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

Site Number	Location	Name	Hwy	km
PH033	Judah Hill	CNR Slide	744:04	59.451
Legal Description		**UTM Co-ordinates (NAD 83)**		
NE¼ 29-083-21 W5M		11V E 482645	N 6231308	

	Date	PF	CF	Total
Previous Inspection:	May 28, 2024	17	4	68 (Slide Risk Rating)
Current Inspection:	May 15, 2025	17	4	68 (Slide Risk Rating)
Road WAADT:	630		**Year:**	2024
Inspected By:	Don Proudfoot, Tyler Clay (Thurber). Rocky Wang (TEC)			
Report Attachments:	☒ Photographs ☒ Plans ☐ Maintenance			

Primary Site Issue:	Two rotational slides, one above the other, with the toe being eroded at the Heart River. Slide movement apparently occurring over an eroded bedrock surface, above river level. Crest of the upper slide has previously affected the highway and rail line near the level crossing. Pile walls and a large gravel toe berm were previously installed to protect the highway and rail line. The Heart River has shifted and is cutting into the slope behind the riprap installed to protect the toe of the toe berm slope.
Dimensions:	80 m wide, 110 m long (plan view). Lower slide slip surface is estimated between 10 m to 15 m deep, with backscarp now about 6 m from SI10-17.
Date of any remediation:	None.
Maintenance:	Highway was closed from May 2013 to January 2014 due to Sunshine Landslide. The inlet to the CNR Trunk downpipe was partially cleaned in 2016. The first void behind the pile wall at the road was filled with concrete in 2020 and the second was filled in 2022. Some ditch and embankment sideslope repairs were completed in 2022. The PH033 site was repaved, and existing guardrail replaced with strong post W-beam 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		☐	☐
☒ Slope Movement	No obvious retrogression of upper main backscarp since 2008. Backscarp has vegetation growth. No obvious slope movement directly downslope from the wall, upslope of S10-17. (Photos 6, 9 and 11) Continued erosion along the northwest near-vertical flank and river erosion with some fresh slumps of the lower landslide toe but no major expansion from the 2024 condition. (Photos 9, 10)	☐	☒

☒ Erosion	Previous sideslope erosion rills and gullying near km 59.55 and km 59.48 have been repaired and no new erosion damage was observed. (Photo 7) Active erosion is occurring below the severed section of the CNR Trunk downslope drainpipe and vertical headwall has been formed. Headwall of erosion gulley is now 10 m from the highway pavement (Photo 5). Repaired erosion voids (first observed in 2020 and 2022), as viewed from the top of the pile wall, showed no visible signs of new void formation at the ground surface behind the wall. However, a 2.5 m diameter void has opened behind piles 2 and 3 exposing one of the piles behind the main pile wall. (Photos 1, 2, 3 and 4) East ditch (south from km 59.51) erosion was repaired in 2022 by regrading and installing TRM and ditch barriers. A minor erosion channel (first noted in 2023) has developed within the ditch bottom and the ditch barriers were partially undermined at some locations condition. (Photo 8) A section between the ditch repair and drainpipe inlet is yet to be repaired (grading and riprap placement) due to ground disturbance agreements over the ACTO gas line. Drainpipe inlet had minor sand and gravel buildup (likely from upslope ditch erosion). A 0.25 m deep erosion rill has developed at this location. (Photo 12)	☒	☐
☐Seepage		☐	☐
☒ Bridge/Culvert	The 600 mm diameter CPP drain pipe has completely failed immediately below the crest of the upper valley slope. As a result, a scour gully with vertical headwall is actively expanding in the slope below the breakage and sediment is accumulating in the intermediate plateau below (Photo 5).	☒	☐
☒ Other	Increased concrete spalling and sloughing between the piles on the CNR retaining wall (noted in previous years). (Photos 3 and 13).	☒	☐

Instrumentation:

Instruments were read on June 10, 2025, and the results are summarized below:

- SI10-16 (installed about 15 m downslope of the CNR pile wall) - Movement rate is consistent with historic trends (0 to 3 mm/yr) over 11.7 m to 13.5 m depth since 2010, and the total cumulative movement has been less than 20 mm.
- .SI10-17 (installed about 6 m from the crest of the main backscarp) - Movement rate is consistent with historic trends (0 to 3 mm/yr) over 9.5 m to 11.3 m since 2010 and the total cumulative movement has been less than 15 mm.

