

<b>SITE NUMBER AND NAME:</b> C023-I and -II Battle River Crossing Erosion and Slope Failure		<b>HIGHWAY &amp; KM:</b> 854:01, 14.017	<b>PREVIOUS INSPECTION DATE:</b> June 24, 2020	<b>INSPECTION DATE:</b> <b>May 31, 2022</b>
<b>LEGAL DESCRIPTION:</b> 16-07-043-17 W4M	<b>NAD 83 COORDINATES:</b> UTM    Northing    Easting 12      5839557      402074		<b>RISK ASSESSMENT:</b> C023-I    PF: 10    CF: 3    TOTAL: 30 C023-II   PF: 8    CF: 4    TOTAL: 32	
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 130 (south) & 90 (north) (Ref No. 114370 & 997079)			<b>CONTRACTOR MAINTENANCE AREA (CMA):</b> 513	

<b>SUMMARY OF SITE INSTRUMENTATION:</b>  There is no instrumentation at the C023 site.  LAST READING DATE: N/A	<b>INSPECTED BY:</b> Chris Gräpel (KCB) James Lyons (KCB) Rocky Wang (AT)
<b>PRIMARY SITE ISSUE:</b> C023 – I: Erosion on north bank of Battle River valley. West side of highway: erosion of unvegetated area upslope of Battle River. East side of highway: failure of gabion mattress armoured ditch chute. C023 – II: A small landslide on the south bank of the Battle River, partially beneath the bridge.	
<b>APPROXIMATE DIMENSIONS:</b> C023 – I: West side – 15 m wide by 50 m long (parallel to highway) area of unvegetated soil; East side – 20 m long length of gabion mattress armoured ditch. C023 – II: Slide on south bank is approximately 30 m wide and approximately 5 m high.	
<b>DATE OF ANY REMEDIAL ACTION:</b> October 2003 – gabion chute and stilling basin constructed in east ditch. (cross-culvert under road carries west ditch flow to gabion mattress lined ditch); 2015 – sediment and vegetation removed from gabion-basket catch basins.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	Gravel surfaced road		X
Slope Movement	X		C023-II: Minimal retrogression of slide west of south abutment; slight retrogression near south abutment below bridge.		X
Erosion	X		C023-I: Rill and gully erosion continue to develop on exposed soil upslope of riverbank on west side of highway. Steep downstream section of gabion mattress armoured channel on east side of highway is progressively failing from edge of water to top of slope.	X	
Seepage		X	N/A – none observed		X
Culvert Distress	X		C023-I: Overgrown vegetation observed in gabion catch basins at culvert inlet and outlet.		X

<b>COMMENTS</b>
<p>C023-I:</p> <ul style="list-style-type: none"> <li>The west side gabion catch basin inlet structure continues to overflow onto the unvegetated slope into the existing erosion gully (first observed during the 2018 inspection) (Photo 1). Although the erosion gully has not expanded significantly since the 2020 inspection, it will continue to expand if left unrepaired.</li> <li>Grass growth is limited to the areas where coir rolls, now deteriorated, retained sediments and seeds from previous seeding.</li> <li>The inlet and outlet gabion catch basin structures on the north side of the bridge remain clogged with no significant change since the 2020 inspection (Photos 2 and 3).</li> </ul>

- Gabion mattress channel lining the ditch on east the side of highway has not been repaired (Photo 4). Water will continue to undermine the mattress until it is repaired. Gabion mattress channel lining at the discharge point into the river is still in good condition.
- Some undermining/erosion of the slope under the RECP was observed during the 2022 inspection.

C023-II:

- The riverbank along the south abutment directly below the bridge is showing signs of retrogressive slope failure. A steep (approximately 1H:1V) riverbank slope 4 m to 5 m high is located at the edge of the river, with approximately 15 m between the crest of the slope and the bridge abutment. The riverbank slope failure does not appear to have changed significantly since the 2020 inspection.

