



January 18, 2008

File: 15-85-72

Alberta Infrastructure and Transportation
Room 301, Provincial Building
9621 - 96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Ed Szmata

**PEACE REGION (PEACE RIVER – HIGH LEVEL AREA)
GEOHAZARD ASSESSMENT
HWY 35:20, SITE PH 49, INDIAN CABINS FROST HEAVES
2007 ANNUAL INSPECTION REPORT**

Dear Sir:

This letter documents the 2007 annual site inspection of Indian Cabins Sites A and B, located on Hwy 35:20 approximately 0.5 and 8.7 km north of the north approach to Indian Cabins Cam, respectively. The inspection was undertaken by Thurber Engineering Ltd. (Thurber) in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE049/2004) with Alberta Infrastructure and Transportation (INFTRA). The inspection was undertaken on April 11, 2007 by Mr. Don Proudfoot P. Eng., and Mr. Gustavo Padros, M.Sc. of Thurber along with Mr. Ed Szmata, and Mr. Roger Skirrow, P.Eng. of INFTRA. This date was selected so that the site could be visited under frozen conditions.

1. BACKGROUND

Two locations (designated Sites A and B) have been subjected to frost heaves in previous years. In Site A, located about 500 m north of Indian Cabins, a 1 m to 1.5 m thick gravel wedge was placed in 2000 to raise the highway. Site B, located about 8.7 km north of Indian Cabins, is a typical location of frost heave activity along this highway where a gravel wedge has not been placed yet. Both sites have experienced cracks on the roadway and required patches in the past.

2. SITE OBSERVATIONS

2.1 Observations at Site A

Our observations of the site are shown on the attached site sketch plan Figure PH49-1 and photos.

Site A had a length of about 200 m. The highway surface had a relatively smooth profile with slight dips at the south and north ends of the site. Several longitudinal cracks were noted on the highway surface on the southern 100 m of the site. Most of these cracks had been previously patched in the past but they had cracked open again and increased their length.

At about the center of Site A, a creek crosses underneath the highway through a culvert. The highway at that location had an ACP patch, extending about 25 m to the south and 50 m to the north of the culvert. The hole noted in the 2006 site visit, located about 3.5 m south of the culvert, had been backfilled and sealed. However, the transverse crack extending from the hole towards the road shoulders still existed and had increased its width to about 10 mm. This transverse crack has a differential drop about 30 mm at the shoulders of the highway.

A slight increase in width and length was noted on the transverse cracks located south of the culvert, through the ACP patch mentioned above. The cracks were 1 m to 2 m long and were located at 2 m to 5 m intervals, as is illustrated on Figure PH49-1. The roadway along the northern 50 m of the site had a wavy surface.

At the time of the 2007 site visit, the surroundings of the highway were covered with snow. However, ponded water was observed on both sides of the highway embankment during the 2006 site visit. A shallow creek flowed under the highway through a 900 mm diameter, smooth-wall steel culvert. The culvert outlet was submerged and could not be inspected. However, settlement around the outlet was noticed.

2.2 Observations at Site B

About 300 m of highway were inspected during the site reconnaissance. At the time of the 2007 site visit, the surroundings of the highway were covered with snow. Observations are shown on the attached sketch plan, Figure PH49-2. Selected photographs of the site taken on April 11, 2007 are also attached.

The highway showed a greater number of longitudinal and transverse cracks since the 2006 site visit, and the previously existing cracks appeared to have increased

their width and length since last year. Due to this, the inspected length of Site B was increased from about 100 m in 2006 to 300 m in 2007.

The pronounced dip located south of the culvert, did not appear to have increased its height since the 2006 site visit. However, new transverse cracks about 2 m long were noticed on the ACP patch, as illustrated on Figure PH49-2. The maximum drop on the roadway ranged from 200 mm to 400 mm at the east and west shoulders, respectively. During the May 2006 site visit, a dip with standing water was observed at that location on both sides of the highway. Ponded water at both ends of the culvert was also observed during the 2006 site visit.

Many previously sealed cracks located north and south of the culvert were noticed to have opened again, as well as old longitudinal construction joints on the pavement, which appeared to be cracking open.

3. ASSESSMENT

As previously mentioned in our 2006 site report, the inspected highway sections appear to be subjected to frost heave. The cold weather and high water levels needed for frost heave are certainly present on site, but the existence of frost susceptible materials needs to be investigated. Long term secondary compression of peat that could be present under the highway is another possible source of observed settlement especially at Site B.

4. RECOMMENDATIONS

A return trip to the site should be carried out in winter to survey the extent of frost heaving and to conduct test pits along the sides of the highway with a large track hoe to investigate subsurface conditions at each site. Three test pits should be excavated on each side of the highway at each site. The walls of the test pits should be inspected for the presence of ice lenses and moisture content profiles and grain size analyses should be conducted.

