



**ALBERTA TRANSPORTATION GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – PEACE-HIGH LEVEL
2020 INSPECTION**

Site Number	Location	Name	Hwy	km
PH59	East Hill	34+770 to 35+680 Site 2	2:60	35.20
Legal Description		UTM Co-ordinates		
S28-083-21 W5M		11V E 484105	N 6231090	

	Date	PF	CF	Total
Previous Inspection:				
Site 2 Downslope	3-Jun-2019	10	5	50
Shallow slide 34+850	3-Jun-2019	9	4	36
Current Inspection:				
Site 2 Downslope	9-Jun-2020	10	5	50
Shallow slide 34+850	9-Jun-2020	9	4	36
Road WAADT:	4580		Year:	2019
Inspected By:	Ed Szmata, TRANS Rocky Wang, TRANS		Don Proudfoot, TEL Tyler Clay, TEL	
Report Attachments:	<input checked="" type="checkbox"/> Photographs		<input checked="" type="checkbox"/> Maintenance Items	
	<input checked="" type="checkbox"/> Plans			

Primary Site Issue:	Large landslide referred to as Site 2 (35+250) previously encompassed highway in the 1980s. The upslope area was mitigated by major crest unloading. The area below the road was mitigated by the construction of large berms. Area is still potentially unstable and has ongoing shallow and deep-seated movements. Shallow slide up to guardrail occurred in 2007 at 34+850.	
Dimensions:	Site 2 is 750 m wide; extends 300 m upslope of roadway to crest of valley and 350 m downslope of roadway to North Heart and Heart Rivers. Shallow slide at 34+850 is approximately 40 m wide and extends 25 m downslope.	
Maintenance:	No maintenance activity since 2011.	
Observations:	Description	Worsened?
<input type="checkbox"/> Pavement Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Shallow slump at 34+850 appears to have minor downslope movement within the displaced slide mass but no major retrogression of the main scarp or lateral expansion (Photo 59-01) with a minimum offset of approximately 0.8 m from the guardrail. Embankment at 35+250 immediately downslope of roadway appears in fair to good	<input type="checkbox"/>

	condition. Flank of scarp near 35+300 has no change from 2019 condition (Photo 59-03).	
<input checked="" type="checkbox"/> Erosion	<p>Erosion gully is active near 35+450, approximately 125 m downslope from highway (Photo 59-05). Overgrown erosion gully downstream of gabion culvert outlet near 35+500 has minor ongoing erosion/expansion at the flanks but no major retrogression since previous inspection (Photo 59-08).</p> <p>Active ditch erosion (up to 1.5 m deep) and associated gully erosion occurring at 35+100, 35+200, and 35+475 (Photo 59-06 and 59-09) from uncontrolled runoff from roadway ditch.</p> <p>Significant silt buildup was noted within ditch fences on the north side of the highway near 35+200.</p>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	Culvert at 35+100 and 35+480 under the highway corroded and the inlet is blocked (Photo 59-04 and 59-06).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Other	<p>Outlet drain pipe blocked in gabion discharge structure at 35+480. Slumping downslope of discharge structure is ongoing. Structure is in similar condition to previous inspection. (Photo 59-07)</p> <p>The slope above the road between 35+200 and 35+400 was under active construction and was being used as a borrow source area for nearby bridge construction (Photo 59-02).</p>	<input type="checkbox"/>
<p>Instrumentation:</p> <p>SI67 – No discernible movement</p> <p>SI69 – No discernible movement</p> <p>SI75 – No discernible movement</p> <p>SI81 – 1.2 mm/yr over 1.9 m to 6.1 m depth; and 1.9 mm/yr over 6.1 m to 9.2 m depth; consistent with past trends.</p> <p>SI82 – Sheared at 11.7 m below ground surface since Fall 2012 reading.</p> <p>Pneumatic piezometer PN-004 showed a decrease in groundwater level of 0.05 m since Fall</p>		



2019. Standpipe piezometer SP-003 showed an increase in groundwater level of 0.02 m. Standpipe piezometer SP-004 showed a decrease in groundwater level of 0.02 m. No change in previously measured trends.

