ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
NORTH CENTRAL REGION – ATHABASCA DISTRICT
2020 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
NC097	Fort McMurray	Parsons Road Overpass/Hwy 63	686:20	
Legal Description		**UTM Co-ordinates (NAD 83)**		
SW7-90-9-W4		12V N 6,293,600	E 473,700	

	Date	PF	CF	Total
Previous Inspection:	May 22, 2019	7	3	21 (Landslide basis)
Current Inspection:	June 25, 2020	7	3	21 (Landslide basis)
Road AADT:	3,910		**Year:**	2019
Inspected By:	José Pineda, Tarek Abdelaziz (Thurber) Arthur Kavulok, Roger Skirrow (AT)			
Report Attachments:	☑ Photographs	☑ Plans		☑ Maintenance Items

Primary Site Issue:	A crack formed across both traffic directions along the top of the Parsons Road overpass (BF85178) between the intersection of the west approach slab and pavement, ~6 m west of the west abutment; 10 to 40 mm dip within the west approach slab.	
Dimensions:	The crack varied from 30 to 60 mm wide, between 250 to 450 mm deep and was about 26 m long (extending completely across all lanes in both traffic directions).	
Date of any remediation:	This overpass was constructed in 2016.	
Site History:	Based on information provided by Alberta Transportation and an examination of the as-built drawings, weak soil overlying limestone bedrock existed at this overpass location. An instrumented test fill was built at the east headslope, supported on a wick drain perforated foundation soil. Based on the performance of that test fill it was determined that in order to meet the construction schedule demands the weak soils had to be completely excavated from the west headslope area (up to 7 m in depth), and the portion of the east headslope not covered by the instrumented test fill (up to 5 m in depth). Engineered fill, mainly consisting of clay shale, was placed to restore the grades, and then the headslope fills were constructed overtop original grade level (up to 13 m in height). The west headslope fill was built with geogrid reinforcement clay shale. An extensive instrumentation program consisting of slope inclinometers, piezometers and settlement cells were installed to monitor construction activities, control fill placement rates, and provide post construction information. Thurber is currently monitoring these instruments as part of the GRMP geohazards contract. The latest readings were undertaken in May 2020.	
Maintenance:	Crack sealing.	
Observations:	**Description**	**Worse?**
☑ Pavement Distress	A 30 to 90 mm wide x ≤ 0.4 m deep x 26 m long crack formed through the pavement along the edge of the west approach slab, about 6 m west of the west abutment. Fatigue cracking extended about 0.3 m west of the crack, where the pavement was slightly higher than it was east of the crack (WB lanes somewhat worse than EB lanes).	☐

☐ Slope Movement		☐
☑ Erosion	Erosion along south face of the fill slope adjacent to the west wingwall and headwall slope, caused by runoff from the end of the southwest drain trough.	☐
☐ Seepage		☐
☑ Bridge/Culvert Distress	Cracks observed between the interfaces of both the north and south drain troughs and wingwalls (30 to 40 mm wide); about 60 mm vertical separation of the sheet metal parging on the west abutment; 70 to 100 mm of headslope settlement along the faces of the wingwalls	☐
☐ Other		☐

See Attached Sketch (Figure 2) Showing Instrument Locations.
Selected Instrumentation Near & South of Crack: SI14-05=2.7mm/yr@5-9m; Settlement since previous readings at Settlement Cells SC14-09=9mm; SC15-04=35mm; Groundwater levels at PZ15-03=Dry at 2.5m; PZ15-04=8 m; PZ15-05=Grnd Level; PZ15-06=3m.
Selected Instrumentation Near & North of Crack: SI15-14= no discernable movement; SI15-03=3mm/yr@3-14m; SI15-17=4mm/yr@2-11m; SI15-19=3mm/yr@6-15m; Settlement since previous readings at Settlement Cells SC14-12=8mm; SC15-06=19mm; SC15-07=23mm; SC15-09=0mm; PZ14-20=4.3m; PZ15-09=Dry at 2.5m; PZ15-07=Grnd Level; PZ15-25=4.6m; PZ15-24=5.3m; PZ15-23=3.2m; PZ15-21=5.8m; PZ15-11=1.3m above ground.

Observations and Assessment:

The site conditions did not change significantly since last year.

The site observations and instrumentation monitoring results indicate progressive settlement and creep movement of the west approach headslope fill. The movement has resulted in the formation of existing crack along west edge of approach slab and the 10 to 40 mm dip within the slab. The existing crack and dip continued to create a rough ride to motorists.

