

**SITE INSPECTION FORM**

<b>SITE NUMBER AND NAME:</b> GP034 Slide South of Kakwa River		<b>HIGHWAY &amp; KM:</b> 40:38, 21.016	<b>PREVIOUS INSPECTION DATE:</b> September 08, 2021	<b>INSPECTION DATE:</b> <b>June 13, 2023</b>
<b>LEGAL DESCRIPTION:</b> NW 28-62-04-W6M	<b>NAD 83 COORDINATES:</b> UTM Northing Easting 11 6028755 399896		<b>RISK ASSESSMENT:</b> PF: 5 CF: 4 TOTAL: 20	
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 780 (north) & 980 (south) (Reference No. 25592, 2022)			<b>CONTRACT MAINTENANCE AREA (CMA):</b> 504	

<b>SUMMARY OF SITE INSTRUMENTATION:</b>  Operable: Two slope inclinometers (SIs) and three pneumatic piezometers (PNs) installed in 2017.  Inoperable: Two SIs and nine PNs installed in 2017.  LAST READING DATE: June 06, 2023	<b>INSPECTED BY:</b> Chris Gräpel (KCB) Courtney Mulhall (KCB) Roger Skirrow (TEC) Max Shannon (TEC)
<b>PRIMARY SITE ISSUE:</b> Slide in highway embankment side-hill fill and foundation on west side of Hwy 40:38 approximately 500 m east of Kakwa River.	
<b>APPROXIMATE DIMENSIONS:</b> Highway embankment slope consists of an approximate 25-m high side-hill fill and toe berm, with the main embankment sloped at approximately 3H:1V and the toe berm sloped at approximately 4H:1V. Toe berm extends approximately 250 m to 300 m along highway.	
<b>DATE OF ANY REMEDIAL ACTION:</b> 1980s and 2020 – toe berm constructed/enlarged and drainage installed as described below. Ongoing pavement patching and overlays, including patch placed in west (southbound) lane after 2021 overlay.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Pavement patch placed after 2021 overlay has settled, but minimal to no cracking observed.	X	
Slope Movement	X		Settlement and cracking in recent pavement patch and SI data indicates ongoing slide movements.	X	
Erosion		X	None observed at time of 2023 inspection.		X
Seepage	X		Conditions during 2023 inspection were drier compared to conditions during 2021 inspection as described below.	X	
Culvert Distress		X	No culverts observed by KCB but drain outlets at WP305 and WP308 appeared in good condition. Drain outlet at WP307 not visible.		X

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**COMMENTS**

Shortly after the highway was constructed in the early 1980's, a toe berm was constructed with a series of 300-mm diameter vertical corrugated-steel pipes (CSP), possibly intended to be dewatering wells, installed within the slope. In 2020, the toe berm was enlarged (approximately 3 m to 6 m of fill placed) with a series of finger drains and drain pipes installed within the slope perpendicular to the highway. Construction was halted when foundation movements and asphalt cracking occurred in response to toe berm construction. Asphalt cracking continued into spring and fall of 2021. Due to the movement, the as-built toe berm was only built to design height from the north to the midpoint of the berm before gradually decreasing to a total reduction of approximately 3 m at the south end of the berm.

In 2020, a groundwater interception trench consisting of non-woven geotextile surrounding granular filter materials and a perforated collection pipe was installed approximately 4 m below the east (northbound) highway ditch. At the time of the 2023 inspection, water was discharging from the collection pipe outlet at WP308 at an estimated rate of 1 L per 5 seconds to 10 seconds.

Slope upslope and downslope of the highway appears to be meta-stable landslide terrain with slide blocks located upslope and downslope of the highway.

Shallow movement recorded in S117-3 is believed to be causing the pavement cracking observed on site and may be an extension upwards along a backscarp, associated with deeper movement. Otherwise, deep movements recorded in S117-2 and S117-3 have slowed since early 2021.

Highway shoulder is steep along west (southbound) lane of Hwy 40:38.

During the 2021 inspection, seepage was observed at numerous locations on the embankment slope and toe berm bench. TEC indicated these areas are typically wet. Conditions during the 2023 inspection were drier, with no visible seepage observed on the embankment slope or toe berm bench. However, the following was observed:

- some water around the drain outlet at WP305;
- a possible former wet area at WP306; and
- dense vegetation around the drain outlet at WP307 although the drain outlet appeared dry.

Toe area is not well drained due to slide blocks and uneven ground downslope of the toe berm.

