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

THURBER

Site Number	Location	Name	Hwy	km
PH093-1	Brick's Hill/Shaftesbury Trail	The Big Eddie	684:02	8.86-8.98
Legal Description		**UTM Co-ordinates**		
NW24/SW25-91-23-W5M		11 E 467,076	N 6,219,660	

	Date	PF	CF	Total
Previous Inspection:	29-May-2024	13	6	58
Current Inspection:	12-May-2025	13	3	39
Road AADT:	360		**Year:**	2025
Inspected By:	Rocky Wang, TEC		Ken Froese, Thurber Don Proudfoot, Thurber	
Report Attachments:	☒ Photographs	☒ Plans	☐ Maintenance Items	

Primary Site Issue:	Massive flow slide through existing fill located downslope of the highway with retrogressive cracks in the sideslope within 3.5 m of highway shoulder. The slide is located where a similar slide occurred in 1986. The current slide has overwhelmed the mitigation work done to repair the 1986 slide.	
Dimensions:	Main landslide is 340 m long, and 43 m from the highway. The main head scarp is about 120 m wide and 6.3 m high while the main earth flow slide body is about 50 m wide.	
Date of Remediation:	1986: Translational landslide repaired using subdrains and toe berm to pinch off the movement flow at the narrow part of the flow path. 2023: Temporary detour constructed to north of site, accepting that the slide retrogression could affect the highway with little warning.	
Maintenance:	2023: Jersey barriers and warning signs installed.	
Observations:	**Description**	**Worsened?**
☒ Pavement Distress	Centerline crack about 30 m long (may be from paving).	☐
☒ Slope Movement	Tension crack arcs along south highway sideslope and continues to drop and widen. The headscarp is slowly retrogressing and may rapidly retrogress as water infiltrates the cracks.	☒
☒ Erosion	Ongoing seepage and weathering causing upper slide blocks to erode.	☒
☒ Seepage	There are damp areas on the west flank. The location of previously installed subdrains is not known. Seepage from the headscarp observed in 2025.	☒
☒ Bridge/Culvert	Outlet of 900 mm CSP on west side is mostly obstructed. Temporary detour has diverted ditch flow to the east along the north side of the highway.	☐
☐ Other		☐

Instrumentation (as of Spring 2025):	
Inclinometers	SI23-1 (between the main scarp and highway): sheared off after Spring 2024 reading at 11.5 m depth after 56 mm of deformation; the rate had slowed slightly to 73 mm/yr compared to the overall rate of 97 mm/yr. SI23-4 (upslope of detour): No clear pattern has developed within the depth of instrument installation (26 m).
Standpipe Piezometers	SP23-2 (West): Stable at 455.4 m El. (3.9 m depth BGS) SP23-3 (East): Initial increasing trend until March 2024 but now stable at 446.6 m El. (4.6 m depth BGS)
Vibrating Wire Piezometers	VW23-1 (datalogged until Nov. 2024): tip at about 18 m below ground and about 7 m below slip surface and dry since installation. VW23-4A/B: 4A tip is about 15 m below ground and dry since installation; 4B tip (datalogged since Nov. 2024) is about 25 m below ground with slight decreasing trend and water level is at 436.7 m El. (20.0 m depth). VW23-5: tip is about 8 m below ground was dry since installation but now shows a trace of water.

Assessment:

A call-out inspection was completed on June 8, 2023. The site background and review of available site information was provided in the July 16, 2023, Call-Out Report. Based on a comparison between the pre-disturbance LiDAR ground surface captured in 2007 and the post-disturbance UAV photogrammetry-derived elevation model, the transition between depletion and accumulation occurs coincident with the downslope end of the toe berm constructed following the 1986 slide. That would suggest that the failure occurred near the base of the fill. Since the failure took 37 years to occur, it may be due to gradually strain softening of the relatively weak native clay soils under the load of the fill that was placed to reconstruct the slope and build the toe berm. This softening, in combination with a gradual loss of cohesion, could have resulted in the observed failure. It is possible that there was also some oversteepening by erosion at the toe of the embankment. The likely source of erosion would be from the gabion mattress lined channel on the west side of the fill. Above-average rainfall may also have been a contributing factor in triggering erosion or raising the local groundwater table. Environment Canada data (from Peace River about 13 km distant) indicates that there was 50 mm of rainfall between May 22 and 24, 2023, which is greater than the long-term 1981 to 2010 Climate Normal of 40 mm for the entire month of May. However, the Google Earth imagery indicated that failure had already initiated earlier in May (assuming their dates are correct) so the heavy rainfall later in the month was not the cause although it most likely contributed to the rate and size of movement. It is possible small slope deformations and minor cracks may have initiated prior to May 2023 and had gone unnoticed.