Maintenance/Repair/Monitoring Recommendations:

C023-I:

- The sediments and vegetation in the gabion basket inlet and outlet structures should be removed.
- The erosion gullies in the slope and berm downstream of the gabion basket inlet structure should be backfilled with fine-grained material. The slope should be graded and seeded with a suitable Badlands seed mix to promote grass growth. Given that bedrock is exposed at surface, to give the seeds a better chance to germinate and form a stable vegetative cover on the western erosion site, the seed could be applied via hydro-mulch or a bonded-fiber matrix, flexible growth medium and then hydro-seeded. Silt fence should be erected at the toe of the slope and maintained until vegetation is established.
- The failed gabion mattress downslope of the gabion basket outlet structure should be removed. The area should be graded to a channel shape, lined with non-woven geotextile or suitable bedding material, and armoured with riprap. Check trenches should be installed at regular intervals to reduce the likelihood of undermining the repaired channel.

C023-II:

- The slope failure observed on the west side of and adjacent to the south bridge abutment should be monitored. Potential repair options include:
  - (i) armouring the riverbank to control erosion upstream of and underneath the bridge deck;
  - (ii) soil nailing could be used to stabilize the slide;
  - (iii) flattening the slope beneath the bridge.

KCB is preparing a memo and Request for Quotation (RFQ) for the repair of the C023-I site. The memo and RFQ will be issued to AT in fall 2022 and construction is anticipated to be completed in late-2022 or 2023.

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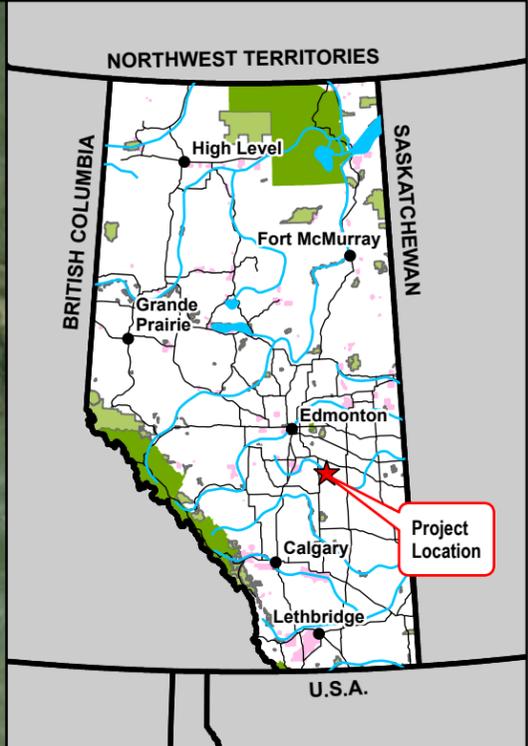
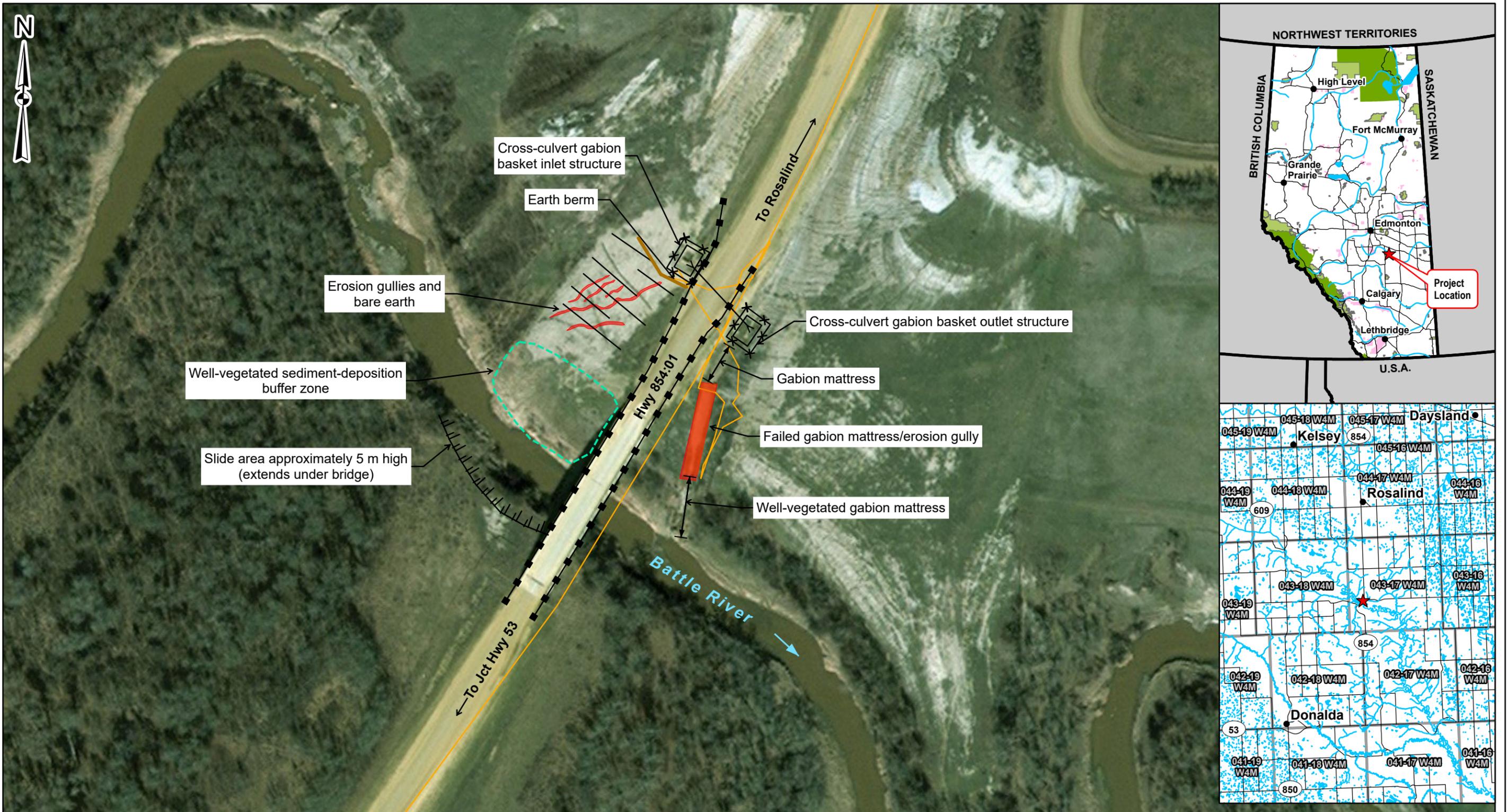
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Chris Gräpel, M.Eng., P.Eng.  
Senior Civil Engineer, Associate



