

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



Site Number	Location	Name			Hwy	km
NC110	Hamlet of Wabasca	Wabasca Lake Slip 'N Slide			754:06	30.9
Legal Description		UTM Co-ordinates (NAD 83)				
NW 27-80-25 W4		12	N6206042	E323067		
	Date	PF	CF	Total		
Previous Inspection:	August 24, 2023	13	10	130		
Current Inspection	June 3, 2024	13	10	130		
Road WAADT:	1,870	Year:		2023		
Inspected By:	José Pineda, Tarek Abdelaziz (Thurber) Arthur Kavulok, Rocky Wang, Gordon Wolters (TEC)					
Report Attachments:	<input checked="" type="checkbox"/> Photographs		<input checked="" type="checkbox"/> Plans		<input checked="" type="checkbox"/> Maintenance Items	
Primary Site Issue	A landslide causing a severe distress on the south bound lane, and possibly impacting the integrity of nearby utility lines.					
Dimensions:	Landslide is about 100 m wide (parallel to the highway alignment) and 22 m long (perpendicular to the highway alignment).					
Site History / Available Information:	<p>This portion of the highway is a two-lane, undivided road with a maximum posted speed limit of 60 km/hr.</p> <p>Based on information provided by TEC, highway surface distress, dips and large cracks have been noted on this site since 2020 and the maintenance crew have been patching this portion of the highway on a yearly basis.</p> <p>A geotechnical investigation, consisting of drilling four test holes along with the installation of slope inclinometers and piezometers, was completed by Thurber in January 2024. The test holes showed the soil conditions mainly consist of medium to high plastic clay fill over high plastic clay over clay till.</p>					
Maintenance /Repairs	Multiples ACP patches have been placed by TEC since the slide was first noted; with the most recent ACP patch placed to seal/smoothen the wider cracks within the northern section of the landslide in the early spring of 2024.					
Observations:	Description					Worse?
<input checked="" type="checkbox"/> Pavement Distress	300 mm drop within the SBL bounded by landslide scarp cracks for a distance of about 50 m within the northern section of the landslide; 50 mm dip causing a twist within the southern section of the landslide					<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Most northern head scarp crack on the highway surface became wider and showed more drop since 2023; open wide longitudinal cracks on the highway surface with the southern section of the landslide, Power pole No. 2 tilting more pronounced since the previous inspection.					<input checked="" type="checkbox"/>

<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Water ponding at the toe of the landslide in a low-lying area.	<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Multiple underground utilities within the sliding mass; including fiber optics, Telus, gas, and overhead ATCO cables.	<input type="checkbox"/>

Instrumentation Readings (Two SIs, Four, VW Piezometers, and Two SP piezometers; June 13, 2024):

SI24-2 showed a rate of movement of 56.6 mm/yr over 1.8 m to 3.6 m since the previous readings on May 1, 2024. This corresponds to an increase in rate of movement of 60.6 mm/yr.

SI24-3 showed a rate of movement of 15.4 mm/yr over 0.6 m to 2.4 m depth since the last readings on February 20, 2024. This corresponds to an increase in the rate of movement by 4.4 mm/yr.

Groundwater levels in SP24-1 and SP24-4 were measured at 1.7 m and 3.6 m below ground surface, respectively.

Vibrating wire piezometer VW24-2A was found to be malfunctioning during the spring 2024 readings. The initial reading in VW24-2A from February 2, 2024, showed a ground water depth of 2.6 m below ground surface. The ground water level in the remaining piezometers ranged between 1.6 m and 9.0 m below ground surface.

Assessment (Refer to attached Figures and Photos):

The severe distress observed along the highway southbound lane surface and the instrumentation monitoring results to date, indicate an actively moving landslide. This movement is likely due the presence of weak high plastic clay foundation soils and high groundwater levels.

The existing 300 mm drop on the highway surface within the northern limit of the landslide is a serious hazard and constitutes a major safety concern to motorists.

The landslide is very active, moving at high rates, and significant movement of the landslide mass may occur abruptly. An accelerated landslide movement may result in the complete loss of the southbound lane and potential distress of fiber optics, gas lines, and overhead power lines located within the landslide mass.

Recommendations:

The following recommendations should be considered in the short-term:

- The MCI should monitor the highway condition on a regular basis and seal all open cracks as they re-appear on the highway surface.
- ACP patch should be placed on the highway SBL, where the severe distress was noted, to eliminate existing hazard and provide a smooth ride to the motorists.
- A landslide warning sign should be placed off the highway surface to warn motorists of the existing hazard.
- TEC should contact the owners of utility lines and notify them of the existing hazard,

The design of a driven steel pile wall, to stabilize the highway movement at this location, is currently underway. The ballpark cost to complete the repair is in the order of \$2.5 to \$3.0 million (including

engineering and contingencies).

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.