Given the long run out of the slide and the appearance of flow slide-type behaviour, an advancing zone of water and mud would have been anticipated but the dried leaves on the gully floor did not show evidence of such. It is possible that there was some wetter material in the initial phase of movement which was subsequently buried by drier material. Thurber's hydrogeologist speculates that flow-type behaviour did occur but only on thin clay layers where excess pore pressures could have initiated slope failure with relatively small amounts of water.

Due to the presence of the large tension crack in the sideslope of the highway at the time of the call-out (3.96 m from the fog line at the closest point), it was agreed to keep the road open but reduce the speed limit to 30 kph, place jersey barriers along the downslope side of the highway, and increase the frequency of inspection. McIntosh Perry (now Egis) was contracted to design a low-speed temporary detour and supervise its construction. The Maintenance Contractor completed the gravel detour construction in September 2023 and the detour can now be used to re-route traffic if/when the landslide retrogresses further and compromises the main highway. For this reason, the Consequence Factor had been lowered in 2024 from that applied at the time of the call-out and the Probability Factor has also be reduced slightly as the retrogression has not advanced as quickly as had been initially anticipated. The Consequence Factor was reassessed in 2025 and reduced further.

Comparison between UAV imagery taken in 2024 and 2025 shows that there has been only minor regression of the main headscarp as noted on the Drawing 32121-PH093-1): the tension cracks in the central portion have become deeper, new crack opened up at the eastern-most edge, and a shorter tension crack appeared on the west-most flank. The overlaying of the 2025 imagery appears to show an overall downslope movement of all features, but this may be inherent inaccuracy in non-survey photogrammetry processing. Seepage, erosion, and weathering have resulted in the dissociation and

toppling of the large blocks immediately below the main headscarp that had already slumped. An erosion channel with deposition has formed in the middle portion of the slide. Comparing with 2024 imagery, the lower portion of the slide appeared unchanged in position and is starting to become grassed. There are additional intermediate tension cracks between the main scarp and the highway mostly on the west portion of the site. All these cracks were wider and deeper than in 2023 and 2024. A centreline crack was noted and measured in 2025. It is likely this is an artifact of paving but was noted this year and will be monitored in future to see if it is widening.

It is expected that the slow movements between the headscarp and the highway will continue until there is a sudden, brittle failure and the next block slides or topples out. This may be triggered by high rainfall raising the groundwater table and lubricating the slip surfaces or by steady erosion of the slide material below the headscarp leading to further destabilization of the overall slope.

Recommendations:

Short-Term:

- Routine monitoring to determine if tension cracking has started within the pavement. If this occurs, then traffic should be shifted onto the temporary detour.

Long-Term remediation options:

a) Realignment of the highway appears to be the most-economical solution. The realignment would be similar to the temporary detour already in place but with improved geometry starting with a cut into the backslope to the east of the site where the highway is protected by the PH009A pile wall and returning to the existing highway alignment on the west side beyond the original 1985 failure extents. There will be significant volumes of cut material that will need to be hauled off the site for disposal.

b) A pile wall could also be considered, either as a standalone repair or in conjunction with the realignment noted in a), but is expected to be quite expensive and difficult to justify for the low traffic volumes. If installed adjacent to the highway the pile wall could be about 150 m long and consist of drilled concrete piles up to 25 m deep with two or more rows of tie-back anchors.

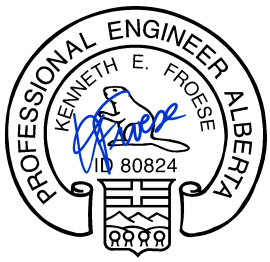
Ongoing Investigation:

- The geotechnical drilling investigation has been completed. The preliminary engineering assessment is underway to consider the potential long-term remediation options.
- Ongoing monitoring of the instrumentation should be continued under the GRMP program.
- It is recommended that this site be inspected annually under the GRMP program.

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, M.Eng., P.Eng.
Partner |Senior Geotechnical Engineer



October 11, 2025

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: Don Proudfoot
RM APEGA ID #: 51674
DATE: October 12, 2025
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Ken Froese, P.Eng.
Senior Associate | Senior Geotechnical Engineer

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.