**LEGEND**

- GPS Track (May 31, 2022)
- Flow Direction
- ✕✕ Fence
- Earth Berm
- Scarp
- Guardrail
- Coir Roll
- Culvert
- Erosion
- Failed Gabion Mattress



NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 12N  
 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 C023 - Battle River Crossing Erosion and Slope Failure Hwy 854:01, km 14.017		
SCALE 1:1,250	PROJECT No. A05116A02	FIG No. 1

File: Z:\A\EDMA05116A02\ABT Central Region GRIMP\400 Drawings\GIS\MXD\2022\C023\_220613.aprx Date: Time: Creator: aharrison

## Inspection Photographs

- Photo 1** Gully erosion occurring on the north slope of the river valley, south of the gabion basket inlet structure. Erosion most likely caused by the inlet structure overflowing since it is clogged with sediment and vegetation. Photo May 31, 2022, facing southwest.



- Photo 2** Vegetation and sediment build-up at the catch basin structure at the inlet of the culvert. Photo taken May 31, 2022, facing southeast.



**Photo 3** Gabion basket outlet structure on east side of highway is clogged with sediments and dense vegetation. Photo taken May 31, 2022, facing east-southeast.



**Photo 4** Failed section of the gabion mattress lined channel east of the highway. Photo taken May 31, 2022, facing northwest.



**Photo 5**      **Poor vegetation cover on the slope east of the highway and gabion mattress lined ditch. There are small erosion gullies forming on the east slope, undermining the geosynthetic covering the slope. Photo taken May 31, 2022, facing west.**

