

SITE NUMBER AND NAME: C042 Water Valley Slide		HIGHWAY & KM: 579:02, 36.540	PREVIOUS INSPECTION DATE: July 10, 2019	INSPECTION DATE: June 23, 2021
LEGAL DESCRIPTION: 06/07-29-029-05 W5M	NAD 83 COORDINATES: UTM Northing Easting 11 5709031 661849		RISK ASSESSMENT: PF: 6 CF: 4 TOTAL: 24	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 1140 (west) and 240 (east) (Ref No. 997242 & 70000145)			CONTRACT MAINTENANCE AREA (CMA): 514	

SUMMARY OF SITE INSTRUMENTATION:		INSPECTED BY: Chris Gräpel (KCB) James Lyons (KCB) Roger Skirrow (AT) Tony Penney (AT)
Operational: One standpipe (SP) and two slope inclinometers (SIs) installed in 2005.		
Inoperable: Four standpipe piezometers (SP) and one pneumatic piezometer (PN) installed in 2005.		
LAST READING DATE: June 12, 2021		
PRIMARY SITE ISSUE: A series of valley slope and embankment fill slides that are exacerbated by creek erosion at the toe of the slope and a seasonally high groundwater table. The slides are located on both sides of Hwy 579, but predominantly on the south side (eastbound lane).		
APPROXIMATE DIMENSIONS: The site is approximately 400 m long, and the slopes are up to 20 m high sloped at approximately 2H:1V to 4H:1V.		
DATE OF ANY REMEDIAL ACTION: 2011 – highway realigned north (upslope) towards backslope		

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Pavement subsided and cracked in various locations		X
Slope Movement	X		Minor recent slope movement and ground cracking on slope below highway	X	
Erosion	X		Creek erosion at toe of slope; two erosion gullies present below highway		X
Seepage		X	None observed		X
Culvert Distress	X		Slope steeply graded downstream of culvert outlet		X

COMMENTS
On the south side (eastbound lane) of the highway, pavement runoff is discharging onto the slope failures (all slides).
<u>Slide area #1</u>
<ul style="list-style-type: none"> A pavement crack approximately 56 m long was observed at the halfway point of the westbound lane during the 2018 inspection. Crack has not expanded since 2018 and 2019 inspections (site was not visited in 2020). The toes of the slides extend to the creek at the toe of the slope. The channel bottom appears stable with no erosion at the edges of the channel. Indicates that erosion due to the creek is not causing the current slope movement.

Slide area #2 (instrument location)

- Seepage observed in erosion gully approximately 8 m below edge of highway has not changed since the 2019 inspection.
- Slide appears to be inactive but could reactivate following heavy rainfall events for a prolonged period of wet weather.
- The flush-mounted headbox (installed in the gravel shoulder) was covered with a rock because it was missing the headbox cap. The headbox should be replaced during the next set of instrumentation readings.

Slide area #3

- There is a steep drop off at the edge of pavement (Photo 3).
- Upslope of the slide area, an arc-shaped crack extends across the centerline into the westbound lane.

Slide area #4

- The slide area appears to have not changed since 2019. However, vegetation on the slope obscures the condition of the slope.
- CSP slope drain below “Curve in Road” sign is corroded and a sinkhole has formed at the fence line, indicating that the culvert has either partially collapsed, or has a separated joint
- Erosion gullies continue to form in the gravel at the crest of the embankment, likely due to surface flows and seepage (Waypoints 0042 and 0043)
- The banks of the creek channel at the bottom of the slope are stable and well-vegetated. Ongoing creek erosion is not contributing to slide movements (Waypoints 0044 to 0046). The valley slope south of the creek is failing, which suggests periods of high ground water is the trigger for movement.
- The slide area extends past the fence line and is within 10 m of the edge of pavement. The fence has tipped over since the 2019 inspection.
- The backscarp is approximately 0.7 m high, and the roadway appears unaffected by the slide.

On the north side (westbound lane) of the highway, there appears to be some minor movement in the backslope where movement has occurred in previous years.

A geotechnical site investigation should be conducted to investigate the subsurface conditions that includes installing additional slope inclinometers to assess the extent and depth of sliding, and piezometers to monitor groundwater conditions. The active piezometer should be continuously logged to assess for short-term changes in groundwater level in response to freshet and heavy rainfall events.

