ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION (PEACE RIVER DISTRICT)
2025 INSPECTION

Site Number	Location	Name	Hwy	km
PH031	Judah Hill	Michelin Slides	744:04	57.664
Legal Description		**UTM Co-ordinates (NAD 83)**		
NE¼ 20-083-21 W5M		11V E 483226	N 6229678	

	Date	PF	CF	Total
Previous Inspection:	May 28, 2024	13	7	91 (Slide Risk Rating)
Current Inspection:	May 15, 2025	13	7	91 (Slide Risk Rating)
Road WAADT:	630		**Year:**	2024
Inspected By:	Tyler Clay, Don Proudfoot (Thurber). Rocky Wang (TEC)			
Report Attachments:	☒ Photographs	☒ Plans	☐ Maintenance	

Primary Site Issue:	Slope instability affecting road and downslope area, including a 50 m wide slide at km 57.8 during the summer of 1997. In 1997, the highway was shifted into the hill on a lightweight (shredded tire) embankment and the west side was buttressed with a tied-back pile wall. Shear key, toe buttress and lightweight shredded tire fill slide repairs were carried out in 1998. Cracking and continued movement was noted at the south end of the site. Additional slope movement was noted at north end of site, between the km 57.8 slide and the repairs conducted for the 'Makeout Slide'. New slide movement was noted on the east side of Hwy 744 towards the Heart River since 2014. Landslide activity is now occurring in opposing directions, leaving the road on a narrow ridge.
Dimensions:	KM 57.8 slide – 50 m to 70 m wide. Slide movement now extending between Michelin and Makeout slides, suggesting a much larger slide zone possibly 500 m wide and extending downslope towards the Peace River. The backscarp of the slide in the Heart River Valley is about 120 m wide along the ATCO Gas pipeline right-of-way (line abandoned and partially removed within the slide area).
Date of any remediation:	1997 – realignment and embankment construction with lightweight fill. 1998 – shear key, toe buttress and lightweight fill.
Maintenance:	Highway was closed from May to December 2013 due to the Sunshine Landslide failure at km 58.2. Ancillary work was performed in the surrounding areas as part of Contract CON0015153, such as the regrading of the NBL ditch, the profiling of the inlet to the 2005 NBL ditch subdrain pipe and the grading of the landslide scarp feature below the 1997 pile wall below the SBL. The PH031 site received a pavement overlay, and the guardrail was replaced with strong post W-beam guardrail in summer 2025 (after the current inspection) as part a larger paving project (CON0023098) of Hwy 744:04 between Peace River and the intersection with Hwy 683.

Observations:	Description:	Worsened?	
		Yes	No
☒ Pavement	Cracks in the road at km 57.65 have opened to up to 20 mm wide with a 150 mm dip at the highway shoulder (Photo 1). The dip across the road at km 57.83, just north of cracking near SI 10-07 became more pronounced since the 2024 inspection. (Photo 7). Faint arc shaped cracks were observed at km 57.58 with some differential settlement in the pavement.	☒	☐
☒ Slope Movement	The west upper sideslope had no major visible changes (Photo 8). At the old pile wall the maximum soil drop was unchanged from the 2024 condition and measured up to 1.8 m below top of pile (Photo 5). Some more movement was visible (relative to the 2024 condition) at the slide located on the lower valley slope on the west side near the outlets of the two 150 mm diameter subdrain pipes. Active erosion within the backscarp and ongoing movement within disturbed slide mass at the landslide through the ATCO R/W towards the Heart River. No major retrogression or expansion was apparent within the main scarp. Increased buildup of soil beneath the vertical, southernmost segment of the scarp. Similar visible changes as per the 2024 inspection. (Photo 4)	☒	☐
☒ Erosion	Erosion damage appeared somewhat worse in the east ditch between km 57.675 and 57.75 (Photo 2). There is also erosion visible above the outlet of the CPP drain pipe at this location. Erosion rill from drainage off the road near km 57.73 is up to 1.1 m wide and 0.6 m deep (Photo 3). Erosion rill has formed downslope of the old pile wall due to concentrated runoff from the road near km 57.8 (Photo 5).	☒	☐
☐Seepage		☐	☐
☐ Bridge/Culvert		☐	☐
☐ Other		☐	☐

Instrumentation:

Instruments were read on June 9, 2025.

