

memorandum



To: J. McDougall
Head, Geotechnical Section
North Bay Region

Date: 1983 11 08

Atten: K. Howe

From: Foundation Design Section
Room 315, Central Building

Re: Roadway Failure
Hwy. #101, 2.93 km
East of Highway 11
W.P. 166-77-01
+ District #14 (New Liskeard)

In response to your request (memorandum, dated 83 05 19) for remedial measures, our Section has investigated the problem at the above-mentioned location. The problem occurs along the outer half of the pavement and shoulder on the north side of the highway (W.B.L.) for a distance of about 90 - 100 m west of a culvert where Black Creek crosses Highway 101. Several longitudinal cracks, combined with the subsidence of the pavement and shoulder surface are visible (refer to Photographs on Figure #1). Patching was required at some locations to keep the road surface in satisfactory driving condition. The investigation consisted of site visits, field work (foundation and survey) and review of the past construction drawings. Unfortunately, the available construction records do not cover the conditions which existed prior to the original construction. (W.P. 155-62, G.B. & Pav; Plan No: B-764-3, Profile No. C-764-4).

Site and Subsurface Conditions

At this location, Hwy. #101 is situated on a sidehill configuration, requiring cut (south side) and fill (north side) sections to realize the profile grade. According to the latest survey (July, 1983), the fill slopes range from 0.9(H) : 1(V) to 3.3(V) : 1(V) within the distressed area. The profile grade of Highway #101 is at El. 89.4 (Sta: 13 + 010) and at El. 98.1 (Sta: 12 + 910). The low lying area, adjacent to the creek channel is at approx. El. 86 $\frac{1}{2}$. The depth of this channel is about 1 m. The creek (known as Black Creek) crosses the highway at approx. Sta: 13 + 044 and runs in a westerly direction at an angle of about 30° measured from the general alignment of the road.

The native subsoil consists of varved clay (alternate layers of silt and clay) with an average undrained shear strength of about 26 kPa (500 PSF). The lower boundary was found to be at El. 77.5. The varved clay is underlain by a compact silty sand to sand deposit. The low lying area at the surface is covered by a 1.2 m thick organic contaminated, soft, cohesive material. The borings which were located on the shoulder or on the pavement (Sta: 12 + 951) indicate the presence of a 2 m thick fill material. Apart from the pavement structure the fill consists of silty clay. Some organic (fibrous) material was also encountered at the contact surface of the fill and native subsoil. The presence of this fibrous material indicates that no topsoil stripping

was carried out prior to the fill construction.

The groundwater level was found to be at El. 82 \pm .

It is pointed out that the elevations quoted in this memorandum are referenced to an arbitrary bench mark: 'Top of S.C.M. at 15.2 m Rt. of Sta: 12 + 840, El. 100.000.'

Discussion and Recommendations

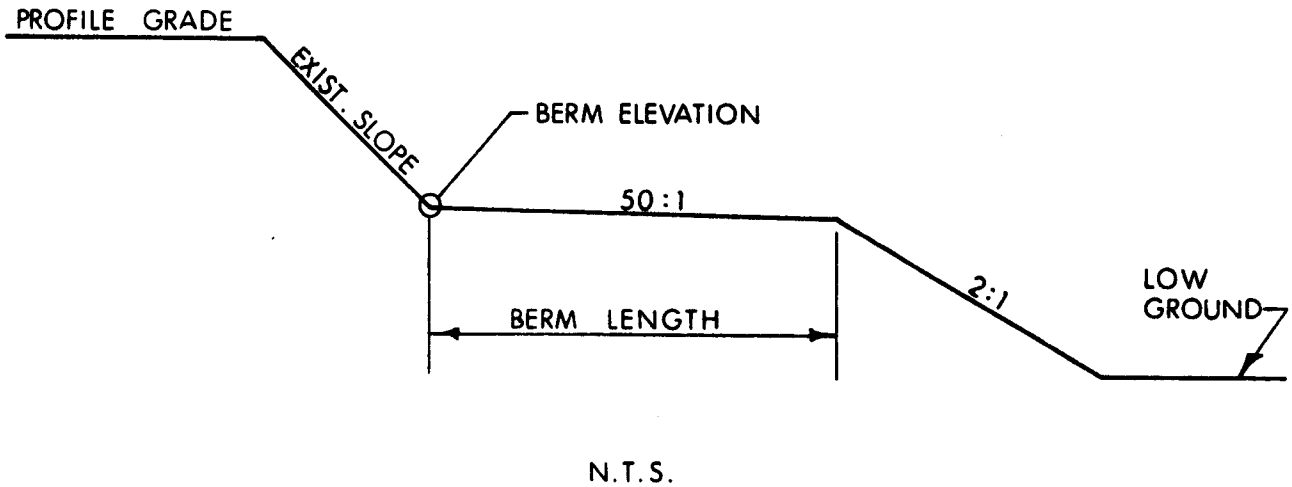
It is believed, that due to the geometry of the original sidehill, some portion of the fill material is resting on the original slopes and some portion of it on the adjacent original lowland. There is no information available concerning benching requirements for the added fills on the natural slopes. Benching is required where the existing slopes are steeper than 3:1. Our experiences with similar types of subsoil (varved clay) indicate that slopes steeper than 3.5 : 1 become unstable with time. Placing additional loads on such slopes (as in this case) without proper treatment aggravates the already somewhat troublesome situation.