Maintenance/Repair/Monitoring Recommendations:

- Continue to patch and pave this section of highway as needed.
- If movements continue and further repair/stabilization work is required, TEC should consider a mitigation method that improves the stability of the highway surface but does not change the state of stress of the slope and trigger more deep-seated movements. Possible repair options could include construction of deep cast-in-place piles through the toe berm and across the failure surface, or construction of a driven-steel wall or a soil nail-reinforced-earth-retaining wall below the edge of pavement to stabilize the small wedge of soil that is moving below the west (southbound) lane of the highway. Estimated cost: approximately \$2,000,000 to \$4,000,000 (deep cast-in-place piles), \$800,000 to \$1,500,000 (100-m-long driven-steel wall), and \$400,000 to \$600,000 (100 soil nails), respectively.



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



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Courtney Mulhall, M.Sc., P.Eng.  
Geotechnical Engineer



### Inspection Photographs

**Photo 1** Overview of GP034 site. Note pavement patch placed after 2021 overlay in west (southbound) lane of Hwy 40:38 (circled in black) and drain outlets at WP305 and WP307 (circled in white). Photo taken June 13, 2023, facing southwest.





**Photo 2** Overview of GP034 site. Photo taken June 13, 2023, facing northeast.





**Photo 3** Pavement patch placed after 2021 overlay in west (southbound) of Hwy 40:38 has settled, but minimal to no cracking observed. Photo taken June 13, 2023, facing north.



**Photo 4** Steep shoulder along west (southbound) lane of Hwy 40:38. Photo taken June 13, 2023, facing south.





**Photo 5** Wet area surrounding drain outlet at WP305. Photo taken June 13, 2023, facing northeast.



**Photo 6** Dense vegetation surrounding drain outlet at WP307 but area otherwise appeared dry. Photo taken June 13, 2023, facing east.

