Alberta Transportation

Attention:  Mr. Ed Szmata
Sr. Construction Technologist

Re:  Peace Region (Grande Prairie) GeoHazard Assessment
(GP 6b)  Hwy 40:36 Sheep Creek – Railway Track Embankment
AT  Regional Geotechnical Contract 106/08
-  Part B – Annual Site Inspection (Slide Tour) Report

In compliance with requirements of the captioned Contract, an annual site inspection of the site was carried out and a report (for 2008 year) is provided with this letter.


1.0  BACKGROUND

As noted in our 2006 Slide Tour Report:

The movement of this steep 2H:1V embankment is considered a deterioration of fill at its sidehill footprint due to adverse influence of high groundwater seepage causing a softening of rocky fill (likely clayshale) materials. The movements are considered of creep (possible lateral spreading) nature of a steep embankment slope. The presence of tension cracks persisted at regular intervals along outside shoulder of pavement because of periodic slow movements of the steep embankment slope apparently in response to adverse episodes of seasonally groundwater recharges. It is believed that high piezometric pressures were invoking movements along the slide plane along the fill footprint.

From observation of this site over past 10 years, the movements are considered slow and highway serviceability can be maintained by pavement patching.

2.0  INSTRUMENTATION INTERPRETATION UPDATE

The details of current (2008) instrumentation results were provided in our 2007 Fall Cycle Instrumentation Report. No obvious changes are noted in comparison with our 2007 interpretation which indicated the followings:

The movement of this steep embankment can be assessed at 7-10m depth range along the outside shoulder of this steep sidehill embankment. Cause of movement should be the deterioration of fill at its sidehill footprint due to adverse influence of high groundwater.
seepage causing a softening of materials as well as internal erosion of fines within the fills.

3.0 OBSERVATIONS

3.1 CURRENT (2008) OBSERVATIONS

The conditions of the site can be noted from the attached 2008 site photos.

- The site conditions was observed to have not deteriorated from that observed in previous year.

3.2 PREVIOUS OBSERVATIONS

As noted in our 2007 report, the site condition has not changed dramatically in comparison with earlier observations which indicated the followings:

- Headscarp cracking of pavement has persisted and cris-crossed highway centreline to backslope ditch.
- Tension cracks has persisted along the guardrail along outside shoulder edge of slope.
- A buried utility line was recently (2005/2006) installed along edge of R/W in-between the railway line and the toe of this highway embankment.
- The movement of this steep embankment is considered a deterioration of fill at its sidehill footprint due to adverse influence of high groundwater and seepage causing a softening of materials. The movements are considered of creep (possible lateral spreading) nature for a steep embankment slope.

3.0 RISK ASSESSMENT

The following assessment is updated, as appropriate, from previous AIT reports.

\[ \text{PF (8)} \times \text{CF (4)} = 32 \]

PF = 8

- Active with moderate rate of movement
- The rocky fill (likely clayshale) used for this embankment, though more tolerant to movements, may have deteriorated under high groundwater seepage conditions

CF = 4

- Partial closure of roadway can be possible in event of mobilization of severe movement

Note:
- The risk assessment is provided based on a categorization of Hazard Probability Factor (PF) and Consequence Factor (CF) as provided by AIT’s RFP 2000. The details are provided in Table II at front portion of this Report.
4.0 COMMENT and ACTION

As site conditions has not changed much, our previous comments are still applicable.

- From observation of this site over past 10 years, the movement rates are considered slow and highway serviceability can be maintained by pavement patching.
- As the site distress is highly influenced by adverse groundwater level and the steep 2H:1V construction of this sidehill fill embankment, it was discussed in our 2007 report that consideration can be given to the design options of
  - Sub-surface drain (open-excavation to about 4m depth) along the backslope ditch maybe one feasible option to lower the high groundwater level.
  - Horizon drains to be drilled in from the toe area can be another option to lower the high groundwater influence.
- In the event of future deteriorate of site, the feasibility of the above drainage measure will be further re-visited with AT if appropriate.
- Visual and instrumentation monitoring should be continued.

5.0 CLOSURE

We appreciate the opportunity to provide the above information. Should you require further information, please contact the undersigned.

Karl Li, P.Eng.
Senior Geotechnical Engineer

cc. Roger Skirrow, P.Eng. AIT Twin Atria

Attachment
- Site Photos