

**ALBERTA TRANSPORTATION AND
ECONOMIC CORRIDORS GRMP
NORTH CENTRAL (ATHABASCA AND FORT
MCMURRAY DISTRICTS)
2025 SITE INSPECTION**



Site #	Location	Name	Hwy	km
NC091-1	NBL - 5 to 6 Km south of Wandering	HWY 63:02 Backslope	63:02	39.27 and
NC091-2	River	Slumps		40.28
Legal Description		UTM Co-ordinates (NAD 83)		
NC091-1: 6 km south of Wandering River		NC091-1	N6113146.92	E405688.87
NC091-2: 5 km south of Wandering River		NC091-2	N6112146.20	E405659.10

	Date	PF	CF	Total
Previous Inspection:	June 4, 2024	13	3	39 (NC091-1)
		11	3	33 (NC091-2)
Current Inspection:	May 14, 2025	14	3	42 (NC091-1)
		14	3	42 (NC091-2)
Road WAADT:	4,270		Year:	2024
Inspected By:	José Pineda, Bruce Nestor (Thurber) Arthur Kavulok, Rishi Adhikari (TEC)			
Report Attachments:	☒ Photographs ☒ Plans ☐ Maintenance Items			

Primary Site Issue	Active landslides toeing out in the highway east ditch, encroaching into private lands, but not impacting the highway.		
Dimensions:	NC091-1: The slide is 150 m wide (parallel to the highway), 30 m long (perpendicular to the highway), and the backslope is about 5 m high (from the crest to the toe) and inclined at about 3H:1V. NC091-2: The slide is 110 m wide (parallel to the highway), 38 m long (perpendicular to the highway), and the backslope is about 5 m high (from the crest to the toe) and inclined at about 3H:1V.		
Maintenance/Repairs:	None		
Observations:	Description	Worse?	
☒ Slope Movement	NC091-1: Up to 2.5 m high head scarp crack in the farmer's field; eight fence posts hanging. Multiple tension cracks within the slide mass, up to 800 mm wide and 600 mm deep between SI18-2 and the head scarp. The toe roll is partially blocking the ditch, and it is about 1 m high. Some retrogression of the head scarp crack noted in 2025. NC091-2: Head scarp crack showed some retrogression during the 2025 inspection. Tension cracks are visible up to 2 m wide and 800 mm deep in the middle of the landslide mass, 14 m south of SI18-4. The toe of the landslide is about 1.5 m high, and it is partially blocking the ditch.	☒	

☒ Seepage	NC091-1 and NC091-2: wet landslide mass; ponding water within a few locations of the landslide mass; toe roll partially blocking water flow along the ditch; catch water ditch near the crest of both slides was impacted by the landslide movement and water from the catch water ditch saturated the landslides.	☒
☒ Other	NC091-1: A severe erosion gully developed within the farmer's field; the gully is about 16 m long, 8 m wide with 1.5 m drop at the deepest location. NC091-2: Severe erosion around the half pipe and the riprap apron; erosion extended to the south of the catch water ditch into private land; half pipe got completely separated from culvert near the top of the slope. Erosion into private land has worsened since 2024 inspection.	☒
Instrumentation (4PNs; Spring 2025): NC091-1: SI18-1 was installed near the toe roll, and SI18-2 was installed near the crest of the landslide. SI18-2 was sheared off at about 3.0 m depth below ground surface a few months after installation. SI18-1 sheared at a depth of 1.2 m between the Spring of 2023 and Spring of 2024. The groundwater level in PN18-2B was 8.3 m below ground surface, which is negligible change since the previous readings. PN18-1 was found to be damaged during the current readings and could not be read. NC091-2: SI18-3 was installed near the toe roll, and SI18-4 was installed near the crest of the landslide. SI18-4 was sheared off at about 3.4 m below the top of casing a few months after installation. SI18-3 was damaged, likely by a mower, and has not been read since the spring of 2019. Groundwater levels ranged between 1.5 m in PN18-4A (near surface clay) to 12.8 m in PN18-4B (in the clay till). The groundwater level decreased by 0.3 m in PN18-4A compared to the spring of 2024 readings. The groundwater level showed negligible change in PN18-4B since the spring of 2024 readings.		
Assessment (Refer to attached Figures): The backslope landslides continued to be active. The landslides are shallow and do not appear to extend below the highway ditch bottom. The soil within the backslopes consist of 3 to 4 m of soft to firm high plastic clay with occasional sand/silt pockets underlain by sand and clay till. However, a sand layer was noted in the test hole near the crest of the NC91-1 site. The slip surface is within the high plastic clay at both sites. Piezometer readings indicate that groundwater levels in the clay are much higher than the underlying strata. It is likely that the slumps have been triggered due to ground water seepage (likely from the catch water ditch) into the clay though the sand/silt pockets resulting in softening of the clay and hence loss of its strength. The failure of half pipe at NC92-2 may have aggravated the situation. In addition, the backslopes appear to be relatively steep, when considering the high plasticity of the clay and the heights of the slope, and this may have been another contributing factor to the observed failures. It is anticipated that both landslides will remain active and continue to retrogress, leading to further loss of private lands until appropriate remedial measures are implemented by TEC. Future prolonged heavy rainfall events are anticipated to raise groundwater levels in the landslides resulting in accelerated movements. In addition, the existing catch water ditches near the crest of both landslides have been impacted by the landslides, resulting in surface water being discharged		

