

SITE NUMBER AND NAME: <b>S031-II Mystery Culvert</b>		HIGHWAY & KM: 762:02, 17.660	PREVIOUS INSPECTION DATE: May 16, 2022	INSPECTION DATE: <b>May 9, 2023</b>
LEGAL DESCRIPTION: 07-19-22-04-W5M	NAD 83 COORDINATES: UTM Northing Easting 11 5639613 672917		RISK ASSESMENT: <b>S031-I:</b> PF: 1 CF: 1 TOTAL: 1 (Not visited) <b>S031-II:</b> PF: 8 CF: 4 TOTAL: 32	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 700 (north) & 1320 (south) (Reference No. 65170 & 60180)			CONTRACTOR MAINTENANCE AREA (CMA): 27	

SUMMARY OF SITE INSTRUMENTATION:  There is no instrumentation at the S031-II site.  LAST READING DATE: N/A	INSPECTED BY: Chris Grapel (KCB) Peter Roy (KCB) Renato Macciotta (U of A) Roger Skirrow (AT) Alex Frotten (AT) Maury Siddons (AT)
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**PRIMARY SITE ISSUE:** Monitoring of two repaired embankment failures. Prior to repair, the embankment failures were impacting the southbound lane at both site I and II.

**APPROXIMATE DIMENSIONS:** S031-I: Slide approximately 45 m wide, up to 3 m into the highway. Cracking previously observed to the middle of the highway. S031-II: Slide approximately 40 m wide, up to 2 m into the highway. Most of the cracking was observed on the west shoulder. The height of the highway embankment is approximately 4 m to 5 m. Before toe berm construction, the embankment was approximately 6 m high.

**DATE OF ANY REMEDIAL ACTION:** Fall 2017 – S031-I was repaired including excavating and replacing the embankment material, building a toe berm, and improving drainage. S031-II – previous pavement patches have been completed at the site. Patch placed after the 2022 inspection.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		S031-II: Pavement patch placed since last inspection. Cracking has not come through new patch.	X	
Slope Movement	X		S031-II: Slight bulge in slope and cracking at the head of the slide.		X
Erosion		X	N/A – none observed		X
Seepage		X	N/A – none observed. A wetland is located along the west side of the highway embankment.		X
Culvert Distress	X		S031-II: The CSP culverts appear rusted and deformed		X

**COMMENTS**

S031-I:

- During the 2023 drive-by inspection the site appeared to be in good condition following 2017 repairs.
- Vegetation is establishing on the slope and no distress was observed in pavement surface.
- The riprap armoured drainage ditch was previously graded improperly (i.e., center of channel was higher than outside edges). However, the MCI reported that the ditch had been repaired. During the 2023 drive-by inspection it appeared that the ditch channel has been regraded.

S031-II:

- There appears to be ongoing settlement and/or slope movement at the site. The pavement patch placed in 2022 did not show any signs of cracking.
- During the 2022 inspection it was noted that the patched area had settled approximately 20 mm (the settlement was approximately 10 mm to 15 mm in 2021). This was not noted in 2023 through the newly patched road surface. However, cracking on the west shoulder is still visible as it was not patched.
- The MCI reported that the pavement had settled approximately 200 mm vertically and required patching in June 2020. During the 2020 inspection, mid-slope tension cracking was noted along the west embankment between the north and south culverts. There is a slight bulge in the slope but no discernible change between the 2021, 2022 and 2023 inspections.
- The total length of the tension crack on the highway surface is approximately 40 m. Longitudinal cracks up to 10 mm wide were observed at the north end of the site close to the west shoulder (this area was not patched and appears unchanged since the previous inspection).
- Two CSP culverts are present at S031-II site that are underlying the highway (oriented east-west). The south culvert was replaced as part of the 2017 repair work, and the north culvert is outside the site limits. Both culverts appeared deformed and bowed beneath the highway embankment. An asphalt apron is at the outlet of the north culvert.
- The east (northbound) ditch appears poorly drained.

Maintenance/Repair/Monitoring Recommendations:

- S031-I can be removed from the active list of sites for the Southern Region. The S031-II site should be inspected annually as part of the Southern Region GRMP Section B inspections.
- Candidate repair options for the S031-II site include: (i) a driven steel H-pile wall (ii) excavate and replace the embankment fill with geogrid reinforced granular fill, including a shear key near the toe of the highway embankment. (iii) Reduce embankment loading using lightweight fill (e.g., cematrix or polystyrene) in the top third of the slope.
- One borehole could be drilled at the S031-II site to assess the ground conditions. A slope inclinometer should be installed in the borehole to assess the depth of movement at the site and to help determine the depth of a potential pile wall repair. A proposal for this work was submitted on December 15, 2022.
- The repair work at the S031-II site could be completed by Alberta Transportation's Highway Maintenance Contractor (HMC). A design memo (including repair sketches and quantity estimates) could be prepared by KCB to assist the HMC.

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Peter Roy, P.Eng.  
Civil Engineer



**Legend**

- - - Transverse Crack
- ~ ~ ~ Tension Crack
- x x Fence
- > Culvert
- GPS Track (May 9, 2023)

NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM ZONE 11N  
 3. IMAGE SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS AND THE GIS USER COMMUNITY.

CLIENT




PROJECT SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM		
TITLE Site Plan S031-2 - Mystery Culvert Hwy 762.02, km 97.660		
SCALE 1:1,500	PROJECT No. A05116A03	FIG No. 1

**Photo 1** West ditch, and a CSP culvert inlet. Photo taken facing north on May 9, 2023.



**Photo 2** West slope. Photo taken facing northeast on May 9, 2023.



**Photo 3** Cracking on the shoulder of the southbound (west) lane. Photo taken facing south on May 9, 2023.



**Photo 4** Slope on the west side of the road. Photo taken facing south on May 9, 2023.

