PEACE RIVER / HIGH LEVEL AREA

2011 CALLOUT INSPECTION



THURBER ENGINEERING LTD. GEOTECHNICAL = ENVIRONMENTAL = MATERIALS

Site Number	Location	۱	Name		Hwy	km				
PH47	West of I	Deadwood, AB	Deadwood	Slide	690:02	Approx. 2.2				
Legal Description	on		UTM Co-ordinates							
SW1/4 28-89-23	-W5M		11V N 6	289120	E 462	E 462789				
		Date	PF	CF	Total					
Previous Inspe	ction:	June 06, 2011	13	3	3	9				
Current Inspec	tion:	August 2, 2011	14 3		42					
Road AADT:		80		2010						
Inspected By:		(Don Proudfoot (Roger Skirrow	, Thurber E and Erwin k	ngineering) (urz, Alberta	Transportatio	n)				
Report Attachments:		Photograph	Maintenance Items							

	1							
Primary Site Issue:	Slope movement affecting highway							
Dimensions:	See drawing							
Date of any remediation:	None in the last year							
Maintenance:	ACP patch (August 2008)	Worsened?						
Observations	Description	Yes	No					
Pavement Distress	Crack widening and vertical drop in asphalt pavement since June 2011 inspection.	Z						
Slope Movement	Slow creep movement causing cracks in pavement	Z						
Erosion								
Seepage								
Bridge/Culvert Distress								
Cother								

Instrumentation:

Two slope inclinometers were installed by J.R. Paine. Slope movement of about 10 mm is recorded between March and May 2011 at depths of about 9 m and 7 m in SI-10-1 and SI-10-2 respectively. The SI plots provided by J.R. Paine are attached with this report.

- **Assessment** (Refer to Figure PH47-1):
 - As recommended during our 2010 assessment, geotechnical investigation was _ undertaken by J.R. Paine which involved drilling five test holes. Two slope inclinometers, three standpipe piezometers and a pneumatic piezometer were also installed as part of the investigation. The test hole logs are attached with this report. The approximate locations of the test holes and SI's are shown on Figures 47-1 and PH47-2. A stratigraphic cross-section is provided on Figure 47-3.
 - The soil conditions as shown in the test hole logs indicate presence of clay fill, overlying clay/clay till followed by clay shale.
 - The slip surface of the slide is based in the shale.

- The slope failure appears to be the result of toe erosion caused by the creek located immediately south of the highway leading to over-steeping of the slope. It is expected that, if left untreated, slow creep movements will continue. Heavy rainfall in July 2011 has triggered the additional movement and it is understood from Alberta Transportation that the slide movement rate increased on July 26, 2011, following a period of heavy rain.
- The pavement cracks have opened up to about 30 mm wide and vertical drops of about 100 mm.

Recommendations:

Three options have been identified as possible long term solutions.

The first option would involve the installation of a 1500 mm diameter CSP culvert along the toe of the slide, which would prevent further creek erosion of the toe of the slope. In addition to the culvert installation, a toe berm would be constructed and the slide mass re-graded to a flatter uniform slope in order to re-establish slope stability. A DFO authorization would be required to carry out this option.

The second solution would be based on the use of a pile wall to stabilize the highway side slope. Drilled, reinforced concrete piles would likely be needed to stabilize the slide. As the slide appears to be greater than 5 m to 6 m deep, tie-back anchors might also be needed.

The third option would include either partial or full excavation of the slide mass, construction of a deep shear key, and reconstruction of the highway sideslope. This option would also involve the lining of the creek bed with rip rap in order to prevent further toe erosion.

In the short term, the cracks, and vertical drops in the pavement structure should be milled and patched to maintain a smooth even road surface for traffic safety.



Photo 1 - View of Highway 690 showing the 2008 ACP patch, looking east.



Photo 2 – View of the crack on the highway and asphalt thickness, looking southwest.



Photo 3 - View of Highway 690 showing the 2008 ACP patch, looking west.