Potential solutions consist of improving drainage through the use of deep muskeg ditches and better definition of the creek bed channels. Consideration could also be given to excavating frost susceptible peat and soils from Site B and replacing them with non-frost susceptible soil or installing a geocomposite tied to subdrains below the highway to act as a capillary break and cover it with rigid insulation to limit frost penetration. Since these measures could be quite expensive perhaps a test section could be developed prior to widespread application. Highway, ditch and creek profiles should be carried out extending at least 500 m in each direction from each site to assist in the design and the test section should be monitored over a few years to assess the effectiveness.

5. CLOSURE

We trust that the above information is sufficient for your present requirements. However, if you have any questions or require any additional input please do not hesitate to call us.

Yours very truly,
Thurber Engineering Ltd.
Don Proudfoot, P.Eng.
Review Principal

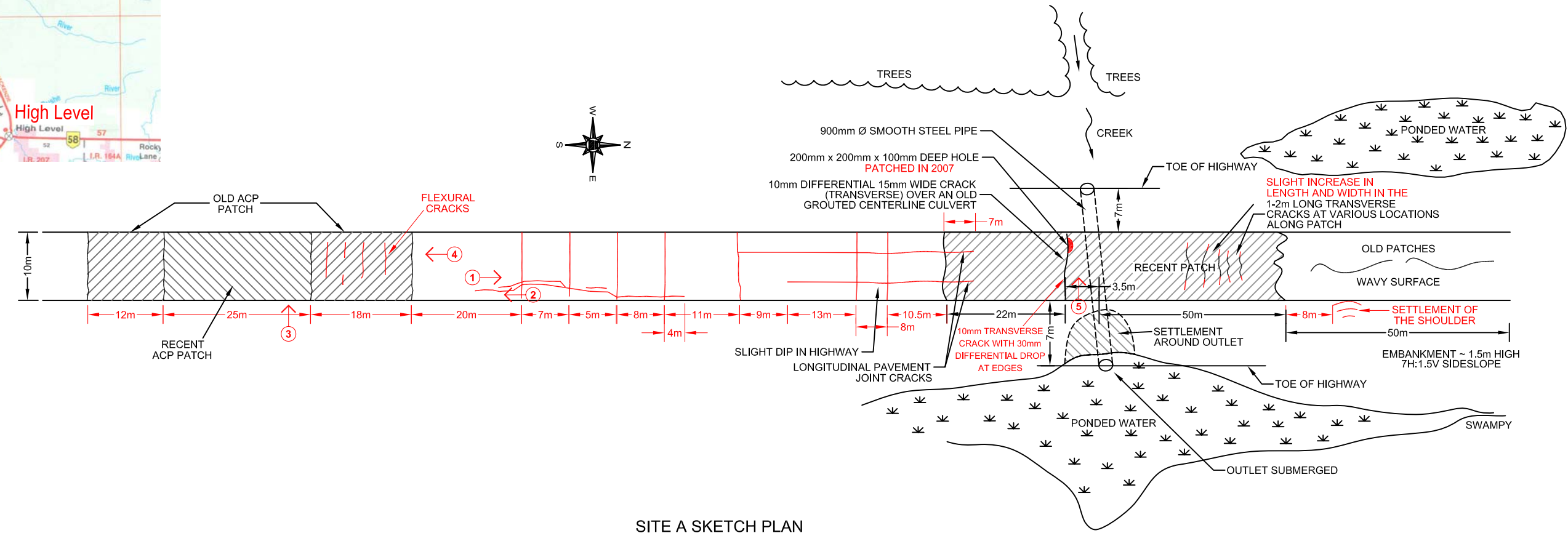
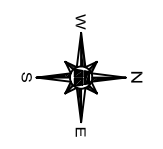
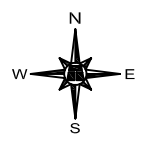


Gustavo Padros, M. Sc.
Project Coordinator
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Attachments

cc: Mr. Roger Skirrow, P.Eng.
Geotechnical Director, Alberta Infrastructure and Transportation

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SITE A SKETCH PLAN
N.T.S.