- PN10-16 (near pile wall) - PN10-16 showed an increase in groundwater level of 0.04 m since the fall of 2024 readings. Ground level has shown a consistent trend since installation in 2010 with groundwater depth between 10 m to 12 m below ground surface.

Assessment (Refer to Drawing PH033-1)**:**

Movement at the toe of the CNR slide is continuing, worsened by river erosion of failed material at the toe of the slide. Erosion at the toe of the slope, which started in 2007, is expected to continue, with consequent further slide movement and retrogression of the backscarp towards the rail line and highway. Now that the river erosion has reached a hard bedrock face, the rate of lateral river erosion directly downslope of the pile wall has slowed.

The CNR drainage trunk pipe is broken immediately below the crest of the valley slope and both water and sediment are pouring directly onto the slope below. A large and active scour gully with vertical drop has formed immediately beneath the break in the pipe. We recommended that this be addressed as a matter of urgency, preferably by replacing the existing segmented CPP with a welded anchored smooth wall steel or HDPE pipe along a flatter alternate alignment in addition to re-profiling and armoring the inlet.

The pile wall along Hwy 744 was drilled to 20 m depth, and terminated above the expected rupture surface, so would be vulnerable to loss of toe support. Thurber completed a preliminary engineering assessment which included a review of the global stability of the wall. It was recommended that some drilled CIP concrete shear piles be installed between the base of the wall and the backscarp fo the lower slide to provide a higher factor of safety against a global failing based along the top of the shale bedrock at the depth that the ongoing creep movements are occurring.

The repairs to the erosion voids (formed behind the pile wall in 2020 and 2022) appear to be performing as intended but there is still ongoing erosion and soil loss between the piles which will likely lead to future formation of voids that can reach the ground surface behind the wall with little to no visible indication. A void has opened between two of the piles (which was repaired by filling with fillcrete under Contract CON0023098 in late summer of 2025. As part of the preliminary engineering assessment completed by Thurber the local stability of the wall and the issues with the wall facing were reviewed and options were provided for improving these.

Recommendations:

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

Investigation:
- Establish survey network around the pile wall, including benchmarks on ‘stable’ ground, and control points on the top and bottom of the wall. Conduct regular surveys every 1 – 2 years to detect movement / deflection of the wall, check for the length of exposed wall and movement of the ground around the wall.
- Assess the stability of the wall and ability to resist overturning based on the length of exposed wall and current ground anchorages. Assess the need for additional wall supports (anchors, piles, etc.) and/or a toe support wall. Thurber submitted a preliminary engineering report assessing the local and global stability of the pile wall in July 2025.
- Options to limit erosion by the Heart River at the toe of the slope should be assessed – this will require a review of river hydraulics and can be completed by Thurber’s in-house hydraulic engineering support.

Maintenance:
- Consider a curb and gutter along the edge of asphalt, or a depressed swale, to channel water away from edge of pavement and to divert runoff away from the back of the piles.
- Fill any new rills around the guardrail posts with gravel covered with seeded topsoil.
- Regrade the ditch where the check dams are undermined, line ditch bottom with granular fill and re-place the TRM, replace / re-install check dams. Clean out drain inlet area and use material to

fill in ditch where required. Alternatively, extend planned rock riprap from inlet area to 100 m to the south.

Short-term Measures:

- Fill the void that has formed between the piles with fillcrete (this was already completed in 2025 as part of CON0023098).
- Replace the wall parging with a more robust solution and fill the voids between piles. Install drainpipes through the new wall facing to avoid blocking seepage. Fill any voids behind the wall with grout or granular fill with non-woven geotextile filter. TEC has elected to pursue a shotcrete facing repair option to replace the existing parging. Thurber has submitted a proposal for detailed design and tender work for the shotcrete facing repair, with LEX3 working as a structural subconsultant. Thurber and LEX3 have also recommended adding some tie-back soil anchors and walers to part of the exposed wall to improve the local stability, in conjunction with the facing repairs ($650k ballpark costs for facing, tie-backs and walers).
- Replace CPP drainpipe with a realigned anchored welded smooth wall steel or HDPE pipe. ($300k - $450k)

Long-term Measures:

- River training works such as rock vanes may be required in support of other repair options, or to limit further slope movement. ($500k - $750k)
- Install a CIP concrete shear pile wall in the bench area between the pile wall and the lower slide (Approx. $2 million).