As mentioned above the low lying area is covered with soft organic contaminated soil which would consolidate for a long period of time under the superimposed loads. In order to check the stability of the existing slopes, analyses in terms of total stresses were carried out. These analyses have indicated that the existing slopes have safety factors less than desirable under these conditions. It is, therefore concluded that the main reason for the roadway instability is the movement of the embankment which is in turn caused by the steep character of the slopes and the inadequate shear strength of the underlying subsoil. In addition, the encountered compressible organic contaminated material may also have contributed to the roadway settlements.

In our opinion, the movement of this particular section of the roadway will continue in the way it has been doing for the past several years unless adequate remedial measures are carried out. We are, therefore recommending the construction of a counter-balancing berm and reshaping the existing slopes above the berm level. The length and the height of the berm will vary, depending on the location. The berm requirements are shown on Figure #2.

The following construction scheme is suggested:

- 1) Divert creek where it is necessary and place rip-rap on the new channel bed and banks.
- 2) Remove the compressible soft material within the limits of the berm and backfill with non-cohesive material. This sub-excavation should be carried out in strips having a width not more than 6 m and backfilled immediately.
- 3) Strip existing slope.
- 4) Construct berm according to the following sketch:



The berm should be tapered (horizontally and vertically) easterly of Sta. 13 + 000 and westerly of Sta. 12 + 920.

- 5) Re-shape existing slope to not steeper than 3:1.

We believe that the berm will considerably reduce the magnitude of the problem. However, the settlement of the aforementioned organic contaminated layer may still continue in the future but to a considerably lesser extent.

If the District wishes to implement our recommendations, they should send the design drawings to the Foundation Design Section for review purposes.

Miscellaneous

It is point out metric units were used in this report. The field survey notes will be provided to the District for estimating purposes.

P. Payer
P. Payer, P. Eng.
Foundations Engineer

PP/mmj

c.c. - B.L. Peltier

ROADWAY FAILURE ON HWY. 101

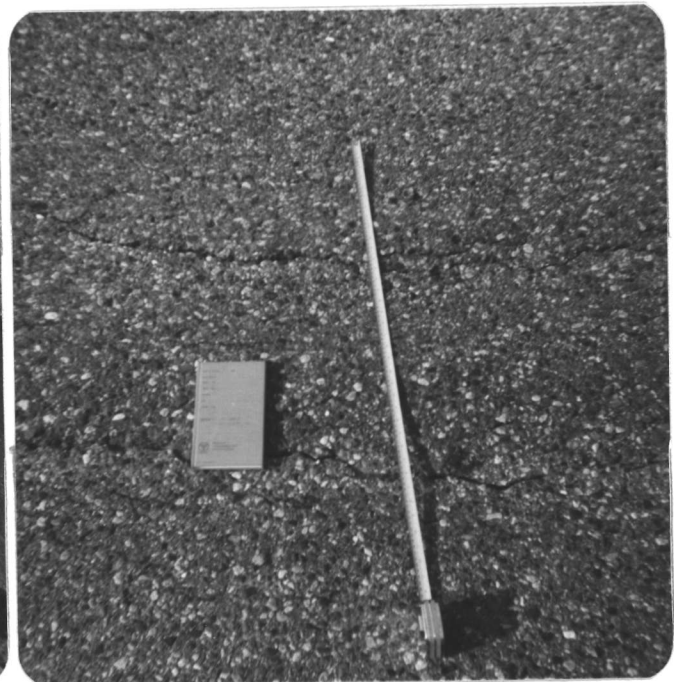


FIGURE 1

STATION	C ELEV.	BERM		DISTANCE FROM C TO TOE OF BERM	ASSUMED EDGE OF CREEK (DISTANCE FROM C)	DISTANCE BETWEEN C & FENCE LINE	REMARKS
		ELEV.	LENGTH				
13+010	89.4	—	—	—	16.8		NO BERM REQUIRED
13+000	90.0	87.8	3.5	16.1	21.5		
12+990	90.8	88.3	4.6	18.5	24.0	13.0	
12+980	91.6	88.7	5.8	20.5	21.7		
12+970	92.5	89.2	6.7	26.0	24.7		
12+960	93.4	89.7	9.0	30.0	24.0		
12+950	94.3	90.2	9.0	31.3	26.0		
12+940	95.2	90.6	12.0	36.0	38.0		
12+930	96.2	91.0	14.6	42.0	39.7	15.7	
12+920	97.1	93.4	9.0	30.8	41 (+)	NO INFO.	
12+910	98.1	—	—		NO INFO.	14.3	NO BERM REQUIRED

FIGURE 2

SITE DESCRIPTION:

83/07/11

THE SITE IS A ROAD THROUGH A STEEP HILL. THE SOUTH SIDE IS A CUT, THE NORTH A FILL. SETTLEMENT IS OCCURRING ON NORTH HALF OF ROAD ONLY.