- SI98-10i (installed at the toe of Michelin Slide repair) - Movement rates are between 0 to 3 mm/yr within six distinct shear planes. Movement rates are largely similar to readings from the past several years.
- SI94-43i (installed approximately 450 m downslope of the road, approximately 100 m below road elevation) - Not read since the Spring 2021 readings; the Spring 2021 readings showed no discernible movement.
- SI10-4 (installed on the east / Heart River side of highway) -showed rates of movement between 1-2 mm/yr since Fall 2024. The movement is in the direction of the active landslide in the Heart

River valley slope. SI10-5 is sheared at 2.1 m depth (2011) and SI10-6 is sheared at 3 m depth (2014).

- SI10-7 (installed on the crest of slope west side of the road) - showed rates of movement toward the Peace River below 2 mm/yr within three movement zones since the fall of 2024 readings.
- SI10-8 – SAA - (installed on the crest of slope west side of the road) - The readings collected from the datalogger for SAA10-8 showed an incremental movement of 1.7 mm over 15.0 m to 16.5 m depth since the fall of 2024 readings, corresponding to an average rate of movement of 1.6 mm/yr over this zone. The overall trend of movement in the SAA seems to indicate that the average movement rate in the instrument has decelerated since the beginning of 2018, compared to the first three years of measurements. The battery powering the SAA's datalogger was found to be stolen in 2020 but was replaced during the Spring 2023 readings.
- SI10-9 - (installed on the crest of slope west side of the road) - showed a rate of movement of 0.1 mm/yr over 6.5 m to 7.7 m depth and a rate of movement of 1.1 mm/yr over 11.9 m to 14.4 m depth since the fall of 2024. Reduced rates of movement have generally been measured since 2013.
- Pneumatic piezometer PN10-4 showed an increase in groundwater level of 0.59 m since the fall of 2024 readings. PN10-6, PN10-7, PN10-8 and PN10-9 showed decreases in groundwater level of 0.47 m, 0.42 m, 2.32 m and 0.41 m, respectively, since the fall of 2024 readings. Vibrating wire piezometer VW17-1 showed a decrease in groundwater level of 0.04 m since the fall of 2024 readings. VW17-2 has been dry since initialization.
- Shear Wave Guide Trial adjacent to SI10-8 (2013) – No longer actively monitored. Refer to paper *Nancy Berg et al "Correlation of Acoustic Emission with Patterns of Movement in an Extremely Slow Moving Landslide at Peace River, Alberta, Canada", dated Feb.6, 2018*.

Assessment (Refer to Drawings PH031-1)**:**

Continued landslide creep downslope of the km 57.8 repair toward the Peace River is expected to continue, however the old pile wall is currently preventing damage to the highway. However, a more pronounced dip in the pavement and cracking was observed between km 57.65 and km 57.7, where there are no piles present. Erosion damage is occurring in localized areas; the active erosion gully west of the highway at km 57.75 appeared to have worsened during the current inspection.

Slope movement in the area west of the highway between the Michelin and Makeout landslides is ongoing at similar or slightly reduced rates that have been measured and observed in the past. Water being shed off the road on the inside of the bend may be contributing to the problem. Cracking and slope movement downslope of the pile wall is ongoing at similar or slightly reduced rates. The existing pile wall is still providing some support to the highway. The instruments on the west side of the highway show ongoing movement at rates previously observed or slightly reduced.

Intermittent movement and active erosion within the backscarp of the slide that is moving toward the Heart River indicates that the road is at risk from both eastward and westward movement. No accelerating movement trends were measured at S10-4 indicating a slide plane has not retrogressed further towards the highway beyond the visible scarp. As first mentioned in 2012, there is no room to move the road at this location and because of the severity and rapidity of movement, design for a pair of tied-together retaining walls should be conducted to limit the extent of work required.

Recommendations:

Monitoring:
Annual inspections should continue with the next inspection occurring in the Spring of 2026.

Maintenance:
- The battery powering the SAA in SI10-8, VW17-1 VW17-2 and the datalogger for these instruments was replaced in Spring 2023 with a smaller battery. The smaller battery proved to be insufficient to power the datalogger through the winter, so a more robust enclosure for a 100 amp-hour battery was installed in November 2024 along with a new solar panel. Continuous readings from the datalogger have been successfully resumed since November 2024.

