PEACE REGION
(GRANDE PRAIRIE DISTRICT – SOUTH) GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **GP054 Debris Flow Corridor South of McIntyre Mine**	HIGHWAY & KM: 40:36, 8.119 to 12.262	PREVIOUS INSPECTION DATE: July 21, 2021	INSPECTION DATE: **June 14, 2022**
LEGAL DESCRIPTION:	NAD 83 COORDINATES: UTM / Northing / Easting	RISK ASSESSMENT:	
South NW 29-57-08-W6M	11 / 5981027 / 358454	**No Recent Occurrence** PF: 7 CF: 6 TOTAL: 42	
North NW 04-58-08-W6M	11 / 5984770 / 360291	**Recent Occurrence** PF: 5 CF: 4 TOTAL: 20	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 820 (north) & 1020 (south) (Reference No. 25592, 2021)		CONTRACT MAINTENANCE AREA (CMA): 504	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
There is no instrumentation at the GP054 site. LAST READING DATE: N/A	Chris Gräpel (KCB) Courtney Mulhall (KCB) Ed Szmata (AT) Kristen Tappenden (AT) Max Shannon (AT) Dwayne Lowen (AT MCI) Mike Schiffer (Ledcor HMC)

PRIMARY SITE ISSUE: Series of recent and possible debris flow locations from backslope along west side of Hwy 40:36, which have/could deposit debris onto highway causing a traffic hazard or into ditches impeding flow. Debris flows (and possible) locations generally correspond to or are adjacent to water courses or smaller gullies/drainage paths down the mountain side. The site is located along the west valley slope of the Smoky River. This site is the debris flow component of the former GP036 and GP049 sites that has been made into a separate site in 2022 for debris flows only. GP036 and GP049 sites are now for rockfalls only.

APPROXIMATE DIMENSIONS: Corridor is approximately 4.5 km long.

DATE OF ANY REMEDIAL ACTION: On-going cleaning of debris flow material from highway ditch and pavement surface.

ITEM	**CONDITION EXISTS**		**DESCRIPTION AND LOCATION**	**NOTICABLE CHANGE FROM LAST INSPECTION**	
	YES	NO		YES	NO
Pavement Distress		X	None observed at time of 2022 inspection.		X
Slope Movement	X		Debris flow material continues to slump towards highway. Slope failure along backslope at some debris flow locations expanding laterally along highway likely due to saturation and softening of materials.	X	
Erosion	X		Gullies being eroded in some debris flow fans, including the km 12.1 site.	X	
Seepage		X	None observed at time of 2022 inspection.		X
Culvert Distress		X	No culverts observed by KCB.		X

COMMENTS

Three event sites visited, one at km 10.9 (WP187), km 11.2 (WP188), and km 12.1 (south of WP189). Several other event sites previously observed/inspected by others along corridor; e.g., km 8.1, 8.8, and 11.3 as shown in figure.

Last known date of debris flow occurrence:

Km	8.1	8.8	10.9	11.2	11.6	12.1
Year	2017	2017	2020	2019 & 2020	2017	2017

Debris flow locations correspond to or are adjacent to water courses or smaller gullies/drainage paths down the mountain side. Water courses that have not generated debris flows yet will eventually generate a debris flow. Depending on the severity of rainfall and timing of last debris flow, higher rainfall amounts could generate another debris flow from a water course that has already generated a debris flow. Additionally, with time, debris will build up in the water course that will eventually get mobilized by a runoff event, possibly smaller or larger than the last triggering event, creating another debris flow.

KCB reviewed available precipitation data for the site from 1967 to 2022 (record discontinuous before 1990). The rainfall data indicates that the debris flows tabulated in the table above each occurred around the same time as a high-than-average rainfall event as shown in Figure 2. Based on the data from Kakwa station (located approximately 30 km northeast of the site) higher-than-average rainfall events were recorded on June 9, 2017 (approximately 80 mm), June 28, 2019 (approximately 70 mm), July 1, 2020 (approximately 70 mm), and June 29, 2022 (approximately 70 mm). The last time a similar rainfall event occurred was 2009 and before that 2001.

Some ponded water (and cattails) at toe of the km 10.9 site, which could be due to seepage and/or poor ditch drainage. Ice build-up in winter near blue highway marker just north of the km 10.9 site.

<u>Debris flow at approximately km 10.9 at WP187</u>

- Last debris flow occurred at this location in 2020.
- Fan is well vegetated, indicating no recent debris flow activity.

