

SITE NUMBER AND NAME: <b>C073-I and -II: Slide and Erosion Sites</b>		HIGHWAY & KM: 580:02, 23.604 2A:12, 15.725	PREVIOUS INSPECTION DATE: June 23, 2021	INSPECTION DATE: <b>May 30, 2022</b>
LEGAL DESCRIPTION: <b>C073-I:</b> SE 06-30-01-W5M <b>C073-II:</b> NE 29-30-01-W5M	NAD 83 COORDINATES: UTM    Northing    Easting 11     5713022    699532 11     5720905    701123		RISK ASSESSMENT: <b>C073-I:</b> PF: 1    CF: 2    TOTAL: 2 <b>C073-II:</b> PF: 1    CF: 7    TOTAL: 7	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): <b>C073-I:</b> 1270 (east) & 1670 (west) (Reference No. 68250 & 76260) <b>C073-II:</b> 3740 (north) & 3080 (south) (Reference No. 70000526 & 70000216)			CONTRACT MAINTENANCE AREA (CMA): 514	

SUMMARY OF SITE INSTRUMENTATION:  There is no instrumentation at the C073 sites.  LAST READING DATE: N/A	INSPECTED BY: Chris Gräpel (KCB) James Lyons (KCB) Rocky Wang (AT)
PRIMARY SITE ISSUE: The C073 slide (C073-I) was believed to be caused by surface water flows off the highway saturating the embankment fill. The C073 erosion (C073-II) is caused by surface water flows from the west (southbound) ditch, over steepened slope for a vegetated slope, and erosion is most likely exacerbated during periods of increased precipitation.	
APPROXIMATE DIMENSIONS: C073-I Slide Site was approximately 20 m wide, 7 m to 11 m high, and 1 m to 2 m deep. The C073-II Erosion Site is approximately 5 to 8 m wide (crest to crest), 3 m deep, and 30 m long.	
DATE OF ANY REMEDIAL ACTION: 2020 – The C073 slide site was repaired in August 2020 and consisted of geogrid reinforced fill, a common fill toe berm, a 900 mm diameter CSP culvert, and an overflow channel. 2021 – The C073-II erosion site was repaired by backfilling the erosion gully with Class 1M riprap.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		C073-I: asphalt placed during the 2020 repairs is in poor condition	X	
Slope Movement	X		C073-I: a thin longitudinal crack was observed between the new asphalt shoulder and the existing asphalt	X	
Erosion		X	C073-II: an erosion gully in in the west (southbound) ditch		X
Seepage		X	N/A		X
Culvert Distress		X	C073-I: the 900 diameter CSP culvert installed in 2020 is in good condition		X

**COMMENTS**

C073-I:

- The shallow surficial slide on the north highway embankment was impacting the north (westbound) lane of Hwy 580. The slide was first inspected by AT and KCB in July 2019 during the Central Region GRMP annual inspection tour. The slide was approximately 20 m wide, 1 m to 2 m deep, and 7 m to 11 m high. Failed material was deposited at the toe of the highway embankment in the ditch bottom, and also to the west of the slide, impacting a private fence and depositing material at the edge of Carstairs Creek. The backscarp of the slide was a vertical face approximately 2 m high, where the guardrail and 5 guardrail posts were left unsupported. KCB issued a call-out report to AT on September 26, 2019.

- A follow-up site visit was completed in May 2020, where KCB and AT discussed repair options. KCB issued a repair design to the Highway Maintenance Contractor (HMC) in July 2020 and the repair was completed in August 2020. The repair included rebuilding the embankment slope with geogrid reinforced fill, a toe berm that abutted against the slope north of the highway embankment, a 900 mm diameter CSP culvert oriented along the existing ditch bottom, a riprap apron at the culvert inlet and outlet, and a riprap lined overflow channel at the toe berm and natural slope contact. The site was hydro-mulched after construction was completed.
- August 2020 and June 2021 – A local resident spoke with KCB and AT regarding a beaver dam on the upstream side of the culvert below the highway embankment (oriented north-south, along Carstairs Creek). There has been beaver damming of the culvert inlet since KCB and AT first inspected the site in July 2019. There still appears to be beaver damming activity at the site. However, the Carstairs Creek water level appears to 0.5 m to 1.0 m lower than during the 2021 inspection
- During construction, the HMC observed an area approximately 15 m west of the original slide that was being impacted from surface water flows over the north edge of the highway. The area was also repaired during construction (topsoil stripping, fill placement, topsoil spreading, and hydro-mulching). The area repaired was approximately 10 m in length.
- The repaired slope, toe berm, and culvert are in good condition and have not changed since the 2021 inspection. The vegetation growth/coverage on the repaired slope and upstream ditch appears to have improved significantly since the 2021 inspection (Photos 1 through 3).
- The ATCO power pole east of the slope repair has had maintenance work completed in late-2021 or early-2022 (Photo 4)
- A wet area was observed (WP 145) in the north (westbound) ditch at the toe of the north back slope, east of the slide repair (Photo 5).
- Pavement cracking and settlement in the south (eastbound) lane approximately 110 m west from the original slide was observed by AT's Highway Maintenance Contactor (HMC) in March 2021 (WP 146). The area was inspected by KCB and AT during the 2022 inspection. There is a longitudinal pavement crack (Photo 6) approximately 75 mm wide and 15 m long that was recently filled. The pavement cracking and settlement may be attributed to an over steepened highway embankment slope. No movement was observed on the south slope downslope of the pavement crack or settlement of the south guardrail.

