

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – GRANDE PRAIRIE DISTRICT-NORTH
2021 INSPECTION**



Site Number	Location	Name	Hwy	km
GP031	South slope of the Peace River Valley near the Shaftesbury ferry crossing	Shaftesbury Slide, South Site	740:02	49.3
Legal Description		UTM Co-ordinates (NAD 83)		
LSD 4-9-82-23-W5M		11U N 6 216 300	E 466 120	

	Date	PF	CF	Total
Previous Inspection:	June 11, 2020	10	1	10
Current Inspection:	July 8, 2021	10	1	10
Road AADT:	160	Year:		2020
Inspected By:	Don Proudfoot (Thurber) Ed Szmata, Kristen Tappenden, Max Shannon (AT)			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

Primary Site Issue:	A landslide was affecting the original alignment of the highway over a 70 m width. A pile wall which had been constructed along the shoulder of the road failed and the highway was shifted onto a detour around the backscarp of the slide. The slide extended down the slope to the terrace where Range Road No.234 is located 35 m below the highway. The backslope, which was about 7 m high, had also been subject to slumping.		
Dimensions:	The main slide was 70 m wide along the highway. Three slumps were affecting the backslope over a combined width of about 80m, west of the main slide.		
History and Date of any Remediation:	<p>The original slide occurred in 2007. A pile wall was completed in 2009. It consisted of 114 driven steel HP310x79 piles and 45 screw anchors (Chance anchors). The piles along the main section of the wall were 22 m long while the “wing wall” piles at each end were 15 m long. The tie-back anchors were 25 m long. Prior to the slide the highway had dropped and was built back up behind the wall with a MSE zone against the wall and granular subbase further away from the wall.</p> <p>The wall failed in July 2014 due to loss of soil support on the downslope side and the highway was shifted onto a gravel detour behind the backscarp of the slide.</p> <p>In the summer of 2017, Thurber conducted a geotechnical investigation and prepared a preliminary engineering assessment with design options for the repair of the landslide. The selected design, which was constructed in 2018 and 2019, consisted of a realignment of the highway into the hillside, cutting back the backslope to a flatter inclination, constructing a toe berm to buttress the highway slope and constructing a concrete pile wall along the downslope shoulder of the highway.</p>		
Maintenance:	Maintenance has not been required since the construction of the latest stabilization measures		
Observations:	Description	Worse?	
<input type="checkbox"/> Pavement Distress		<input type="checkbox"/>	

<input checked="" type="checkbox"/> Slope Movement	A small slump has formed in the cut slope above the west riprap channel	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	There is evidence of erosion outside the project limits resulting in silt accumulating in a low spot in the southwest highway ditch	<input type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	There was a steady drip coming from the drainpipe indicating the presence of groundwater	<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Some excess Class 1M riprap was stockpiled along the toe of the toe berm and is available for future repairs when needed	<input type="checkbox"/>

Instrumentation:

4 slope inclinometers were installed in the pile wall and have measured deflections as follows:

- SI18-P10 = 3.2 mm of pile head deflection
- SI18-P30 = 2.5 mm of pile head deflection
- SI18-P50 = 2.1 mm of pile head deflection
- SI18-P70 = 3.3 mm of pile head deflection

Assessment:

The previous failure occurred because the slope below the original pile wall slid away leaving the wall unsupported. This resulted in a catastrophic failure of the steel piles, which were severely bent over. High groundwater levels were also a factor. In addition, the backslope inclination was too steep for the clayey soils that were present in it.

The new design added a large toe berm and cut back the backslope to reduce the overall inclination of the combined fill and backslope. A drainage blanket was constructed under the berm to prevent a buildup of groundwater behind the new berm fill. The pile wall was added to protect the new road surface from the existing landslide scarp that was located at the edge of the temporary detour fill. Surface drainage was also controlled by draining the upslope ditch water into a welded SWSP drop pipe, and precipitation and groundwater seepage from the slide mass into a riprap lined swale, both of which were extended down to the terrace at the toe of the valley slope.

The remedial measures appear to be performing well to date. Pile deflections are all within expected ranges and the global stability of the toe berm and backslope slopes look good. Grass growth is well established on the site and the erosion prevention measures appear to be working.

The slump located above the west riprap channel is likely located in weak native material that had been pre-sheared during landslide events prior to construction. This should be repaired before it grows.

Recommendations:

Maintenance

The local slump above the west riprap channel should be excavated and replaced with free draining gravel.

It was agreed with AT that due to good performance since the remediation work was completed, this site will be removed from the formal geohazard site assessment program and will be occasionally monitored by AT personnel going forward.

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.

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

Renato Clementino, P.Eng.
Review Principal



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.

