gathering this information may identify new areas of concern within the Mount Meager volcanic complex. If this occurs, the following measures are recommended to allow for a risk-based management of the hazards:

1. Estimate credible ranges of volumes and runout distances for areas of slope stability concern. The credible runout distances can be overlain with known infrastructure or areas of environmental or cultural importance to establish elements potentially exposed to the hazard.
2. Working with all involved parties, develop a framework for prioritizing the hazards based on the elements exposed to the hazard, and potential consequences of impacts. This prioritization would be valuable in establishing the level of effort for ongoing monitoring or mitigation measures based on the risk of an event.

BGC recognizes that implementing all of these recommendations will require support from multiple levels of government.

6.0 CREDITS AND ACKNOWLEDGEMENTS

BGC would like to acknowledge Jeanine Engelbrecht, Ph.D., P.Geo., for her contributions to the remote sensing analyses in this report. BGC would also like to express its appreciation for the support and input provided by Tammie Jenkins of the Lil'wat First Nation, Kevin Clark of the Pemberton Valley Diking District, and the Centre for Natural Hazards Research at Simon Fraser University.

7.0 CLOSURE

We trust the above satisfies your requirements. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

BGC Engineering Inc.
per:



Andrew Mitchell, Ph.D., P.Eng.
Senior Geotechnical Engineer

Reviewed by:

Michael Porter, M.Eng., P.Eng.
Principal Geological Engineer

EGBC Permit to Practice, BGC Engineering Inc. 1000944

AM/MJP/ab/sjk

Attachment(s): Limitations
References
Figures
Photos

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[2] References in these Limitations to the "document" include the document to which these Limitations are attached, any content contained in this document, and any content referenced in this document but located in one of BGC's proprietary software applications (e.g., Cambio).

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Read. P.B. (1990). *Mount Meager Complex, Garibaldi Belt, Southwestern British Columbia*. Geoscience Canada **17**(3), 167-170.

FIGURES



NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Background imagery from the Squamish-Lillooet Regional District Cambio webpage: https://app.cambioearth.com/SLRD/vNext, inset image from the Squamish-Lillooet Regional District webpage: https://www.slrd.bc.ca/

PREPARED BY:	FIGURE TITLE:		
AM	SITE OVERVIEW		
CHECKED BY:	CLIENT:		
MJP	SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
AM	AS SHOWN	1358014	1

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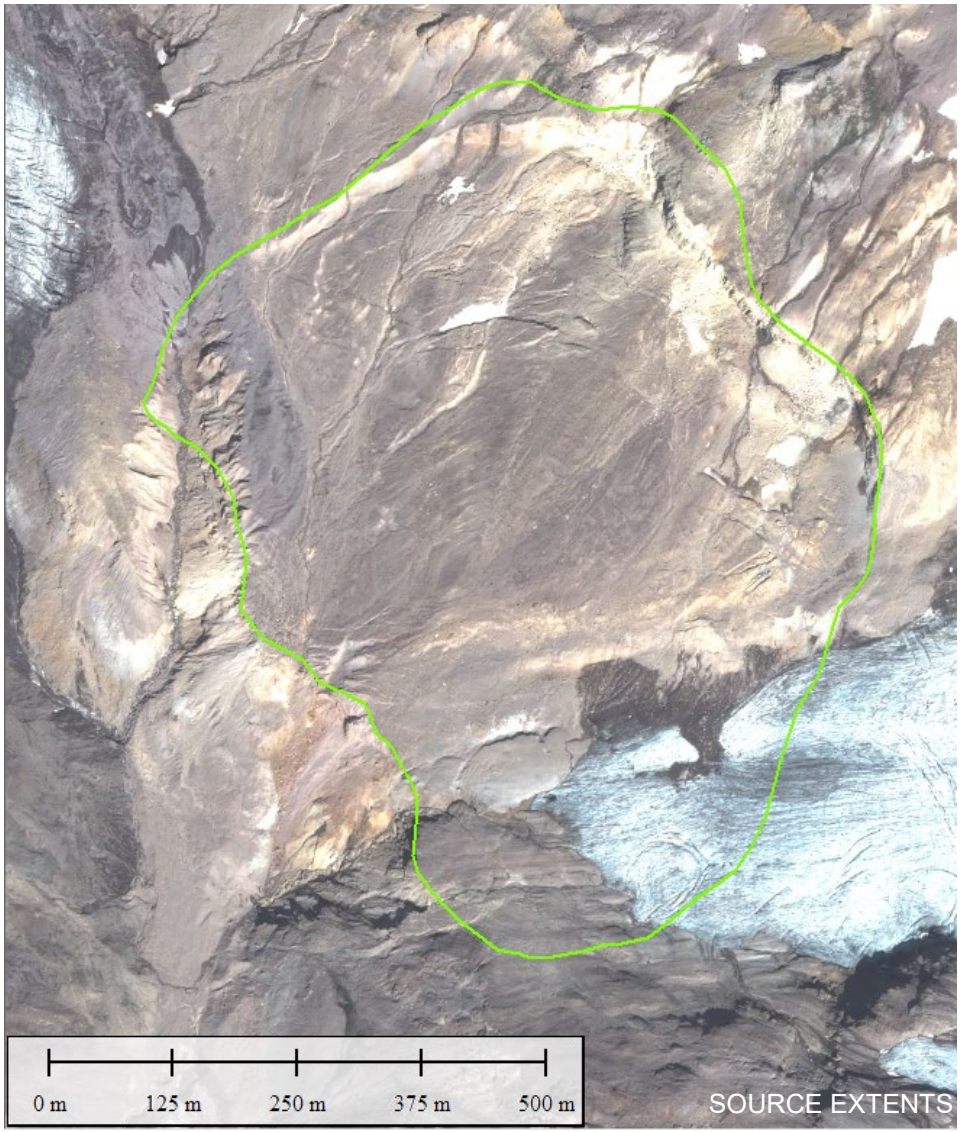