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 TOTHE 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\32121 AT GRMP Peace River District 2021-2025\CAD\2025 GEOHAZARD\KEF\32121 PH093-1.dwg - 1 - Oct. 10, 2025

CRACK
2023: 80mm WIDE, 290mm DEEP, 800mm DIFF
2024: 400mm WIDE, 1.5m DEEP, 700mm DIFF
2025: 2.7m WIDE OVERALL, 700mm DIFF

CRACK 300mm WIDE, 1.6m DEEP, 0mm DIFF

0.8m DIFF

2024: 1.5m DIFF AT FENCE LINE
2025: 0.6 DIFF AT FENCE LINE

900mm DIA CSP - OUTLET MOSTLY OBSTRUCTED

HWY 684

CRACK: 400mm DEEP, 50mm DIFF

2023: 5.5m VERTICAL HEIGHT OF SCARP
2024: MOVEMENT INCREASED TO 6.3m VERTICAL

2024: SIGNIFICANT TENSION CRACK DEVELOPMENT

PIECES OF ASPHALT EXPOSED AT 1.9m BELOW GROUND SURFACE

2024: 2.2m VERTICAL
2025: 2.7m VERTICAL (SEEPAGE BELOW)

CRACK STARTING: 100mm WIDE, 500mm DEEP

PILE OF GABION STONE

2025: SEEPAGE CAUSED SMALL FLOW SLIDE WITH MAIN DEBRIS

3.5m NEAR-VERTICAL SLOPE

TEARING STARTS ALONG EDGES OF GABION MATTRESS

0.9m VERTICAL

SEEPAGE AND PONDING WATER BELOW CHANNEL ALIGNMENT

2025: THIS BLOCK BROKEN UP AND WAS ERODED / FLOWED DOWN SLOPE

2023 & 2024: TWO SEEPS

SLICKENSIDED SURFACES NOW COVERED WITH RAVELLED MATERIAL

2025: EROSION CHANNEL AND DEPOSITION AREAS FORMING

60° LATERAL SLIP SURFACE,OVERALL SCARP ABOVE ABOUT 5.8m HIGH, ACP NOTED IN SLIDE DEBRIS

EXPOSED LATERAL EDGE OF SLIP SURFACE INCLINED TOWARD GULLY AT 83° ON THE UPPER PART AND 75° ON THE LOWER

LOWEST OBSERVED PORTION OF GABION MATTRESS

CENTERLINE CRACK
10-20mm WIDE, 0mm DIFF,
GRAVEL INFILL

TEMPORARY DETOUR CONSTRUCTED FALL 2023

2025: 1.2m DEEP, 0.6m WIDE

2025: 2.3m DEEP, 0.8m WIDE

2025: 3.3m DEEP, 0.6m WIDE

2023: 50mm WIDE, 400mm DEEP 0mm DIFF
2025: 220mm WIDE, 400mm DEEP, 200mm DIFF

BIRCH LOGS AT 3.3m BELOW GROUND SURFACE

2023: 5.9m VERTICAL HEIGHT OF SCARP WITH TENSION CRACK 2.9m UPSLOPE;
2024: ERODED SOMEWHAT, NOW ONLY ABOUT 3.7m VERTICAL