Assessment:

Small deep-seated movements are occurring within fill embankment downslope of roadway (35+250) indicating low Factors of Safety. However, movements appear to have steadied and the acceleration observed approximately eight years ago (rates up to 30 mm/yr) has subsided. Measured rates of movement within two of the instruments below the road have averaged around approximately 2 mm/yr to 6 mm/yr the last several years. No movement has been measured within the SI upslope of the road at 35+200. Shallow slump at 34+850 appears to be only intermittently active and is not expanding significantly. Shallow slumping upslope of roadway is active but has limited potential to affect roadway at this time.

Erosion is very active and deep in the north ditch and within two major gullies south of the highway. Ditch should be regraded and armored. Culvert drainage should be restored. Current gullies do not present an immediate risk to the highway but consideration of adding a trunk drain to this section should be considered to reduce rate of retrogression.

The unloading of the upslope area above the highway between 35+150 to 35+400 is expected to help reduce the potential reactivation of the old landslide plane from the 1980s; however, careful attention to post construction details will be required (grading, establishing vegetation, directing drainage) to prevent creating new backslope stability, erosion and drainage problems within the disturbed soils and new slope profiles.

Recommendations:

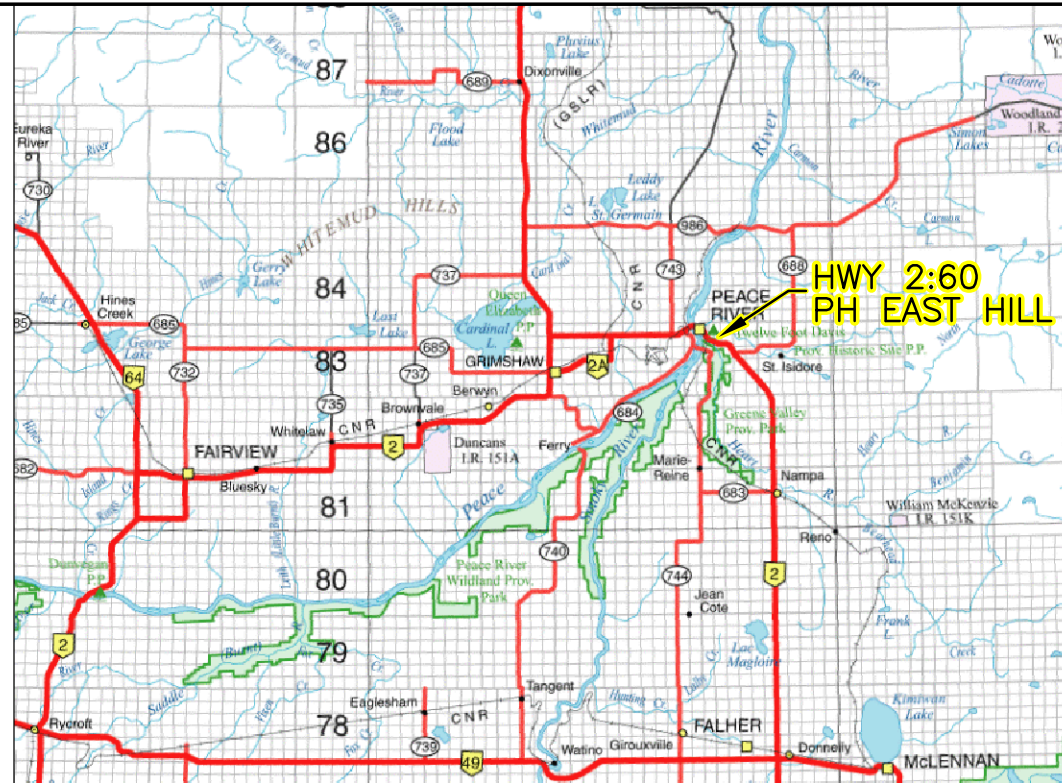
Cost

Drain pipe outlet needs to be cleared in gabion discharge structure at 35+480. Culvert at 35+480 under the highway needs to be repaired and north ditch regraded (using nearby borrow fill?) and armored with ECM or similar (from 35+275 to 35+650). Regrading of the slope or fill placement at 34+850 may be required in the future if the guardrail becomes undermined due to erosion or movement at the slide scarp.

