

**ALBERTA TRANSPORTATION AND  
ECONOMIC CORRIDORS  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – PEACE RIVER DISTRICT  
2024 INSPECTION**



Site Number	Location	Name	Hwy	km
PH091	East of Manning	Embankment Settlement East of Manning	691:02	4.2
Legal Description		UTM Co-ordinates		
SW-25-91-23-W5		11U N 6,308,105	E 465,862	

	Date	PF	CF	Total
<b>Previous Inspection:</b>	3-Jun-2022	10	4	40 (Callout)
<b>Current Inspection:</b>	30-May-2024	10	4	40
<b>Road AADT:</b>	440		<b>Year:</b>	2023
<b>Inspected By:</b>	Rocky Wang, TEC Robert Senior, TEC		Ken Froese, Thurber Tyler Clay, Thurber	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs		<input checked="" type="checkbox"/> Plans	<input type="checkbox"/> Maintenance Items

<b>Primary Site Issue:</b>	Landslide affects the 7 m high north sideslope of the highway embankment, causing distortion and distress on the highway pavement.		
<b>Dimensions:</b>	The landslide is about 50 m wide (on highway) with an embankment fill height of 7 m on north sideslope. The depth of the landslide is estimated at 4 to 5 m BGS based on slope stability back analysis results.		
<b>Date of Remediation:</b>	None. Preliminary design report completed in November 29, 2023. Detailed design of a toe berm buttress is in progress to address the issues at this site.		
<b>Maintenance:</b>	2017: Highway Patching 2022: Highway Patching 2024: Highway Patching (July)		
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>	
<input checked="" type="checkbox"/> Pavement Distress	The main crack pattern has resurfaced after the 2022 patch.	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	The site was visited in 2023 and cracks and a slight bulge in the north sideslope west of the zone of distress on the pavement. A toe roll was confirmed in 2024 and had increased in height from 2023 observations.	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Erosion		<input type="checkbox"/>	
<input type="checkbox"/> Seepage		<input type="checkbox"/>	
<input type="checkbox"/> Bridge/Culvert		<input type="checkbox"/>	
<input type="checkbox"/> Other		<input type="checkbox"/>	

<b>Instrumentation: (Fall 2023)</b>	
Standpipe TH23-1 Standpipe TH23-3	Short term monitoring indicated that the groundwater table is about 1.2 m to 1.4 m below the existing ground surface.
<b>Assessment:</b>	
This site was patched 3 to 4 years ago (likely 2017 or earlier) when the distress appeared to be rutting in the outer wheel path of the west-bound lane (WBL). However, the “rutting” has increased in extents to the center of the lane indicating there might be a landslide occurring. The site was scheduled for additional patching in the summer of 2022 to maintain a safe traveling surface. The MCI requested a	

callout on April 27, 2022, to assess the site to see if additional remedial measures should be considered. The site was inspected during the 2022 Geohazard Risk Management Program (GRMP) tour.

At the time of the callout inspection, the main crack pattern was located within a 50 m wide zone around km 4.15. The main crack was in the outer wheel path of the WBL and had an overall width that ranged from 150 mm to 200 mm, widths that ranged from 20 mm to 30 mm, and differential that ranged from 20 mm to 50 mm.

During the callout, observations at the toe of the slope noted a potential toe roll at the level of the adjacent field, although thick bush somewhat obscured the slope. This possible toe roll was between 200 mm and 400 mm high and spanned a distance of about 50 m and was in line with the main crack noted on the highway. During the 2024 inspection, the toe roll was confirmed and was 100m to 450 mm high.

There was another potential toe roll noted during the callout about 45 m east of the proposed patch but was only 100 mm in height and could be the result of previous farming disturbance. There was no obvious corresponding crack and differential in the highway surface at this location. A power pole near this area had a 4° lean towards the highway. As this was the first observation, it is not known if this indicates movement or is unchanged since installation. During the 2024 inspection, the toe roll was more confirmed and was 250 mm high and it is possible it extends further east.

