

SITE NUMBER AND NAME: S055 East of Gleichen		HIGHWAY & KM: 901X, 9.2 km east of 547	PREVIOUS INSPECTION DATE: July 8, 2020	INSPECTION DATE: July 7, 2021
LEGAL DESCRIPTION: 02-12-022-22 W4M	NAD 83 COORDINATES: UTM Northing Easting 12 5634864 364825		RISK ASSESSMENT Slide: PF: 9 CF: 2 TOTAL: 18 Erosion: PF: 5 CF: 2 TOTAL: 10	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 320 (west), (Ref. No. 109170)			CONTRACTOR MAINTENANCE AREA (CMA): 30	

SUMMARY OF SITE INSTRUMENTATION: None	INSPECTED BY: Chris Morgan (KCB) Margot Lederman (KCB) Roger Skirrow (AT) Alex Frotten (AT)
LAST READING DATE: N/A	

PRIMARY SITE ISSUE: A runoff erosion gully on the north side of the highway and slope instability on the south side. Repair activities were completed in 2018, however the slope drain became blocked in spring 2019 due to grass buildup on the fine mesh screen (aperture size of 15 mm) fitted to the pipe inlet, leading to overtopping of the ditch block and erosion of the repaired surfaces. The erosion gully and slope drain on the north side were repaired in late 2019, including replacement of the inlet trash rack.

In 2020, instability was observed in the slope reconstruction on the south side of the highway. Sloughing was visible at the toe of the repaired zone.

APPROXIMATE DIMENSIONS: Highway embankment constructed on south flowing creek, approximately 15 m high. The embankment side slope on the north side is approximately 2H:1V. The southern side slope is steeper than the north side.

DATE OF ANY REMEDIAL ACTION: Repair to the slope failure on south side was completed in November 2018 by excavating the slide mass and replacing it with compacted gravel fill. Repair of the erosion gully on the north side was completed in December 2018 using a slope drain.

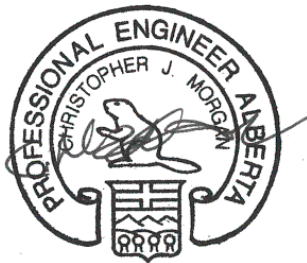
ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	Gravel road. No signs of cracking or distress on the highway surface.		X
Slope Movement	X		Slide repairs completed in 2018 south of highway. In 2020, it was noted that the repair has partially failed.		X
Erosion	X		Erosion rills up to 50 mm deep on the south side, where slope not vegetated.		X
Seepage	X		Washed out section of vegetation and granular fill on the south side of the highway near the fence line, thought to be due to seepage or saturation of fill due to infiltration.		X
Culvert Distress	X		Slope drain washout north of highway led to sediment build-up at the inlet to the 900 mm diameter highways culvert downstream of the slope drain, and restriction of flow through the culvert under the CP Rail line.		X