\$50,000

Continue to monitor instruments twice yearly and undertake annual inspections.

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KEY MAP
SCALE 1:1 000 000

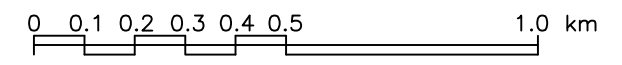
LEGEND:
PH59 EXTENT



PH59 34+770 TO 35+680
HWY 2

NOTES:

- 1 DRAWING MUST BE USED IN CONJUNCTION WITH THE ATTACHED REPORT REFERENCE 13351 DATED DECEMBER 2020 AND IS SUBJECT TO THE STATEMENT OF LIMITATIONS AND CONDITIONS INCLUDED IN THE REPORT.
- 2 AIR PHOTO BASE FROM TARIN RESOURCE SERVICES LTD. 0.4 m/PIXEL (2012).
- 3 CHAINAGE SHOWN ARE APPROXIMATE ONLY.



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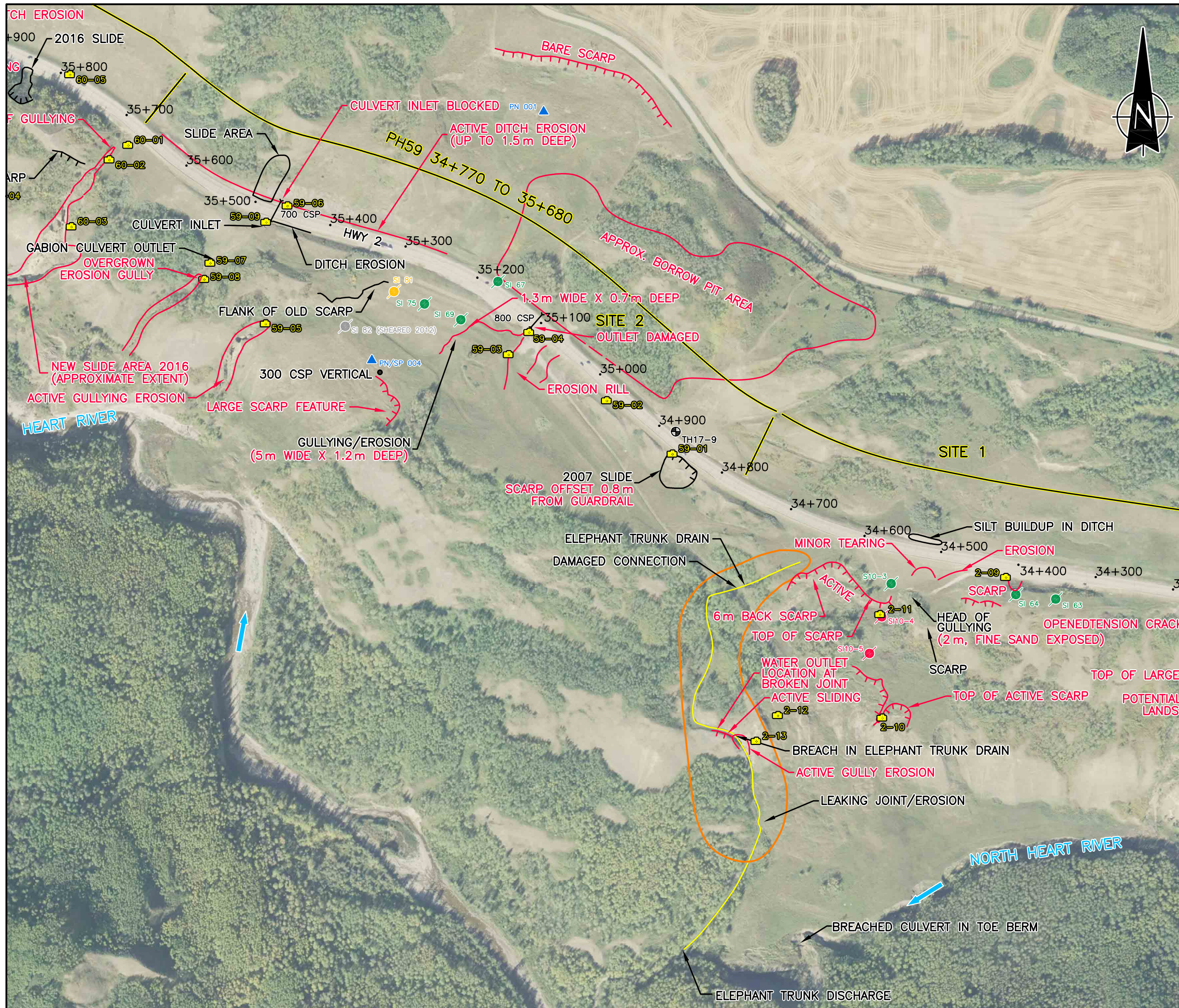
PEACE REGION (PEACE RIVER/HIGH LEVEL)