2025: NEW TENSION CRACK

2m WIDE BLOCK SEMI-DETACHED FROM HEADSCARP - CRACK WAS 1.2m DEEP WITH 150mm HORIZONTAL DISPLACEMENT

2025: UPPER PORTION BROKEN UP

2024: THIS FLANK UNCHANGED
FINE, UNIFORM "BEACH" SAND EXPOSED IN SCARP

4.4m VERTICAL HEIGHT OF SCARP, TENSION CRACK 1m FURTHER UPSLOPE

2025: ONLY MINOR CHANGES

2024: RETROGRESSION AND RAVELLING NOTED
1m VERTICAL HEIGHT OF SCARP

NO CHANGE IN SLIDE
DEBRIS: MINOR EROSION CHANNEL HAS FORMED WHILE REST IS BECOMING MORE VEGETATED

2 SETS OF LATERAL SLIP SURFACES: OUTER BETWEEN 29° AND 41° TO CENTER OF SLIDE, INNER 42°

SLIDE DEBRIS SPILLED OVER UNDISTURBED GRASS CREATING LATERAL RIDGE

LATERAL RIDGE ABOUT 1.5m HIGH

RIDGE ABOUT 3m HIGH AND SPILLING DOWN ONTO TREES

PIECES OF ASPHALT EXPOSED NEAR SURFACE OF SLIDE DEBRIS

LATERAL RIDGE ABOUT 3.3m HIGH

SLOPE AT CREST OF TOE: ~30°

SLOPE NEAR BOTTOM OF SLIDE TOE: ~43°

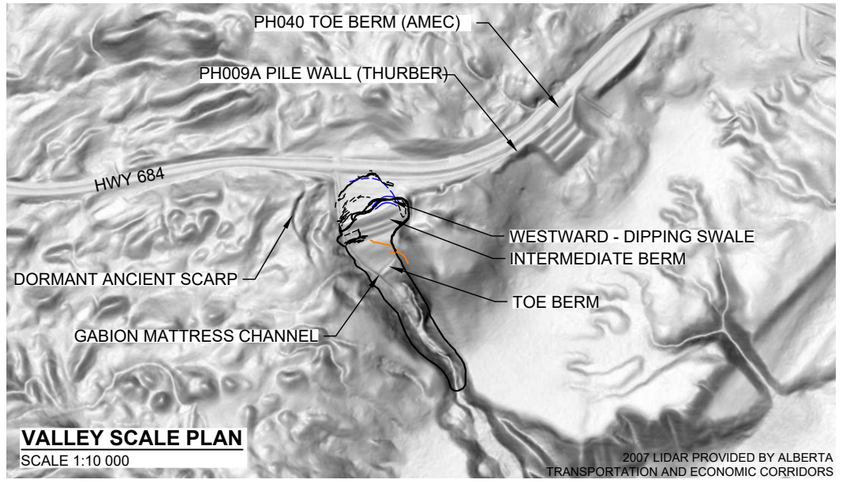
2023: GULLY FLOOR BEYOND SLIDE DRY AND UNDISTURBED

TILTING TREES ON WEST SIDE OF GULLY

N
W E
S

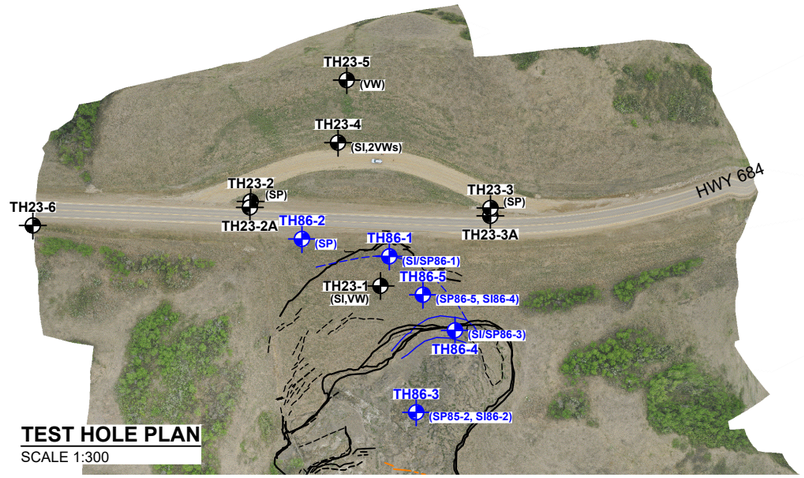
DRONE ORTHO
SCALE 1:2500

0 25 50 75 100 125 150m
SCALE 1:2500



VALLEY SCALE PLAN
SCALE 1:10 000

2007 LIDAR PROVIDED BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS



TEST HOLE PLAN
SCALE 1:300

LEGEND

- SCARP
- CRACK
- PRE-SLIDE CRACKS SEEN ON GOOGLE EARTH MAY 10, 2023, SATELLITE IMAGE
- POTENTIAL 1986 CONSTRUCTION EXTENTS
- ESTIMATED 1986 CENTERLINE
- 1986 SLIDE EXTENT
- 1986 SCARP
- DIRECTION AND NUMBER OF PHOTO
- SURVEYED TEST HOLE LOCATION
- APPROXIMATE ALBERTA TRANSPORTATION 1986 TEST HOLE LOCATION (NUMBERING TAKEN FROM EBA MAY 23, 1986, REPORT)
- (SP) STANDPIPE PIEZOMETER
- (SI) SLOPE INCLINOMETER
- (VW) VIBRATING WIRE PIEZOMETER

NOTES
1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS FROM MAY 2023 CALLOUT; SOME NOTES REMOVED FOR CLARITY.
3. MAY 2025 OBSERVATIONS SHOWN IN RED.