- Granular fill should be used to fill the upper erosion gully near km 57.75 to reduce rates of further pavement and guardrail post undermining. Sand buildup from winter road sanding should also be removed from under the guardrail as this is what is concentrating the runoff that is creating the erosion gully
- Class 1M riprap should be added to the east ditch to reduce rates of erosion between km 57.675 and 57.75. Alternatively, the ditch should be cleaned out, regraded, and have ECB and synthetic check dams installed. Existing rock can be salvaged and placed back around the outlet and inlet areas of the culverts.

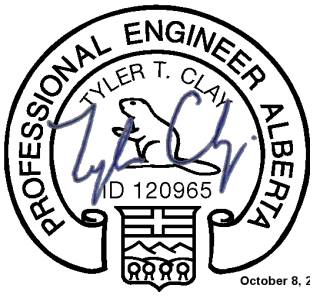
Long-term Measures:

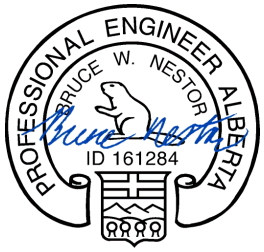
- Long-term repair using ~ 230 m of tied back retaining walls. Approximately 80 m would be required on the Heart River side and 150 m on the Peace River side, extending south from the km 58 wall. ($15M)

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.

Don Proudfoot, P.Eng.
Principal | Senior Geotechnical Engineer





October 3 2025

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: Don Proudfoot
RM APEGA ID #: 51674
DATE: October 6, 2025
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Tyler Clay, P.Eng.
Geological Engineer
Field Inspection

Bruce Nestor, P.Eng.
Geotechnical Engineer
Report Preparation

THURBER

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.

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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.

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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

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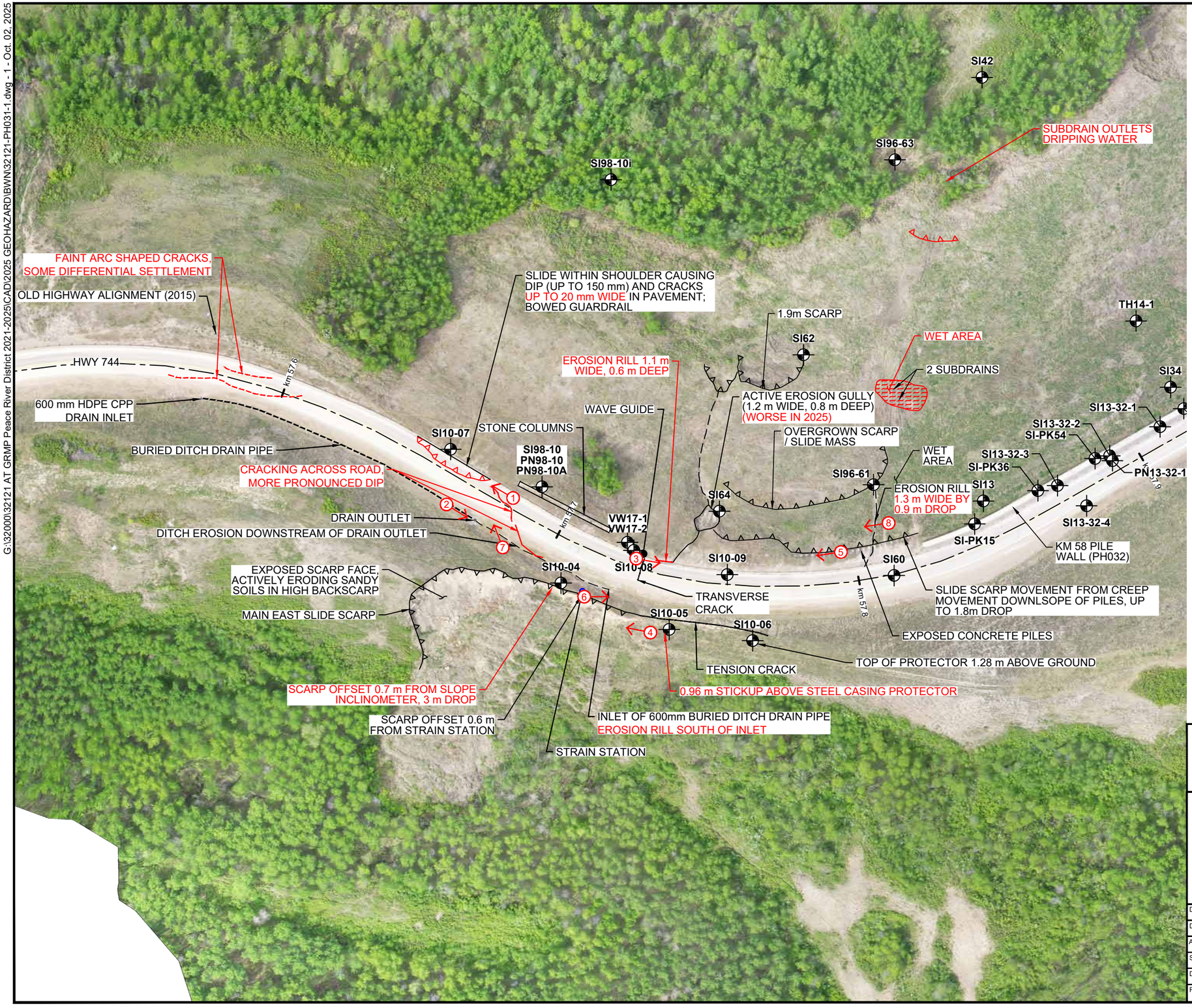