PEACE RIVER EAST HILL
HWY 2:60 (PH59)
KEY MAP

FIGURE PH59-1

DRAWN BY	ICB
DESIGNED BY	TTC
APPROVED BY	WCW
SCALE	1:15 000
DATE	DECEMBER 10, 2020
FILE No.	13351-C4A





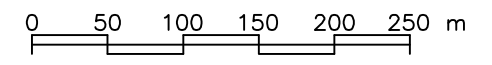
LEGEND:

- HORIZONTAL CHAINAGE (37+130 GROUARD BRIDGE) ● 34+900
- PHOTOGRAPH LOCATION 📷 40-01
- TEST HOLE LOCATION ⊕
- SLOPE INCLINOMETER
- NO MOVEMENT
- CREEP
- MEASURABLE MOVEMENT (OR RECENTLY SHEARED)
- PIEZOMETER
- PH59 EXTENT ———
- SLIDE ———
- DRAIN BOUNDARY ———



NOTES:

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- AIR BASE FROM TARIN RESOURCE SERVICES LTD. 0.4 m/PIXEL (2012).
- SLIDE FEATURES, PHOTOGRAPHS AND CHANIANGE ARE SHOWN APPROXIMATE ONLY.



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PEACE REGION (PEACE RIVER/HIGH LEVEL)

**PEACE RIVER EAST HILL
HWY 2:60 (PH59) STA. 34+770 TO 35+680
LOCATION PLAN**

FIGURE PH59-2

DRAWN BY	ICB
DESIGNED BY	TTC
APPROVED BY	WCW
SCALE	1:5000
DATE	DECEMBER 10, 2020
FILE No.	13351-C5A





Photo 59-01.
Looking east at headscarp area of shallow landslide on downslope side of roadway. Small downslope movement within displaced slide mass but no major expansion at the main scarp since 2009 (34+850).



Photo 59-02.
Looking northwest towards the slope above the highway that was excavated for borrow fill for other highway work (35+000).



Photo 59-03.
Looking west across
the berm below the
road embankment
(35+250).



Photo 59-04.
Looking at damaged
culvert outlet
(35+100).



Photo 59-05.
Looking downslope at head of the widest segment of an erosion gully approximately 125 m downslope (south) from the highway (35+450).



Photo 59-06.
Buried and blocked culvert inlet near 35+475. Significant north ditch erosion upslope and downslope of inlet (up to 1.5 m deep).



Photo 59-07.
Gabion culvert outlet structure (35+500) appears in similar condition to previous inspections.



Photo 59-08.
Overgrown erosion gully downstream of gabion culvert outlet near (35+500). Minor ongoing erosion/expansion at the flanks but no major retrogression since previous inspection.



Photo 59-09.
Looking east towards the south ditch erosion upslope from the culvert outlet that drains towards the river (35+500). No significant change from 2019.