<u>Debris flows at approximately km 11.2 at WP188 sites</u>

- Last debris flows occurred at this location in 2019 and 2020.
- Main debris fan is approximately 20 m wide, but backslope failure around debris fan is approximately 50 m to 60 m. Slope is approximately 10 m high.
- Water observed flowing along south edge of main/largest debris fan.
- Fan is fairly well vegetated, indicating no recent debris flow activity.

<u>Debris flow at approximately km 12.1 just south of WP189</u>

- Last debris flow occurred at this location in 2017.
- Debris fan is poorly vegetated with erosion gully eroded down center, indicating at least higher water flows at this site that are hindering vegetation growth Debris flow deposit appears wet.

<u>Maintenance/Repair/Monitoring Recommendations:</u>

- Continue to clean ditch regularly to maintain debris flow storage volume (i.e., keep ditch as wide and deep as possible to retain material within the ditch) and reduce the potential for material reaching the highway.
- No debris flow related signage along corridor. Only “watch for fallen rock” signs on either side of GP036 site. Additional signage should be installed along corridor warning motorist of the debris flow risk, especially during rainfall events.

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the exclusive use of Alberta Transportation (Client) for the specific application to the Peace Region (Grande Prairie District – South) Geohazard Risk Management Program (Contract No. CON0022166) and it may not be relied upon by any other party without KCB's written consent.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. KCB makes no warranty, express or implied.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

(i) The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.

(ii) The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.

(iii) The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.

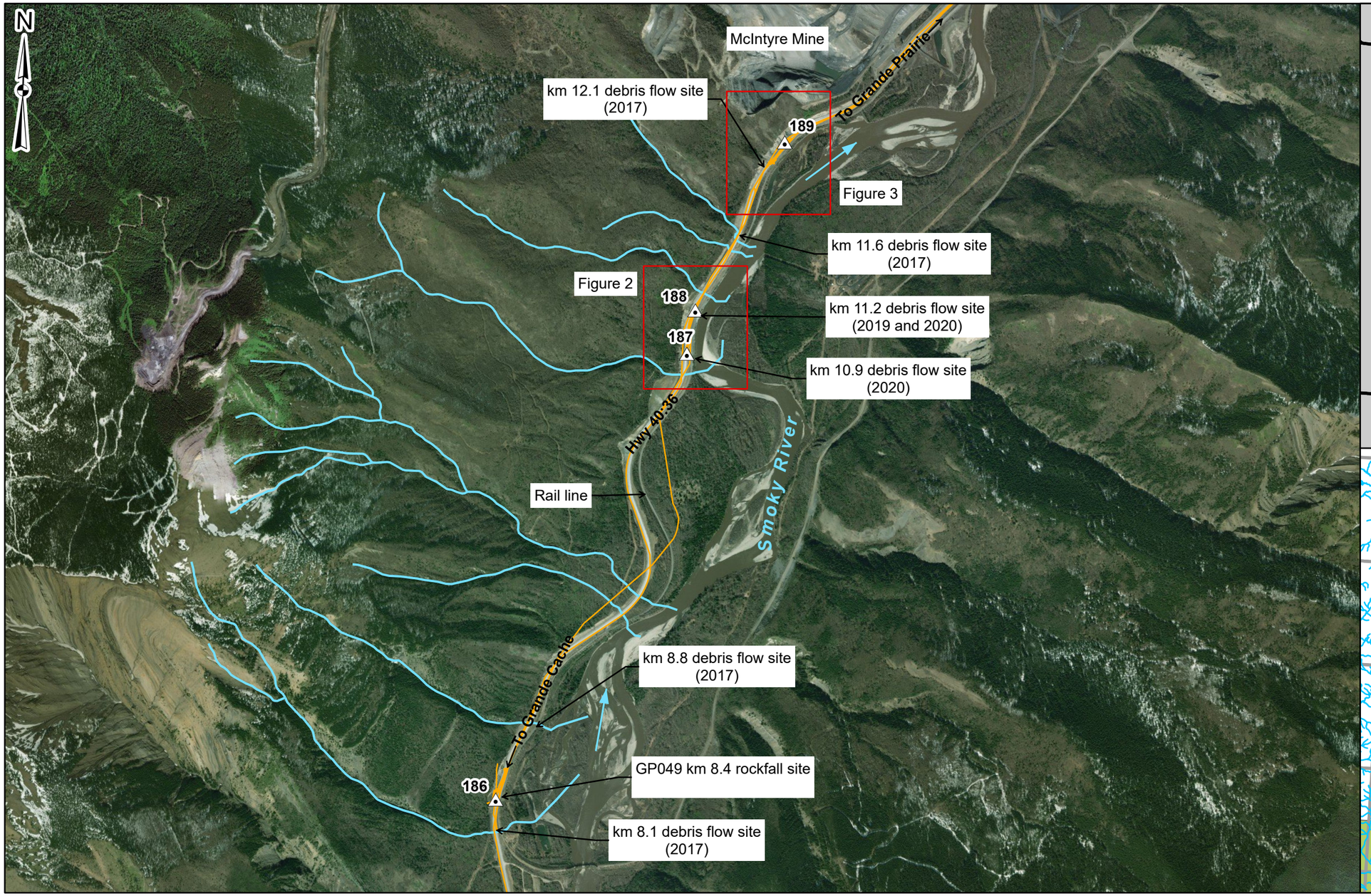
(iv) KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