Short-term repair could include installing short length drainage swales upslope of the slope failures to intercept pavement surface runoff and divert it into vegetated areas away from the slope failures that extend to the pavement surface. This may exacerbate slope movements in other areas but will reduce the potential for exacerbating existing slope failures that are already impacting the highway.

Long-term repair options include:

- Realign the highway further to the north; possibly with backslope flattening and drainage to lower the groundwater table (e.g., horizontal drains, or gravel columns with pumps). The impact of dewatering on nearby wells and dugouts will need to be assessed.
- Pile-wall repair is not a preferred option due to the potential length of pile wall that could be required.
- Armouring the toe of the slope to reduce toe erosion is not preferred due to access and environmental considerations.

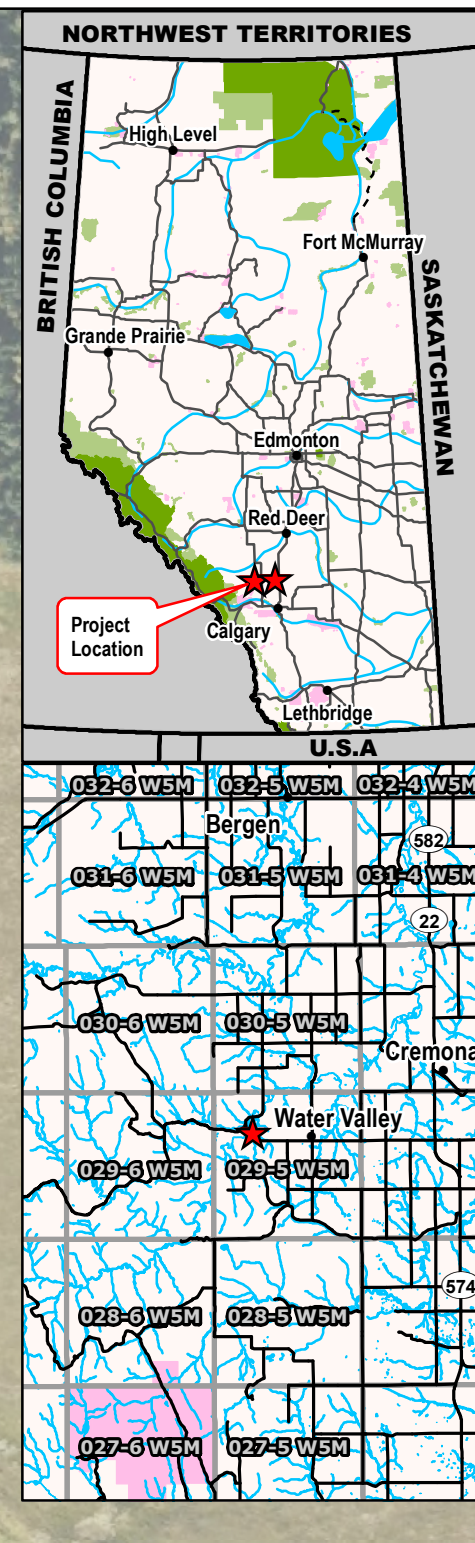
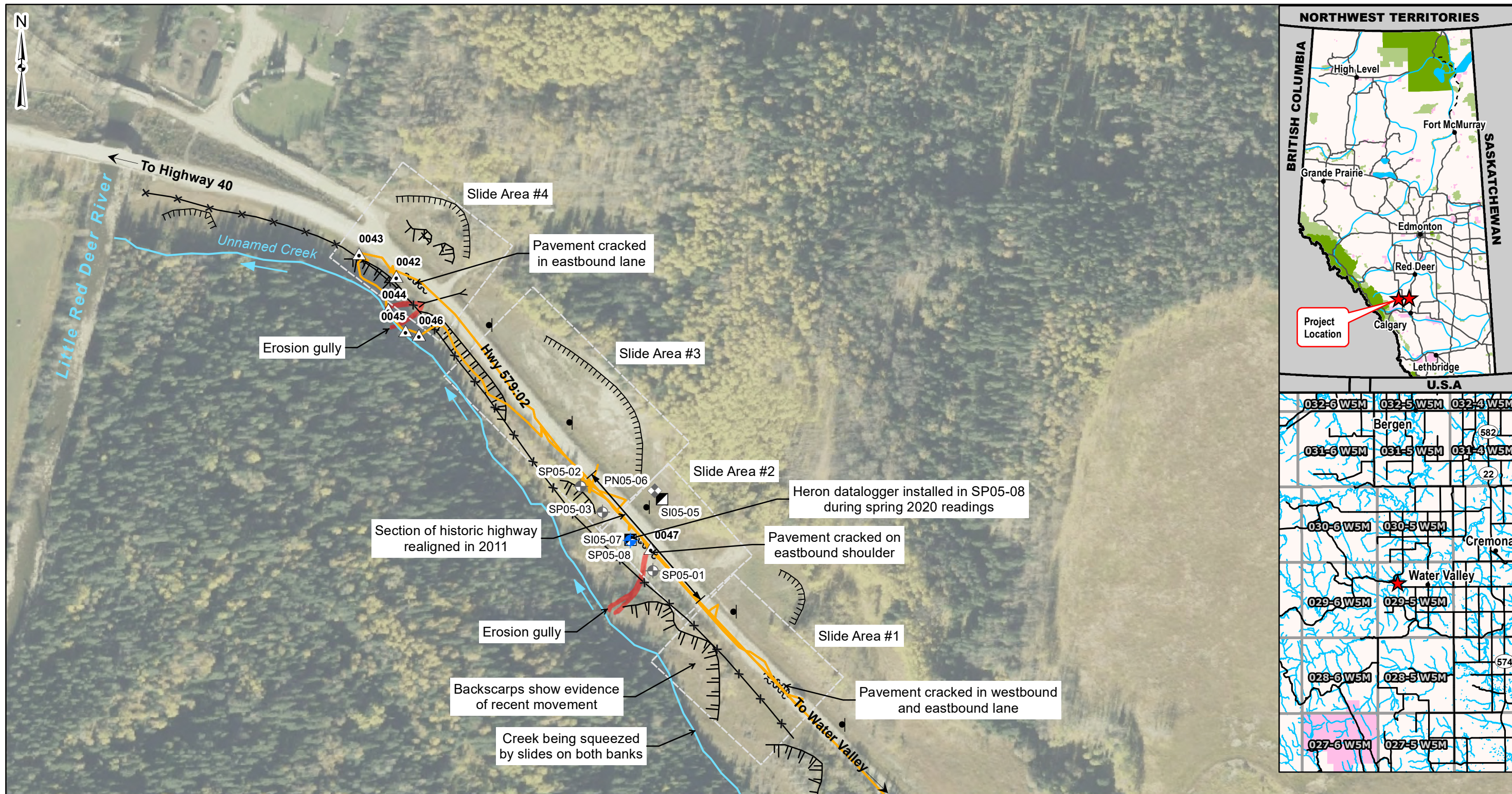
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Chris Gräpel, M.Eng., P.Eng.
Civil Engineer, Associate



