PART B: 2002 SITE VISIT
LANDSLIDE RISK ASSESSMENT
PEACE REGION (PEACE RIVER VALLEY/HIGH LEVEL)

SITE PH12: JUDAH HILL

LEGAL LOCATION: 83-21-W5M

Location along Highway: Station 57+050 to 57+250: Debris Slides #1 through #4
Station 57+550: Debris Slide #6
Station 57+700: Slide #1 in Zone D2
Station 57+800 to 58+000: slide in Zone D1
Station 58+200: Debris Slide #5
Station 59+000: settlement of uphill lane of road, Zone B1
Station 59+500: slump of backslope
Station 59+600: slide at CNR crossing

AT FILE: H744:04

Date of Site Visit: 8 May 2002

The Judah Hill Road approaches the Town of Peace River from the south. As it descends from prairie level it follows a spur between the Heart River and the Peace River. The valley of the Peace River is 220 m deep at this location. Judah Hill includes sites along a 2.5 km section of road. Instabilities have been reported along Judah Hill Road since it was paved in 1984. Cracks were noticed at the crossing of the CNR track soon after, and a landslide developed in the following years. The road was stabilized with an anchored caisson wall and a toe berm.

More recently, a number of instabilities were reactivated following two years of high precipitation in 1996 and 1997. Among these are a number of debris slides. The scarps of the debris slides had widths ranging from 10 m to 30 m. The valley walls are very steep, such that material that detached slid a long distance.

The slides at Zones D1 and D2 (Slide #1) occurred in an old failure bowl, where the road was on fill. The thickness of fill below the road appears to have been relatively small (possibly 4 m at Slide #1).

Station 57+050 to 57+250: Debris Slides #1 through #4

No movement observed. Water appears to collect in the roadside ditch. It is recommended that the grade of the ditch be improved.

Station 57+550: Debris Slide #6

No movement observed at the stabilized slope, good vegetation cover.

Station 57+700: Slide #1 in Zone D2

Significant Observations

In 2000, a crack was observed in the road at the location of the scarp of the slide, which had been stabilized in 1999. The crack was approximately 25 mm wide, and there was very little settlement. This year there may have been minor additional movement.

Changes from Previous Visits

The crack in the road may have widened slightly. No significant movement was observed since 2001 (Photo 1).

Discussion

The crack may be a consequence of the settlement of the fill (clay fill and tire shreds), surficial slope movement of the steep slope leading up to the road or more extensive slide movement. It appears most likely that it is a consequence of settlement of the fill.

Assessment

PF(9) * CF(3) = **27.** A crack has formed, so there is some movement. The road could probably be detoured around the slide, if necessary.

Recommendations

It is recommended that the crack be monitored, it should be infilled as required. At present the nature of the movement is not known (settlement, shallow slope movement or more extensive slide movement), more time is required to clarify this. A slope inclinometer could be installed in the slope a short distance downhill of the crack to clarify the nature of the movement.

Station 58+200: new slide North of Zone D2

At Station 58+200, cracks and settlement of the pavement have developed. This was noted in 2001, but was more pronounced this year. The settlement and the crack appear to indicate a slide that is developing. This is the location of an old debris flow (Debris Flow #5).

Significant Observations

- At the location of the settlement, the slope below the road is very steep (35 degrees) and approximately 25 m high.
- A debris flow had originated from the slope several years ago. The scarp of the debris flow is approximately 10 m wide and is a few metres below the road surface (Photos 2 & 3).
- At the base of the slope is a slide that has moved parallel with the road. The slide is in the order of 25 m wide and 50 m long (Photo 2).

- The debris flow and the slide were inspected by AMEC in 1998. At the time these features appeared recent. It is suspected that they had formed in 1996 or 1997, two years with high precipitation in the Peace River area.
- A crack runs diagonally across the road and could be traced in the downhill gravel shoulder to the scarp of the debris flow (Photos 4 & 5). An extension of this crack that would define the remainder of the main scarp of a slide was not observed.
- The road has settled in the order of 50 mm.

Changes from Previous Visits

Minor settlement of the road was observed in 2001. This year the settlement was more pronounced. Cracks could be traced in the gravel shoulder, suggesting recent movement.

Discussion

It appears that a slide is developing. Beyond the settlement of the road and the cracks, there is no other surface expression. The slopes along Judah Hill are very steep (in the order of 35 degrees) and the soils consist mostly of lacustrine clays and clay tills. Some of these are pre-sheared. Thus, a small change, for instance in pore water pressures, can trigger slope instability.

Assessment

Risk Assessment
PF(10) * CF(6) = **60**. This appears to be an active slide. If significant movement occurs, the road would need to be closed, because there is no space for a detour.

Recommendations

It is recommended that the nature of the slope be investigated. It is recommended that two or three slope inclinometers be installed in the slide (two by the road and one at the base) to determine the depth of movement.

Station 59+000: settlement of uphill lane of road, Zone B1

Cracks and depressions of the pavement have been observed on the downhill side of the road for many years. The cracks and depression of the pavement extended over a length of 250 m.

In 1988, stone columns were installed in the downhill side of the road. To reduce erosion of the slopes, a curb was installed at the downhill side of the road and drains were installed that channelled the water to the ditch at the uphill side of the road. Also in 1988, a geomembrane liner was installed in the uphill ditch to reduce percolation of water into the slope.

In 1998, a seepage interceptor ditch was installed in the ditch at the uphill side of the road and a French drain was installed uphill of the road. The interceptor ditch reached to a depth of 2.5 m. It was lined on the downhill side with a geomembrane.

Photo 6 presents a photograph of settlement of the uphill lane of the road at Zone B1. The settlement is accentuated by stone columns that were installed in this area in 1988.

Station 59+600: slide at railway crossing

In 1984, cracks were observed in the road at the CNR crossing. The railway track also experienced movement. In the following years, a number of remedial measures were implemented as movement continued. In 1984, CNR constructed a pile wall. In addition, the railway grade was shifted several metres to the west and the road crossing was shifted to the south of the original crossing. In 1985, a toe berm was constructed by CNR and in 1987 horizontal drains were installed. In 1987, a portion of the toe berm failed. In 1988, a pile wall was constructed by AT below the road. It is uncertain whether the wall reached to the rupture surface. Later when movement continued; anchors, pumped wells and additional piles were installed to stabilize the road.

The pile wall appears to be performing well. Slope inclinometers have been covered when the road was overlayed in 1999. It may be possible to uncover them. The catch basin for the elephant trunk that conveys water from the uphill ditch is silted up and needs to be cleared out. It appears that the pumps are not in working order.

Recommendations

Considerable repairs were undertaken at this site in the past. There is some uncertainty regarding the performance of the wells and the impact this may have on the stability of the wall and the slide. It is recommended that the performance of the wall be monitored. Apparently, slope inclinometers were present uphill of the wall, but they have been covered with asphalt. It is recommended that the existing slope inclinometers be read if possible or that new slope inclinometers be installed.