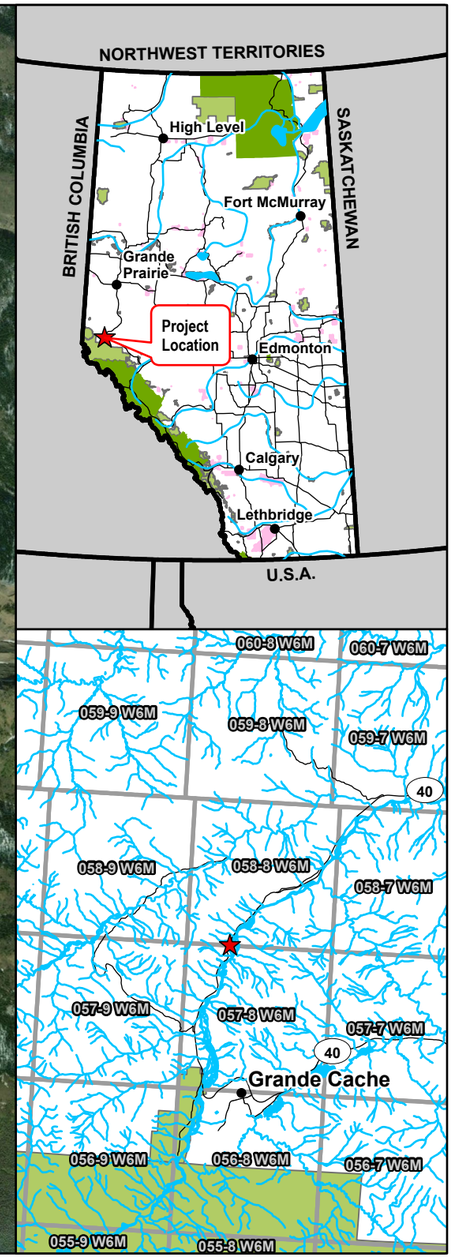
(v) This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

December 19 2022
I.D. # 58463

Chris Gräpel, M.Eng., P.Eng.
Senior Civil Engineer, Associate

PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.
RM SIGNATURE: _____
RM APEGA ID #: 187607
DATE: 19 Dec. 2022
PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)





Legend

- GPS Waypoint (June 14, 2022)
- GPS Track (June 14, 2022)
- Flow Direction
- Watercourse

0 1 Kilometres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 11N
3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH) GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
GP054- Debris Flow Corridor South of McIntyre Mine
Hwy 40:36, km 8.119 to 12.262

