

**ALBERTA TRANSPORTATION AND  
ECONOMIC CORRIDORS  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)  
2024 INSPECTION**



**THURBER ENGINEERING LTD.**

<b>Site Number</b>	<b>Location</b>	<b>Name</b>	<b>Hwy</b>	<b>km</b>
PH036	Dunvegan	Dunvegan South Elephant Trunk	2:68	16.216
<b>Legal Description</b>		<b>UTM Co-ordinates (NAD 83)</b>		
NW¼ 06-080-04 W6M		11U E 398549	N 6196741	

	<b>Date</b>	<b>PF</b>	<b>CF</b>	<b>Total</b>
<b>Previous Inspection:</b>	May 20, 2022	10	4	40
<b>Current Inspection:</b>	May 24, 2024	10	3	30
<b>Road AADT:</b>	2,520	<b>Year:</b>		2023
<b>Inspected By:</b>	Don Proudfoot, José Pineda (Thurber). Rocky Wang, Robert Senior (TEC).			
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs	<input checked="" type="checkbox"/> Plans	<input type="checkbox"/> Maintenance	

<b>Primary Site Issue:</b>	Band couplings on surface of 900 mm corrugated plastic pipe had failed, allowing water to drain onto the slope. Slope failures occurred in the gully through which the drain was routed, because of the additional water and dislocated the pipe. Large landslides formed along the alignment of the drainpipe.		
<b>Dimensions:</b>	The head of the gully is 100 m wide and was showing signs of on-going slide movement. The length of dislocated pipe was approximately 200 m prior to its repair in 2020, with a further 450 m of pipe beyond the mouth of the gully.		
<b>Date of any remediation:</b>	The dislocated pipe was replaced with a 760 mm diameter smooth wall steel pipe (SWSP) in 2020. The upper portion of the SWSP, from the highway to the backscarp, as well as the portion of the pipe which crossed the landslide backscarp, was trenched below the ground surface and backfilled with excavated clay to secure the pipe. The portion of the pipe running down the valley slope was placed on an approximately 3 m wide fill pad. Once the welded SWSP reached the lower intact portion of the original elephant trunk pipe (900 mm big O pipe), it was inserted into the big O pipe. The contractor then secured seven of the pipe elbows, as well as the insertion point of the SWSP into the CPP, with mounds of excavated clay. Lateral movements and vertical gaps under the SWSP were observed in the 2022 inspection. These issues were addressed with additional repair work conducted in 2023, consisting of: 1) Gaps in the upper steeper portion of the SWSP were filled. 2) The ground surface along the steeper lower portions of SWSP was shaped, lined with TRM, and installed synthetic ditch erosion barriers across swales installed on either side of the SWSP. 3) The trench backfill over the portion of the SWSP extending between the highway and the pipe vent was regraded, topsoiled, and seeded.		
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>	
		<b>Yes</b>	<b>No</b>
<input type="checkbox"/> Pavement		<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	There is continuing shallow and deep slide movement through the gully along which the Elephant Trunk was routed. Scarps continue to develop across the head of the gully, with additional scarps extending south towards the 2+500 slide.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	The four backslope slumps from Station 2+050 to about 2+280 continue showing creep movement and partial blocking the upslope ditch.		
<input checked="" type="checkbox"/> Erosion	Minor rills developed on the side slope below the SWSP second horizontal bend	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Some seepage noted on the side slope near the top of the backscarp.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	No signs of structural damage were noted in the new SWSP.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>	<input type="checkbox"/>

**Instrumentation:**

SI-30A installed near the Elephant Trunk at 2+300 and shows creep movement ranging from 0.4 mm/yr to 1.6 mm/yr at depth from 0.4 m to 21.8 m. The overall downslope movement has increased by up to 2.6 mm/yr since the fall 2023 readings.

SI-30B installed near the crest of the slope above the original Dunvegan Slide, near the head of the gully with the Elephant Trunk, shows ongoing creep movement ranging from 1.0 mm/yr to 9.3 mm/yr at 0.4 m to 17 m depth. The overall downslope movement has increased by up to 10 mm/yr since the fall 2021 readings.

**Assessment:**

Surficial soil at this location is very sensitive to moisture content and the rupture of the old elephant trunk resulted in all upslope drainage flowing into the head of the gully. This excessive water flowing in an uncontrolled manner had been soaking and eroding the valley slope which in turn resulted in accelerated slide movement.

Flow slide movement has expanded to the south, with the development of a scarp running between the Elephant Trunk and the 2+500 slide. The SWSP installed in 2020 can now transfer runoff from the east ditch of the highway down to the big O pipe section located on the flat ground below the valley slope, without leaking water onto the slope. This should continue to allow the slope to dry out a bit and should significantly reduce the amount of erosion and local slide movement rates compared to the condition prior to replacing the elephant trunk.

**Recommendations:**

The TRM lined swale north of the SWSP will be extended (as part of some ongoing hillside repairs at PH055 and PH037) about 30 m east to address local erosion occurring in this area.

In the future, if an opportunity presents itself, consideration should be given to improving the stability of the landslide mass using bio-engineering techniques such as live staking to vegetate the landslide mass to increase the roughness of the slopes, reduce runoff flow velocities and help dry the slope through evapotranspiration, thus decreasing the erosion potential and shallow slope failures.

This site should be inspected again in 2026.

## **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.  
Partner | Senior Geotechnical Engineer

José Pineda, P.Eng.  
Associate | Senior 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.

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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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- 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.