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

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PROFESSIONAL ENGINEER ALBERTA
BRUCE W. NESTOR
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PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: Don Proudfoot
RM APEGA ID #: 51674
DATE: October 6, 2025
PERMIT NUMBER: P005186
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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.

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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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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.

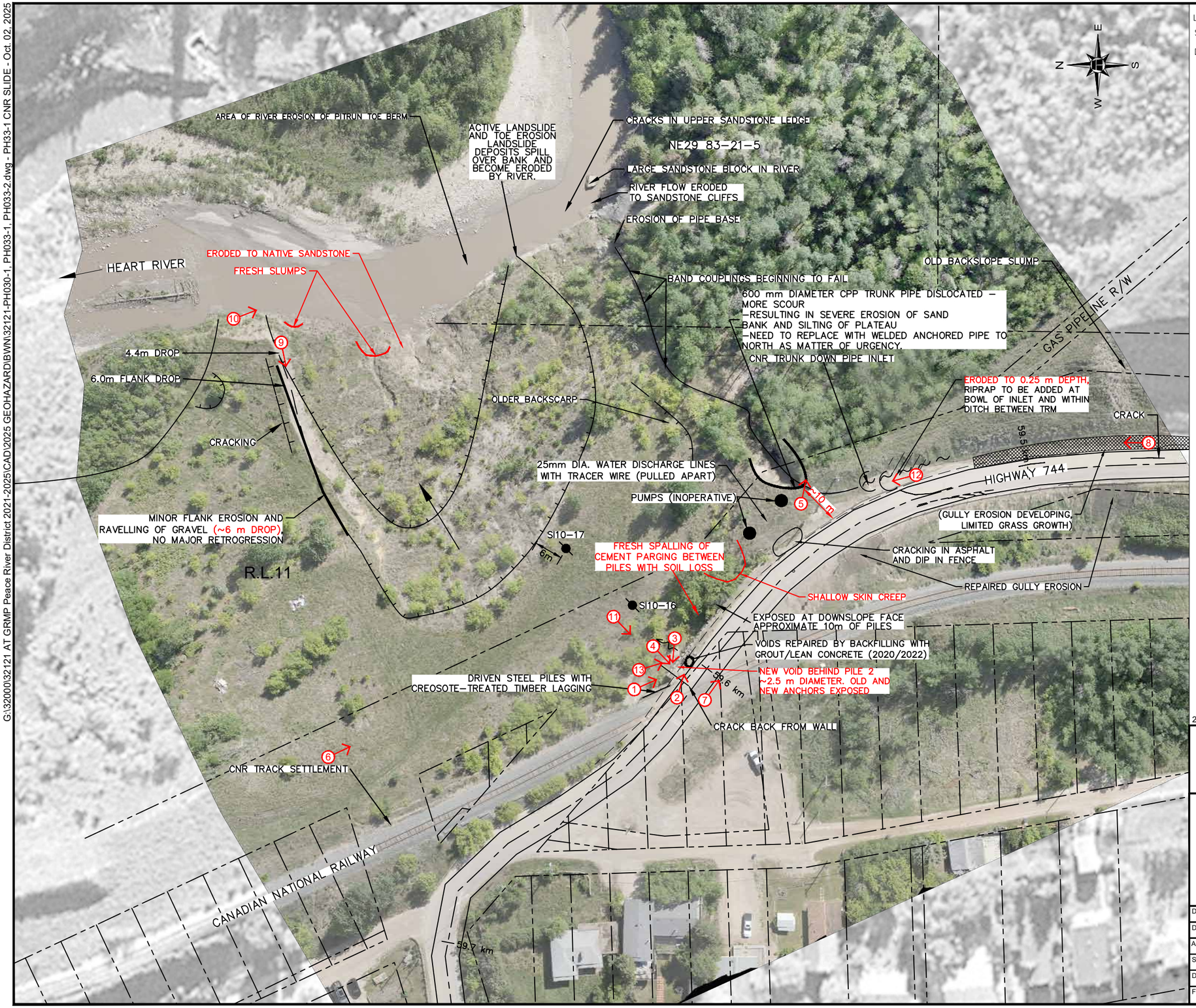
b) **Reliance on Provided Information:** The evaluation and conclusions contained in the Report have been prepared based on conditions in evidence at the time of site inspections and based on information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions 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