The site was also visited in 2023 in passing and during this visit scarp cracks were visible on the north sideslope west of the distressed area on the pavement. However, during the 2024 inspection, the scarp was not visible in the tall grass on the sideslope.

Based on satellite imagery, a series of meander scars is located on a river terrace at this location. the geohazard site is located adjacent to the south end of a meander scar. Natural river banks and slopes above meander bends are typically oversteepened due to active erosion by the river. As the river channel meanders and abandons old channels, the slopes will reach marginal equilibrium. They are often susceptible to instability depending on changes in the groundwater table, stress regime such as eventual loss of cohesion, and slope loading such as the construction of a highway embankment. It is possible that the construction of the highway so close to the crest of the slope has, over time, changed this sensitive balance such that the slope is no longer stable. Higher than average rain fall levels in the last few years may be the final trigger to activate slope movements. The observed slope distress may be a phase of creep movement leading to the development of a failure surface sufficient for larger-scale displacement. The depth of failure is likely near or at the base of the slope along high plastic clay fill and in-situ soils. It is anticipated that the distress will continue until there is a significant drop in the highway surface.

#### **Recommendations:**

##### **Short Term:**

Short-term road maintenance (patching and milling to provide a safe, smooth surface) should continue as required. Sealing of cracks on the road surface would assist in limiting the infiltration of water into the embankment.

##### **Medium to Long Term:**

We understand that this site will be remediated as part of the HWY 691:02 overlay contract tentatively scheduled for 2025. We recommend proceeding with the detailed design for this landslide repair. The preliminary design indicated construction of a toe berm that is 13.5 m wide and 4.5 m high at 3.5H:1V inclination would be required.

##### **Geohazard Inspections:**

Due to the ongoing movements observed at this site, it is recommended that the Geohazard inspection continued to be undertaken biennially. If construction is confirmed to take place in 2025, we recommend conducting an inspection in the Spring of 2025 to confirm the lateral extent of the slide and take measurements from the instrumentation on site.

**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.

Roger Skirrow, M.Sc., P.Eng.  
Senior Geotechnical Engineer

Mark Gallego, P.Eng.  
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.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE 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. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

### 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 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.

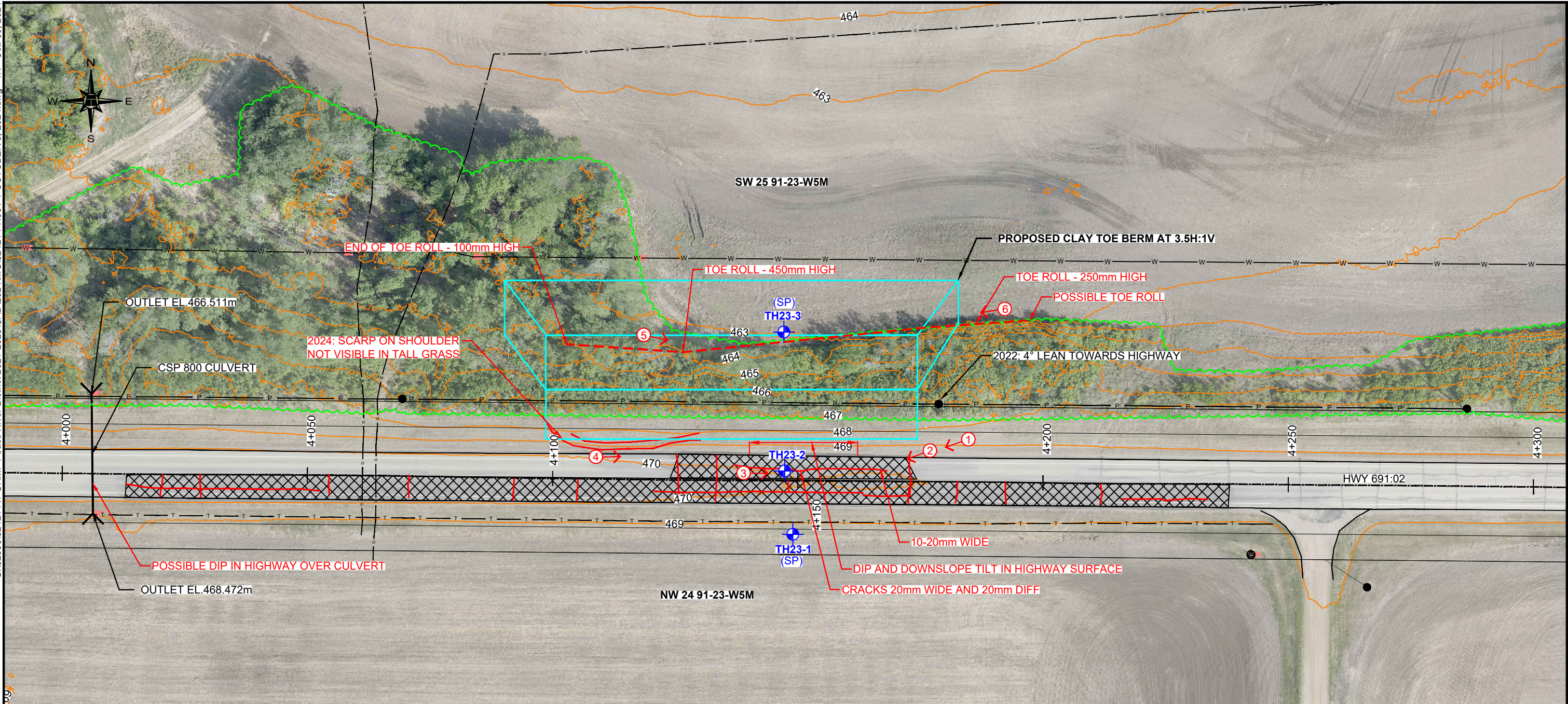
### 6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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

