



THURBER ENGINEERING LTD.

ALBERTA TRANSPORTATION LANDSLIDE RISK ASSESSMENT

SECTION A: GEOTECHNICAL FILE REVIEW

PEACE REGION - PEACE RIVER - HIGH LEVEL AREA

**SITE PH67: HWY 682:02 EAST HILL DITCH EROSION
(KM 13.8 TO KM 14.1)**

Highway Control Section:	HWY 682:02
Nearest Landmark	West of Fairview, AB
Legal Location:	SE35/NW36-81-5-W6M
Date of Initial Observation:	2007
Date of Last Inspection:	June 2015
Last Inspected By:	Thurber Engineering Ltd. (Thurber)
Instruments Installed:	None
Instruments Operational:	N/A
Risk Assessment:	PF(12) x CF(3) = 36
Last Updated:	Thurber Engineering Ltd., March 2016
Previous Update:	N/A



1. LOCATION

The subject site is located along Highway 682:02 between km 13.8 and 14.1 east of Hines Creek Bridge, west of Fairview, AB. The site location is shown on Figure PH67-1, attached for insertion in Section G.

2. GENERAL DESCRIPTION OF SLOPE INSTABILITY

The slope instabilities at this site consist of significant erosion in the north ditch, which originated from a culvert outlet near the top of the east hill of Hines Creek. A large erosion scour hole and associated erosion is present below/around the culvert outlet. The ditch erosion is about 330 m long, and up to 4 m deep and 8 m wide and has encroached into the edge of the highway shoulder at a couple locations. There are also a couple of north highway embankment slumps.

Since 2014, it appears a dip across the highway near the sag pond is getting worse, and suggests that a landslide is developing at this location.

3. GEOLOGICAL/GEOTECHNICAL CONDITIONS

Physiographic Region: Located in the Peace River Lowland (Atkinson, N. and Lyster, S., 2010).

Bedrock Geology: Consists of Upper Cretaceous age deposits: predominantly Dunvegan Formation consisting of light grey to yellow-grey sandstone interbedded with laminated siltstone and dark grey clay shale. (Bedrock Geology of Alberta, ERCB/AGS, 2013).

Surficial Geology: The area along the flanks of the valleys consists of slump/colluvium deposits consisting of mixed glacial and bedrock materials. The plateau areas consist of glaciolacustrine deposits consisting of laminated to massive fine sand, silt and clay (Surficial Geology of Alberta, ERCB/AGS, 2013).

Hydrogeology: Local groundwater and surface water flow is expected to be towards Hines Creek. Regional groundwater flow is towards the Peace River, located approximately 16 km to the west of the site (Hydrogeological Map Clear Hills – Chinchaga River Alberta, ARC, 1972).

Stratigraphy: No stratigraphy is currently available at the site.



4. CHRONOLOGY

2007

The 2007 annual inspection carried out by Thurber for PH15 indicated the presence of ditch erosion between km 13.8 and km 14.1 originating from a culvert outlet. A large erosion scour hole is present below the culvert outlet. The erosion is about 2 m wide and 4 m deep.

2009

Thurber's 2009 annual inspection indicated that riprap had been placed in the scour bowl, a portion of the backslope was flattened, and ditch erosion was backfilled (but not armoured) in 2007. The erosion within the ditch was noted to be deeper and wider than in 2007. The location of a sag pond was noted to the west of the culvert. The sag pond was noted to be eroding into the highway surface up to the white line. Cracking and spalling of the north shoulder was observed. Active erosion was observed along the north ditch of the highway.

2010 - 2012

Thurber's 2010 and 2011 annual inspections indicated continued erosion in the north ditch. Thurber's 2012 annual inspection indicated the ditch erosion had increased in width to almost 3 m. A dip in the highway at the location of the cracking and spalling was observed.

2013 and 2014

Thurber's 2013 inspection indicated that heavy spring runoff this year significantly increased the south ditch erosion. Within a month, the maintenance contractor as part of emergency measures, filled the eroded ditch and rebuilt the two eroded paved shoulder areas with pitrun gravel. However, it was not properly compacted, and subsequent runoff had already begun eroding through the recently placed loose gravel backfill.