ORTHOMOSAIC FLOWN BY THURBER MAY 2024;
BASE MAPPING BY McINTOSH PERRY / EGIS 2023

Alberta

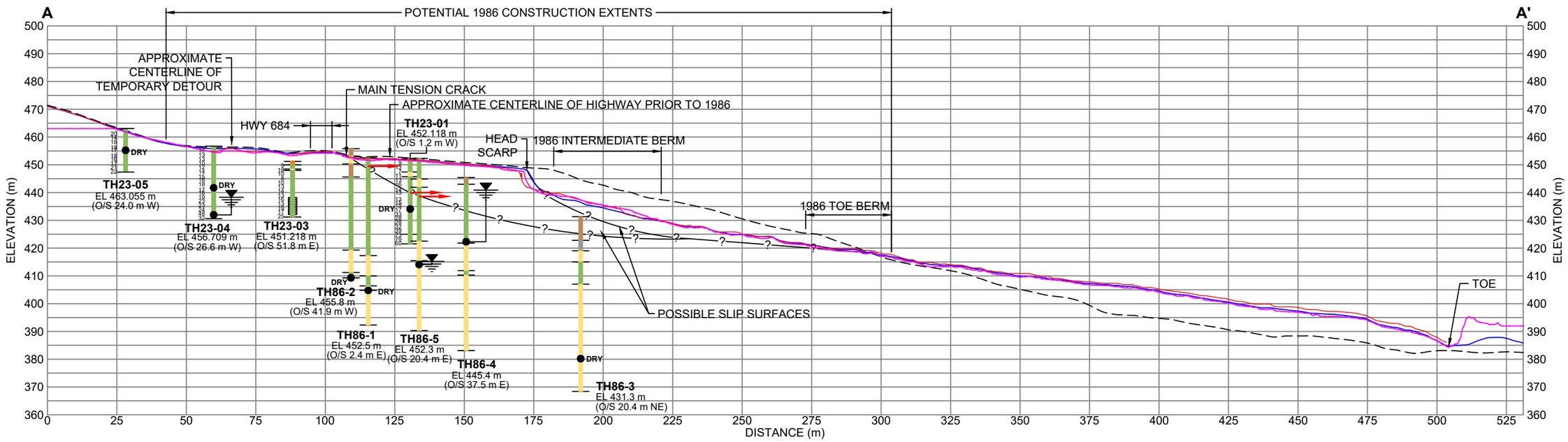
PEACE REGION (PEACE RIVER DISTRICT)

PH093: BIG EDDIE: HWY 684:02 KM 8.86 TO KM 8.98
2025 SITE INSPECTION PLAN

DWG No. 32121-PH093-1

DRAWN BY	DLA
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	OCTOBER 2025
FILE No.	32121

THURBER



LEGEND

- 15 SPT N VALUE
- WATER LEVEL IN PIEZOMETER (NOVEMBER 16, 2023)
- VIBRATING WIRE PIEZOMETER TIP LOCATION
- STANDPIPE PIEZOMETER SCREENED INTERVAL
- ZONE OF MOVEMENT IN SLOPE INCLINOMETER
- 2007 LIDAR PROFILE
- 2023 LIDAR PROFILE
- 2024 DSM PROFILE (APPROX)
- 2025 UAV PROFILE (APPROX)

- FILL
- CLAY
- CLAY TILL
- SAND, GRAVEL
- SILT

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. ELEVATIONS FOR THE 1986 TEST HOLES WERE RELATIVE AND HAVE BEEN ADJUSTED TO FIT ESTIMATED PRE-SLIDE TOPOGRAPHY.
3. 2007 LIDAR PROVIDED BY TEC, 2023 LIDAR FLOWN BY MCINTOSH PERRY/EGIS USING RTK CONTROL, 2024 DIGITAL SURFACE MODEL DERIVED USING SfM TECHNIQUES FROM UAV FLOWN BY THURBER

Alberta

PEACE REGION (PEACE RIVER DISTRICT)

PH093: BIG EDDIE: HWY 684:02 KM 8.86 TO KM 8.98 CROSS-SECTION A-A'

DWG No. 32121-PH093-2

DRAWN BY	DLA
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:1500
DATE	OCTOBER 2024
FILE No.	32121

THURBER

Photo 1: Looking west along as-yet uncracked highway surface. Centerline crack may be between mats from last paving/overlay.

Photo 2: Looking southwest along main tension crack at the highway sideslope with measuring transect stakes in foreground.

Photo 3: Looking southeast along the rest of the main tension crack at the highway sideslope.

Photo 4: Looking east along the main headscarp where the portion is regressing towards the highway.

Photo 5: Looking south down the axis of the landslide mass. Vegetation is starting to grow.

Photo 6: Stretching gabion mattress along the west flank of the landslide.

Photo 7: Additional scarps just beyond the west flank of the landslide. This is starting to move in 2025.

Photo 8: Looking east across the main landslide scarp.

Photo 9: Toppling blocks at the face of the main headscarp.

Photo 10: Looking east along face of the main headscarp.

Photo 11: Looking southeast at the east flank of the main landslide.

Photo 12: Looking west at the main landslide headscarp.