Tarek Abdelaziz, Ph.D., P.Eng.
Partner | Senior Geotechnical Engineer

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



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment 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.

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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.

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- 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 are judgmental in nature. 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 persons making use of such documents or records with our express written consent should 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 persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should 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 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.

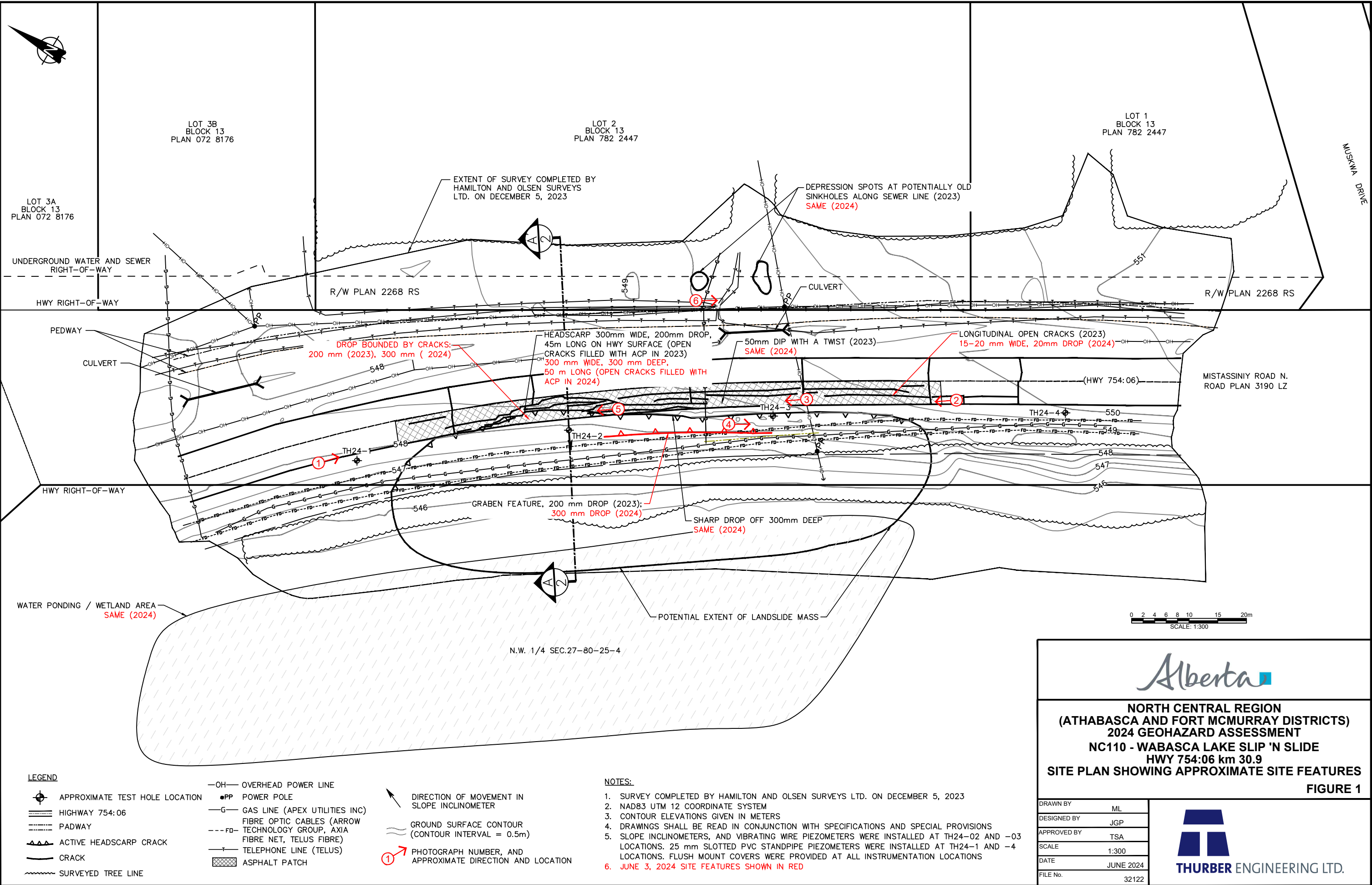
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

