

SITE NUMBER AND NAME: C025 Western Monarch Slide		HIGHWAY & KM: 569:02, 18.469	PREVIOUS INSPECTION DATE: June 24, 2021	INSPECTION DATE: May 31, 2022
LEGAL DESCRIPTION: 02-20-27-18-W4M	NAD 83 COORDINATES: UTM Northing Easting 12 5686096 395423		RISK ASSESSMENT: PF: 7 CF: 4 TOTAL: 28	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 80 (west) (Reference No. 113210)			CONTRACT MAINTENANCE AREA (CMA): 521	

<p>SUMMARY OF SITE INSTRUMENTATION:</p> <p>Operational: One vibrating wire piezometer (VWPs) and one standpipe piezometer (SP) installed in 2004 (dry since installation).</p> <p>Inoperable: One slope inclinometer (SI) installed in 2004, one SI installed in March 2017 (instrument was found sheared 0.6 m below ground surface during spring 2019 readings), and one piezometer installed in 2017.</p> <p>LAST READING DATE: May 16, 2019 (no longer reading instruments)</p>		<p>INSPECTED BY: Chris Gräpel (KCB) James Lyons (KCB) Rocky Wang (AT) Justin Corbeill (AT)</p>
<p>PRIMARY SITE ISSUE: A natural slope failure in bedrock that is retrogressing towards the south side (eastbound lane) of Hwy 569 where it traverses the slope of a small valley that leads to the Red Deer River valley. A potential sinkhole associated with old coal-mine workings in the area was observed in the ditch close to the intersection of Hwy 569 and Hwy 10/Hwy 564.</p>		
<p>APPROXIMATE DIMENSIONS: The slide is approximately 25 m wide, and the backscarp is within 2 m of the guardrail. The slope is approximately 20 m high sloped between 1.5H:1V to 2H:1V.</p>		
<p>DATE OF ANY REMEDIAL ACTION: Fall 2008 – slope excavated below failure surface and reconstructed with geosynthetic reinforced granular fill.</p>		

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	Gravel surfaced road, recently graded, difficult to assess if there is any recent distress.		X
Slope Movement	X		The slide appears to have widened to the southwest and slide mass has settled since 2018 inspection; slide blocking creek.		X
Erosion	X		Erosion caused by surface water flow on edge of highway.		X
Seepage		X	N/A – none observed		X
Culvert Distress		X	N/A – no culverts at the site		X

<p>COMMENTS</p> <p>During the 2019 inspection, AT and KCB inspected the top of the backslope to further assess highway re-alignment. Benches in the backslope above the highway could be part of a larger historic landslide or they could be remains of earthworks from historic coal-mining activity. A drilling investigation with instrument installation will be required to assess the stability of the backslope and to assess subsurface conditions before road relocation and associated excavations are undertaken.</p> <p>KCB and AT have observed minimal change in the slide over the past few years.</p>

Drainage at the site is poor, with surface water flows over the slide area. Rills have formed along the south shoulder (eastbound lane) of the highway.

The slope and slide area, except for the near-vertical back and side scarps, are well vegetated with grass (Photos 1 through 4). The north edge of the slide is at the tree line (WP 167)

Another slide was identified on the south side (eastbound lane) of Hwy 569, approximately 350 m to the east (downslope) of the C025 site. The slide appears to be upslope from what might be a coal slack pile. The slide is currently not impacting the highway.

Coal slack waste piles from historic mining activities at this site are present to the northeast of the site. The C025 site is underlain by old mine workings (from AER database on coal-mine workings). A potential coal-mine void sinkhole was first observed during the 2021 inspection, in the westbound ditch, near the intersection of Hwy 569 and Hwy 10/Hwy 564 (WP 166). The sinkhole appears to have increased in size since the 2021 inspection.

The thickness of the overburden material appears to be less near the intersection, at a lower elevation (the coal-seam would have been generally horizontal) which means that sinkholes from coal-mine roof collapse would be more likely to be present at surface.

Maintenance/Repair/Monitoring Recommendations:

- Re-alignment of the road upslope (i.e., north) towards the backslope, which would require land acquisition. The realignment would need to avoid areas undermined by coal mining (e.g., near the intersection of Hwy 569 and Hwy 10/Hwy 564).
- Drainage improvements (e.g., construct ditches).
- An alternate approach to mitigating slide risk to the highway is to soil nail the slope like what is being considered for C017 and also being constructed this year for S039. Soil nailing would reinforce the backslope and reduce the potential for future regression towards the highway.