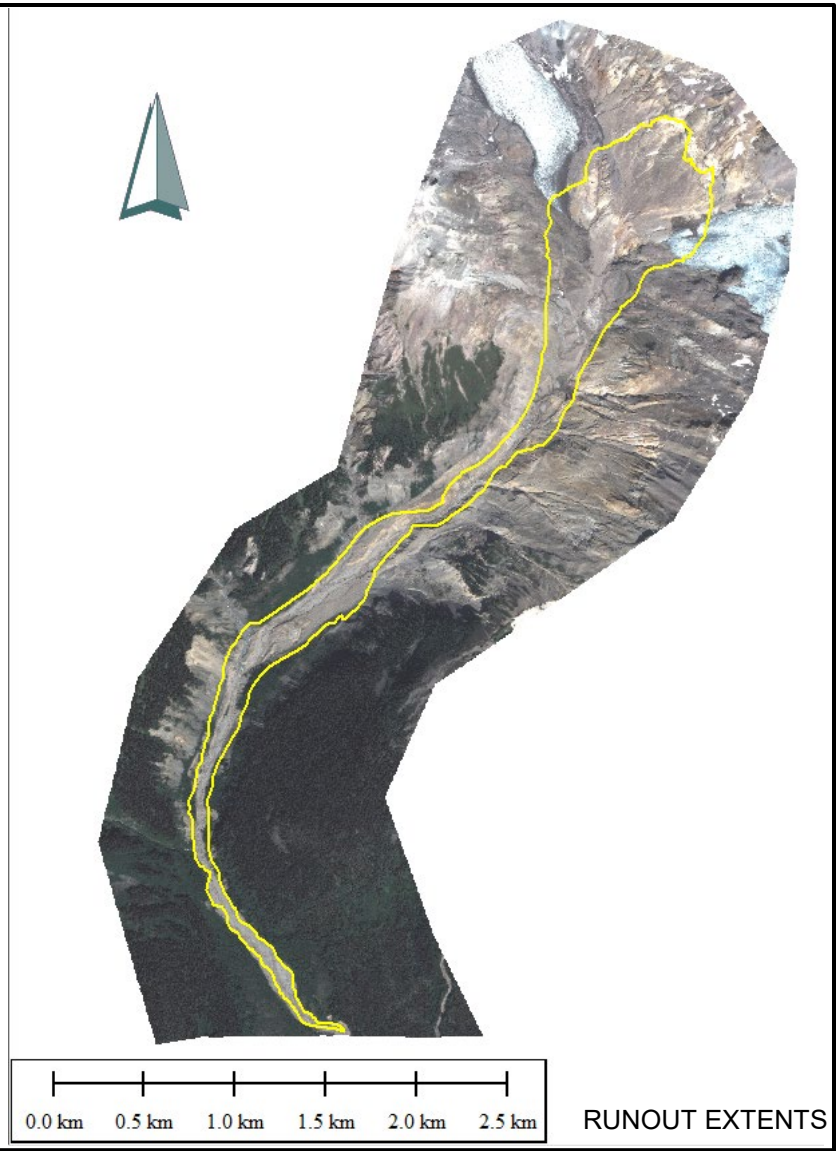
NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Background imagery from the European Space Agency Copernicus Browser, https://browser.dataspace.copernicus.eu/ Imagery date: September 18, 2026.

PREPARED BY: AM	FIGURE TITLE: PHOTOGRAPH LOCATIONS		
CHECKED BY: MJP	CLIENT: SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY: AM	SCALE: AS SHOWN	PROJECT NO: 1358014	FIGURE NO: 2

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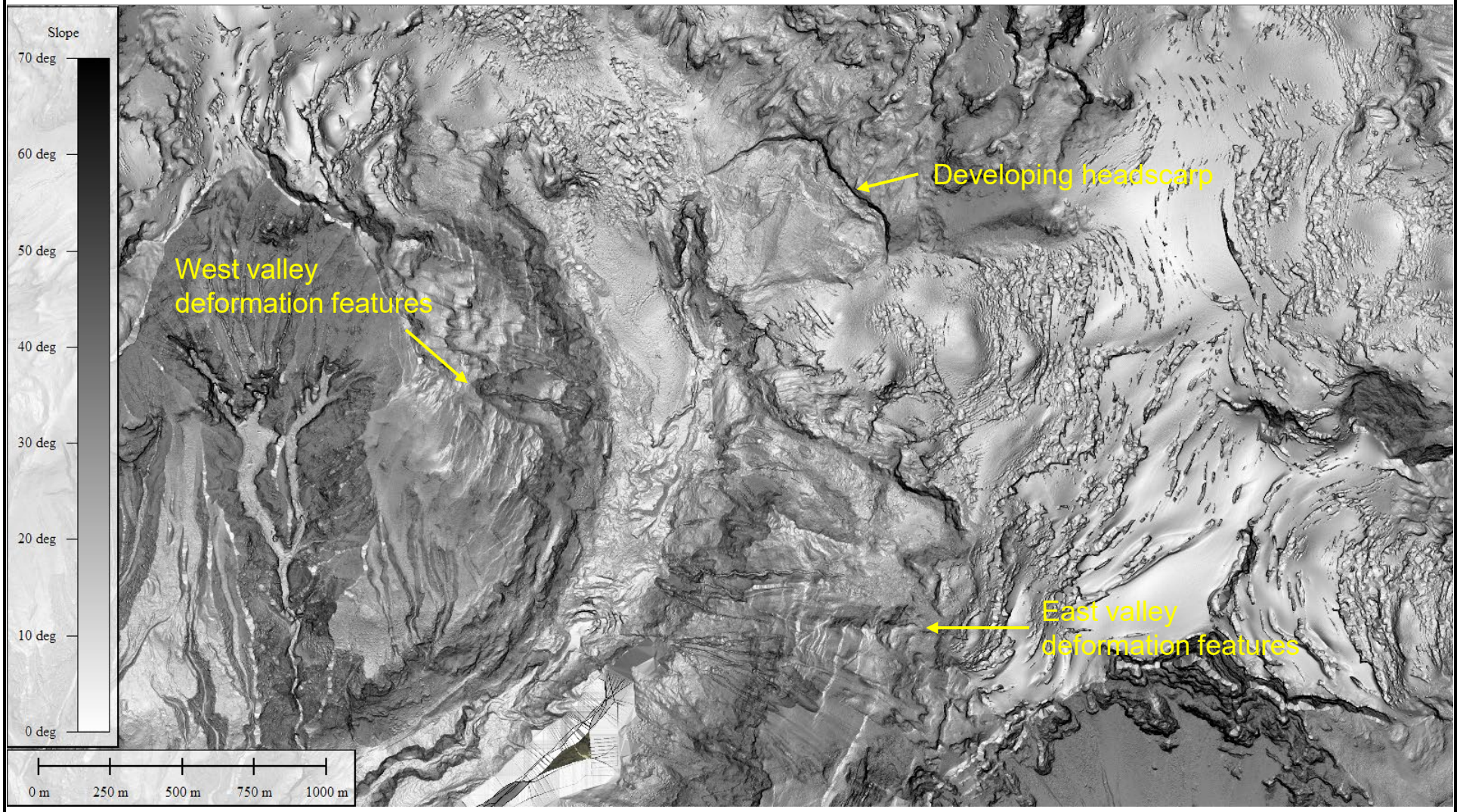


NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Imagery from Pleiades Satellite Imagery, collected August 25, 2025.

PREPARED BY: AM	FIGURE TITLE: PRE-EVENT SATELLITE IMAGE (AUGUST 2025)		
CHECKED BY: MJP	CLIENT: SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY: AM	SCALE: AS SHOWN	PROJECT NO: 1358014	FIGURE NO: 3

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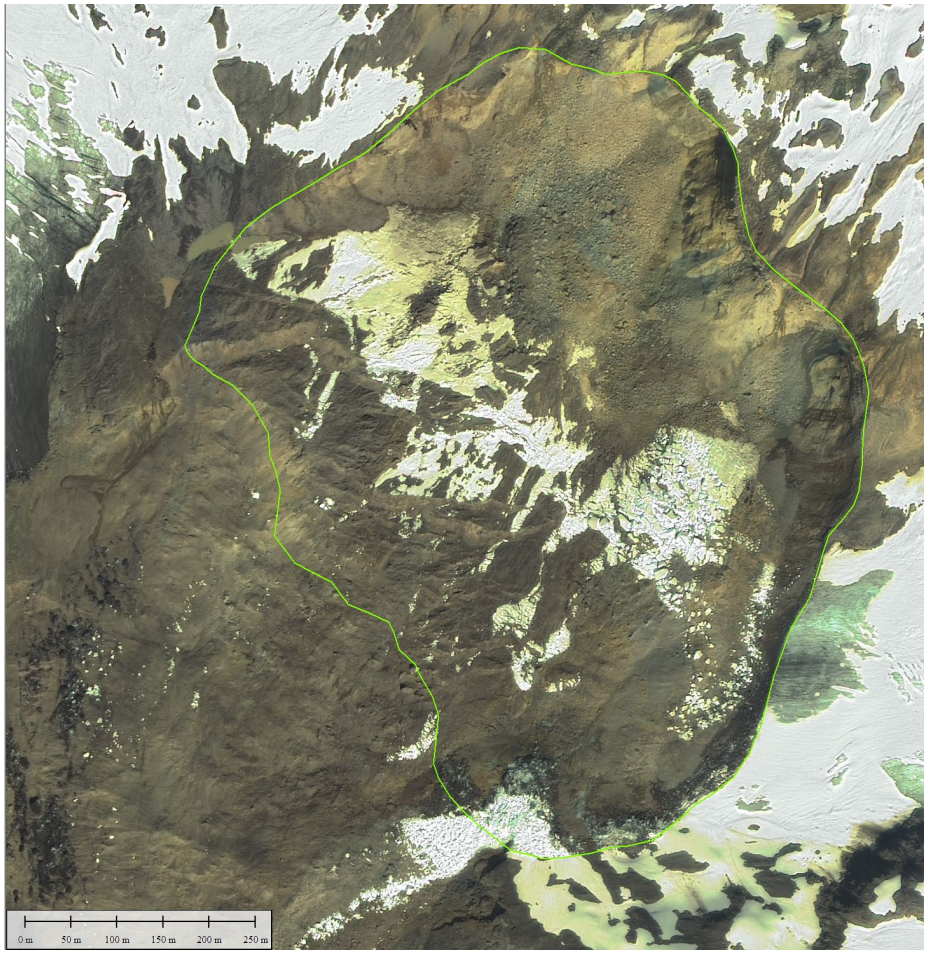


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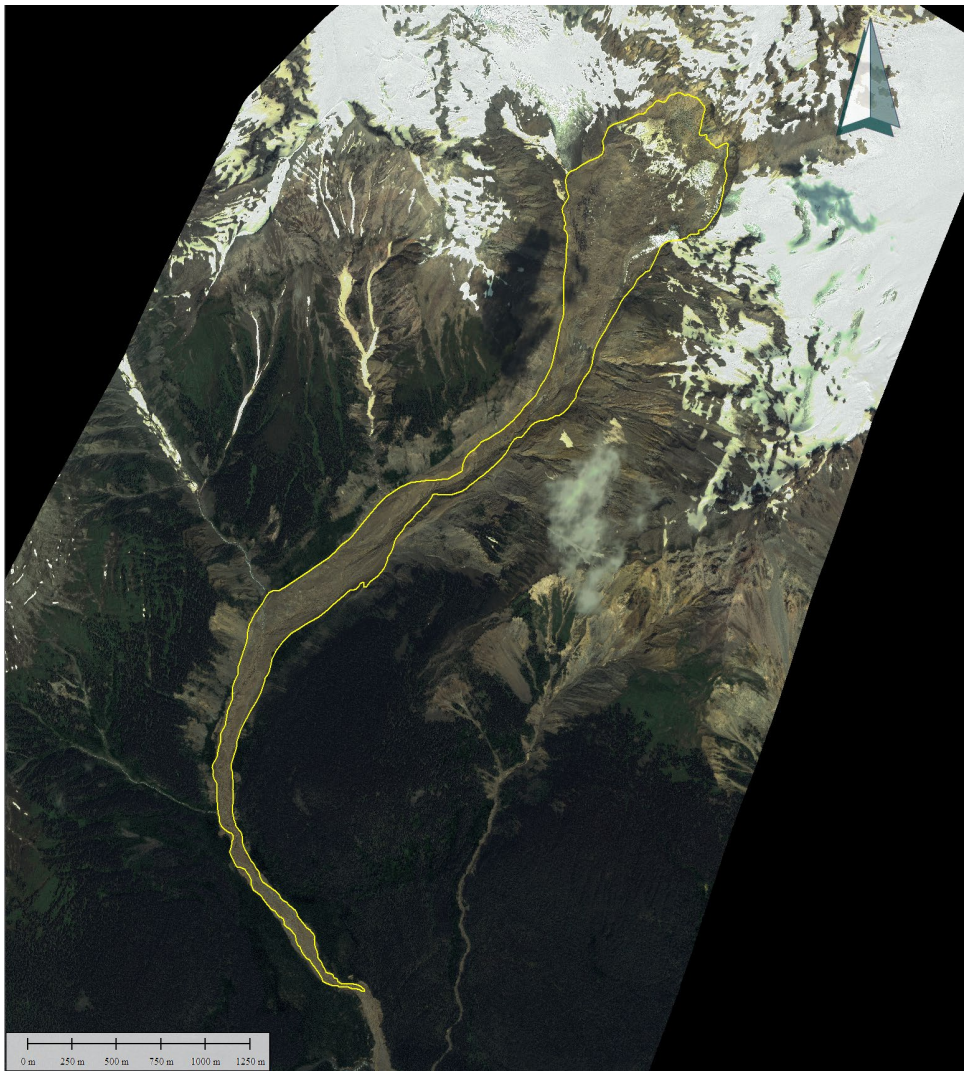
1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Topographic data is a 1 m lidar-derived DEM from data collected in multiple missions in 2015 and 2016, provided by SFU (Glyn Williams-Jones, September 28, 2026).

