4.9 S10 – HIGHWAY 762 S10(C)

Background

Site C is located on Secondary Highway 762, approximately 22 km south of the junction with Highway 22X (as measured along the highway) and approximately 550 m north of the junction with Secondary Highway 549. The highway crosses over a small creek at this site with the creek flow conveyed by a culvert.

Annual assessments were performed at this site by AIT and AMEC personnel from 2000 to 2005. AMEC also inspected the site during a call-out request by AIT on June 21, 2005 (prior to the 2005 annual inspection). An annual inspection was not performed at this site in 2005.

There is limited background information available regarding this site prior to the 2000 inspection. Minor settlement and cracking of the road surface was noted at this site during the 2000 to 2004 inspections and weak foundation materials below the road embankment were postulated as the cause. An overlay was placed at this site in July 2003. It was also noted that the west ditch would pond water during wetter times of the year and required regrading to re-establish drainage towards the culvert at the creek crossing.

During the 2005 inspection some relatively more significant cracking and settlement of the road surface was noted along an approximately 15 m long segment of the northbound lane roughly 45 m north of the culvert. It appeared that the cracking had developed during or following the heavy rains during late June 2005. The road surface had not been critically damaged at that point, however further settlement would likely have necessitated a reduced speed limit. Some significant erosion was also noted in the west ditch, south/upgradient of the culvert inlet and was attributed to flash-flood level runoff during the June 2005 rains.

The road surface was repaired with an overlay at some point after the 2005 inspection. The site was not inspected during 2006 therefore there is no record of the extent of the 2005 overlay nor any subsequent cracking.

Site Assessment

The site assessment was performed on June 18, 2007. The weather at the time of the site assessment was partly cloudy and there had been a rain shower at the site a few minutes before the inspection started.

The site assessment covered the road surface through the Site C area as well as the areas around the inlet and outlet of the culvert below the road.

Observations

The following points summarize the observations made during the site assessment. Please also refer to Appendix S10 for a location plan of the site along with annotated photographs.

- An overlay had recently been applied on the northbound lane around an area approximately 10 to 15 m north from the culvert below the road. The overlay appeared to be several inches thick in some locations. Photos S10(C)-2 and 4 show typical views of the recent overlay area. The location of the overlay likely corresponds to the cracking area noted in the 2005 inspection (see Photo S10(C)-1) that was roughly 45 m north of the culvert.

- As shown in Photo S10(C)-3, the accumulated thickness of the recent and previous overlays on the northbound lane have created a steep slope (greater than 45°) along the east shoulder. Portions of this slope are in the order of 1.3 m high.

- A sinkhole was noted in the road embankment slope above the culvert inlet. Photo S10(C)-5 shows the sinkhole. This sinkhole developed after the 2005 inspection. At the time of the 2007 inspection, the sinkhole was in the order of 1 to 1.3 m wide at surface and very approximately 0.75 to 1 m deep.

- Based on the water levels at the culvert inlet (west side) and outlet (east side) at the time of the inspection, the elevation of the culvert outlet is roughly 0.3 to 0.4 m lower than the inlet. It is not clear if this elevation difference reflects the actual gradient of the culvert as installed, or is due to localized settlement around the culvert outlet. Photos S10(C)-5 and 6 show views of the culvert inlet and outlet, respectively.

Discussion

Based on its location, the recent overlay was likely placed to repair settlement and cracking of the road surface that was similar to that noted in the 2005 inspection and shown on Photo S10(C)-1. However, because the site was not inspected in 2006 or prior to the recent overlay, this is no information to confirm the extent and magnitude of the cracking.

The erosion damage in the west ditch from the peak flows during the June 2005 rains has not been repaired. It does not appear to have destabilized the road fill embankment to date.

The cause of the sinkhole that has developed in the west slope of the road embankment above the culvert inlet is not clear. It may be the result of some of the road embankment fill eroding and piping away through loose backfill around the culvert or even through hole in the culvert.

As noted in previous reports, the ponding of water in the west ditch is unfavourable from a geotechnical perspective because it provides a source of water that could contribute to instability of the road fill embankment and/or the road foundation.

Assessment and Risk Level

There appear to be two separate geotechnical risks to the highway at this site:

- The settlement and cracking of the road surface approximately 10 to 15 m north of the culvert.

- The sinkhole in the embankment slope above the culvert inlet.

The settlement and cracking of the road surface appears to be the more significant risk at present.

AMEC recommends the following Risk Level factors for the settlement and cracking of the road surface:

- The Probability Factor should be set at 9 to reflect the active settlement and cracking in the northbound lane that has necessitated the recent overlay and the current uncertainty regarding the movement rate and extent. This is unchanged from the 2005 assessment.

- The Consequence Factor should be set at 3 based on a judgment that continued settlement of the northbound lane can be treated as a maintenance issue and will likely not require partial closure of the road. If additional settlement of the northbound lane occurs it may be necessary to increase the recommended Consequence Factor.

Therefore, the recommended Risk Level for this site is 27, which is the same as recommended in the 2005 assessment.

Recommendations

AMEC recommends the following work for this site:

AMEC personnel should make a visual inspection of this site in conjunction with the Fall 2007 instrument readings at the nearby S8 – Fisher Creek site. The purpose of this visual inspection would be to:

- Check for any cracking and settlement of the road surface developing in the area of the recent overlay.
- Comparing any such damage to the damage noted during the 2005 inspection.
- Checking the condition of the sinkhole above the culvert inlet.

The information from this inspection can be used to clarify and revise the Risk Level for this site and determine if repair measures are required.

The sinkhole in the west embankment slope above the culvert inlet should be overexcavated in order to check its depth and extent and to investigate whether or not it was caused by embankment soil piping into the culvert via a hole or separation in the

culvert. This work could likely be done by an excavator working from the road surface and care would need to be taken to shape the excavation so as to not destabilize the southbound lane of the road. It would be appropriate for AIT to instruct the maintenance contractor to perform this work with an AMEC representative on site to make observations of the excavation and sinkhole conditions. The excavation would need to be backfilled with good quality and compacted backfill material.

Drainage improvements should be made in the west ditch, north of the culvert crossing. As discussed during previous site inspections, the most practical option appears to be the installation of a perforated drain pipe in a trench along the base of the existing ditch. The drain should flow to the south. A site survey will be required in order to design the trench excavation and specify the drain details.