B.H. 1 IS AT THE TOE OF THE SLOPE. WATER LEVEL DATA IS VARIED: WITHIN THE BOREHOLE THE W.T IS 5' 11" (24 HRS LATER IT HAD RISEN TO 3' 2"); THERE IS A CREEK 3' FROM THE HOLE APPROXIMATELY 15" LOWER; THE CONE HOLE (WHICH WENT 2' 5" DEEPER THAN THE HOLE) HAD A STRONG ARTESIAN FLOW.

THE ARTESIAN FLOW WAS PLUGGED WITH A FIVE FOOT STICK 2-3" IN DIAMETER - NO FURTHER LEAKAGE WAS OBSERVED DURING THE REMAINDER OF THE JOB

B.H. 2 : THROUGH THE PAVEMENT IN THE SETTLED AREA.

B.H. 3 ON THE SHOULDER OPPOSITE B.H. 2

B.H. 4 EAST OF B.H. 2, THROUGH THE PAVEMENT IN THE UNAFFECTED AREA.

CHRIS M'LORE



Ministry of
Transportation and
Communications

FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 1 OF 8

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 1
DRILLER ORLA GROUND ELEV. 91.0 JOB No. W.P. 166-87-01
ENGINEER C. McLORG CASING SIZE H.S. AUGERS DATE 8/07/05
SITE LOCATION 2.93 km E of #11 ON #101 LOCALLY REFERRED TO AS GARDINERS HILL
HOLE LOCATION BOTTOM OF NORTH SLOPE (45' LEFT OF #)
REMARKS WATER TABLE 5' 11" DOWN INITIALLY 24 HRS LATER @ 2' 5"

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
		START BOREHOLE		
0	2.5'	AUGER - ORGANICS		
2.5	4.0'	S.S. SILTY CLAY - CL. (2)	S.S.1	1-3-4
2.5	5.0'	AUGER (2)		
5.0'	6.5'	S.S. SILTY CLAY SOME AMORPHOUS ORGANICS	S.S.2	2-3-3
6.5	8.0	VANE TEST		
		UNDIST. $20(36+38)/1 = 1480$ P.S.F		
		REMOLD $20(24+18)/1 = 840$ P.S.F.	79.5 KPa	
		$S = 1.8$		
5.0'	8.0'	AUGER	T.W.3	PH.
8.0'	9.5'	2" SHELBY TUBE		
8.0'	10.0'	AUGER		
10'	11.5'	S.S. (2) SILTY CLAY CL + CI	S.S.4	2-2-2
10'	12.5'	AUGER		
12.5'	14	S.S. SILTY CLAY CL + CI	S.S.5	1-2-3
14'	15.5'	VANE TEST		
		UNDIST. $20(36+35)/2 = 710$ P.S.F	33.8 KPa	
		REMOLD $20(10+8)/4 = 90$ P.S.F		
		$S = 7.99$		



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 2 OF 3

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 1
DRILLER ORLA GROUND ELEV. 91.0 JOB No. L.P. 166-82-01
ENGINEER C. McLOUGHERY CASING SIZE 11.5" AUGER DATE 8/3/07
SITE LOCATION 2.93 km E of #11 on #101 REFERRED TO AS GARDINERS HILL
HOLE LOCATION _____
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
12.5'	15.5'	AUGER		
15.5'	17'	2" SHELBY TUBE	T.W. 6	PH.
15.5'	17.5'	AUGER (2)		
17.5'	19'	S.S. CLAY WITH/AND SILT. <u>CL</u>	S.S. 7	2-2-2
17.5'	20'	AUGER (3)		
20'	21.5'	S.S. CLAY SOME/TRACE SILT <u>CL to CI</u>	S.S. 8	3-3-3
21.5'	23'	VANE TEST		PH
		UNDIST: $20(18 + 20)1 = 760$ P.S.F.	36.2 V.S.A	
		REMOLD: $20(10 + 12)1/2 = 720$ P.S.F.		
		$S = 3.5$		
20'	25'	AUGER		
25'	26.5'	2" SHELBY TUBE	T.W. 9	PH.
25'	27.5'	AUGER - SOME SAND ON RODS @ 27'	S.S. 10	4-3 1/5"
27.5'	29'	S.S. 27.5' - 28.5' (4) CLAY WITH SILT <u>CL</u>		2. (no movement after)
		28.5' - 29' WELL GRADED SAND		
29'	30'	AUGER SOMETHING LIKE OTTAWA SANDS. 1/1		2. (no movement after)
30'	30' 9"	S.S. WALL GR. SA SOME SILT SOME GRAL.	S.S. 11	35-60 1/3"
		END BORE HOLE		