In 2014, another heavy spring runoff occurred, and caused significantly more severe erosion than previously observed along the north ditch and below the culvert outlet, depositing the pitrun gravel at the west end of the ditch where the gradient flattens out. The north ditch erosion now extends into the 9m clear zone almost the entire way (generally between 3m to 6m from the white line), and at the sag pond (where there is a dip/crack in the highway) it had bitten into the north highway shoulder inside the white line at a couple locations (~14 m and ~18 m long). As part of maintenance repairs, some large riprap pieces were also added beyond the culvert outlet in 2014, however they are diverting flow into the highway embankment and causing erosion at this location.



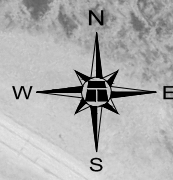
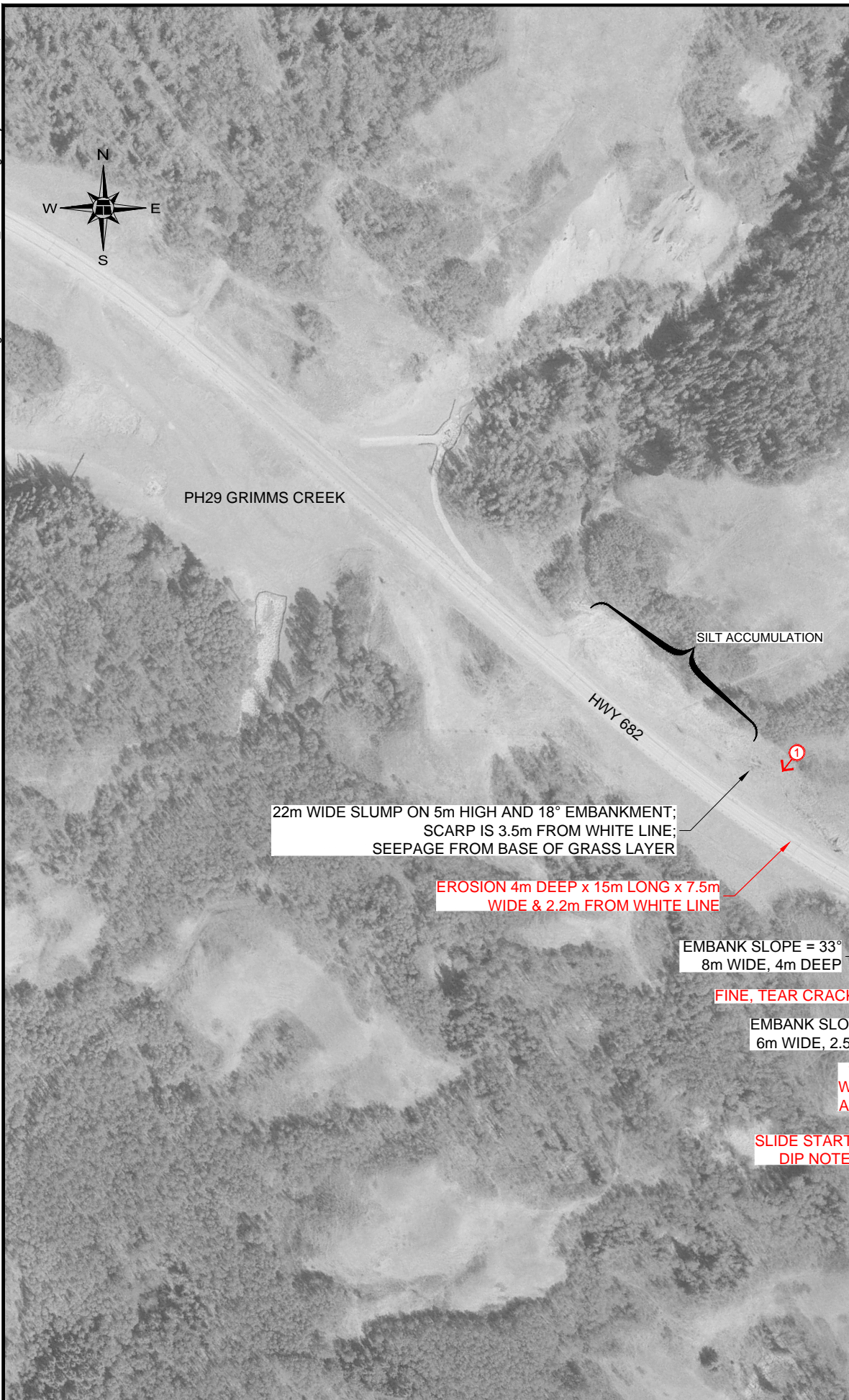
2015