PREPARED BY: AM	FIGURE TITLE: PRE-EVENT LIDAR TOPOGRAPHY		
CHECKED BY: MJP	CLIENT: SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY: AM	SCALE: AS SHOWN	PROJECT NO: 1358014	FIGURE NO: 4

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SOURCE EXTENTS



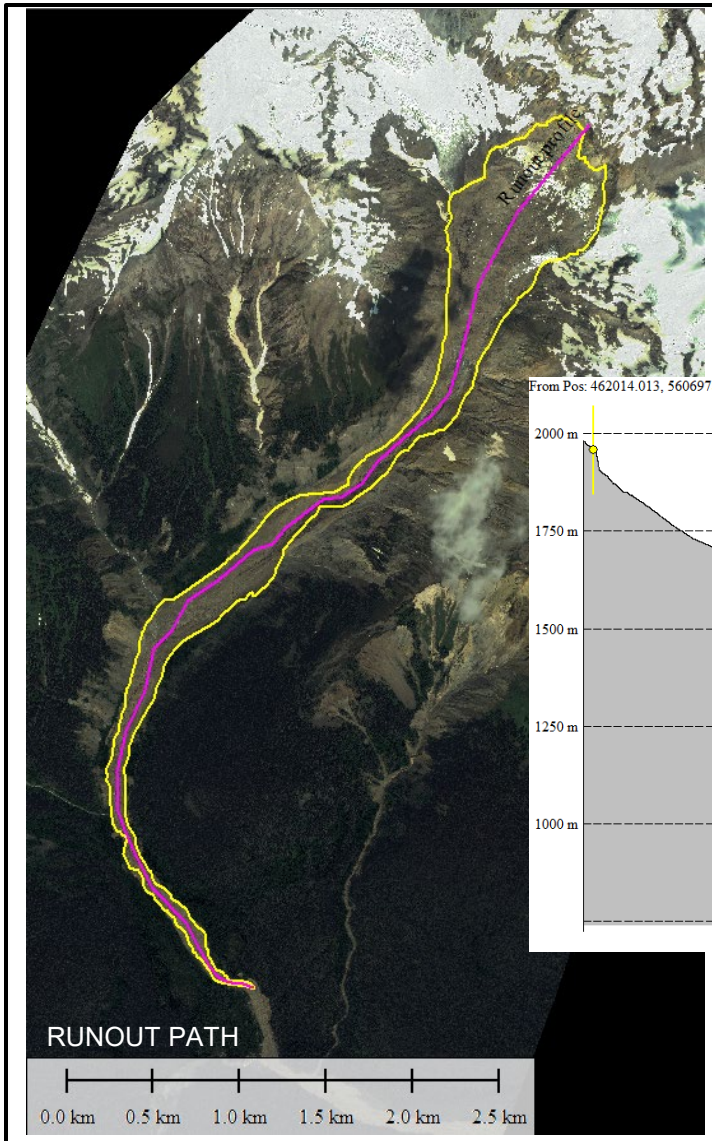
RUNOUT EXTENTS

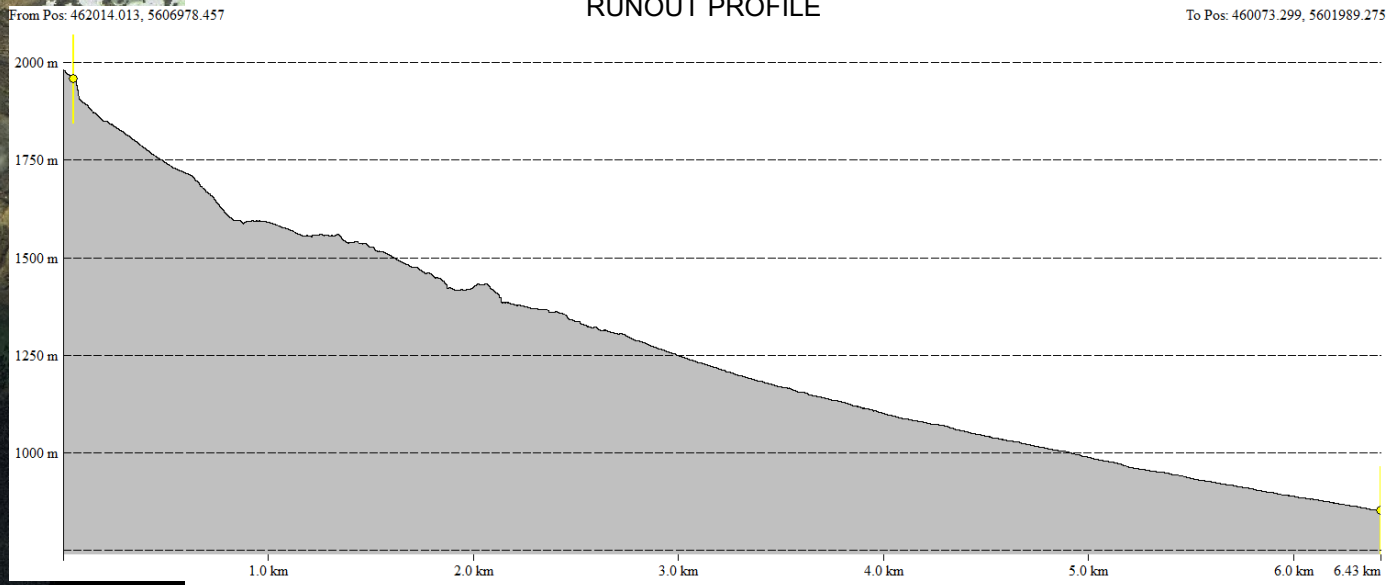
NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Imagery from Superview Satellite Imagery, collected August 5, 2026.