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 1
DRILLER ORLA GROUND ELEV. 91.0 JOB No. W.P. 166-82-01
ENGINEER C. McLORE CASING SIZE H.S. AUGERS DATE 8/3/65
SITE LOCATION 2.93 km E of #11 on 101 REFERRING TO AS CARDINERS HILL
HOLE LOCATION _____
REMARKS _____

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FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 1 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 2
DRILLER ORLA GROUND ELEV. 99.35 JOB No. L.R. 166-77-01
ENGINEER C.M. LORG CASING SIZE H.S. AUGERS DATE 8/3/05
SITE LOCATION 2.93 km E of 11 on 101 REFERRED TO AS GARDINER'S HILL
HOLE LOCATION STA 12+048.6 2m L of E
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
		CONE TEST		
0'	11'	0-23-28-13-6-5-6-7-13-19-18		
11'	21'	25-20-19-14-17-17-18-17-19-20		
21'	31'	25-23-20-26-25-22-29-26-26-24		
31'	41'	26-27-26-28-27-26-25-29-31-29		
41'	51'	33-32-36-35-34-38-34-38-37-32		
51'	61'	30-31-35-31-52-37-45-35-36-46		
61'	66'4"	100-67-48-56-33-100 1/4"		
		END CONE TEST		
		START BORE HOLE		
0'	1'6"	1 AUGER - 0-3" ASPHALT 3"-18" GRANULAR 'A'		
1'6"	3'	S.S. WELL GRADED SAND (GRAN. 'A' 'B') TRACE GRAVEL - TRACE ASPHALT - CONTAMINATION?	S.S. 1	9-23-18
1'6"	3'	AUGER		
3'	4'6"	S.S. 3'-4' W. CR. SA. (GRAN. 'C') 4'-4'6" SILTY CLAY CL	S.S. 2	10-10-9
3'	4'6"	AUGER		
4'6"	6'	S.S. SILTY CLAY TRACE FIBROUS ORGANICS	S.S. 3	2-4-5
4'6"	6'	AUGER		
6'	8'	2" SHELBY TUBE	T. 404	PH
6'	8'5"	AUGER		
8'5"	9'5"	S.S. SILTY CLAY TO SILT TR CLAY <u>CLAY ML</u>	S.S. 5	2-4-5



Ministry of
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FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 2 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 2
DRILLER ORLA GROUND ELEV. 99.35 JOB No. V.P. 166-77-01
ENGINEER C. McLOUG CASING SIZE 1.5 AUGERS DATE 83/07/06
SITE LOCATION 2.93 km E of H on 101 REFERRED TO AS GARDINER'S HILL
HOLE LOCATION STA 13 + 048.6 2.0 m L of E
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
9.5'	11'	VANE TEST - NO ADVANCE POSSIBLE		
9.5'	9.5'	AUGER		
9.5'	11'	S.S. STIFF CLAY <u>CL</u>	S.S. 6	2-3-4
9.5'	11'	AUGER		
11'	13.5'	2" SHELBY TUBE	T.U. 7	PH
11'	13'	AUGER		
13'	14.5'	S.S. CLAY TRAIL SILT <u>CL</u> (C?)	S.S. 8	2-1-2
14.5'	16'	VANE TEST		
15'	16'	S.S. UNDIST. $20(44+44)/2 = 880$ P.S.F	S.S. 9	
			41.9 KPa	
15'	16'	REMOLO: $20(28+30)/4 = 290$ P.S.F		
16'	18'	S.S. UNDIST. $S = 3.0$	T.U. 10	
13'	16'	AUGER		
16'	17.5'	S.S. CLAY TRAIL SILT <u>CL</u> & <u>CL</u>	S.S. 9	1-1-1
16'	17.5'	AUGER		
17.5'	19.5'	2" SHELBY TUBE	T.U. 10	PH
17.5'	19.5'	AUGER		
19.5'	21'	S.S. CLAY <u>CL</u>	S.S. 11	1-1-2
21'	22.5'	VANE TEST		
		UNDIST. $20(28+28)/1 = 1120$ P.S.F		
			53.3 KPa	
		REMOLO: $20(18+18)/4 = 180$		
		$S = 6.2$		