SCALE	PROJECT No.	FIG No.
1:21,000	A05116A01	1

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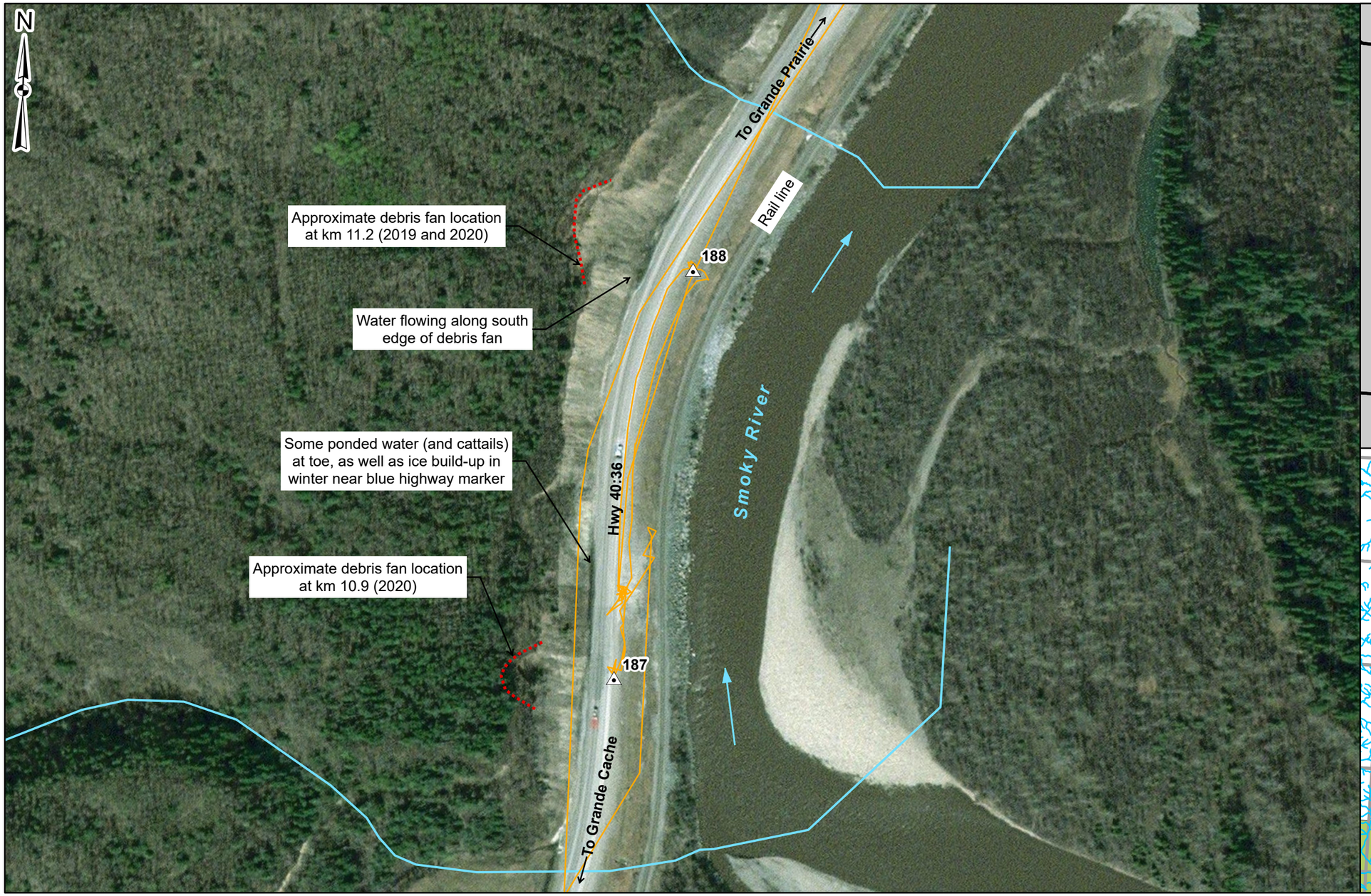

