

SITE NUMBER AND NAME: NC044 – Cattlepass East	HIGHWAY AND KM: 633:02, km 1.434	PREVIOUS INSPECTION: June 15, 2022	CURRENT INSPECTION: June 11, 2024
LEGAL DESCRIPTION: NW 29-53-6-W5M	NAD83 COORDINATES: UTM11U 5942545N, 642834E		RISK ASSESSMENT: PF: 9 CF: 4 Total: 36
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 460 (2023)		CONTRACTOR MAINTENANCE AREA (CMA): 509	

SUMMARY OF INSTRUMENTATION: Two slope inclinometers, one pneumatic piezometer and two vibrating wire piezometers are operational at this site. LAST READING DATE: May 16, 2024	INSPECTED BY: Stantec: Leslie Cho, Sonja Pharand AT: Kristen Tappenden, Tim Germyn
PRIMARY SITE ISSUE: Slope instability due to relatively high embankment over soft ground with shallow groundwater level.	
APPROXIMATE DIMENSIONS: 170 m along the road by 75 m wide.	
DATE OF ANY REMEDIAL ACTION: Toe berm was constructed in 2011. Pavement overlaid in 2013, and the westbound lane was patched in 2014. The westbound lane and parts of the eastbound lane were patched in June 2017.	

ITEM	CONDITIONS EXIST		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Cracks reflecting through overlay and patches.	X	
Slope Movement	X		Pavement cracks are present along the highway, continued creep measured by slope inclinometers.	X	
Erosion	X		Erosion gully along the north ditch near west end of pavement patch.		X
Seepage		X			X
Culvert Distress	X		Ponded water at both ends of the culvert. Culvert inlet submerged in the north. Dip observed above culvert in south ditch.	X	
Other		X			X

COMMENTS
<ul style="list-style-type: none"> The cracking pattern on the highway appeared to have progressed since the previous inspection. Further cracks are reflecting through the pavement patches and a new crack, 0-15 mm wide, was observed near the west end of the 2013 patch (Photos 1 to 4). The curved crack in the east bound lane near SI17-01 has been sealed (Photo 2). Map pavement cracking is present on the east side of the site. A road sign warning of the bumps ahead was observed to be placed at the far west side of the site, for east bound traffic. Multiple sets of tire marks were observed within both lanes, which may be due to vehicles suddenly braking after traveling over the bumps (Photo 3). The potential toe bulging observed near SI05-7 (which has sheared) appears to still be present (Photo 5) with little to no change observed. SI17-01 shows continued movement at a rate of about 2 mm/yr between 6 m and 10 m depth. SI17-02 shows an incremental movement of 3 mm between 10 m and 13 m depth since the last reading in Spring 2023 with a

current rate of movement of 3 mm/yr. Ongoing movement may be due to high pore pressures at the site. A possible source of water infiltration into the slope is through the erosion channel on the north ditch. The ponded water on both ends of the culvert may also be infiltrating into the slope.

- The berm was grass covered with no visible signs of distress observed.
- A dip was observed in the south ditch, approximately above the culvert alignment.
- Standing water was observed at both ends of the culvert as shown in Photos 6 and 7. Water appeared to be flowing through the culvert, however, water appears to be very slowly draining from the outlet. The water collected at the outlet appeared still and murky.
- Erosion is ongoing in the north ditch. During the inspection the west end of the erosion channel appeared dry, while the east end appeared to be wet (Photo 8).
- The groundwater level in PN05-8 increased by 0.4 m since the last reading in Spring 2023 and is now within 0.3 m from ground surface. The groundwater level in VW17-02 dropped by 0.1 m, and is now 1.1 m below ground surface, while the groundwater level in VW17-01 rose by 0.1 m but remains 3.3 m below ground surface.