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 3 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 2
DRILLER ORLA GROUND ELEV. 99.35 JOB No. W.P. 166-77-01
ENGINEER C. McLORG CASING SIZE H.S. AUGERS DATE 83/07/06
SITE LOCATION 2.93 km E of #11 on #101 AT "GARDINER'S HILL"
HOLE LOCATION STAY 3 + 048.6 2.0 m L & R
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
7.9	22.5	AUGER		
22.5	24	S.S. CLAY [ⓐ] TRACE / NO SILT <u>CL</u>	S.S. 12	1-1-2
22.5	24	AUGER		
24	25.5	2" SHELBY TUBE	T.W. 13	PH
25.5	27	VANE TEST		
25.5	27	S.S. UNDIST: $20(52+52) \frac{1}{2} = 1040$ P.S.F.	49.5 KPa	
		Remold: $20(20+20) \frac{1}{4} = 200$ P.S.F.		
		$S = 5.2$		
24	27	AUGER [ⓐ]	S.S. 14	1-2-2
27	28.5	S.S. CLAY TR. SILT		
28.5	30	VANE TEST.		
		undist: $20(24+24) 1 = 960$ P.S.F.	45.7 KPa	
		remold: $20(28+28) \frac{1}{4} = 280$ P.S.F.		
		$S = 3.4$		
27	30	AUGER [ⓐ]	S.S. 15	1-1-3
30	31.5	S.S. CLAY TRACE / SOME SILT		
30	31.5	AUGER		
31.5	33.5	2" SHELBY TUBE	T.W. 16	PH
30.5	33.5	AUGER [ⓐ]	S.S. 17	1-3-3
33.5	35.5	S.S. CLAY NONE / TRACE SILT <u>CL to CF</u>		



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 4 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 2
DRILLER ORLA GROUND ELEV. 99.35 JOB No. W.P. 166-7701
ENGINEER C. McLORG CASING SIZE 4.5 AUGERS DATE 83/07/06
SITE LOCATION 2.93 km E of #11 on #101 @ GARDINER'S HILL
HOLE LOCATION STA. 13+048.6 ; 2.0m L of
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
35'	36.5'	VANE TEST:		
		UNDIST. $20(24+26)/4 = 1000$ P.S.F		
			47.6 UPa	
		REMOLD. $20(30+30)/4 = 300$ P.S.F		
		S = 3.1		
33.5'	36.5'	AUGER @ <u>CL</u>	S.S. 18	-LOW 2
36.5'	38'	S.S. CLAY - ALTERNATELY LAYERED WITH SILTY CLAY		
36.5'	38'	AUGER		
38'	40'	2" SHELBY TUBE	T.U. 19	P.H.
33.8'	40'	AUGER @ - ENCOUNTERED WATER AT 38.5'		
340'	41.5'	S.S. CLAY TR/SOME SILT <u>CL</u>	S.S. 20	2-2-4
41.5'	43'	VANE TEST:		
		UNDIST. $10(48+48)/4 = 960$ P.S.F		
			45.7 UPa	
		REMOLD. $20(24+26)/4 = 250$ P.S.F		
		S = 3.8		
40'	43'	AUGER @	S.S. 21	2-2-3
43'	44.5'	S.S. CLAY SOME SILT <u>CL</u>		
43'	44.5'	AUGER	T.U. 22	PH
44.5'	46.5'	2" SHELBY TUBE		
44.5'	46.5'	AUGER @		
46.5'	48'	S.S. CLAY WITH/AND SILT <u>CL to ML</u>	S.S. 23	2-5-6



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 5 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 2
DRILLER ORLA GROUND ELEV. 99.35 JOB No. W.P. 166-77-01
ENGINEER C. M'LORE CASING SIZE H.S. AUGERS DATE 83/07/06
SITE LOCATION 2.93 km E of #11 on 101 REFERRED TO AS GARDINERS HILL.
HOLE LOCATION STA. 13+048.6 2.0 m L of E
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
48'	49.5'	VANE TEST UNDIST. $20(34 + 38)1 = 1440$ P.S.F		
		REMOID. $20(36 + 36)1/2 = 720$ P.S.F S = 2.0	68.6 U ₂	
46.5'	49.5'	AUGER ①		
49.5'	51'	S.S. SILT SOME CLAY <u>CL - ML</u>	S.S. 24	3-3-3
49.5'	51'	AUGER		
51'	53'	2" SHELBY TUBE	T.W 25	PH.
51'	53'	AUGER ②		
53'	54.5'	S.S. SILTY CLAY <u>CL</u> 54.5' - 54.5' TRACE SAND	S.S. 26	SPANK OF IT'S OWN WEIGHT
54.5'	56'	VANE TEST - NO ADVANCE UNDIST. REMOID.		
53'	54.5'	AUGER - SOME BLEW BACK INTO AUGERS (28")	S.S. 27	30-16-48
54.5'	56'	S.S. (LOTTAWA SAND & GRAVEL) WITH SILT (MC)		
54.5'	56'	AUGER		
56.5'	58.5'	S.S. 57' - 57.5' (MC) LOTTAWA SAND AND GRAVEL WITH SILT AS PER S.S. 27 57.5' - 58.5' SILT TRACE CLAY ML - MT?	S.S. 28	5-7-8



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 2
DRILLER ORLA GROUND ELEV. 99.35 JOB No. W.P. 166-7701
ENGINEER C. M. ORC CASING SIZE H.S. AUGERS DATE 83/07/06
SITE LOCATION 2.93 km E of #11 on #101 AT "CAROINER'S HILL"
HOLE LOCATION STA 13+048.6 2.0 m L of E
REMARKS _____