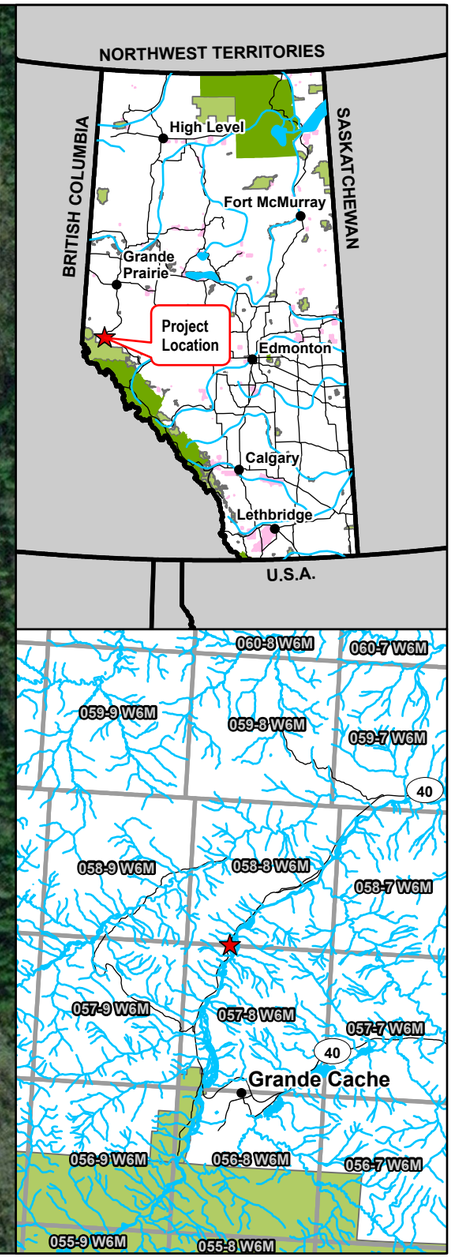

Legend

- GPS Waypoint (June 14, 2022)
- GPS Track (June 14, 2022)
- Flow Direction
- Watercourse
- Debris Fan

0 100 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
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3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH) GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
GP054- Debris Flow Corridor South of McIntyre Mine
Hwy 40:36, km 10.9 and 11.2

SCALE	PROJECT No.	FIG No.
1:2,250	A05116A01	2

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Legend

- GPS Waypoint (June 14, 2022)
- GPS Track (June 14, 2022)
- Flow Direction
- Concrete Lock Block
- Guardrail
- Culvert

0 50 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 11N
3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH) GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
GP054 - Debris Flow Corridor South of McIntyre Mine
Hwy 40:36, km 12.1

SCALE	PROJECT No.	FIG No.
1:1,500	A05116A01	3

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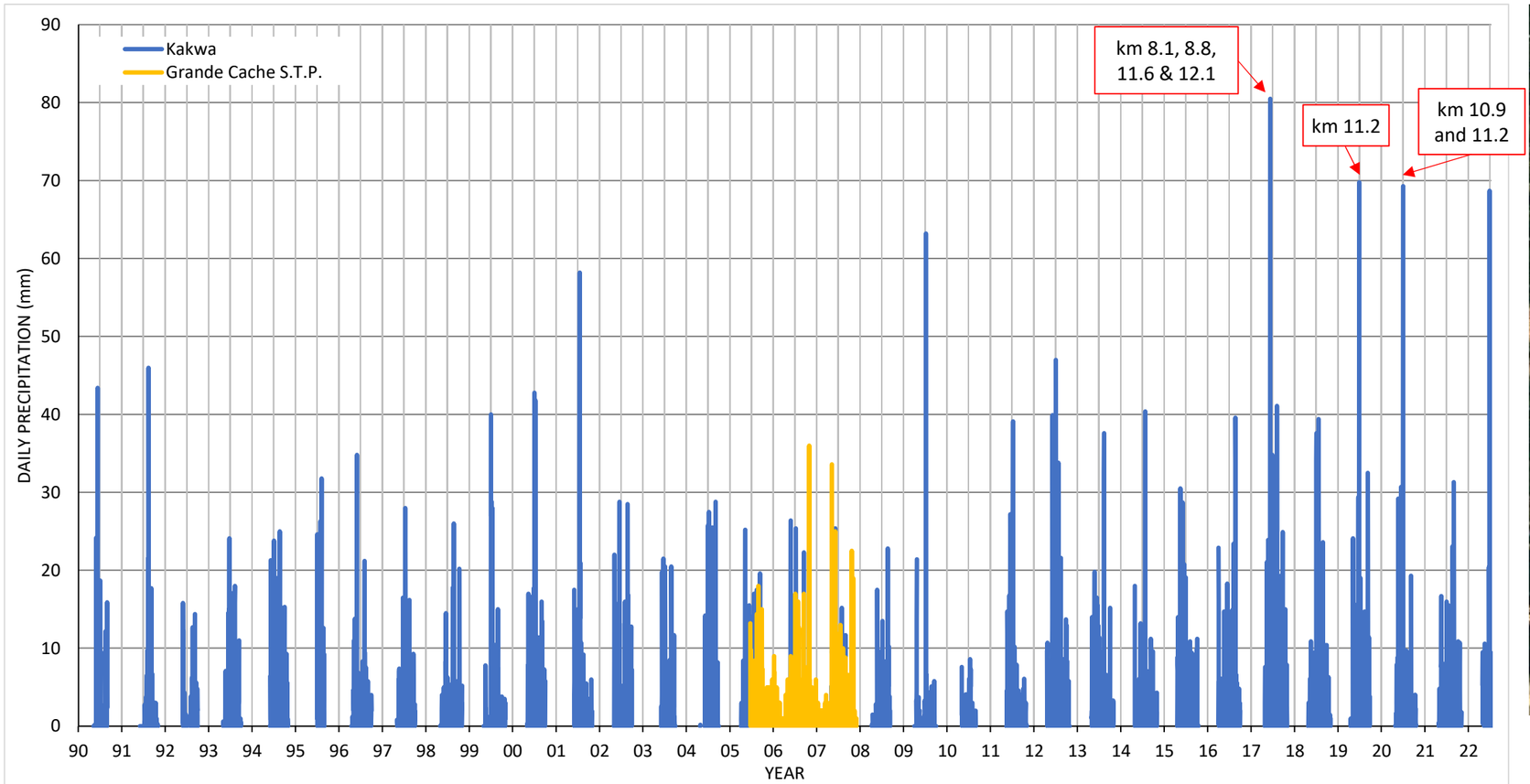