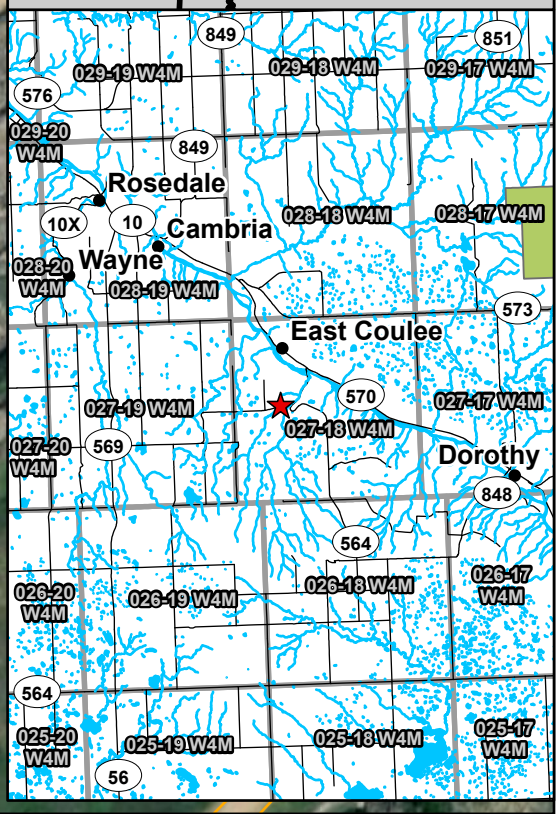
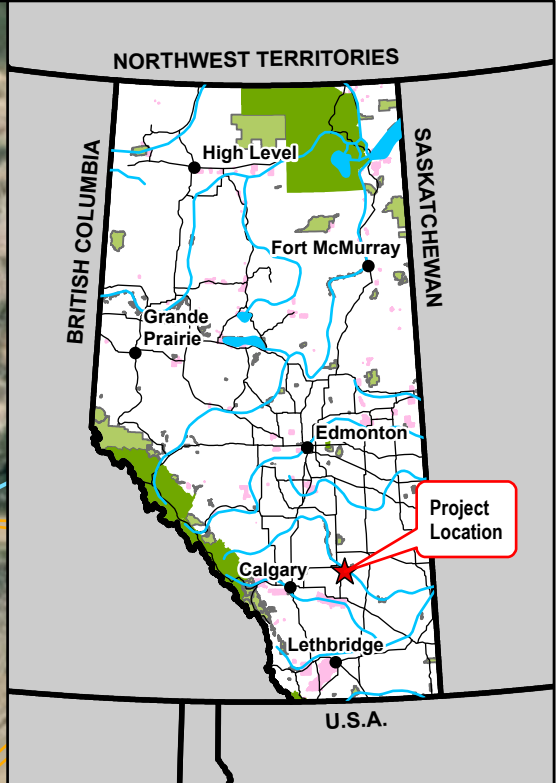
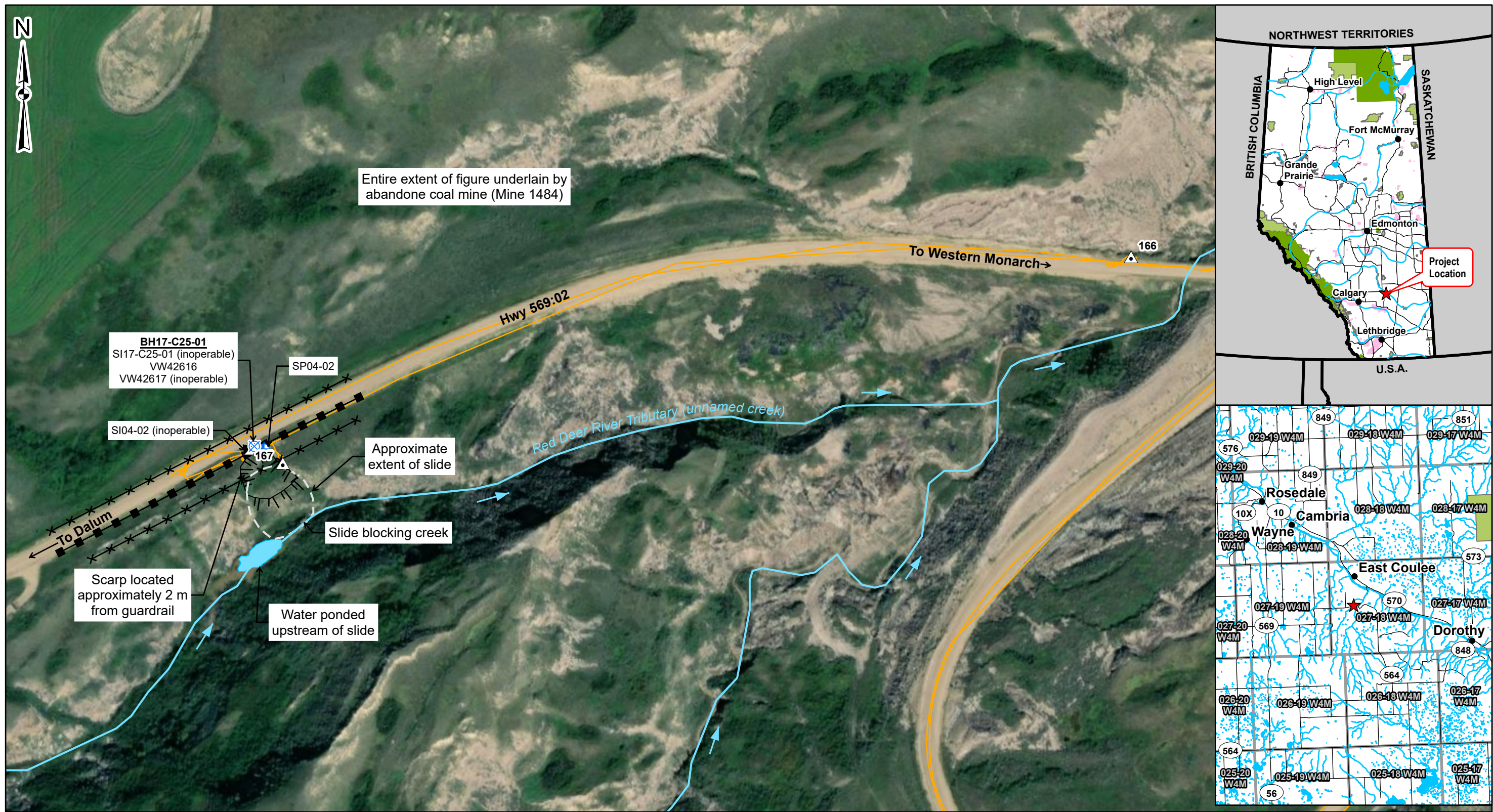
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<p>Chris Gräpel, M.Eng., P.Eng. Senior Civil Engineer, Associate</p>	
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Legend

