Site 36 – Junction Hill Retaining Walls

This site is located approximately 1.4 km west (northbound) from the junction between Highways 40, 541 and 940 at Highwood House. There are two vertical retaining walls at this site:

- An approximately 6 to 7 m high and 70 m long wall above the highway.
- An approximately 8 m high and 50 m long wall below the highway.

It appears that both walls are "reinforced earth" style walls, with a series of metal retaining straps connected to the concrete face panels and extending into the backfill behind the wall.

The wall above the highway appears to be off-vertical and tilted towards the highway. Vertical retaining walls are often constructed with a slight batter back from the road in order to offset an optical illusion that they are actually tilting outwards, however as shown in Photos 1 and 2, there is a distinct visual impression that the face of this wall is tilted towards the highway. It is possible that any such tilting occurred during or shortly after construction of the wall as the shear resistance along the retaining straps was first mobilized.

Gully erosion due to surface runoff was noted in the slope immediately east of the retaining wall above the road (Photo 3). This erosion has deposited soil into the ditch along the north side of the road. Due to the very low ditch gradient along the ditch in this area, the accumulated soil has partially blocked a culvert at the east end of the retaining wall above the road (Photos 4 and 5).

The retaining wall below the road (Photos 6 and 7) appeared to be vertical and in good condition.

AMEC recommends the following Risk Level factors for this site using AIT's general geohazard frequency-severity matrix:

- Probability Factor of 5 based on the moderate level of uncertainty regarding the possible tilting of the retaining wall above the road.

- Consequence Factor of 3 based on the potential for closure of one lane of the road if either of the retaining walls were to fail.

Therefore, the recommended Risk Level for this site is 15. If further investigation of the possible active tilting of the retaining wall above the road finds that the wall is not moving, then the Probability Factor could be reduced to 1 or 2 and the Risk Level would be reduced correspondingly.

If AIT wishes to further investigate the possible active tilting of the retaining wall above the road, AMEC recommends:

1. Using a plumb bob to determine if the wall face is off vertical, and if so measure the horizontal offset of the top of the wall relative to the toe. This survey could be done after this segment of the highway re-opens on June 15, 2006 and then repeated in the fall of 2006 in order to check if the tilting is ongoing.

The following options could be used to provide a greater level of monitoring if required in the future:

1. Establishing survey targets on the wall face and tracking their position over time in order to see if the wall face is moving or tilting outwards. This form of monitoring should only be undertaken if millimeter scale accuracy and precision can be achieved with the survey methods used.

2. Install tiltmeter(s) at one or more locations on the wall face.

Photo 1 (top) – July 2005 – Facing west along the eastern end of the retaining wall above the road. The maximum height of this wall was approximately 6 to 7 m. There is a distinct visual appearance that this wall is leaning outwards. However, it is not known if any tilting of the wall towards the road occurred during or shortly after construction as the retaining strips behind the wall were loaded for the first time or if ongoing tilting of the wall is occurring.

Photo 2 (middle) – July 2005 – Another view of the retaining wall above the road showing the central portion and west end of the wall.

Photo 3 (bottom) – July 2005 – Gully erosion due to surface runoff on the slope above the road, immediately east of the retaining wall above the road. The eroded soil has been deposited in the ditch at the toe of the slope and partially blocked the culvert shown in Photos 4 and 5.

Photo 4 (top) – July 2005 – Inlet of the culvert adjacent to the east end of the wall and largely blocked by soil deposited in the ditch below an erosion area on the slope above the road (just east of the retaining wall and as shown on Photo 3).

Photo 5 (middle) – July 2005 – Ponded water and soft ground in the ditch adjacent to the east end of the wall above the road. The ditch gradient in this area has effectively been lost due to cattle traffic that has reworked and softened the ground.

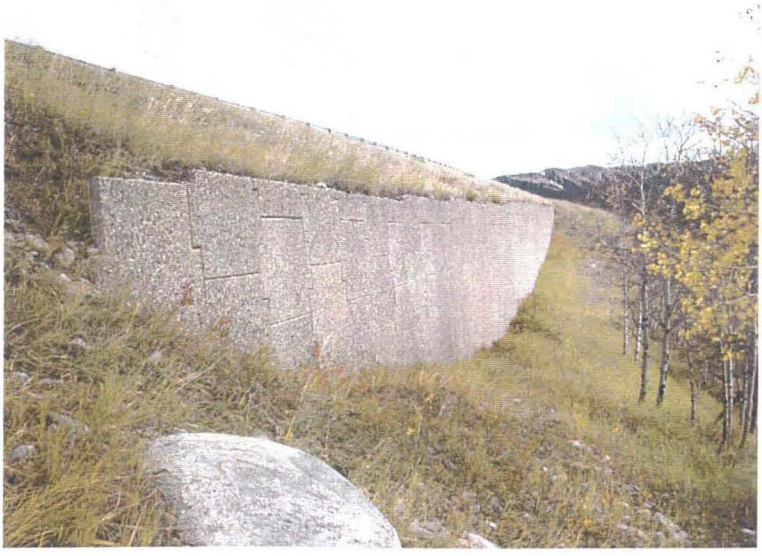

Photo 6 (bottom) – September 2005 – Facing east across the retaining wall below the road. The maximum height of this wall is approximatel 8 m.

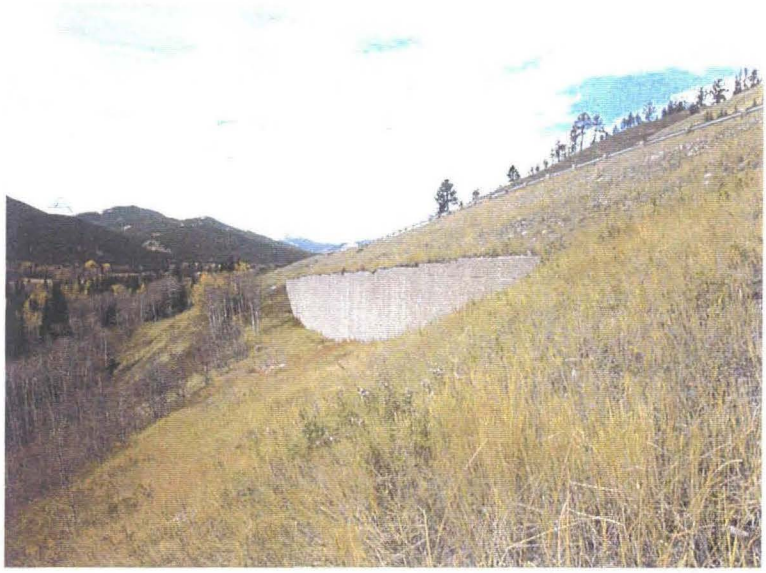

Photo 7 (top) – September 2005 – Facing west across the retaining wall below the road.