PREPARED BY: GMF	FIGURE TITLE: LANDSLIDE SOURCE AND RUNOUT EXTENTS (POST-EVENT SATELLITE IMAGE AUGUST 2026)		
CHECKED BY: MJP	CLIENT: SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY: AM	SCALE: AS SHOWN	PROJECT NO: 1358014	FIGURE NO: 5

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PATH LENGTH = 6,400 m
ELEVATION CHANGE = 1,130 m

NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Imagery from Superview Satellite Imagery, collected August 5, 2026.
3. Topographic data is a 1 m lidar-derived DEM from data collected in multiple missions in 2015 and 2016, provided by SFU (Glyn Williams-Jones, September 28, 2026).

PREPARED BY:	FIGURE TITLE:		
GMF	LANDSLIDE SOURCE AND RUNOUT EXTENTS (POST-EVENT SATELLITE IMAGE AUGUST 2026)		
CHECKED BY:	CLIENT:		
MJP	SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
AM	AS SHOWN	1358014	6

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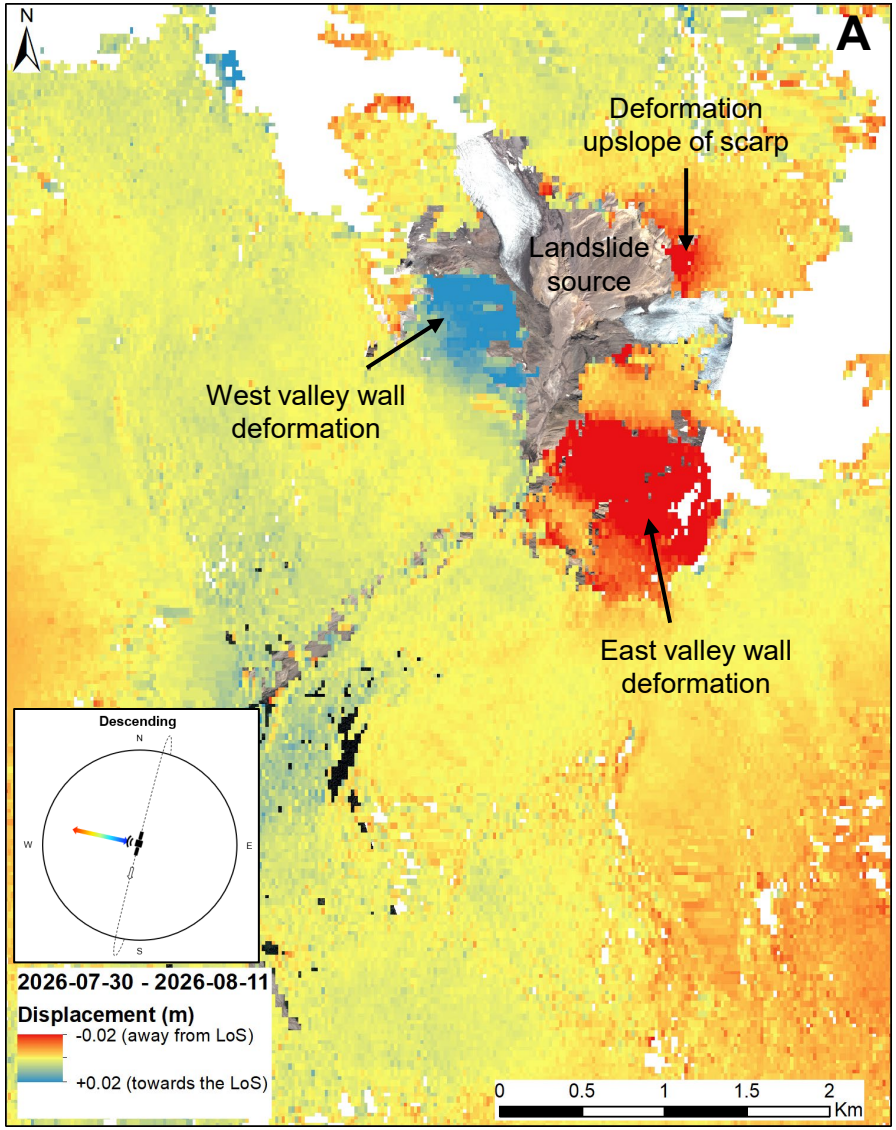
EAST VALLEY WALL