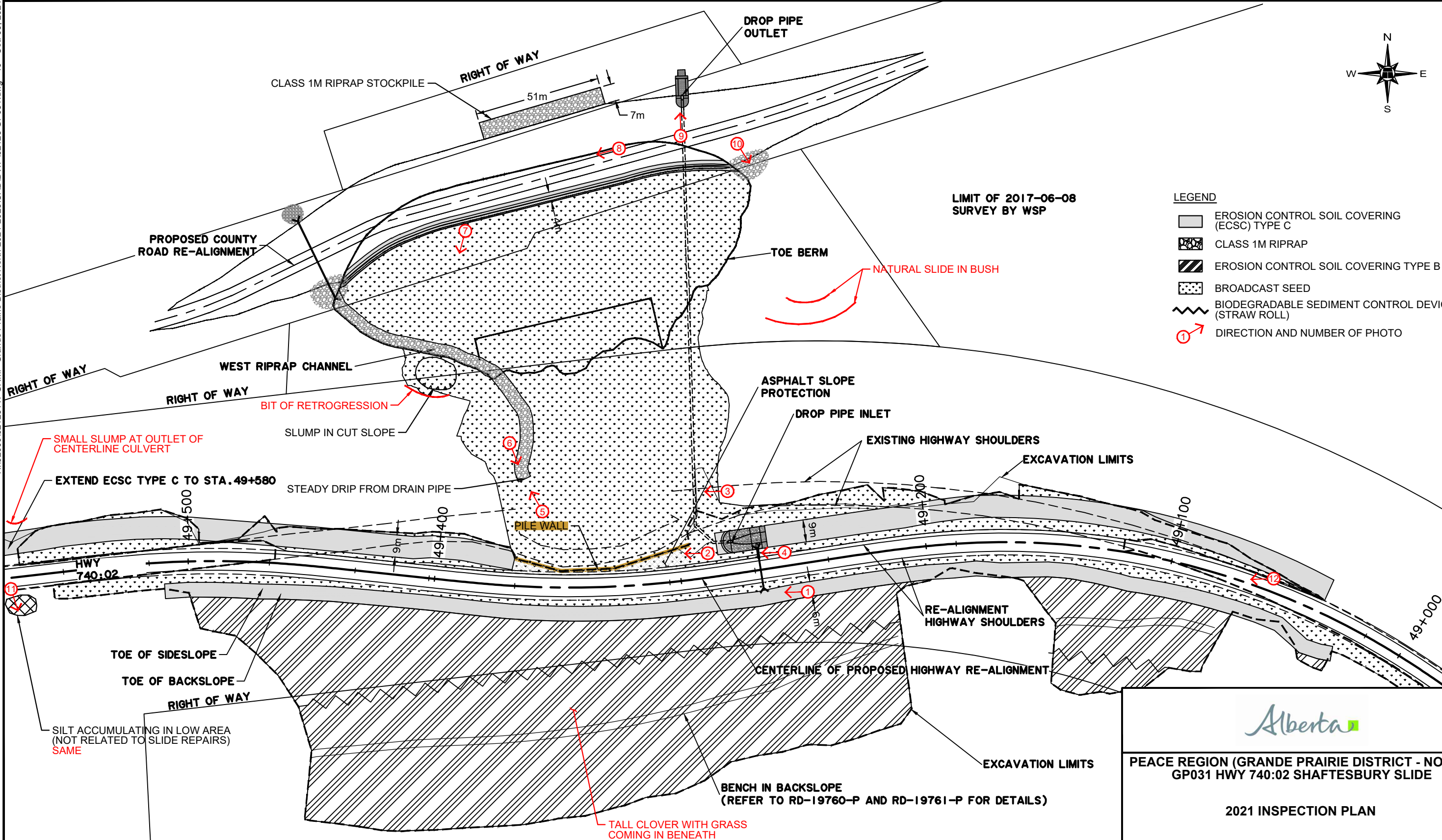
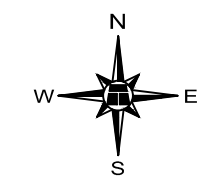
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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.

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- LEGEND**
- EROSION CONTROL SOIL COVERING (ECSC) TYPE C
 - CLASS 1M RIPRAP
 - EROSION CONTROL SOIL COVERING TYPE B
 - BROADCAST SEED
 - BIODEGRADABLE SEDIMENT CONTROL DEVICE (STRAW ROLL)
 - DIRECTION AND NUMBER OF PHOTO

Alberta

**PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)
GP031 HWY 740:02 SHAFTESBURY SLIDE**

2021 INSPECTION PLAN

DWG No. 32123-GP031-1

NOTES:

1. JULY 8, 2021 FEATURES SHOWN IN RED

0 20 40 60 80 m
SCALE 1:1500

DRAWN BY	ML
DESIGNED BY	DWP
APPROVED BY	DWP
SCALE	1:1500
DATE	OCTOBER 2021
FILE No.	32123





Photo 1.
Looking west at the
backslope of the
repaired landslide
area.



Photo 2.
Looking west at the
pile wall.



Photo 3.
Looking west at the grass covered slope below the pile wall.



Photo 4.
Riprap area at culverts.



Photo 5.
Looking north at
West Riprap
Channel.



Photo 6.
Seepage from
drainpipe into West
Riprap Channel.



Photo 7.
View of slump above
West Riprap
Channel, looking
south.



Photo 8.
Looking west along
County road over toe
berm.



Photo 9.
Looking north at
gabion dissipation
bowl at outlet of drop
pipe.



Photo 10.
Looking southeast at
landslide in natural
forested slope.



Photo 11.
Silty runoff
accumulating in low
area south of
highway. Not related
to the landslide
repairs



Photo 12.
Looking southwest at
realigned backslope.