The movement will likely continue to occur for a few years and the situation may get worse with time. If a void exists below the approach slab, it may get bigger in size with time and additional differential settlement may impact the integrity of the slab. Furthermore, surface water infiltration into the open crack will likely saturate and soften the high plastic approach fill, resulting in further softening of subgrade below the slab and may eventually impact the stability the slope.

Minor erosion was also noted within the south side slope to the west of the drain trough. Runoff from the end of the drain trough has also created minor erosion along the south headslope by the south wingwall. It appears that runoff does not flow through along the gravel filled geocell channel due to insufficient channel cross-sectional depth (it is almost flat). The eroded surfaces are not currently severe and are in the order of 0.2 m wide and < 0.2 m deep. However, severe erosion may occur within the side slope and headslope if erosion issues are not dealt with in the near future.

Recommendations:

Maintenance:

The local MCI should periodically monitor the crack and measure the crack widths/depths at the five locations shown on Figure 1, attached. The bridge abutments/headslopes/approach fills should also be monitored for any signs of new or additional movements or settlements.

Consideration should be given for coring through the concrete slab (a minimum one hole along each of the traffic directions), to confirm whether a void exists beneath the slab at the crack location. Any voids identified within the slab should be filled with flowable grout.

It is recommended to sawcut a 600 mm strip of pavement (starting from the western edge of the approach slab) for the full depth of the crack. The exposed surfaces be cleared of any loose material and filled with ACP across both EBL and WBL (26m long). Asphalt should be extended far enough into the slab footprint to improve/smoothen existing dip near the end of the bridge. The gaps between drain troughs and wingwalls should also be filled with grout.

Once the crack is repaired and grade re-established, it will be important to routinely inspect and monitor the performance of the repair area. A history of the future crack development and any sort of maintenance (including future re-sealing of open cracks and placement of ACP patch) should be recorded.

A few sandbags should be placed along the east edge of the southwest concrete drain trough and runoff channel to divert surface runoff from going eastwards down the slope. The sandbags should extend at least 5 m southwards along the channel, or until the point where the existing channel has sufficient cross-sectional depth to carry the flow. The eroded section of the slope immediately to the west of the gully should be repaired though excavating all loose material (no deeper than the underside of the trough) and re-building this area using clay to match adjacent grade. This could be considered as a temporary measure to re-establish flow along the channel and reduce future erosion issues.

Short Term:

If the cracking becomes more severe or continues to get worse, a structural engineer should be called to examine the location and severity of the cracking, so that the structural integrity of the constructed overpass works is not threatened.

Ball Park Cost $15,000 to $20,000.

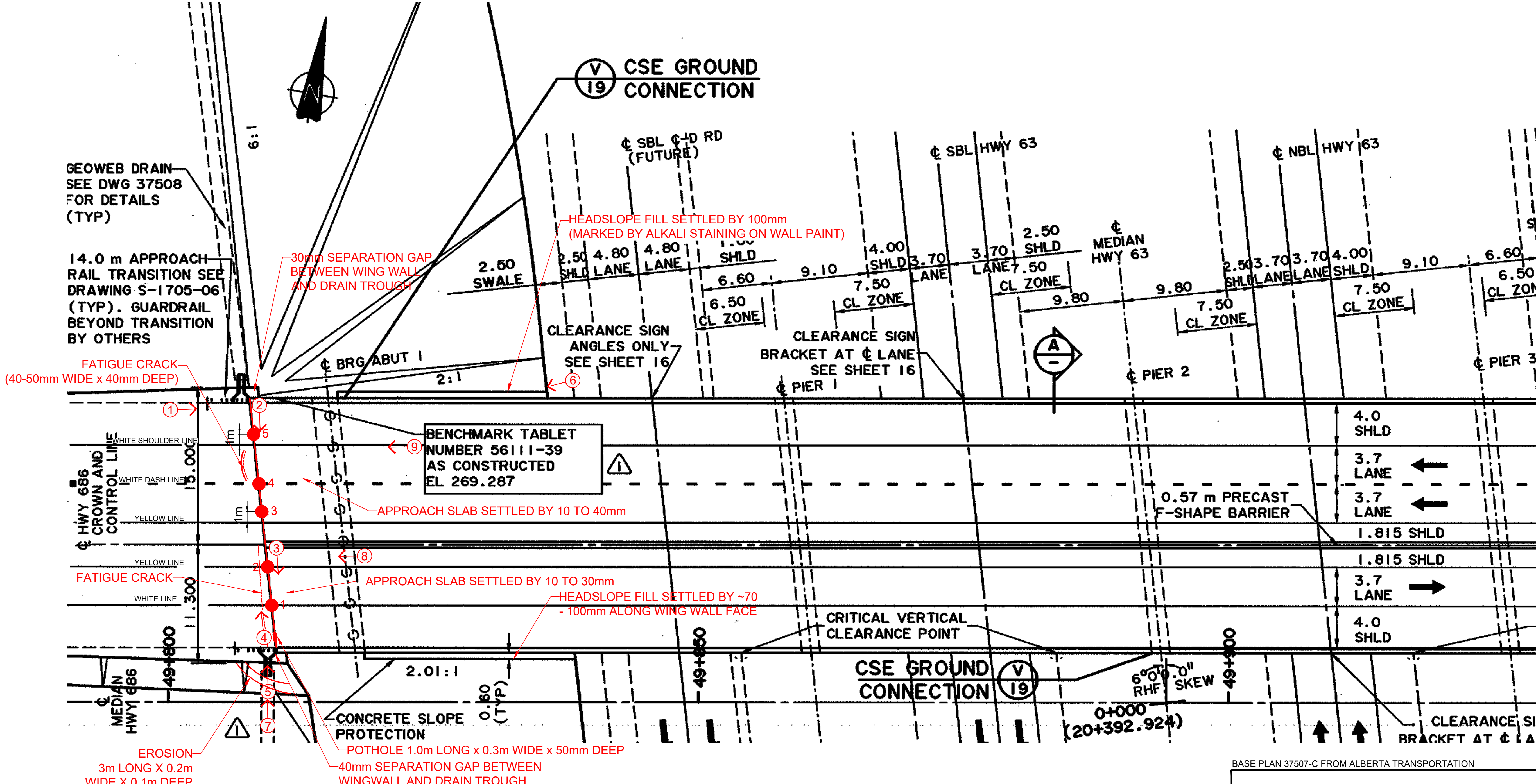
Medium to Long Term:

If the sandbags are not effective at re-directing the flow southwards along the gravel filled geocell channel, the medium-term recommendation is to remove the upper approximate 5 m reach of the existing gravel/geocell extending from the end of the drain trough. This portion of the channel area should then be properly graded to re-establish a sufficient cross-sectional geometry size to carry surface runoff, and then relined with new geocell and gravel infilling.

Ball Park Cost $25,000 to $30,000.

If the cracking/settlement continues and becomes a structural or safety concern, reconstruction of the west approach apron/fill area in proximity to the crack may be required.

Ball Park Cost VARIABLE, depending on methodology.



BASE PLAN 37507-C FROM ALBERTA TRANSPORTATION

LEGEND

- ● CRACK MEASUREMENT LOCATION
- — CRACK LOCATION
- ① PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION

CRACK LOCATION	MAY 22, 2019 WIDTH (mm)	MAY 22, 2019 DEPTH (mm)	JUNE 25, 2020 WIDTH (mm)	JUNE 25, 2020 DEPTH * (mm)	JUNE 25, 2020 DROP (mm)
1	30	265	30	240	10
2	41	330	50	340	30
3	30	295	90	230	30
4	58	320	60	260	40
5	42	455	50	400	10

* SAND AND SALT WERE NOTED WITHIN BOTTOM OF CRACK.

0 5 10 15 20 25m

SCALE 1:400

NOTE:
JUNE 25, 2020 SITE OBSERVATIONS ARE SHOWN IN RED.

Alberta

HWY 686 (PARSONS ROAD OVERPASS) / HWY 63

2020 SITE INSPECTION PLAN

FIGURE 1

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	TSA
SCALE	1:400
DATE	AUGUST 2020
FILE No.	13357

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Photo 1 – Looking east at the bridge westbound lanes. The crack is across both traffic lane directions and has formed between the approach slab and the pavement, about 6 m west of the west abutment fingerplate.

Photo 2 – Looking south at the crack across the westbound lanes towards the median. Note the ~0.3 m wide fatigue cracking on the west (higher) side of the crack. The crack is 40 to 50 mm wide x 40 m deep.

Photo 3 – Looking south across the eastbound lanes. Note the fatigue cracks along the west (higher) side of the main crack.

Photo 4 – Looking north across the eastbound lanes.

Photo 5 – Looking at the south drain trough. Note the cracking between the drain trough and concrete wingwall.

Photo 6 – Looking at the north face of the north wingwall and side slope above the west abutment. Note the fill settlement averages ~100 mm marked by the alkali staining on the paint.

Photo 7 – Looking north at the erosion formed along the south wingwall and side slope at drain trough location

Photo 8 – Looking west at bump on the eastbound lanes. The approach slab settled by 10 to 30mm.

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Photo 9 – Looking west at bump on the westbound lanes. The approach slab settled by 10 to 40mm.