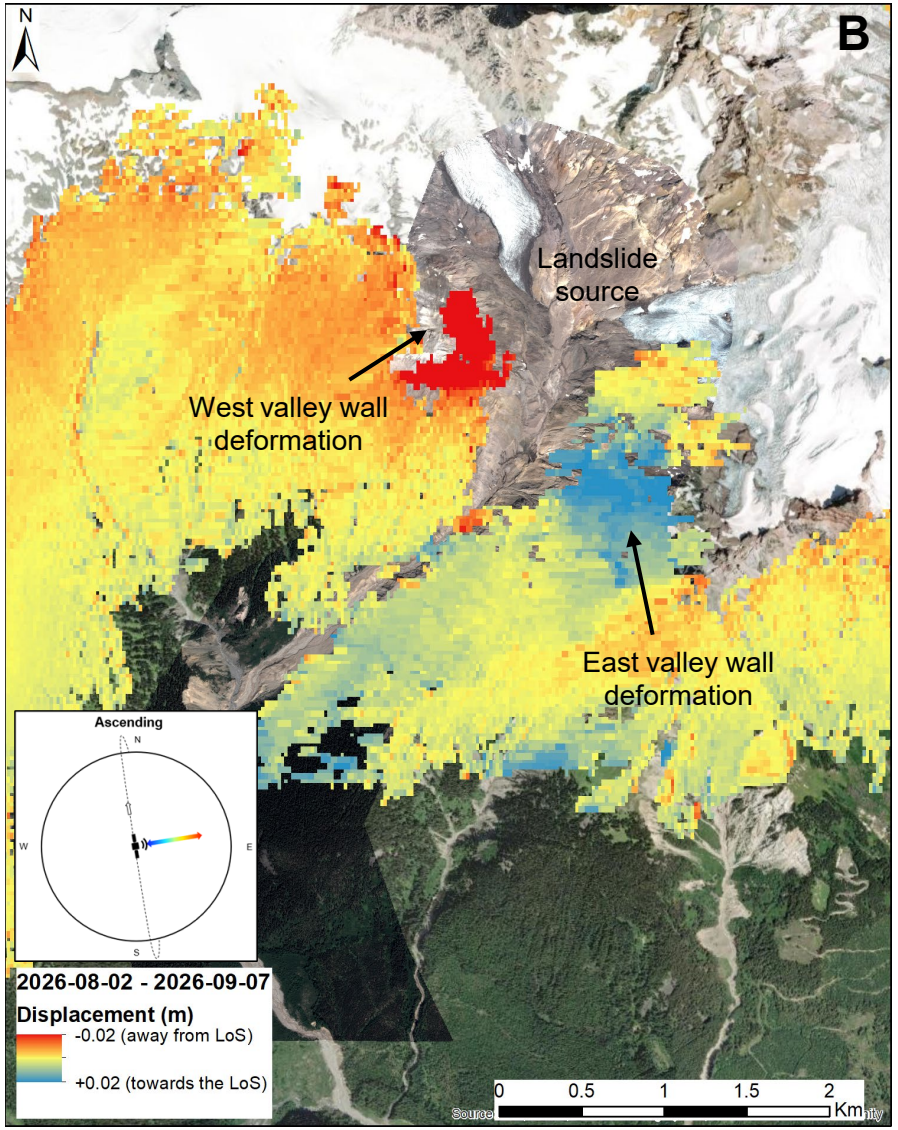
NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Imagery from Pleiades Satellite Imagery, collected August 25, 2025.

PREPARED BY: GMF	FIGURE TITLE: POTENTIAL SLOPE INSTABILITY AREAS		
CHECKED BY: MJP	CLIENT: SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY: AM	SCALE: AS SHOWN	PROJECT NO: 1358014	FIGURE NO: 7

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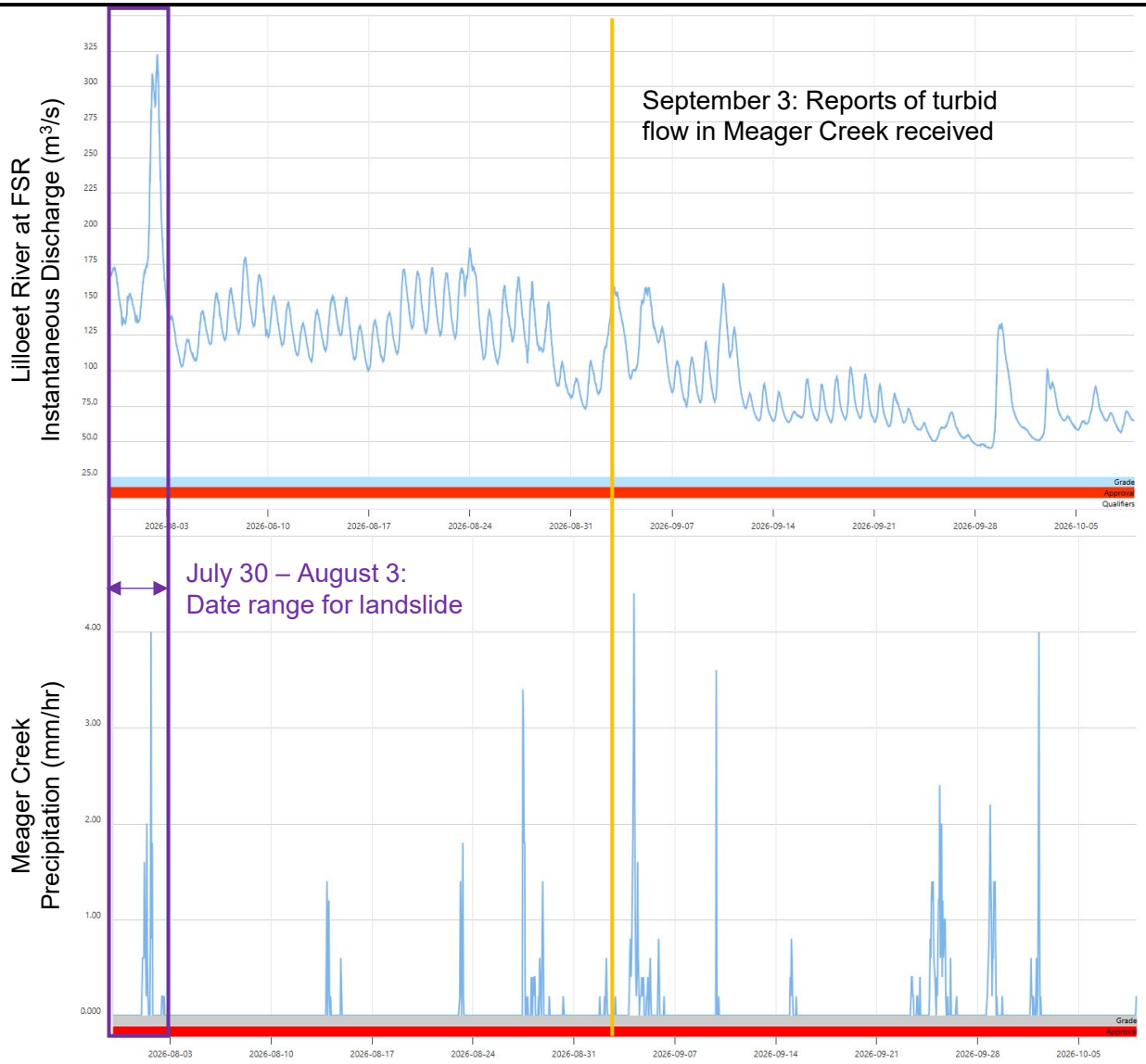


NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. A: The data shows the InSAR displacement, measured between July 30, 2026 and August 11, 2026, extracted from Sentinel-1 data captured in the Descending geometry.
3. B: The data shows the InSAR displacement, measured between August 2, 2026 and September 7, 2026, extracted from Sentinel-1 data captured in the Ascending geometry.

PREPARED BY:	FIGURE TITLE:		
JE	InSAR DISPLACEMENT		
CHECKED BY:	CLIENT:		
MJP	SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
AM	AS SHOWN	1358014	8

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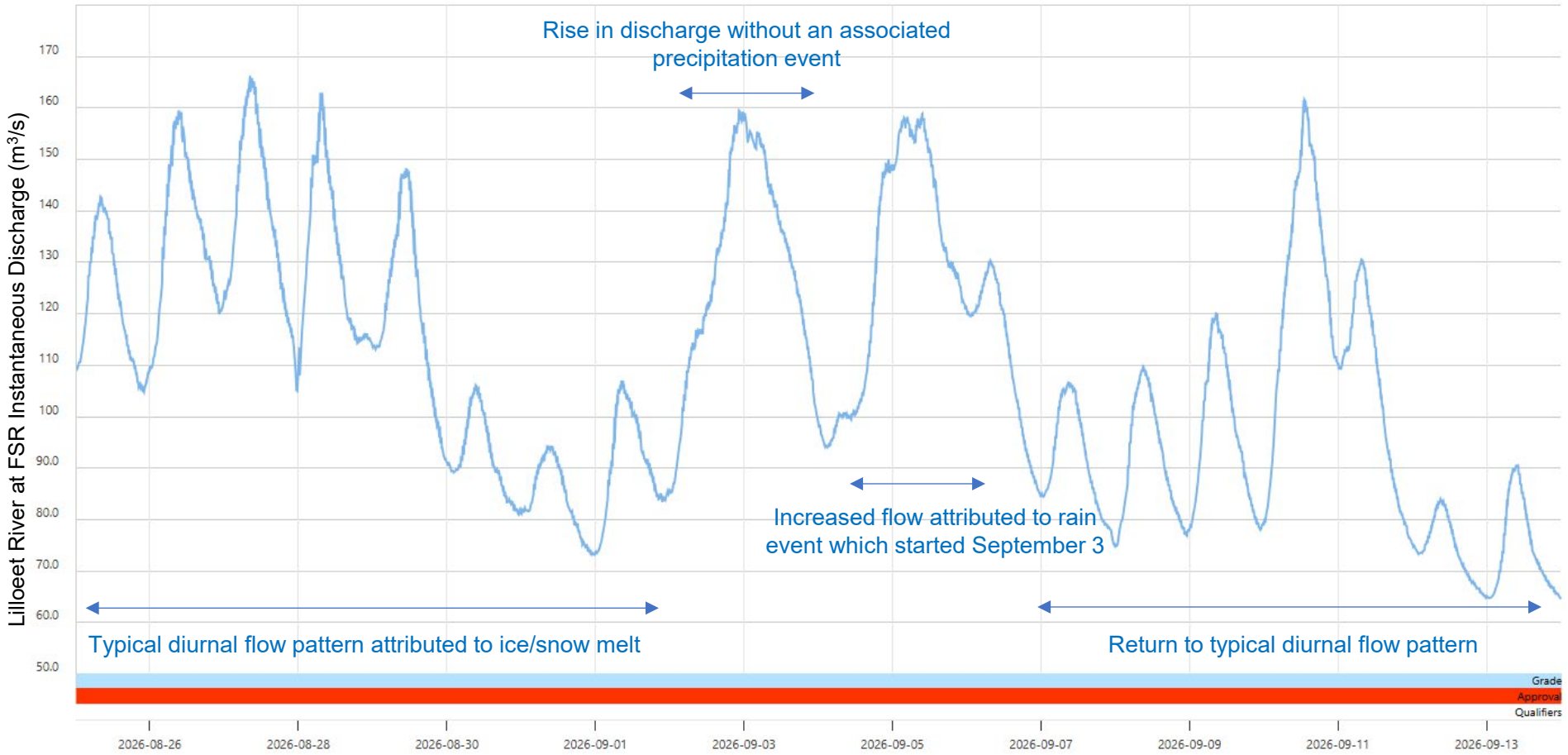


NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Discharge data measured at station 08MG0001 – Lillooet River at FSR, obtained from BC Ministry of Environment Aquarius web portal: https://bcmoe-prod.aquaticinformatics.net/Data.
3. Precipitation data measured at station MOF_1083 – Meager Creek, obtained from PVDD web portal: https://water.nhcweb.com/.

PREPARED BY:	FIGURE TITLE:		
AM	LILLOOET RIVER DISCHARGE AND PRECIPITATION AT MEAGER CREEK		
CHECKED BY:	CLIENT:		
MJP	SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
AM	NTS	1358014	9

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September 3, Reports of turbid flow in Meager Creek received

NOTES:

1. This Figure should be read in conjunction with BGC's report titled Devastator Creek Landslide Response, and dated October 28, 2026.
2. Discharge data measured at station 08MG0001 – Lillooet River at FSR, obtained from BC Ministry of Environment Aquarius web portal: https://bcmoe-prod.aquaticinformatics.net/Data.