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FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 1 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 3
DRILLER ORLA T. GROUND ELEV. 99.0' JOB No. UB. 166-77-01
ENGINEER C. M'KORR CASING SIZE H.S. AUGER DATE 83/07/08
SITE LOCATION 2.93 km E of #11 on #101 REFERRED TO AS GARDINER'S HILL.
HOLE LOCATION STA 13 +048.8 3.9 m R of Φ
REMARKS LATER. ENCOUNTERED @ 10'

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
0.	1.5'	AUGER		
1.5'	3.0'	S.S. ⁽¹⁾ OTTAWA SAND SOME SILT TR. GRAVEL	S.S. 1	6-18-13
1.5'	3.0'	AUGER		
3.0	4.5'	S.S. 3.0' - 3.5' ⁽²⁾ OTTAWA SAND AS ABOVE	S.S. 2	3-3-6
		3.5' - 4.5' ⁽²⁾ SILTY CLAY TR. SA TR. ORGAN		
3.0'	4.5'	AUGER ⁽³⁾		
4.5'	6.0'	S.S. STIFF SILTY CLAY POSSIBLE TR. SA.	S.S. 3	2-2-1
6.0	7.5'	VANE TEST - NO ADVANCE POSSIBLE		
		UNDIST:		
		REMOLD.		
4.5'	6.0'	AUGER		
6.0'	8.0'	2" SHELBY TUBE	T.W. 4	PH
8.0'	9.5'	VANE TEST		PM
		UNDIST: 20 (28+26) 1 = 1080 P.S.F.	SL. 4.4	
		REMOLD 20 (22+22) 1/4 = 220 P.S.F.		
		S = 4.9		
6.0'	9.5'	AUGER ⁽⁴⁾		
9.5'	11.0'	S.S. CLAY POSSIBLE TR. SILT $\frac{CI}{5}$	S.S. 5	1/2-1/2-1



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 2 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 3
DRILLER DRLA GROUND ELEV. 99.0 JOB No. WB.166-77-01
ENGINEER C. McLORE CASING SIZE H.S. AUGERS DATE 8/3/07/08
SITE LOCATION 2.93 km E of 11 on #101 @ "GARDINER'S HILL"
HOLE LOCATION STA 13+048.8 3.9 m R of C
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
11.0	12.5	VANE TEST UNDIST: $20(40+42)/2 = 820$ P.S.F. REMOLO: $20(20+20)/4 = 200$ P.S.F. S = 4.1	39 KPa	
9.5	12.5	AUGER	S.S. 6	1-1-1
12.5	14	S.S. 5: STICKY GREY CLAY POSSIBLE TR. SILT <u>CI</u> - AS PER S.S. 5 - DISCARDED.		
14	15.5	VANE TEST		
15	15	UNDIST: $20(26+28)/1 = 1080$ P.S.F. REMOLO: $20(50+48)/4 = 490$ S = 2.2	51.4 KPa	
12.5	15.5	AUGER		
15.5	17	S.S. 5: CLAY <u>CI</u> CLAY POSSIBLE TR. SILT <u>CI</u> - AS PER	S.S. 7	1/2-1-1 1/2
17	18.5	VANE TEST		
18	18	UNDIST: $20(28+28)/1 = 1120$ P.S.F. REMOLO: $20(12+12)/4 = 480$ P.S.F. S = 2.3	53.3 KPa	
15.5	18.5	AUGER		
18.5	20.5	2" SHELBY TUBE	T.W. 8	PH.
20.5	22	VANE TEST		
		UNDIST: $20(28+30)/1 = 1160$ REMOLO: $20(14+20)/4 = 170$ S = 6.8	55.2 KPa	



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 3 OF 6

DRILLING CO. ATKINS DATUM ELEV. ARBITRARY B.H. No. 3
DRILLER ORLAT GROUND ELEV. 99.0 JOB No. U.P. 166-77-01
ENGINEER C. MCLOUGHLIN CASING SIZE 14.5" AUGER DATE 8/3/07
SITE LOCATION 2.93 km E of #11 on #101 CALLED "GARDINER'S HILL."
HOLE LOCATION STA 13+048.9, 3.9 m R of L
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
18.5'	22'	AUGER		
22	23.5'	S.S. @ CLAY POSSIBLE TR. SILT. <u>CL - CI</u> - DISCARDED.	S.S. 1	1-1-2
23.5'	25'	VANE		
		UNDIST. 20 (36+36) 1 = 1440 P.S.F.	68.6 KPa	
		REMOLD. 20 (22+22) 1/4 = 220 P.S.F. S = 6.5		
22	25	AUGER @		1-2-3
25'	26.5'	S.S. CLAY <u>CL - CI</u>	S.S. 10	
26.5'	28'	VANE TEST		
		UNDIST. 20 (42+42) 1 = 1720 P.S.F.	81.9 KPa	
		REMOLD. 20 (20+20) 1/2 = 400 P.S.F. S = 4.3		
25'	28'	AUGER @	S.S. 11	1-3-3
28'	29.5'	S.S. CLAY <u>TRACE SILT. CL</u>		
29.5'	31'	VANE TEST		
		UNDIST. 20 (28+30) 1 = 1160 P.S.F.	55.2 KPa	
		REMOLD. 20 (18+20) 1/4 = 190 P.S.F. S = 6.1		
28	31	AUGER	T.W. 12	PH.
31	33	2" SHELBY TUBE		