- ▲ GPS Waypoint (May 31, 2022)
- Slope Inclinator
- ⊗ Vibrating Wire Piezometer
- ⊕ Standpipe Piezometer
- GPS Track (May 31, 2022)
- - - Bench
- ⊥ Scarp
- Guardrail
- ✕✕ Fence
- Flow Direction
- Watercourse
- ☾ Ponded Water

NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM ZONE 12N
 3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS
 4. LOCATION OF INSTRUMENTS IS APPROXIMATE (NOT SURVEYED)

CLIENT

Alberta

Klohn Crippen Berger

PROJECT CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM		
TITLE Site Plan C025 - Western Monarch Slide Hwy 569:02, km 18.469		
SCALE 1:2,750	PROJECT No. A05116A02	FIG No. 1

File: \\nt.kohn.com\ProjData\AIEDM\A05116A02\Drawings\GIS\MXD\2022\C025_220616.aprx Date: Time: Creator: aharrison

Inspection Photographs

Photo 1 Oblique aerial photo of the C025 slide. Photo taken May 31, 2022, facing northwest.



Photo 2 Guardrail on the south side of Hwy 569. Photo taken June 24, 2021, facing west.



Photo 3 Eastern flank of the slide. Small amount of ongoing erosion occurring on the vertical face where there is no vegetation (Waypoint 167). Photo taken June 14, 2021, facing north.



Photo 4 Backscarp of the slide south of Hwy 569. The slide does not appear to have progressed since the 2021 inspection and appears to be inactive, excluding some minor erosion on the near-vertical backscarp. Photo taken June 24, 2021, facing northwest.



Photo 5 Potential coal-mine sinkhole first observed during the 2021 inspection, located at Waypoint 166. Photo take on June 24, 2021, facing northeast.