Photo 4 - View of asphalt crack and dip



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PROJECT: BF #7	3271-CSP Replacement -	SH 690 Deadwood				PROJECT NO: 6487-	-2	BOREHO	LE NO: 10-3	3
CLIENT: Yellowhe	ad Engineering Services	DRILL	em Auger		ELEVATI	ON:				
OWNER: Alberta	Transportation	LOCAT	ION: Dit	ch No	orth of	Scarp				
SAMPLE TYPE	SHELBY TUBE	CORE SAMPLE	SP	r sam	PLE	GRAB SAMPLE		COVERY		
BACKFILL TYPE	BENTONITE	PEA GRAVEL	∭ SL(DUGH		GROUT		CUTTINGS	SAND	
Depth (m) SOIL SYMBOL USC	SC DESCR)IL RIPTION		SAMPLE TYPE	SPT (N)	▲ POCKETPEN. (kPa)▲ 100 200 300 400 PLASTIC M.C. LIQUID ↓ ↓ ↓ 20 40 60 80	_	OTHER DATA	SLOTTED	PIEZOIME LER Elevation (m)
-2 CI -1 CI -2 CI -4 CI -4 CI -4 CI -4 CI -4 CI -4 CI -4 CI -6 CS	 FILL (CLAY TILL) : clay, n moist, very stiff, brown, clear moist, very stiff, brown, clear class, very stiff, brown, clear class, very stiff, brown, clear class, cl	nedium to high plastic, an, till features astic, very moist, firm, features, trace gravel ck noted at bottom of c, gray approximately 150mm approximately 150mm B m. No water and no sthole.	1.2 m		41	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Shelby Tu OU: 326: DD: 1745 MC: 20.2 Shelby Tu OU: 330.] DD: 1765 MC: 20.3 P.L. = 17.5	be: 17 kPa Kg/m ³ % be: 55 kPa Kg/m ³ %	M.C. = 21.8	
	, HOGGAN ENGINEERING & TESTI/	NG (1980) LTD. 1750 Edm Phor Fax:	95 - 106 Ave onton, AB ne: (780) 48 (780) 489-0	enue T5S 1E 9-0700 0800	7 REV Fig.	GED BY: R Evans /IEWED BY: R Rau No: 4		OMPLETION OMPLETION	DEPTH: 8.84 DATE: 15/10/ ⁻ Pag	m 10 e 1 of 1

PROJ	PROJECT: BF #73271-CSP Replacement - SH 690 Deadwood PROJECT NO: 6487-2 BOREHOLE NO: 10-4											
CLIEN	CLIENT: Yellowhead Engineering Services DRILL METHOD: Solid Stem Auger ELEVATION:											
OWN	OWNER: Alberta Transportation LOCATION: SI No. 10-1 Installed											
SAMF	SAMPLE TYPE SAMPLE SAMPLE SAMPLE GRAB SAMPLE											
BACK	BACKFILL TYPE BENTONITEPEA GRAVEL				∭SLC	SLOUGH 🚺 GROUT 🛛			CUTTINGS	SAND		
Depth (m)	SOIL SYMBOL	USC	S(DESCF	oil Ription		SAMPLE TYPE SPT (N)	▲ POCKETPEN. (kPa)▲ 100 200 300 400 PLASTIC M.C. LIOUII 20 40 60 80)	OTHER DATA	CLOPF	SLUPE INDICATOR	Elevation (m)
0 1 2 1 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1		CI	 FILL (CLAY) : high plastic clean, till features CLAY : medium to high pl gray At 2.0m: Organic layer, pr 75mm Below 2.0m: lighter gray Below 2.3m: high plastic, trace gravel Below 3.8m: very stiff, od stringers Below 5.3m: gray, more p still odd tiny very moist striic At 5.5m: very moist, cryst CLAYSHALE : highplastic crumbly on auger Below 8.4m: augered up, At 8.5m: in pen, some lay one slickensided break, we At 8.9m: harder layer, postilickensided breaks At 10.0m: in pen, some lay one slickensided breaks Below 12.5m: more auge At 13.1m: in pen, all clays At 14.6m: in pen, gray sh break, more homogenous, row slough on completion of No watertable readings available readings availabl	c, moist, very stiff, g astic, very moist, fir eaty, approximately moist, stiff, till featu d tiny very moist gr pronounced till featu ngers als in pen, oxides c, silty, gray, weather less recovery rering, breaks at lay eathered, full recove sibly siltstone ayering, some red up, bit less reco shale, hard ale, one slickenside silt lens 0.0 m. No water an f testhole. ailable.	gray, <u>1.5 m</u> rm, v ures, ay ures, <u>6.7 m</u> ered, overy overy ed	y 9 y 9 y 13 y 62 y 59 y 72 x 85 x 100	20 40 60 80 21.4	P.L. = 17. P.L. = 17. Shelby T QU: 231 DD: 169 MC: 22. Shelby T QU: 208 DD: 173 MC: 21. P.L. = 18. P.L. = 18.	LL. = 46.5 LL. = 46.5 LL. = 48.5 Ube: .38 kPa 3 Kg/m ³ 4 % Ube: .01 kPa 11 Kg/m ³ 6 % .9 L.L. = 54.0	M.C. = 21.4 M.C. = 24.5		
<u>18 - 18</u> איז					17505 - 106		GGED BY: R Evans	: C	OMPLETION	DEPTH: 16	.00 m	1
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JRF	1				Fax: (780) 489-0	Fig.	No: 4			P	age 1	1 of 1