into the landslide mass at each of the sites. This continued inflow of surface water is expected to sustain elevated groundwater levels within the slopes at both sites.

The presence of open wide cracks and erosion gullies within lands currently being farmed is a safety concern. In addition, based on information provided by Mr. Arthur Kavulok of TEC, the farmer has reached out and ask TEC to address the slumping as they continue to lose farmland as a result of the ongoing erosion and landslide retrogression.

The landslide debris is partially blocking the highway ditch at both locations and hence impeding surface drainage in the highway ditch. This may result in elevated groundwater levels in the highway embankment and potential instabilities in the future.

Recommendations:

It is recommended that the frequency of the site inspections be increased to every second year. The long-term repairs should be completed in a timely manner to reduce the likelihood of further loss of farmland.

Short-Term

The farmers of the land parcels located near the top of the backslope at both slump locations should be advised of the ongoing risk that exists at these locations.

The local MCI should consider the following:

(a) undertake slight grading of the highway ditch at the slump locations, as needed, to promote surface drainage. Excavated material from the ditch should be pushed back against the toe of the slope. Excessive removal of landslide debris from the toe of the slope could result in accelerated movement,

(b) seal open cracks in the slope surface to reduce surface water infiltration into the slide mass. A small track mounted equipment could be used to smoothen the slope surface and fill in any dips without causing significant changes in grade, and

(c) place a snow fence around areas impacted by the landslide within the private lands or backfill these areas to eliminate existing hazard. However, this can only take place after consultation with the landowner(s).

Long-Term

There are two potential general approaches that could be considered to repair these sites:

1. Excavate and replace the slide material with imported low to medium plastic clay and reconstruct the slope at the original inclination (3H:1V). In this option, a gravel drainage blanket should be included along the back and at the base of the excavation to promote drainage. At least two subdrain pipes will need to be included along the base of the excavation within the drainage blanket to direct the flow into a controlled manner into the ditch; or
2. Excavate and reconstruct the backslope to 4H:1V or flatter. In this option, excavated materials will need to be reworked (moisture conditioned) before being recompacted, if the material is deemed suitable. A drainage blanket and closely spaced subdrains will need to be included

in the reconstructed slopes to promote drainage. Acquisition of additional ROW will be required if it is decided to pursue this option.

For any of the above options, the subdrain pipes will need to daylight into the highway ditch. Riprap protection of the ditch will be needed within the repaired area to prevent future erosion issues.

At both sites, the catch water ditch will need to be reconstructed using low to medium plastic clay, realigned to be a few meters away from the top of the slope in the vicinity of the landslides, and lined with an impervious barrier to prevent further erosion and saturation of the slopes. At NC091-2, it is possible to re-grade the catch water ditch to drain towards a centerline culvert located south of the site at approximate km 40.090. During construction, the catch water ditch flow will need to be temporarily diverted away from the slope repair area.

The estimated cost of repairing each site would range from \$700K to \$800K excluding engineering.

Closure

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

Yours very truly,
Thurber Engineering Ltd.
José Pineda, M.Eng., P.Eng.
Associate | Senior Geotechnical Engineer

Bruce Nestor, M.Eng., P.Eng.
Geotechnical Engineer

STATEMENT FOR USE AND INTERPRETATION OF REPORT

1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE OF THE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives, and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT.** Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