C073-II:

- An erosion gully has formed in the west (southbound) ditch, approximately 20 m west of Hwy 2A. The erosion gully is approximately 5 m to 8 m wide (crest to crest), 3 m deep, and 30 m long. The erosion gully has 1H:1V side slopes and is east (downslope) of a private landowner's fence.
- KCB and AT believe the erosion gully formed due to the steepness of the ditch at the erosion site (estimated to be between 12.5% to 14.0%), large catchment area, and inadequate erosion protection (i.e., only vegetation). Erosion is likely exacerbated by periods of increased precipitation.
- The depth of the erosion gully decreases further downstream (north) where a well-vegetated area acts as a sediment trap. No sediments were observed at the outlet of the erosion gully.
- KCB and AT inspected 6 years ago and agree the erosion gully has not significantly changed since that inspection (i.e., retrogressed towards the highway or private fence).
- The erosion gully was repaired by the HMC by backfilling the erosion gully with Class 1M riprap in November 2021. The repair is in good condition. (Photos 7 through 10). However, upstream of the repair, the ditch and embankment slope are poorly vegetated and small riprap particles up to 200 mm in diameter were observed along the slope (Photos 9 and 10). The MCI should monitor the vegetation growth and the HMC may have to reseed.

Maintenance/Repair/Monitoring Recommendations:

C073-I:

- If the pavement cracking and settlement continues to impact the south (eastbound) lane, a repair like the C073-I repair (i.e., geogrid reinforced granular fill) could be completed to improve the embankment stability. The MCI should regularly inspect the site for signs of movement.

C073-II:

- The 2021 repair was successful and appears to be in good condition. If the vegetation cover does not improve, the HMC should reseed the site in fall 2022.

This report is an instrument of service of Klohn Crippen Berger Ltd. (KCB). The report has been prepared for the exclusive use of Alberta Transportation (Client) for the specific application to the Central Region Geohazard Risk Management Program (Contract No. CON0022160) and it may not be relied upon by any other party without KCB's written consent.

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- (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.
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- (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.

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



- Legend**
- ▲ GPS Waypoint (May 30, 2022)
  - GPS Track (May 30, 2022)
  - ~ Crack
  - Guardrail
  - ×× Fence
  - > Culvert
  - ⊥ Toe Berm
  - - - Repair Extent
  - ▣ Riprap