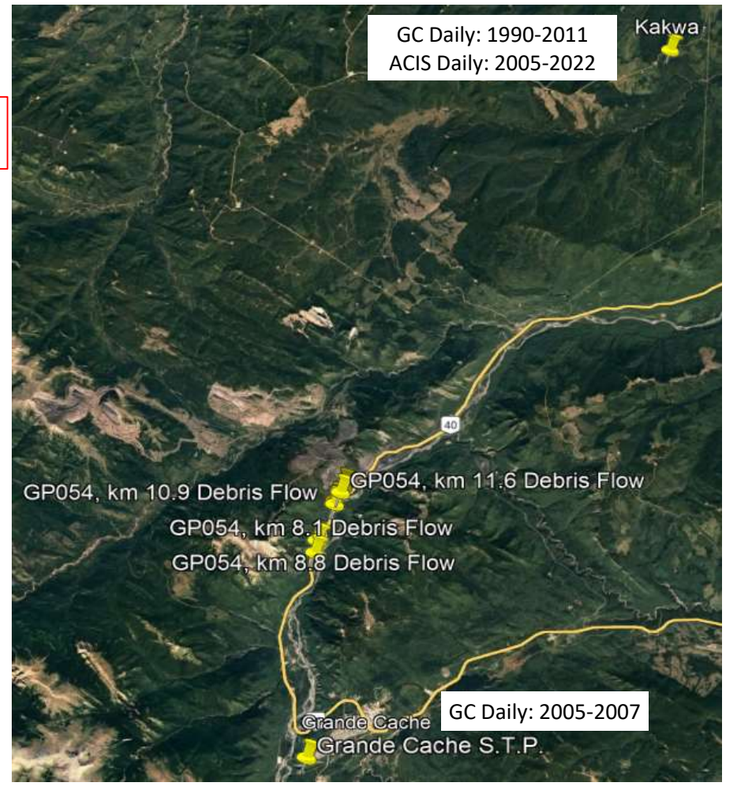

NOTES:
1) DATA DOWNLOADED FROM GOVERNMENT OF CANADA OR ALBERTA CLIMATE INFORMATION SERVICE (ACIS) WEBSITES.
2) DATA DISCONTINIOUS BEFORE 1990 SO NOT INCLUDED.
3) KAKWA AND GRANGE CACHE S.T.P. STATIONS LOCATED APPROXIMATELY 30 KM AND 12 KM FROM SITE.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Rainfall Data
GP054 - Debris Flow Corridor
South of McIntyre Mine
Hwy 40:36; km 8.119 to 12.262

SCALE	PROJECT No.	FIG No.
-	A05116A01	4

Inspection Photographs

Photo 1 **Debris flows at km 8.1 and 8.8 along backslope on west side of Hwy 40:36. Note water courses above debris flow locations. Photo taken June 14, 2022, facing southwest.**