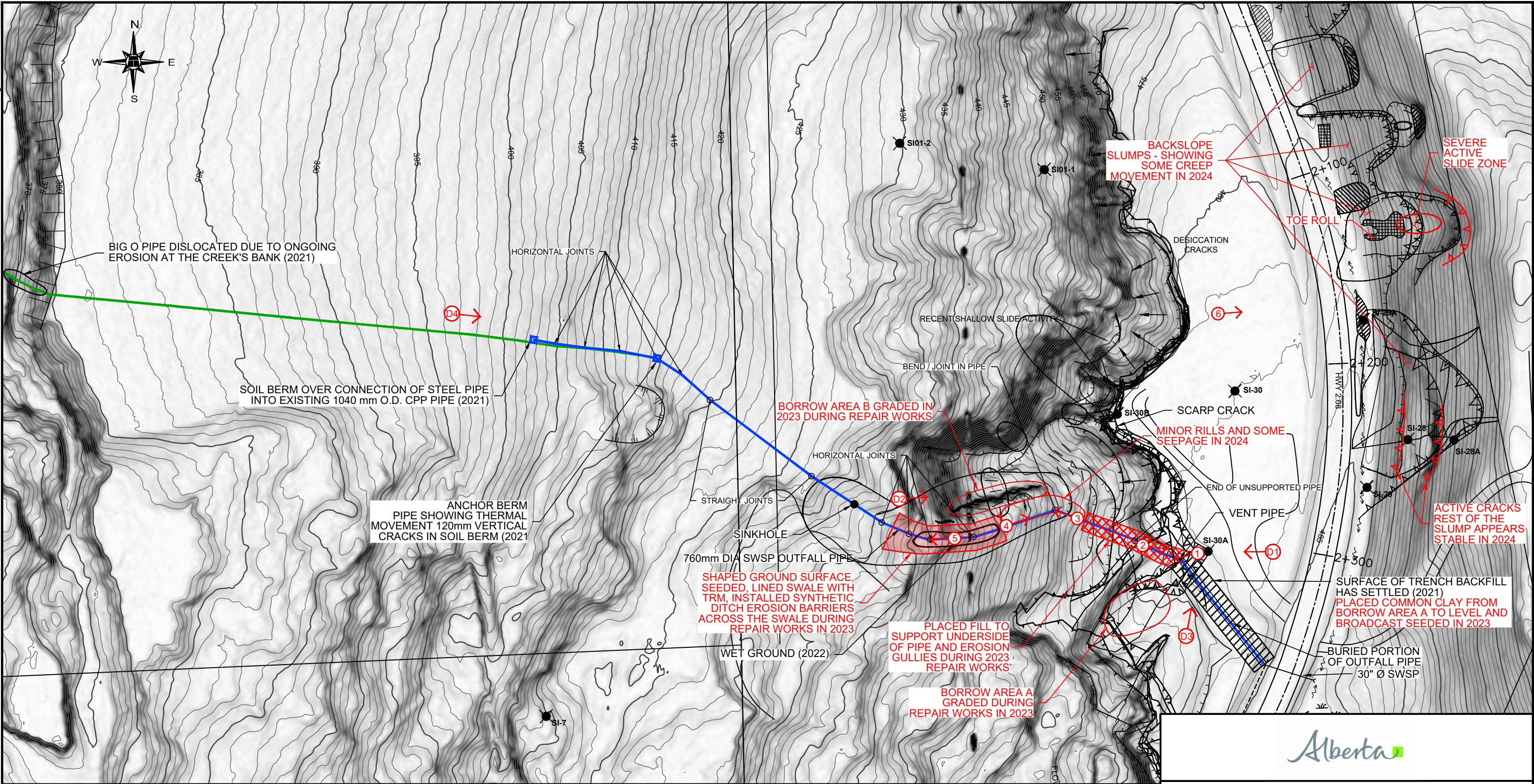
### 6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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.

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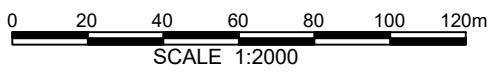
  
**PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)  
 PH036 DUNVEGAN SOUTH - ELEPHANT TRUNK**  
**2024 PH036 INSPECTION PLAN**  
**FIGURE 1**

**LEGEND**

	SLOPE INDICATOR
	SLOPE INDICATOR (INACTIVE/DESTROYED)
	DIRECTION AND NUMBER OF PHOTO
	LANDSLIDE SCARP 2018, 2019, 2021
	LANDSLIDE SCARP 2022

**NOTES:**

1. LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
2. MAY 24, 2024 OBSERVATIONS SHOWN IN RED



DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	DWP
SCALE	1:2000
DATE	OCTOBER 2024
FILE No.	32123

  
**THURBER ENGINEERING LTD.**





**Photo D1.**  
**Oblique drone view of elephant trunk on lower slope**



**Photo D2.**  
**Oblique drone view of elephant trunk on upper slope**





**Photo D3.**  
**Oblique drone view of backslope slumps**



**Photo D4.**  
**Oblique drone view of elephant trunk on lower slope**





**Photo 1. Looking northeast from Sta. 2+320 towards the Dunvegan Elephant Trunk consisting of a 760 mm diameter smooth wall steel pipe**



**Photo 2. Looking upslope at Elephant Trunk Pipe where fill was placed in 2023 to support the underside of pipe and erosion gullies.**





**Photo 3. Looking at graded Borrow Area B used during the 2023 repairs.**



**Photo 4. Minor Rills and some seepage noted in 2024**





**Photo 5. Looking downslope at SWSP middle bend where the ground surface shaped, seeded, and swales were lined with TRM and protected with geosynthetic ditch barriers.**



**Photo 6. Looking east at backslope slumps showing ongoing creep movement**