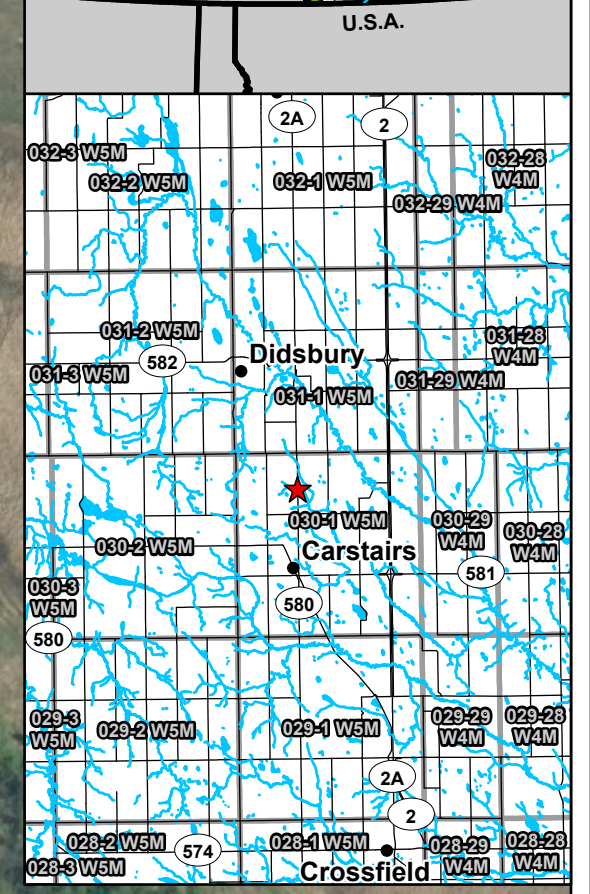
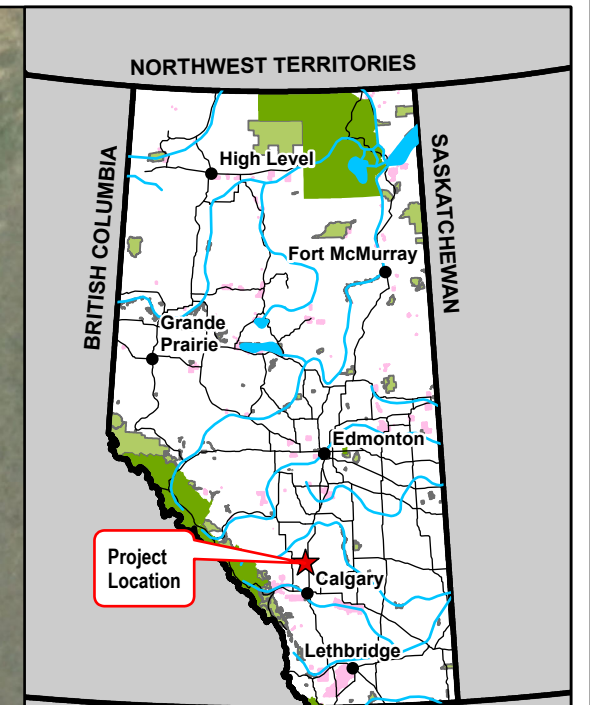
NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT

*Alberta*

**Klohn Crippen Berger**

PROJECT CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM		
TITLE Site Plan C073-I - Southwest of Carstairs Hwy 580:02, km 26.304		
SCALE 1:750	PROJECT No. A05116A02	FIG No. 1



Unnamed water body

Erosion gully backfilled with Class 1M riprap in late-2021

To Didsbury

Hwy 2A:12

To Carstairs

**Legend**

- GPS Track (May 30, 2022)
- Guardrail
- Fence
- Erosion



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PROJECT CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM		
TITLE Site Plan C073-II - North of Carstairs Hwy 2A:12, km 15.725		
SCALE 1:1,500	PROJECT No. A05116A02	FIG No. 1

## Inspection Photographs

**Photo 1** The vegetation cover in the north (westbound) ditch and repaired slope has increased significantly since the 2021 inspection. Photos taken June 23, 2021 and May 30, 2022, facing west.



**Photo 2**      **The Carstairs Creek water level has decreased by 0.5 m to 1.0 m between the 2021 and 2022 inspections. Photo taken June 23, 2021 and May 30, 2022, facing northwest.**



**Photo 3** The east side of the slide repair, 900 mm diameter CSP culvert inlet, riprap apron, and overflow channel. Photo taken May 30, 2022, facing west.



**Photo 4** Maintenance work was completed in late-2021 or early-2022 on the ATCO power pole east of the slide repair. Photo taken May 30, 2022, facing west.





**Photo 5** A wet spot was observed in the north (westbound) ditch (WP 145) east of the slide repair. Photo taken May 30, 2022, facing east.



**Photo 6** Pavement cracking in the eastbound lane, west of the C073-I site that was repaired in August 2020. Photo taken May 30, 2022, facing west.



**Photo 7** The erosion gully north of west of Hwy 2A was backfilled with Class 1M riprap in November 2021. Photo taken May 30, 2022, facing northwest.



**Photo 8** The backfilled erosion gully near the top of the slope. Photo taken May 30, 2022, facing southwest.



**Photo 9** Poor vegetation cover along the west (southbound) ditch, south of the C073-II repair. Small riprap particles (up to 200 mm diameter) were observed along the west embankment slope. Photo taken May 30, 2022, facing north.



**Photo 10** The west embankment slope and south portion of the C073-II 2021 repair. Photo taken May 30, 2022, facing south.