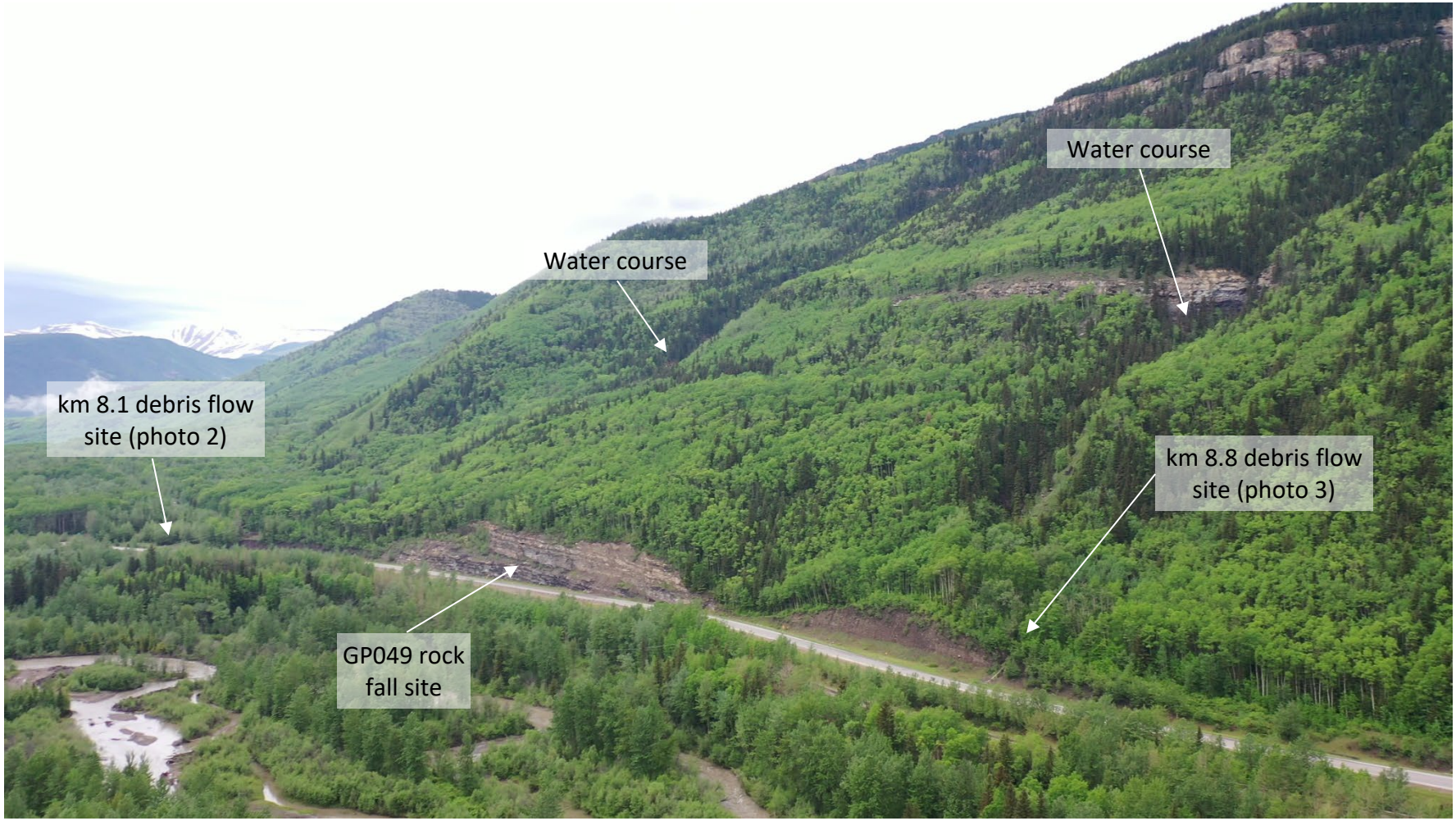

Photo 2 **Debris flow at km 8.1 along backslope on west side of Hwy 40:36. Note water course above debris flow location. Photo taken June 14, 2022, facing west.**

Photo 3 **Debris flow at km 8.8 along backslope on west side of Hwy 40:36. Note water course above debris flow location. Photo taken June 14, 2022, facing west.**