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 4 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 3
DRILLER ORLA T. GROUND ELEV. 99.6 JOB No. L.P. 166-72-01
ENGINEER C. McLORG CASING SIZE H.S. AUGERS DATE 83/07/08
SITE LOCATION 2.93 km EA #11 on #101 at "GARDINER'S HILL"
HOLE LOCATION STA 13+048.8 3.9 km R A &
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
33'	34.5'	VANE TEST. <u>26+28</u>		
		UNOIST. <u>20 (20+20) 1/2 = 1080 P.S.F.</u>	<u>51.4 KPa</u>	
		REMOLD <u>20 (20+20) 1/2 = 400 P.S.F.</u>		
		<u>S = 2.7 I.F.</u>		
33.5'	34.5'	AUGER <u>(e)</u>	<u>S.S. 13</u>	<u>2-2-3</u>
34.5'	36'	<u>S.S. CLAY TR. SILT</u> <u>CL</u> - DISCARD		
36'	37.5'	VANE TEST:		
		UNOIST. <u>20 (32+32) 1/2 = 1280 P.S.F.</u>	<u>61 KPa</u>	
		REMOLD: <u>20 (16+16) 1/2 = 320 P.S.F.</u>		
		<u>S = 4.0</u>		
34.5'	37.5'	AUGER <u>e1</u>		
37.5'	39'	<u>S.S. CLAY</u> OCCASIONAL SILT LAYERS <u>CL</u> - DISCARD	<u>S.S. 14</u>	<u>1-3-4</u>
39'	40.5'	VANE TEST. UNOIST. <u>20 (46+46) 1/2 = 920 P.S.F.</u>	<u>43.8 KPa</u>	
		REMOLD: <u>20 (24+26) 1/2 = 250 P.S.F.</u>		
37.5'	40.5'	AUGER <u>(d)</u>	<u>S = 3.6</u>	
40.5'	42'	<u>S.S. CLAY</u> <u>CL - CH</u>	<u>S.S. 15</u>	<u>4-4-4</u>
42'	43.5'	VANE TEST		
		UNOIST. <u>20 (38+38) 1/2 = 1520 P.S.F.</u>	<u>72.3 KPa</u>	
		REMOLD <u>20 (32+32) 1/2 = 320 P.S.F.</u>		
		<u>S = 4.75</u>		



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 5 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 3
DRILLER ORLAT GROUND ELEV. 99.0 JOB No. U.P. 166-77-01
ENGINEER C. M'LORE CASING SIZE H.S. AUGERS DATE 83/07/08
SITE LOCATION 2.9 km E of #11 on #101 @ "GARDINER'S HILL"
HOLE LOCATION STA 13 +048.8; 3.9 m R A E
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
40.5	43.5	AUGER		
43.5	45.5	2" SHELBY TUBE	T.N. 16	PH
45.5	47'	VANE TEST - NO ADVANCE PAST 46' POSSIBLE. UNDIST. REMOLD		
43.5	46.5	AUGER	S.S. 17	3-7-4
46.5	48.5	S.S. VANE SOFT SILTY CLAY @		
48'	49.5	VANE TEST UNDIST: $20(18+13)/1 = 720$ P.S.F. REMOLD: $20(56+56)/4 = 560$ P.S.F. $S = 1.2$	34.3 KPa	11.7
46.5	49.5	AUGER V.P. CLAY	S.S. 18	7-8-8
49.5	51	S.S. SILTY CLAY, OCCASIONAL SILT LAYERS. - DISCARD		
51'	52'	(ONLY 1' ADVANCE POSSIBLE) VANE TEST UNDIST: $20(12+14)/1 = 520$ P.S.F. REMOLD: $20(40+40)/4 = 320$ P.S.F. $S = 1.6$	24.8 KPa	
49.5	52'	AUGER - FIRMED UP AT 52'		
52'	53.5	S.S. 52'-53' (SILT CLAY) TR. OTTAWA	S.S. 19	23-9-7
	54'	SAND		
		53'-54' SILT TR. CLAY MCL-CL		