RECOMMENDATIONS

- Short term recommendations include sealing of any cracks to reduce surface water infiltration into the slope and pavement structure. Additional pavement patches are not recommended since it is considered an additional driving force on the embankment. Mill and fill could be completed such that the final pavement elevation is not higher than the existing elevation.
- Stantec also recommends that a road sign warning of the bumps ahead be installed on the east end of the site, similar to the one installed on the west side.
- The MCI should continue to inspect the culverts on site on a regular basis to reduce the risk of pore pressures building up in the berm and slope and to maintain functionality. A CCTV inspection could be conducted to assess the culvert condition.
- Grading may be considered at the culvert inlet to reduce the amount of ponded water. However, grading works would likely occur outside of TEC's right-of-way.
- The erosion gully in the north ditch should be repaired to reduce seepage of water into the slope and under the highway.
- Long-term remediation may consist of lowering the overall highway grade to reduce the driving force on the slope. The high-level cost of grade reduction is \$400,000 to \$700,000 not including engineering costs. Alternatively, reconstruction of the highway using lightweight fill may also help reduce the driving force on the slope. The high-level cost for reconstruction using lightweight fill is \$1.5M to \$2.3M, excluding engineering costs.
- Site inspections frequency should remain at every two years with instrumentation monitoring completed annually in the spring.

PREPARED BY: Sonja Pharand, P.Eng.	REVIEWED BY: Xiteng Liu, M.Sc., P.Eng., PMP	PERMIT TO PRACTICE

2024 Site Inspection Photos at NC044



Photo 1: Pavement cracks at east limits of 2017 patch. Looking west.



Photo 2: Pavement cracks in EB lane sealed since 2022 inspection. Looking west.

2024 Site Inspection Photos at NC044



Photo 3: Cracks and skid marks on Highway 633. Looking east.



Photo 4: Pavement cracks just before west limits of 2017 patch. Looking east.

2024 Site Inspection Photos at NC044



Photo 5: Potential bulging near SI05-7. Looking northwest.



Photo 6: Ponded water at culvert inlet. Looking northeast.

2024 Site Inspection Photos at NC044



Photo 7: Ponded water at culvert outlet. Looking south.



Photo 8: Erosion gully along north ditch of Highway 633. Looking east.

2024 Site Inspection Photos at NC044



Photo 9: Site overview photo, taken by drone. Looking northeast.

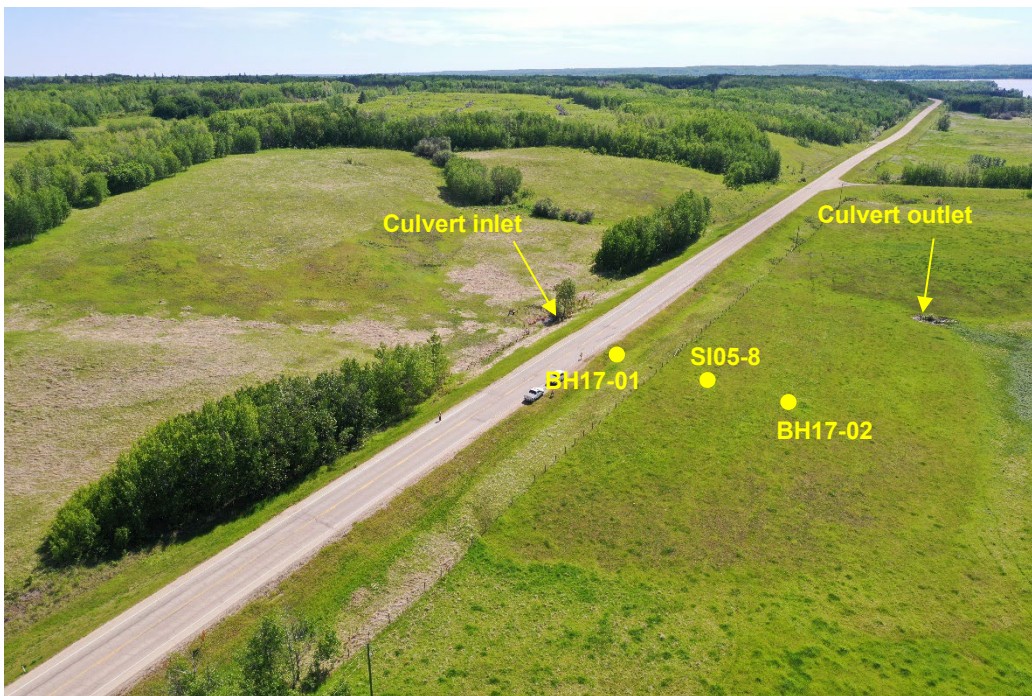


Photo 10: Site overview photo, taken by drone. Looking northeast.