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LEGEND

- APPROXIMATE INSTRUMENT LOCATION
- **SI** SLOPE INCLINOMETER
- **VW** VIBRATING WIRE PIEZOMETER
- **PN** PNEUMATIC PIEZOMETER
- ① DIRECTION AND NUMBER OF PHOTO

NOTES:

1. SITE FEATURES ARE APPROXIMATE AND DRAWING WAS RESET IN 2024. CONSULT 2023 DRAWING FOR HISTORICAL INFORMATION
2. MAY 15, 2025 OBSERVATIONS SHOWN IN RED
3. 2024 ORTHOMOSAIC DERIVED FROM UAV IMAGERY FLOWN BY THURBER IN MAY 2024

0 10 20 30 40 50 60 70 m

SCALE 1:1250

Alberta

PEACE REGION (PEACE RIVER DISTRICT)

PH031-1 MICHELIN SLIDES
2025 SITE INSPECTION PLAN

DWG No. 32121-PH031-1

DRAWN BY	DLA
DESIGNED BY	BWN / TTC
APPROVED BY	DWP
SCALE	1:1250
DATE	SEPTEMBER 2025
FILE No.	32121

THURBER

Photo 1.

Looking southwest along the centerline of Hwy 744:04 at km 57.68 near the north end of the 2015-16 realignment. Cracks are up to 20 mm wide. Localized settlement (estimated up to 150 mm) is more apparent at the shoulder relative to the 2024 condition.

Photo 2.

Looking northeast along the east ditch near km 57.67 where there is ongoing erosion above the CPP drain pipe outlet, and in the ditch beyond.

Photo 3.

Looking north at erosion rill on the west side of the highway near km 57.73. The rill is up to 1.1 m wide and 0.6 m deep.

Photo 4.

Looking south along the landslide backscarp at the top of the Heart River valley on Hwy 744:04 at km 57.85.

Photo 5.

Looking south along the west side of Hwy 744:04 at protruding piles near km 57.9. Max drop of 1.8 m below top of pile (unchanged since 2024). An erosion rill has formed from runoff between the piles.

Photo 6.

Looking north along the east side of Hwy 744:04 at km 57.72 and upslope of the landslide movement towards the Heart River. No new cracks were apparent in the pavement or ditch area upslope from the backscarp.

Photo 7.

Looking southwest along Hwy 744:04 from km 57.69 at the crack and dip across the road. Crack has opened up to 20 mm wide and the pavement dip has become more pronounced since the 2024 inspection.

Photo 8.

Looking south near km 57.8 along the west side slope below the highway with active gully erosion and old, vegetated slide scarps. No major visible difference in the slide terrain within the upper slope relative to the 2024 condition.