PREPARED BY:	FIGURE TITLE:		
AM	LILLOOET RIVER DISCHARGE		
CHECKED BY:	CLIENT:		
MJP	SQUAMISH-LILLOOET REGIONAL DISTRICT		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
AM	NTS	1358014	10

BGC Engineering

PHOTOS

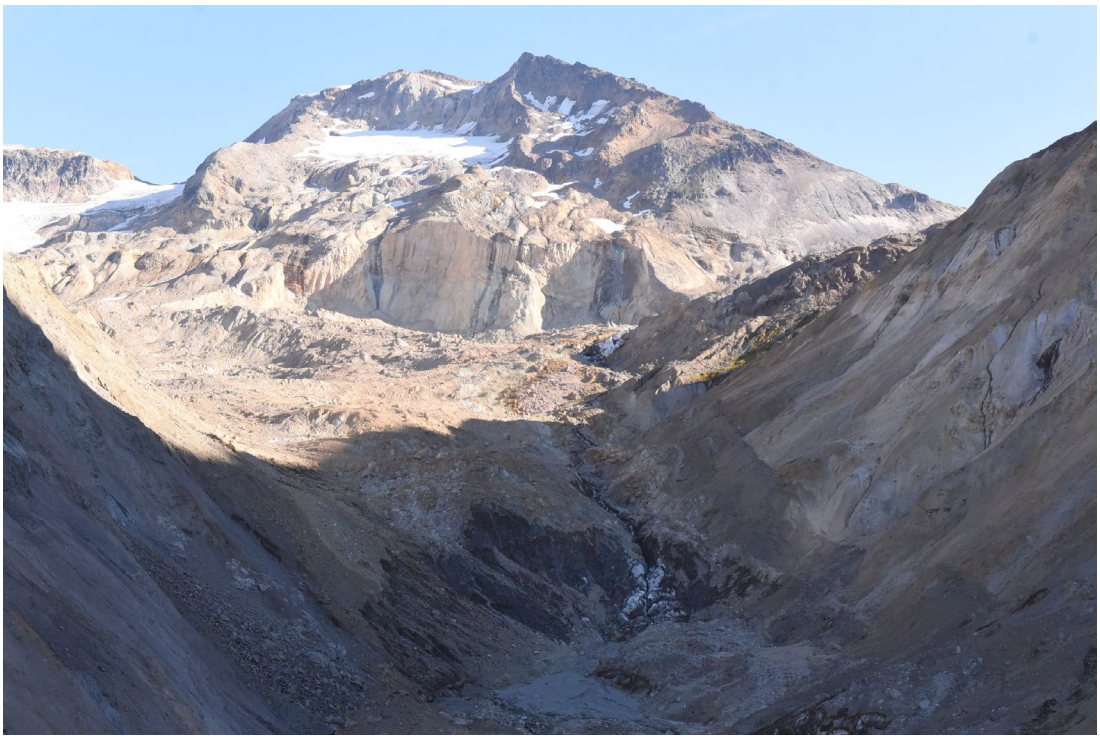


Photo 1 **Landslide source zone and upper debris field with mixed fragmented rock and glacier ice. September 18, 2026.**



Photo 2 **Downstream extend of runout zone where the event had transitioned to a debris flow. September 18, 2026.**

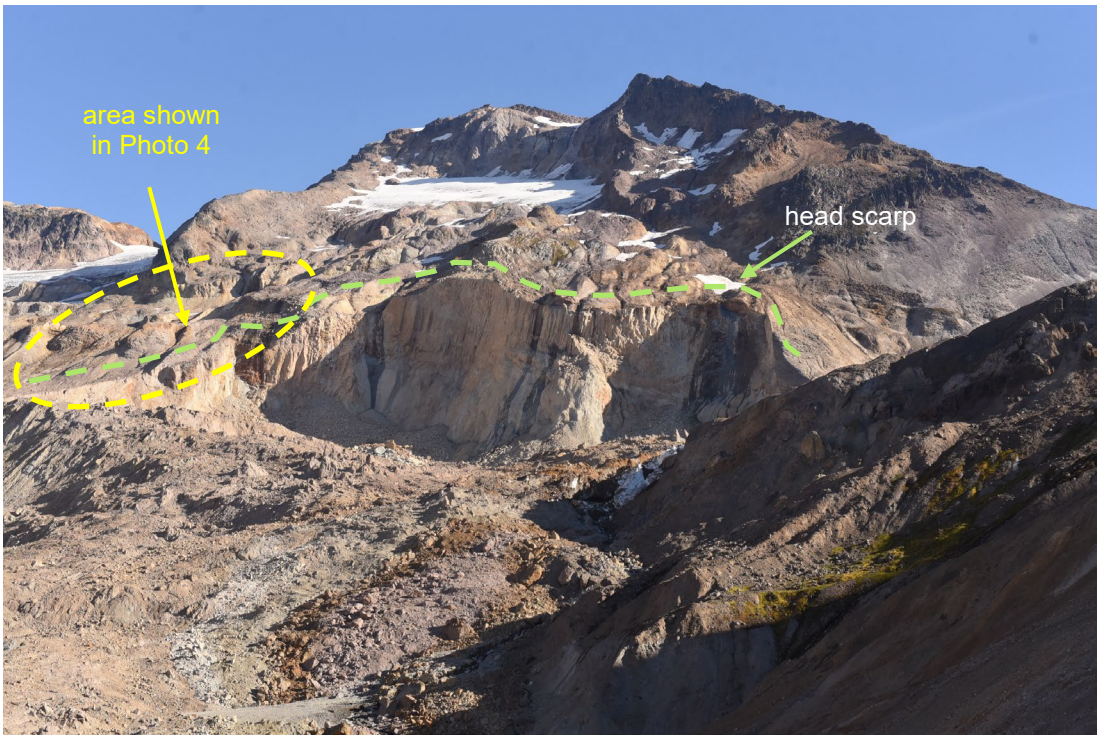


Photo 3 **Annotated photo of the head scarp and location of observed cracking on the western flank. September 18, 2026.**



Photo 4 **Tension cracks behind the western flank of the head scarp. September 18, 2026**



Photo 5 Cracking and deformation features on western valley wall, downstream of the source zone. September 18, 2026.



Photo 6 Cracking on the eastern valley wall, downstream of the source zone. September 18, 2026.



Photo 7 Surface water downcutting through landslide debris in the runout path. September 18, 2026.