PROJ	PROJECT: BF #73271-CSP Replacement - SH 690 Deadwood PROJECT NO: 6487-2 BOREHOLE NO: 10-5												
CLIEN	CLIENT: Yellowhead Engineering Services DRILL METHOD: Solid Stem Auger ELEVATION:												
OWN	OWNER: Alberta Transportation LOCATION: SI No. 10-2 Installed												
SAMPLE TYPE													
BACK	BACKFILL TYPE BENTONITE . PEA GRAVEL					DUGH		GROUT		_ CUTTINGS	SAND		
Depth (m)	SOIL SYMBOL	nsc	S DESCI	oil Ription	75 mm	SAMPLE TYPE	SPT (N)	▲ POCKETPEN. (kPa)▲ 100 200 300 400 PLASTIC M.C. LIQUII)	OTHER DATA	AT .	SLOPE INDICATOR	Elevation (m)
0 1 2 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1		CH CS	ORGANICS : Topsoil to 7 CLAY : silty, some sand, moist, very stiff, brown - At 0.8m: in pen, high plas with white specs, dessicat - Below 0.8m: high plastic, - Below 1.8m: high plastic, - At 3.0m: Clay, light gray, 25mm - Below 4.0m: dark gray CLAYSHALE : high plast gray, highly weathered, sil - Below 5.3m: slightly mois auger, hard - At 7.3m: in pen, hard, lig slickensides in dark gray of - At 8.4m: in pen, harder, I partings - at 13.0m: in pen, slightly - at 13.0m: in pen, slightly	5mm, black medium to high pl stic, slightly moist, ed, odd root hair , moist, stiff, till fea , more moist, not l wet spot, approxi ic, moist, very stiff t partings st, ran up and crur ht gray silt parting lay less slickensides, l more moist 4.5 m. No water a f testhole.	75 mmy astic, gray atures ayered mately <u>4.7 m</u> , dark mbly on s, less silt		13 11 16 4-50 61 64 83 80	$ \begin{array}{c} 18:5 \\ 14.7 \\ 22.2 \\ 23 \\ 22.9 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 22.5 \\ 20.7 \\ 20.$	Shelby 1 OU: 19 DU: 17 OU: 20 DU: 17 OU: 20 DD: 17 OU: 29 DD: 17 MC: 18 - too cru OU: 57 DD: 18 MC: 17	Fube: 8.49 kPa 31 Kg/m³ .7 % Fube: 0.99 kPa 66 Kg/m³ .3 % Imbly for PP Fube: 7.59 kPa 23 Kg/m³ .9 %			
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RP 6	1	<u>IH</u>			Phone: (780) 48 Fax: (780) 489-	89-0700 0800	Fia	ievved by: к каu No: 4	(<u>VDATE: 9/1</u> F	VIV Page	1 of 1
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