

**ALBERTA TRANSPORTATION AND  
ECONOMIC CORRIDORS GRMP  
NORTH CENTRAL (ATHABASCA AND FORT  
MCMURRAY DISTRICTS)  
2024 SITE INSPECTION**



<b>Site Number</b>	<b>Location</b>	<b>Name</b>	<b>Hwy</b>	<b>km</b>
NC077-1	Approximately 25 km west of Slave Lake and 15.5 km east from the junction of Highways 2 and 33	West of Canyon Creek	2:48	26
<b>Legal Description</b>		<b>UTM Co-ordinates (NAD 83)</b>		
SE-34-73-8-W5M		11 N 6136974	E 617878	

	<b>Date</b>	<b>PF</b>	<b>CF</b>	<b>Total</b>
<b>Previous Inspection:</b>	June 6, 2022	11	3	33
<b>Current Inspection:</b>	June 3, 2024	11	3	33
<b>Road WAADT:</b>	3210	<b>Year:</b>		2023
<b>Inspected By:</b>	Tarek Abdelaziz, José Pineda (Thurber) Arthur Kavulok, Gordon Wolters, Rocky Wang (TEC)			
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	A landslide affecting the highway north side slope; head scarp crack is located within the highway clear zone	
<b>Dimensions:</b>	About 30 m wide along the highway alignment and 33 m long along the slope direction.	
<b>Site History</b>	The landslide's head scarp was first noticed in the spring of 2012.	
<b>Date of any remediation:</b>	N/A	
<b>Maintenance:</b>	Mr. Wolters indicated that an old 900 mm diameter centre line culvert, located east of the landslide, was lined with a 600 mm diameter SWSP in 2022 and Class 1 Riprap was placed at the inlet and outlet; the highway surface was overlain in 2022.	
<b>Observations:</b>	<b>Description</b>	<b>Worse?</b>
<input checked="" type="checkbox"/> Pavement Distress	Highway surface: 5-10 mm wide longitudinal cracks and up to 20 mm wide transverse crack	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	0.3 m to 1.4 m drop across the landslide head scarp cracks; most southern head scarp crack is at 4.4 m from white line (no retrogression noted in the 2024 inspection); drop across the western and eastern flank cracks by 0.8 m and 0.9 m, respectively; well-defined toe roll at the bottom of the slope; tilting and falling trees within the bottom of the slope	<input type="checkbox"/>
<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Ponding water within slide mass; seepage near the bottom of the slope; the highway south ditch above landslide location was dry in 2024	<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Water is flowing into the 600 mm diameter centerline culvert; the landslide mass is more vegetated than observed in 2022	<input type="checkbox"/>
<b>Instrumentation: (none)</b>		

**Assessment** (Refer to attached Figure):

Further retrogression of landslide head scarp crack towards the highway was not observed and overall landslide features such as the distinct toe roll and flanks cracks remained relatively unchanged since the 2022 site inspection visit.

The existing cracks on the highway lanes may reflect poor/soft subgrade condition due to high ground water levels in this area and/or ongoing deterioration of pavement surface condition.

The presence of seepage and wet surface conditions within the slide mass suggests that the landslide movement was influenced by an increase in groundwater levels. Inadequate surface drainage in south ditch, as noted in previous years, might have triggered the landslide. Maintenance work carried out by TEC on the centre-line culvert east of the landslide seems to have improved water ponding on the south ditch. As a result, the rate of landslide movement appears to have decreased compared to previous years.

The highway condition has not yet been impacted by the landslide movement. However, accelerated landslide movements may occur in the future in response to further rise in groundwater levels (e.g. due to heavy rainfall events). Accelerated landslide movement could result in the head scarp retrogression into the highway driving surface and/or appearance of landslide-related cracks in the highway driving lane(s) due to partial loss of lateral support from the moving mass.

The existing drop within the highway north side slope constitutes a potential hazard for runaway vehicles.

**Recommendations:**

It is recommended to visit this site again in the spring of 2026.

In the short term, the local MCI should watch closely for any cracking on the highway surface and periodically measure the distance between the landslide head scarp crack and the edge of the highway (at least twice a year between the spring and fall seasons). Open cracks on the highway surface should be sealed to prevent surface water infiltration into the landslide mass, which would result in further landslide movement and retrogression into the highway surface. A sharp shoulder warning sign should be placed to warn motorists of the present hazard. Consideration should also be given to installing a guard rail along the edge of the highway to protect runaway vehicles.

Consideration should also be given to digging narrow shallow trenches (perpendicular to the highway alignment and not exceeding 0.5 m wide x 0.5 m deep) within the landslide mass using a long reach excavator to drain ponded water and promote drainage within the landslide area.

An intermediate-term repair option might include reinforcing the side slope area above existing headscarp. In this option, 6 m long soil nails installed in 1x1 m<sup>2</sup> grid pattern should reduce the risk/rate of headscarp retrogression into the highway shoulder and lanes. The ballpark cost of this option would be in the range of \$180,000. The estimated cost might become lower if the mobilization of the equipment could be shared with other sites.

The following options may be considered in the long-term to remediate the landslide.

1. Excavate and replace the landslide mass with gravel: In this option, sub-drains should be included within the gravel replacement zone to prevent future rise in ground water levels. This option will require negotiations with utility companies and land acquisition. The ballpark cost of this option would be in the range of \$700,000.
2. Construct an earth-fill toe berm to buttress the landslide mass: In this option, it will be required to locate a borrow source and construct a riprap-lined swale to divert the drainage gully around the edges of the toe berm. This option will also require negotiations with utility companies and land acquisition. The ballpark cost of this option would be in the range of \$500,000.

Prior to the design and implementation of a preferred remedial measure, it is recommended to drill at least one test hole within the landslide mass to determine soil and groundwater conditions.

**Closure**

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

Yours very truly,  
Thurber Engineering Ltd.  
Tarek Abdelaziz, Ph. D, P.Eng.  
Partner | Senior Geotechnical Engineer

José Pineda, M.Eng., P.Eng.  
Associate | Senior Geotechnical Engineer



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- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

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Photo No. 1 – Looking west at highway surface at the landslide location. Highway was overlaid in 2022



Photo No. 2 – Looking east at transverse and longitudinal reflective cracks on the highway surface at the landslide location



Photo No. 3 – Looking west at a 5 to 10 mm wide longitudinal crack on the highway surface



Photo No. 4 – Looking east at the landslide developed on the highway side slope; head scarp crack measured at 4.4 m from the white line (same as measured in 2022)



Photo No. 5 – Looking southeast at the head scarp crack of landslide mass; a distinct toe roll noted at the bottom of the slope; more vegetation grew within the landslide mass



Photo No. 6 – Looking east at north highway embankment side slope with the slide in the central portion of the photo





Photo No. 7 – Looking west at low lying zone in the southern ditch (dry in 2024)



Photo No. 8 – Looking northeast at the inlet of the 600 mm diameter SWSP culvert



Photo No. 9 – Looking south at the outlet of the 600 mm diameter SWSP culvert