Thurber's 2015 inspection indicated that the ditch erosion (now up to 8 m wide and 4 m deep), and the north highway shoulder/embankment slumps, have gotten worse. The dip and crack in the eastbound lane of the highway opposite the sag pond (first observed in 2014) has gotten worse, suggesting that a landslide is developing in the south sideslope at this location, moving southwards.



REFERENCES

1. Atkinson, N. and Lyster, S., 2010. "Bedrock Topography of Alberta, Canada," ERCB/AGS Map 50, scale 1:1,500,000.
2. Prior, G.J., Hathway, B., Glombick, P.M., Pana, D.I., Banks, C.J., Hay, D.C., Schneider, C.L., Grobe, M., Elgr, R. and Weiss, J.A., 2013. "Bedrock Geology of Alberta." ERCB/AGS Map 600, scale 1:1,000,000.
3. Fenton, M.M., Waters, E.J., Pawley, S.M., Atkinson, N., Utting, D.J. and McKay, K., 2013. "Surficial Geology of Alberta." ERCB/AGS Map 601, scale 1:1,000,000.
4. Alberta Research Council, 1972. "Hydrogeological Map Clear Hills – Chinchaga River Alberta."



PH29 GRIMMS CREEK

SILT ACCUMULATION

HWY 682

22m WIDE SLUMP ON 5m HIGH AND 18° EMBANKMENT;
SCARP IS 3.5m FROM WHITE LINE;
SEEPAGE FROM BASE OF GRASS LAYER

EROSION 4m DEEP x 15m LONG x 7.5m
WIDE & 2.2m FROM WHITE LINE

EMBANK SLOPE = 33°
8m WIDE, 4m DEEP

FINE, TEAR CRACKS

EMBANK SLOPE = 33°
6m WIDE, 2.5m DEEP

11m LONG, 100mm
WIDE OPEN CRACK
ALONG WHITE LINE

SLIDE STARTING ON SOUTH SIDE.
DIP NOTED ACROSS HIGHWAY

OVERLAND FLOW EROSION BESIDE CULVERT OUTLET
IN EMBANKMENT (5m WIDE x 4m HIGH)
- PITRUN IN SIDESLOPE & DITCH BOTTOM IS ERODING &
SLUMPING LEAVING THE SIDESLOPE TOO STEEP
OPPOSITE THE CULVERT.
-10 LARGE RIPRAP ADDED BELOW CULVERT OUTLET

FRESH, 2m HIGH BACKSLOPE
SCARP ALONG BUSH LINE,
DUE TO DITCH EROSION

EROSION SCARP IN
SIDESLOPE 0.7m FROM
WHITE LINE

20m LONG, ACP PATCH (ON
NORTH HALF OF WESTBOUND
LANE) HAS DROPPED 50mm, AND
IS SETTLING / SHIFTING TOWARDS
DITCH (CRACKS IN PATCH)