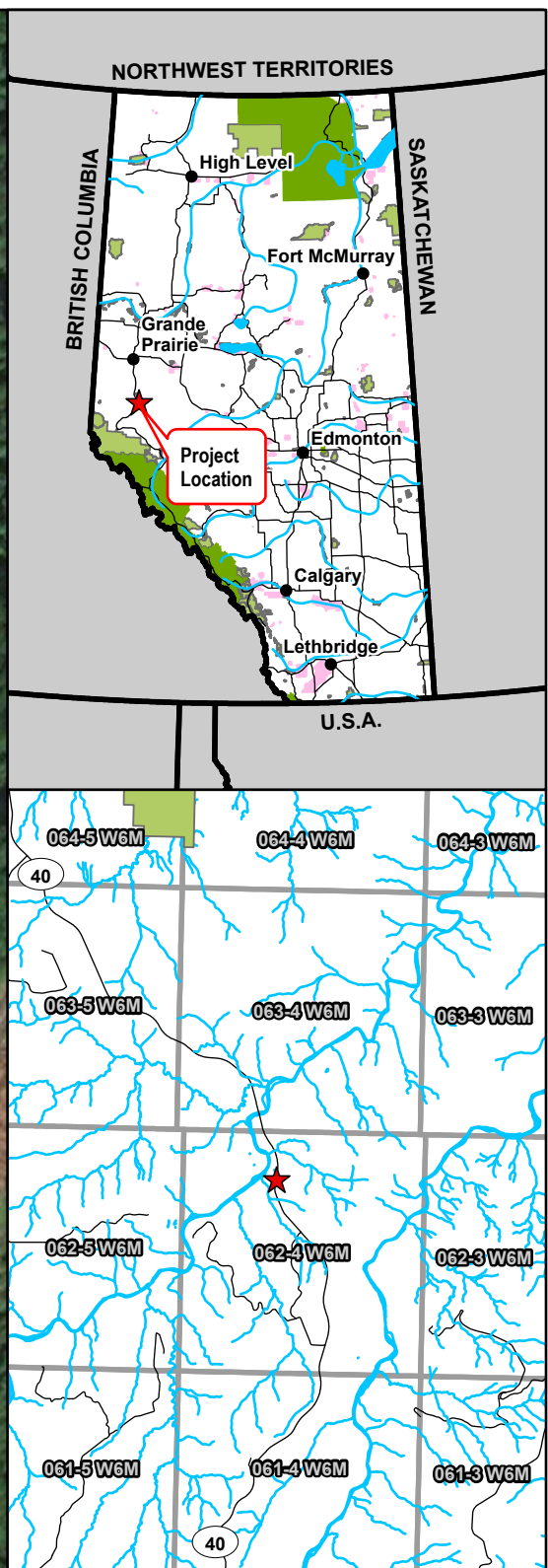
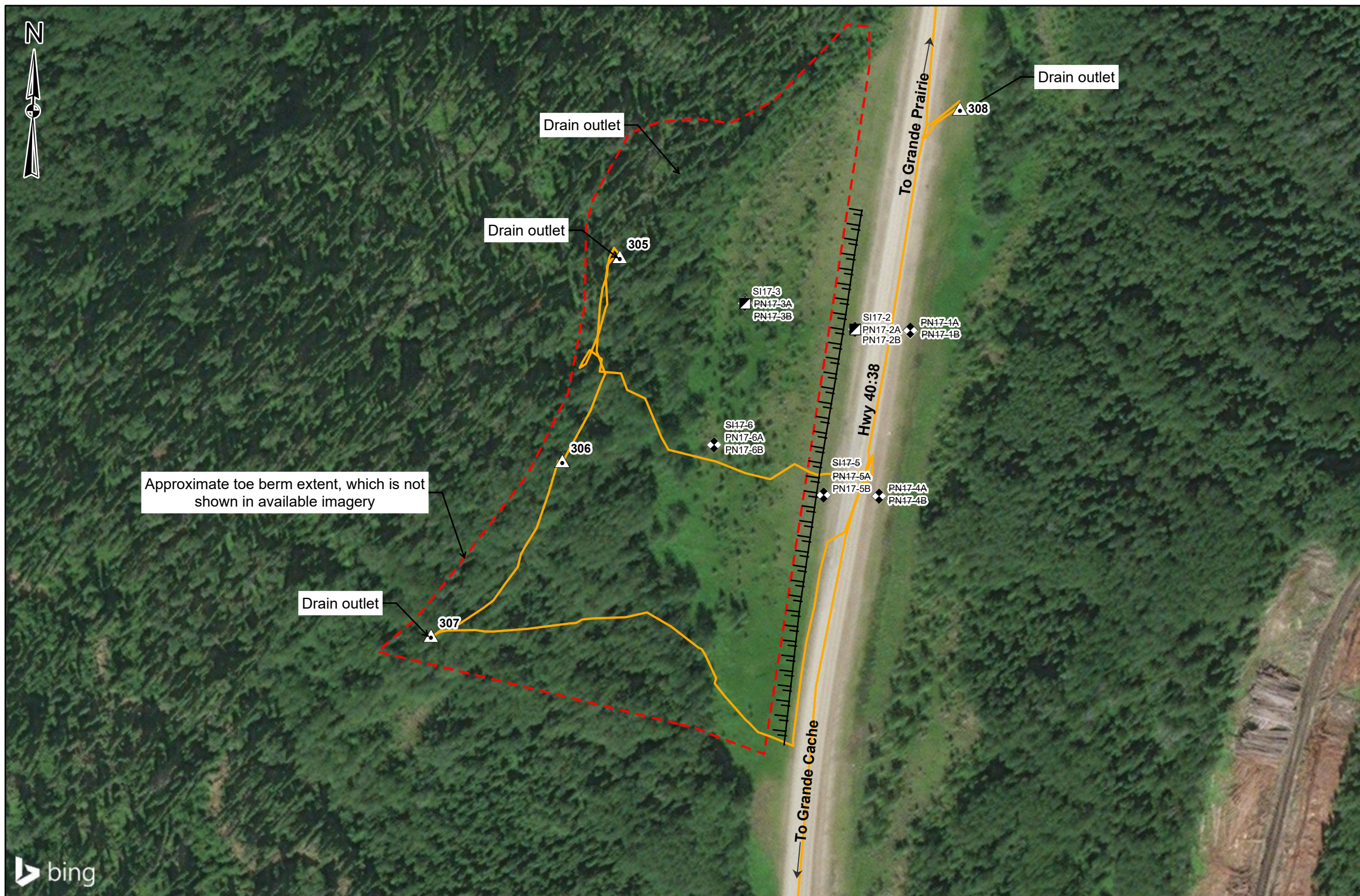


**Photo 7**      **Flowing drain outlet in east (northbound) ditch of Hwy 40:38 at WP308. Photo taken June 13, 2023, facing southeast.**





File: \\nt.kohn.com\ProjData\A\EDM\A05116A01\ABT Grande Prairie South GRMP\401 Drawings\GIS\MXD\2023\Section B\ABT\_GFSouth\_SectionB\_230619.aprx Date: Time: Creator: aharrison



**Legend**

- ◆ Pneumatic Piezometer (PN)
- Slope Inclinator (SI)
- ▲ GPS Waypoint (June 13, 2023)
- GPS Track (June 13, 2023)
- ⊥ Crest
- - - Approximate Extent of Toe Berm



NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR, CNES  
 4. INSTRUMENT LABELS THAT ARE INDICATED WITH STRIKE THROUGH TEXT ARE INOPERABLE.

CLIENT



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

TITLE  
 Site Plan  
 GP034 - Slide South of Kakwa River  
 Hwy 40:38, km 21.016

SCALE 1:2,000 PROJECT No. A05116A01 FIG No. 1