Legend

▲ GPS Waypoint (June 23, 2021)	● Power Pole	~~~~~ Crack
◆ Pneumatic Piezometer (PN) (inoperable)	→ Flow Direction	Scarp
⊕ Standpipe Piezometer (SP) (inoperable)	TTTTTTT Crest of Slope	—<—>— Culvert
■ Slope Inclinometer (SI)	✕—✕ Fence	— Creek
⊕ Standpipe Piezometer (SP)	— Erosion	
— GPS Track (June 23, 2021)		

NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM Zone 11N
 3. IMAGE SOURCE: Abacus Datagraphics Ltd. Image dated July 30, 2013 to October 14, 2013
 4. Location of instruments is approximate (not surveyed)

CLIENT: Alberta Government

PROJECT: CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
C042 - West of Water Valley Slide
H579:02, km 36.540

SCALE: 1:2,500 **PROJECT No.:** A05116A02 **FIG No.:** 1

Time: 14:50:49 PM
 Date: November 08, 2021
 File: Z:\AEDM\A05116A02\ABT_Central Region_GRI\IP\400 Drawings\GIS\MXD\2021\Section\B\C042_B_211108.mxd

Inspection Photographs

Photo 1 **Oblique air photo of the C042 site, showing Slide No. 1, 2, and 3 locations (refer to figure for extents). Slide No. 4 is located west, past the bottom of photo. Photo taken June 23, 2021 facing east.**



Photo 2 Fence downslope of Slide Area No. 4 has tipped over (roadway remains unaffected). Photo taken June 23, 2021 facing east.



Photo 4 Flush-mounted headbox is missing its cap and require replacement. Photo taken June 23, 2021.



Photo 6 **Vegetation on slope and north (westbound) ditch bottom. Photo taken June 23, 2021 facing northwest.**