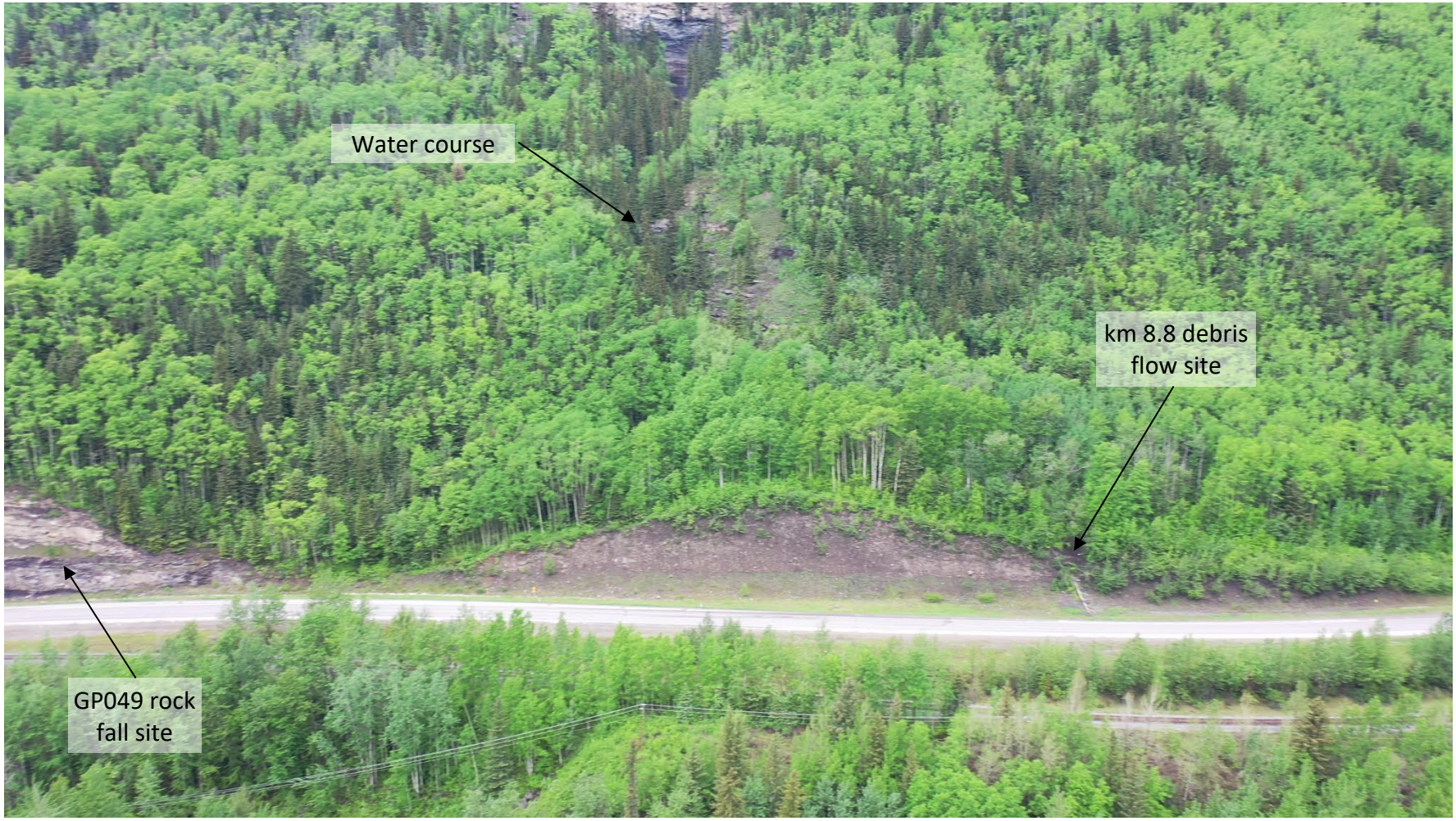

Photo 4 **Debris flow location (km 8.8) along backslope on west side of Hwy 40:36. Note water course above debris flow locations. Photo taken June 14, 2022, facing west.**

Photo 5 **Debris flow at km 10.9 along backslope on west side of Hwy 40:36 at WP 187. Photo taken June 14, 2022, facing west.**

Photo 6 **Wet area along backslope on west side of Hwy 40:36 just north of debris flow at WP187. Photo taken June 14, 2022, facing southwest.**

Photo 7 **Backslope on west side Hwy 40:36 between debris flows at km 10.9 and km 11.2 (WP187 and WP188). Photo taken June 14, 2022, facing northwest.**

Photo 8 **Debris flow at km 11.2 along backslope on west side of Hwy 40:36 at WP188. Photo taken June 14, 2022, facing west.**

Photo 9 **Debris flow at km 12.1 along backslope on west side of Hwy 40:36 just south of GP036 site and WP189. Note erosion gully down debris fan. Photo taken June 14, 2022, facing west.**