COMMENTS
<p>Construction was carried out in winter 2018 to repair an erosion gully and slope instability. The slope drain installed north of the highway became obstructed in spring 2019 leading to erosion and undermining of the HDPE pipe. The MC completed slope drain repairs in late 2019.</p>
<p><u>North Side of Highway</u></p> <p>Vegetation is well established across large portions of the repair. Erosion rills 5 to 50 mm deep were noted where vegetation coverage is poor. The lower portion of the slope drain is covered with straw matting to promote vegetation growth, and the outlet is covered with riprap (150 mm minus) to minimize deflection during outflows.</p> <p>During the 2021 site visit the ditch was dry. Localized ditch erosion upstream of the slope drain inlet was visible. Erosion rills were up to 100 mm deep and 0.5 m wide.</p> <p>In 2020 it was estimated that outflows from the HDPE slope drain were less than flow in the ditch, possibly due to leakage. Site observations in 2021 noted that the final joint at the downstream end of the HDPE pipe had separated, leading to leakage at the joint, minor erosion of riprap, and settlement of the geotextile on the south side of the pipe.</p> <p>The v-ditch from the slope drain outlet has been partially eroded but is still functional. A steel culvert beneath the highway at the toe of the embankment remains infilled with sediment as a result of the spring 2019 ditch block overtopping. The sediment plug restricts flows to the south, which also impedes flow from the CSP culvert under the CP Rail line.</p>
<p><u>South Side of Highway</u></p> <p>On the south side of the highway, sloughing of the 2018 granular repair continues. It appears that surface runoff or seepage is contributing to ground saturation, and that the granular fill is acting as a preferential flow pathway. Granular backfill has failed at the toe of the repaired zone, near to the fence line. The head scarp of the sloughing is located 2.8 m upslope from the fence line and is approximately 2.3 m wide by 1 m high.</p> <p>Tension cracking was noted midslope on the east and west flanks of the repaired area during the 2020 inspection, and ongoing retrogression of the failure is likely over time. The failed material is displacing the fence downslope. Vegetation coverage has not changed significantly when compared to 2020 observations.</p>
<p>Recommendations:</p> <ul style="list-style-type: none"> • North side: Clean out the two CSP culverts at the toe of the slope and restore full functionality to provide highway drainage, and to permit drainage from agricultural land north of the CP Rail line. • North side: Monitor leakage due to separated slope drain joint. • North side: Install geofabric at the inlet to the slope drain to direct all ditch flow into the HDPE pipe. A custom “boot” is recommended around the HDPE pipe to provide a full seal around the pipe. • South side: Improve highway drainage, construct a berm or regrade the highway surface to avoid runoff concentrating at the 2018 repair location (which represents a low point on the south side of the highway). • South side: Monitor sloughing at the location of the 2018 repair, and adjacent areas of sloughing which are visible but were not a part of the 2018 repair. The embankment on the south side of the highway is steep and future slope stabilization may be required. Due to the steepness, active ground anchoring solutions should be considered.
<p>The site should be inspected every two years</p>
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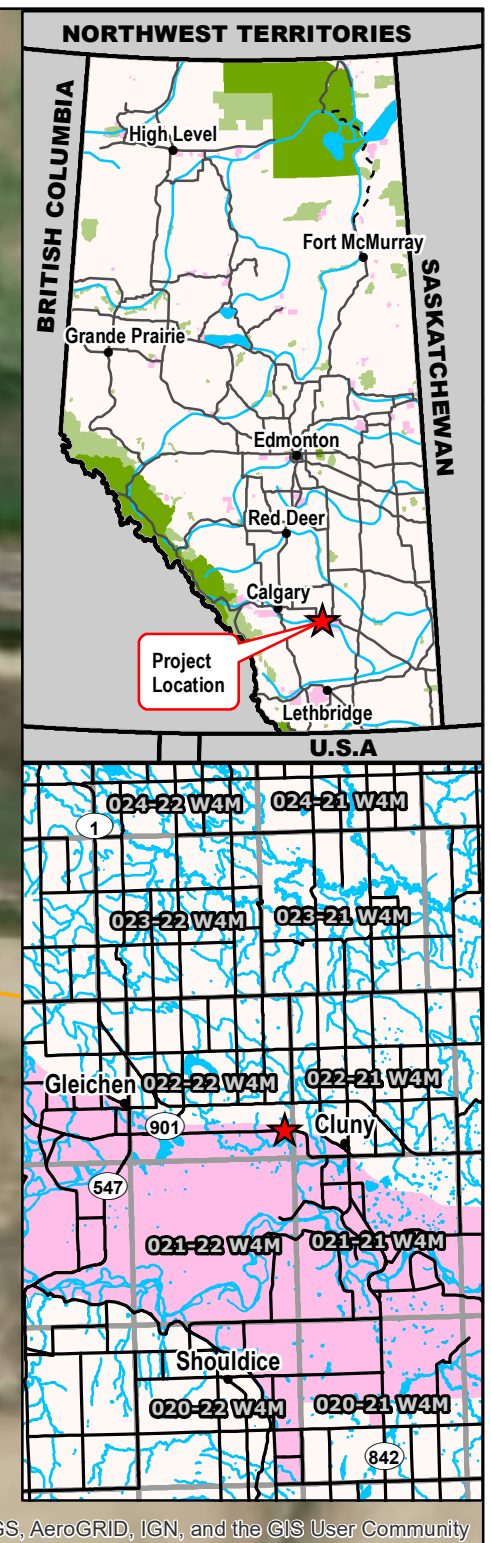
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- (ii) The observations, findings, and conclusions in this report are based on observed factual data and conditions that existed at the time of the work. and should not be relied upon to precisely represent conditions at any other time.
- (iii) KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.



2021-11-24

Chris Morgan, M.Sc., P.Eng.
Senior Geotechnical Engineer



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Legend**
- GPS Track (2021)
 - x—x Fence
 - - - Failure Material
 - - - Tension Crack
 - - - Culvert
 - - - Main Scarp
 - Flow Direction



NOTES: 1. HORIZONTAL DATUM: NAD83 2. GRID ZONE: UTM Zone 12N 3. IMAGE SOURCE: World Imagery, ESRI ArcGIS Online Source date July 12, 2019	CLIENT 	PROJECT SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM
		TITLE Site Plan S055 - East of Gleichen Hwy 901X
SCALE 1:1,200	PROJECT No. A05116A03	FIG No. 1

Time: 11:40:11 AM
 Date: October 12, 2021
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Photo 1 North side of highway – Reinstated ditch block at slope drain inlet. Photo taken facing west on July 7, 2021.



Photo 2 North side of highway – View west from upper part of slope drain towards outlet. Photo taken facing west on July 7, 2021.



Photo 3 North side of highway – Localized erosion due to separation of HDPE pipe joint in lower portion of slope drain. Photo taken July 7, 2021.



Photo 4 South side of highway – Visible granular fill and displaced vegetation near fence line due to washout of a portion of the repaired section. Photo taken on July 7, 2021.



Photo 5 South side of highway – Displaced mid slope fence line due to failure of 2018 granular embankment repair. Photo was taken facing west on July 7, 2021.