3.0m WIDE,
0.6m DEEP

2.1m WIDE,
1.0m DEEP

1.5m WIDE,
0.7m DEEP

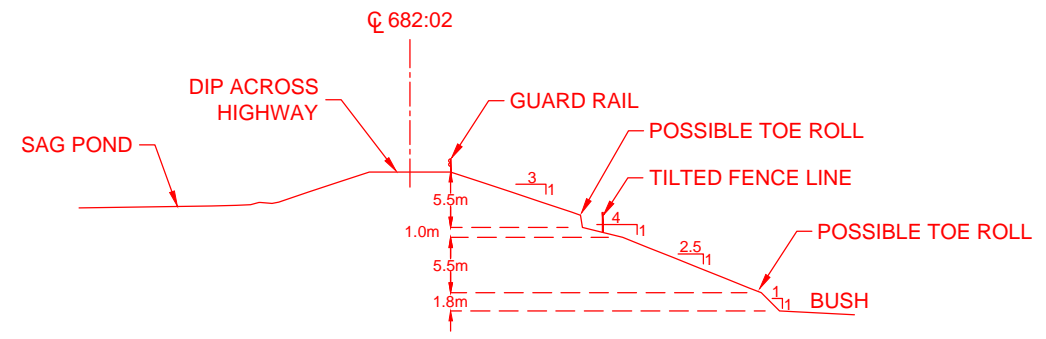
EROSION ENCROACHING
WITHIN 0.8m OF WHITE LINE

PATCH IN WESTBOUND LANE

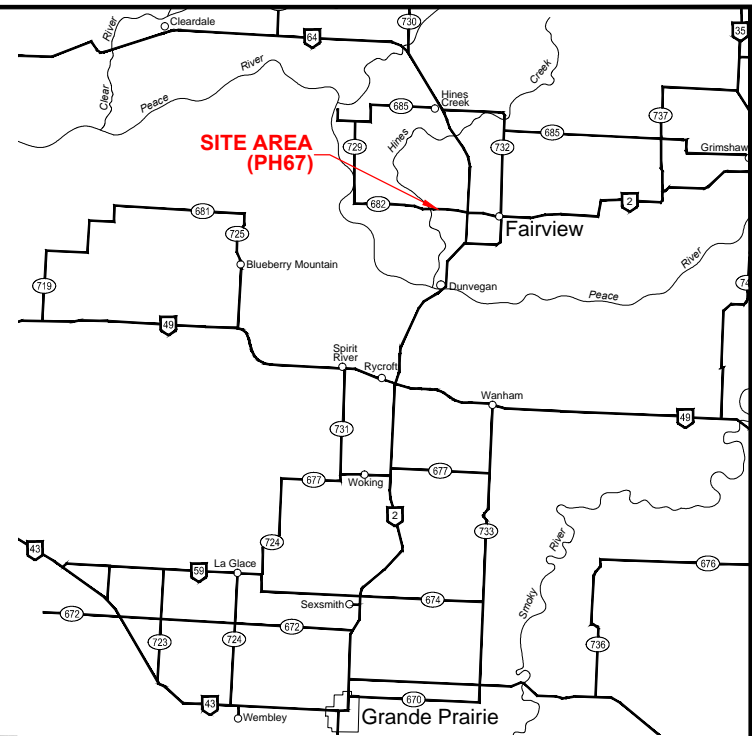
6m EROSION GULLY
IN DITCH - HITS NEW
RIPRAP & GETS
DEFLECTED INTO
SIDESLOPE &
ERODES IT

600mm Ø CULVERT
AT km 14.1

5m LONG CRACK 0.8m
OUTSIDE WHITE LINE



CROSS-SECTION A-A'
SCALE APPROX. 1:750



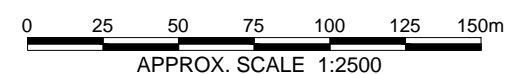
KEY PLAN
SCALE 1:1 500 000

LEGEND

← ① APPROXIMATE DIRECTION
OF PHOTO TAKEN

NOTES

1. JUNE 8, 2015 OBSERVATIONS SHOWN IN RED
2. EROSION WAS WORSE IN 2015.
3. LAPRAIRIE PERFORMED SOME GRADING & PITRUN ADDITION IN MAY 2013 (~\$12 000).
4. A SEMI-CONTINUOUS 60mm WIDE CRACK EXISTS ALL ALONG THE CENTRE OF THE WEST BOUND LANE.



BASE AIR PHOTO TAKEN IN MAY, 2010



**PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH67 HWY 682:02 - HINES CREEK**

2015 PH67 INSPECTION PLAN

FIGURE PH67-1

DRAWN BY	KLW
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	APPROX. 1:2500
DATE	JUNE 8, 2015
FILE No.	15-16-361