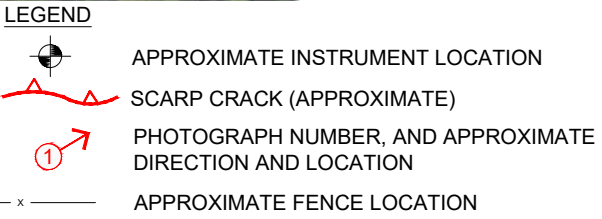
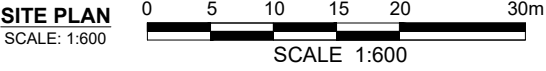
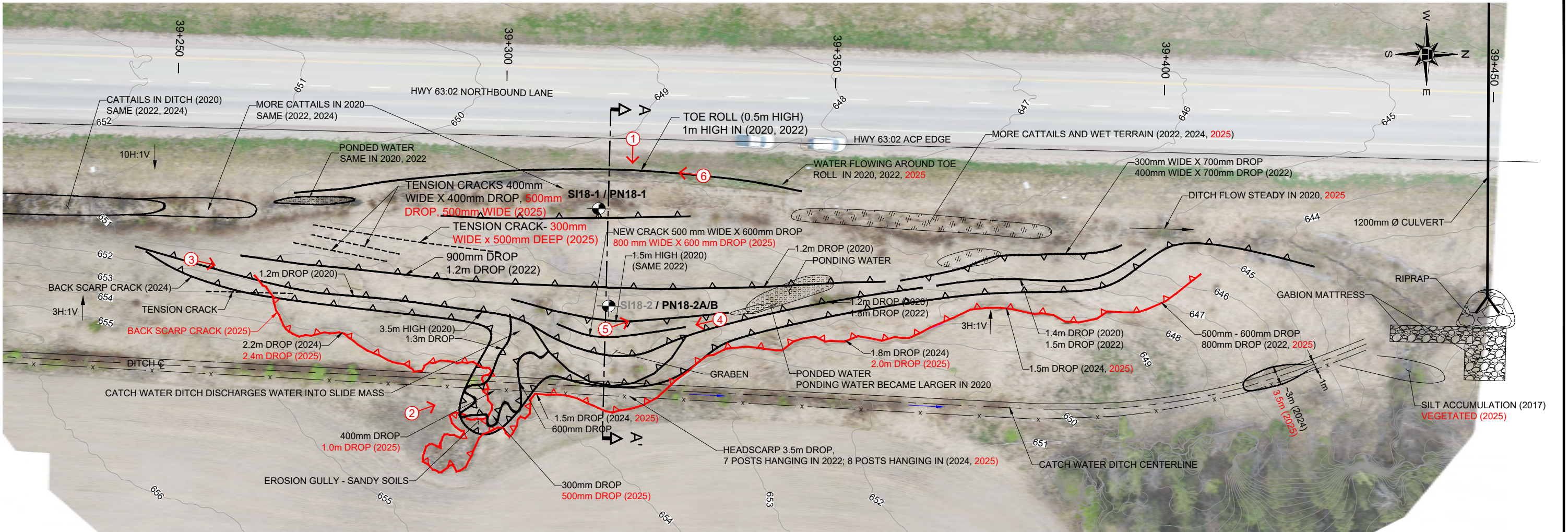
5. INTERPRETATION OF THE REPORT

- a) **Nature and Exactness of Soil and Contaminant Description:** Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors is inherently judgement-based. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other parties making use of such documents or records with or without our express written consent need to be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) **Reliance on Provided Information:** The evaluation and conclusions contained in the Report have been prepared based on conditions in evidence at the time of site inspections and based on 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 resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties 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 is recommended to 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 need to 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 to confirm and document that the site conditions do not materially differ from those 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.

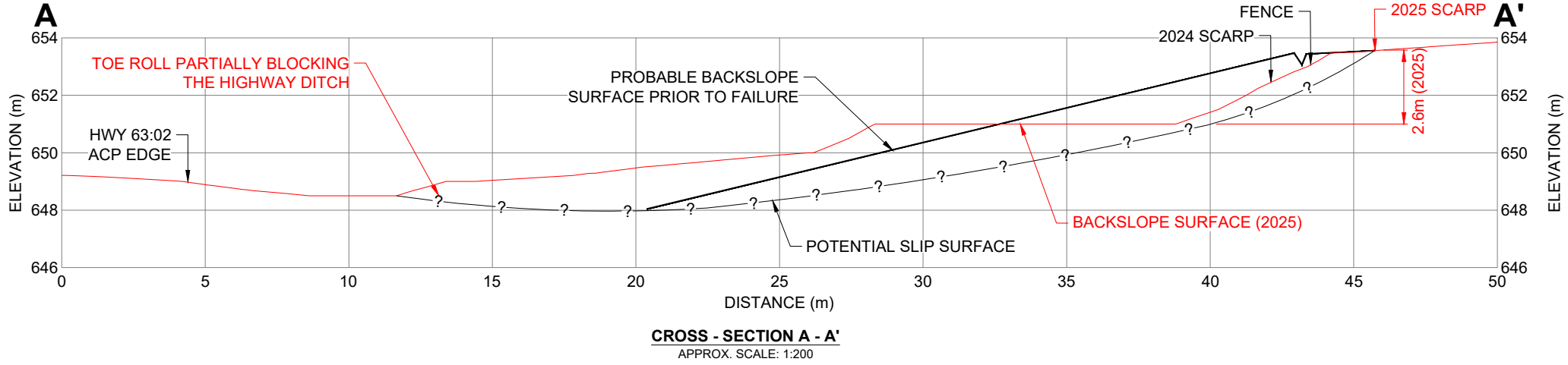
6. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or other parties who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes, but is not limited to, decisions made to develop, purchase, or sell land, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.

G:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\2025 GEO HAZARD\32122-NC091 FIGURE 1-2 JULY 24, 2025.dwg - 1N - Jul. 24, 2025



- NOTES:**
1. SITE PLAN AND CROSS-SECTION BASED ON SIMPLE FIELD MEASUREMENTS AND LIMITED DRONE SURVEY ON MAY 14, 2025.
 2. MAY 14, 2025 SITE INSPECTION OBSERVATIONS SHOWN IN RED.

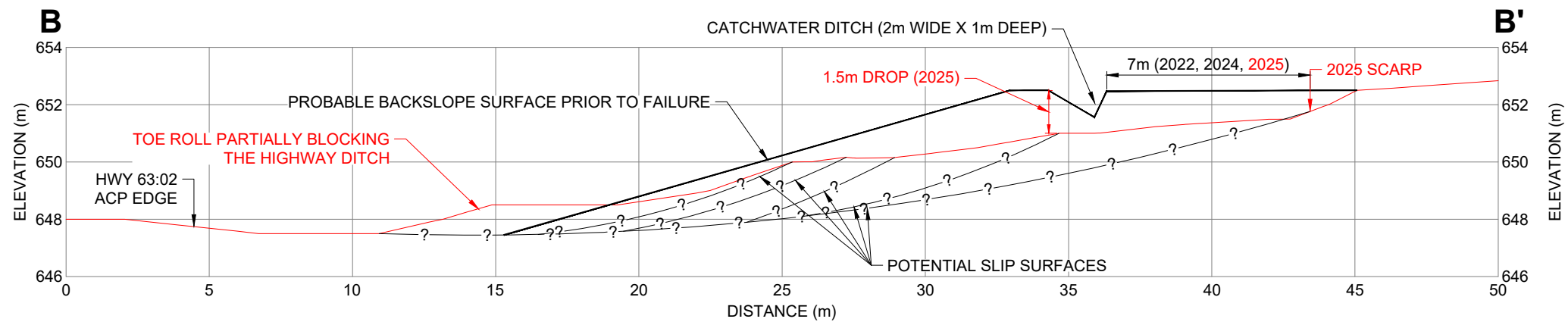


**NORTH CENTRAL REGION
(ATHABASCA AND FORT McMURRAY DISTRICTS)
2025 GEOHAZARD ASSESSMENT**

**NC091-1: HWY 63:02 KM 39.35 - BACKSLOPE SLUMP
SKETCH SHOWING SITE FEATURES**

FIGURE 1

DRAWN BY	ML
DESIGNED BY	JGP / BWN
APPROVED BY	TSA
SCALE	AS SHOWN
DATE	JULY 2025
FILE No.	32122



THURBER



Photo 1. NC091-1: Looking east at the landslide mass.



**Photo 2. NC091-1: Looking northwest at the erosion gulley developed within the farmer's field.
Erosion has worsened since 2024 inspection.**



Photo 3. NC091-1: Looking north at landslide backscarp crack showing a 2.4 m drop approximately 5 m west of the upslope ditch.



Photo 4. NC091-1: Looking south at landslide mass. The retrogression of the backscarp crack into the farmer's field is visible on the left of the photo. Eight barbed if it got wire posts were hanging in 2025.



Photo 5. NC091-1: Looking northwest at graben feature developed in the middle of the landslide mass.



Photo 6. NC091-1: Looking south at flow in the highway ditch.



Photo 7. NC091-2: Looking north near the southern flank of the landslide; note the presence of a distinct toe roll in the ditch.



Photo 8. NC091-2: Looking south at the landslide mass; note the distinct toe roll in the ditch and the presence of multiple tension cracks within the backslope.



Photo 9. NC091-2: Looking south at a scarp crack developed within the crest of the backslope.



Photo 10. NC091-2: Looking southwest at erosion near the scarp crest which has retrogressed into the farmer's field.



Photo 11. NC091-2: Looking south at water pooled within the landslide mass.



Photo 12. NC091-2: Looking west at the failed riprap apron and half-pipe culvert.