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 others 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.

G:\32000\32121 AT GRMP Peace River District 2021-2025\CAD\2024\MG\32121 PH091-1 OCTOBER 9, 2024.dwg - 1N - Oct. 09, 2024

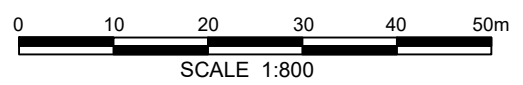


**LEGEND**

- TEST HOLE LOCATION
- STANDPIPE PIEZOMETER
- CRACK
- WATER LINE (UNDERGROUND)
- TELUS CABLE (UNDERGROUND)
- POWER LINE (OVERHEAD)
- TREE LINE
- POWER POLE
- ACP PATCH (SURVEYED JUNE 2023)
- GROUND SURFACE CONTOUR (CONTOUR INTERVAL = 1m)
- PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION

**NOTES**

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. JUNE 2024 OBSERVATIONS SHOWN IN RED.
3. THE UTILITY LINES SHOWN ON THIS PLAN WERE ONLY SURVEYED IN THE AREAS CLOSE TO THE HIGHWAY. SOME OF THE LINES EXTEND BEYOND THE LIMITS SHOWN ON THE PLAN



LIDAR SURVEY AND ORTHOPHOTO ACQUIRED USING UAV FLOWN BY MCINTOSH PERRY 2023-05-26



**PEACE REGION (PEACE RIVER DISTRICT)**

**HWY 691:02 km 4.14-4.18  
PH091: 4 km EAST OF MANNING, ALBERTA  
2024 SITE INSPECTION PLAN**

**DWG No. 32121-PH091-1**

DRAWN BY	ML
DESIGNED BY	MG
APPROVED BY	DWP
SCALE	1:800
DATE	OCTOBER 2024
FILE No.	32121





**Photo 1 – Looking west over distressed area where dip is visible in the roadway surface.**



**Photo 2 – Looking west at distressed area.**



**Photo 3 – Looking east at the central portion of the crack forming in the area of distress.**



**Photo 4 – Looking east from past the previously patched area.**



**Photo 5 – Observed toe roll below the area of distress.**



**Photo 6 – Looking west along the toe of the slope.**