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.



LEGEND:

SLOPE INDICATOR

DIRECTION AND NUMBER OF PHOTO ①

NOTES:

1. LOCATION DATA RECORDED USING HANDHELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
2. MAY 15, 2025 OBSERVATIONS SHOWN IN RED.

0 10 20 30 40 50 60m

SCALE 1:1000

2023-05-29 AIR PHOTO FROM MP

Alberta

PEACE REGION (PEACE RIVER DISTRICT)

PH033-1 JUDAH HILL - CNR SLIDE
2025 SITE INSPECTION PLAN

DWG No. 32121-PH033-1

DRAWN BY	DLA
DESIGNED BY	BWN / TTC
APPROVED BY	DWP
SCALE	1:1000
DATE	SEPTEMBER 2025
FILE No.	32121

THURBER

Photo 1.

Looking southeast from the north end of the CNR pile wall. Grout / lean concrete overflow from the 2022 repair of the void behind the wall is visible at the toe of the wall.

Photo 2.

View of the repaired area behind the pile wall where erosion voids formed in 2020 and 2022. The repair involved geotextile supported by wood cribbing and backfilled with grout/lean concrete. The voids were a result of soil loss between the piles. and over 5 m in depth prior to repair.

Photo 3.

Looking south at the soil loss between the northernmost piles (1 to 5) of the CNR pile wall north of Hwy 744:04 at km 59.61. Increased buildup of soil spalling between the piles since 2024. Note wood cribbing was set behind piles 3-4 to contain the grout backfill for the previous void repair; however, some grout still did flow through and has set along the toe of the piles.

Photo 4.

Close up view of void that has developed between piles 2 and 3 at the north end of the CNR pile wall due to soil loss between the piles. Void is approximately 2.5 m in diameter. One of the additional piles installed in 1989 behind the original pile wall has been exposed by the void.

Photo 5.

Looking east at the break in the 600 mm diameter CPP trunk pipe and associated erosion gulley at the crest of the Heart River valley slope. The erosion gulley is 10 m from the edge pavement of the northbound highway lane.

Photo 6.

Looking southeast from the north side of the lower slide main scarp. No major changes observed in the slope area directly below the pile wall since 2024.

Photo 7.

Looking southeast at CNR rail crossing and at previous erosion repairs in highway embankment beyond. Sideslope erosion repairs appeared effective and similar to the 2024 conditions.

Photo 8.

Looking north towards the east ditch with previous erosion damage that was repaired in 2022 (regraded, with TRM and ditch barriers). Vegetation was not well established and there was a minor erosion channel starting to develop within the ditch bottom and some barriers were partially undermined.

Photo 9.

Looking west at the lower slide mass. There was some increased erosion along the slide flank relative to the 2024 condition but no major expansion. The overall drop is approximately 6 m.

Photo 10.

Looking south towards the base of the lower slide and bedrock exposure at the river. Some minor lower slide activity with fresh slumps and active erosion of slide materials entering over the bank.

Photo 11.

View southwest towards the lower slope area downslope from the base of the pile wall and immediately upslope of the main slide scarp monitored by SI10-17. No visible indications of landslide movement were observed in this area and conditions were similar to 2024 inspection.

Photo 12.

Buildup of eroded ditch sediment (sand and gravel) at the down pipe trunk inlet. 0.25 m deep erosion rill has developed in this area.

Photo 13.

Looking towards the southeast at the base of the pile wall with spalling concrete parging between the piles.