LEGEND

① → PHOTO AND DIRECTION

MAY 2007 OBSERVATIONS SHOWN IN RED

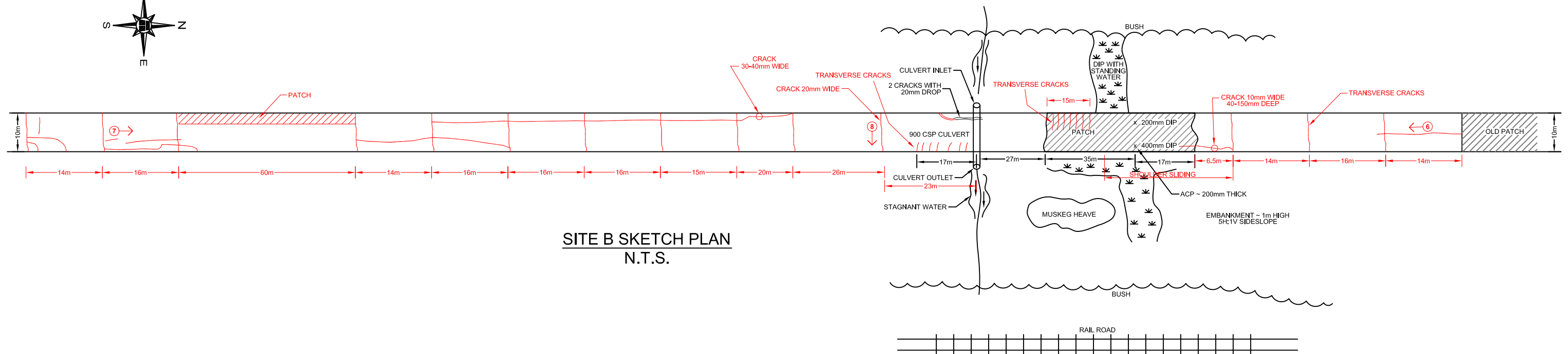
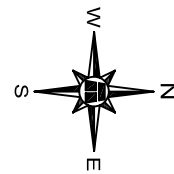
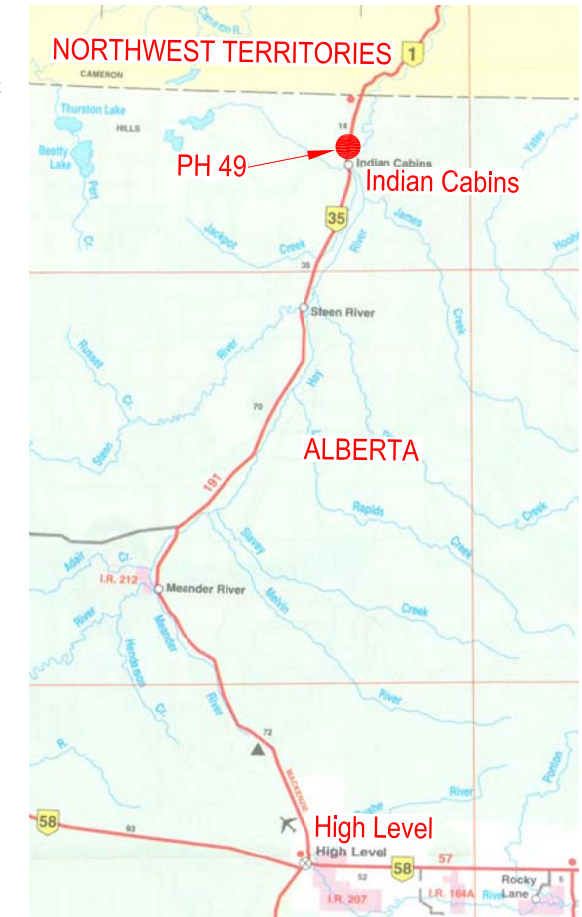
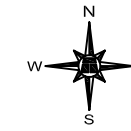
NOTE

SITE WAS COVERED IN SNOW, EXCEPT FOR HIGHWAY SURFACE.

FIGURE PH49-1
PH49 : HWY35 SITE A, 0.5 Km NORTH OF INDIAN CABINS
PEACE REGION (PEACE RIVER / HIGH LEVEL)
GEOHAZARD ASSESSMENTS

DATE : MAY 2007
THURBER PROJECT # 15-85-72





SITE B SKETCH PLAN
N.T.S.

LEGEND

- ① → PHOTO AND DIRECTION
- MAY 2007 OBSERVATIONS SHOWN IN RED

NOTE

SITE WAS COVERED IN SNOW, EXCEPT FOR HIGHWAY SURFACE.

FIGURE PH49-2
PH49 : HWY35 SITE B, 8.7 Km NORTH OF INDIAN CABINS
PEACE REGION (PEACE RIVER / HIGH LEVEL)
GEOHAZARD ASSESSMENTS

DATE : MAY 2007
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Photo 1 - Graben type crack at Site A.



Photo 2 - View of ACP patches at south end of Site A, looking south.



Photo 3 - Overlay 300 mm thick in ACP patch in Site A.



Photo 4 - Flexural cracks in old ACP patch at south end of Site A, looking south.



Photo 5 - Transverse crack above culvert in Site A, looking west.



Photo 6 - Looking south from north end of Site B.



Photo 7 - Looking north from south end of Site B.



Photo 8 - Transverse crack 20 mm wide in Site B.