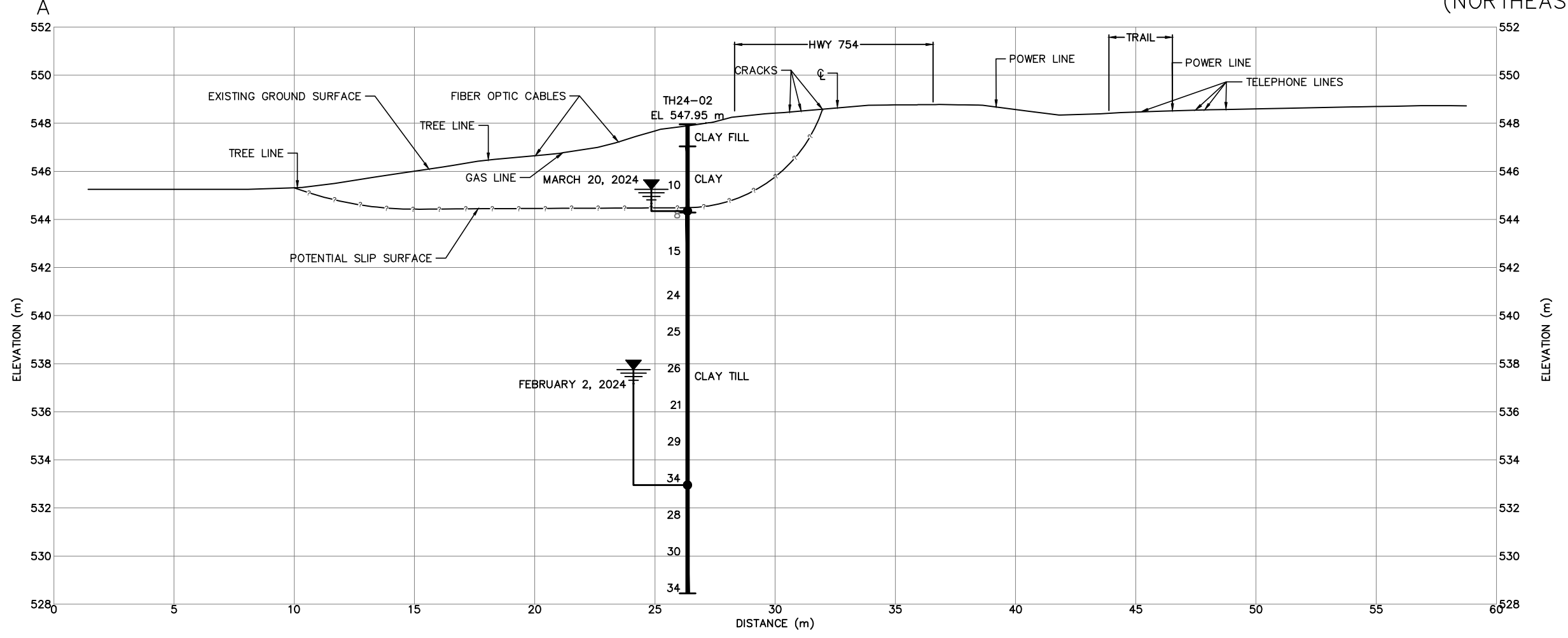
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H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\2024\UGP\32122 NC110-1-2.dwg - TN - Aug. 06, 2024



(SOUTHWEST)

A'
(NORTHEAST)



LEGEND

- SPT N VALUE
- WATER LEVEL IN PIEZOMETER
- VIBRATING WIRE PIEZOMETER TIP
- STANDPIPE PIEZOMETER SCREENED INTERVAL
- ZONE OF MOVEMENT IN SLOPE INCLINOMETER

NOTES:

1. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.
2. GROUND SURFACE PROFILE IS BASED ON THE SURVEY DATA COLLECTED BY HAMILTON AND OLSEN ON DEC 5, 2023



**NORTH CENTRAL REGION
(ATHABASCA AND FORT MCMURRAY DISTRICTS)
2024 GEOHAZARD ASSESSMENT
NC110 - WABASCA LAKE SLIP 'N SLIDE
HWY 754:06 km 30.9
SITE PLAN SHOWING APPROXIMATE SITE FEATURES**

FIGURE 2

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	TSA
SCALE	1:100
DATE	JUNE 2024
FILE No.	32122





Photo 1. Northern flank of landslide. Head scarp open cracks were filled with ACP in early Spring 2024. Note the significant dip on the highway surface (approximately 300 mm drop).



Photo 2. Looking north at the landslide area. Anchor Power Pole No. 3 on the LHS and the Power Pole No. 2 on the RHS of the photo are bent due to the high tension in the overhead cable.



Photo 3. Longitudinal cracks (15-20 mm wide, 20 mm drop) within the previously patched area. There is a 50 mm dip with a twist on the southern portion of the site.



Photo 4. Southern flank of the landslide (looking south); 1.2 m wide x 0.2 m deep landslide crack on the highway west side slope.



Photo 5 A. (2023) – Headscarp Crack 45 m long, 300 mm wide with 200 mm drop



Photo 5 B. (2024) – Headscarp Crack 50 m long, 300 mm wide, 300 mm drop

Photo 5. Looking north at the severely impacted section of the highway by the landslide movement. Photo 5 A and 5 B were taken in 2023 and 2024, respectively



Photo 6. Looking south from the east side of the highway at Power Pole No. 2, which appeared to have tilted more between 2023 and 2024