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 3
 DRILLER ORLA T. GROUND ELEV. 99.0 JOB No. 00.166-77-01
 ENGINEER C. m^oLORE CASING SIZE H.S. AUGERS- DATE 83/07/08
 SITE LOCATION 2.93 km E of #11 on #101 e^o GARDINERS HILL
 HOLE LOCATION STA. 13+048.8 3.9 m R of #
 REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
52'	54'	AUGER	S.S. 20	8-10-9
54'	55.5'	S.S.: 54'-54'9" - SILT TR. CLAY		
		54'9" - 55'6" - SILT SOME CLAY, SOME SAND TRACE GRAV.		
54'	55.5'	AUGER		
55.5'	57'	S.S.: 55.5' - 56'9" (SAND & SILT) SOME CLAY	S.S. 21	7-11-15
		56'-9" - 57' (NO) SAND & SILT SOME GRAV. TR. CLAY.		
55.5'	57.5'	AUGER		
57.5'	58.5'	S.S.: OTTAWA SAND SOME GRAVEL SOME	S.S. 22	15-14-16
		SILT POSSIBLE TR. CLAY - <u>BORDERLINE</u> (C) (NO)		
57.5'	59.5'	AUGER		
59'	60.5'	S.S.: FINE OTTAWA SAND SOME SILT TR. GRAVEL	S.S. 23	8-7-6
		POSSIBLE TR. CLAY (NO)		
59'	60.5'	AUGER (NO)	S.S. 24	8-7-10
60.5'	62'	S.S.: SAND WITH SILT TR. GRAV.		
		END BOREHOLE.		



FIELD BORING LOG

SOIL MECHANICS SECTION

SHEET 1 OF 6

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 4
DRILLER ORLA T. GROUND ELEV. 98.3 m JOB No. L.P. 166-77-01
ENGINEER C. M'KORC CASING SIZE H.S. AUGERS DATE 83/07/11
SITE LOCATION 2.93 km E of #11 on #101 AT "GARDINERS HILL"
HOLE LOCATION STA 13+061 ; 2.4 m L (NORTH) of #
REMARKS WATER TABLE @ 31'

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
		START BOREHOLE		
0	1.5	AUGER		
1.5	3.0	S.S: GRAN. 'C' ^(N/C) TRACE/SOME SILT. TRACE ASPHALT - (CONTAMINATION?)	S.S. 1	10-42-31
1.5	3.0	AUGER ^(N/C)		
3.0	4.5	S.S: GRAN. 'C' TRACE GRAV. TR. ASPHALT - POOR RECOVERY - DISCARDED.	S.S. 2	9-8-7
3.0	4.5	AUGER ^(N/C)		
4.5	6.0	S.S: SILTY CLAY TR. GRAV. - TOO STIFF FOR A VANE TEST.	S.S. 3	3-3-6
4.5	6.0	AUGER ^(N/C)		
6.0	7.5	S.S: SILTY CLAY - FIBROUS ORGANIC LAYERS, OCCASIONAL SAND LAYERS.	S.S. 4	3-4-5
6.0	7.5	AUGER ^(N/C)		
7.5	9.0	S.S: SILTY CLAY (AS S.S. 3 & 4) - DISCARDED.	S.S. 5	2-3-4
9.0	10.5	NO ADVANCE POSSIBLE FOR VANE		
7.5	9.0	AUGER ^(N/C)		
9.0	10.5	S.S: SILTY CLAY	S.S. 6	2-4-5



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 4
DRILLER ORLA T. GROUND ELEV. 98.3 m JOB No. U8.166-77-01
ENGINEER C. M. KORL CASING SIZE A.S. AUGERS DATE 83)07/11
SITE LOCATION 2.93 km E of #11 on #101 @ "CARDINERS MILL"
HOLE LOCATION STA 13+061 ; 2.4 m L (north) of #
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
9.5'	10.5'	AUGER (C)		
10.5'	12'	S.S. SILTY CLAY <u>CL</u> - DISCARDED	S.S. 7	2-3-2
12'	13.5'	VANE TEST UNDIST. $20(42+42)1 = 1680$ P.S.F. <u>80 KPa</u> REMOLD. $20(18+18)1/2 = 360$ P.S.F. <u>S = 4.7</u>		
10.5'	13.5'	AUGER	T.W. 8	PH
13.5'	15.5'	2" SHELBY TUBE		
15.5'	17'	VANE TEST UNDIST. $20(22+22)1 = 880$ P.S.F. <u>42.4 KPa</u> REMOLD. $20(16+16)1/4 = 160$ P.S.F. <u>S = 5.5</u>		
13.5'	17'	AUGER (C)	S.S. 9	1-1-1
17'	18.5'	S.S. CLAY TR. SILT <u>CL</u>		
18.5'	20'	VANE TEST UNDIST. $20(24+24)1 = 960$ P.S.F. <u>45.7 KPa</u> REMOLD. $20(28+28)1/4 = 280$ P.S.F. <u>S = 3.4</u>		
17'	20'	AUGER (C)	S.S. 10	1-1-1
20'	21.5'	S.S. CLAY <u>CL</u> - DISCARDED		
21.5'	23'	VANE TEST: UNDIST. $20(26+28)1 = 1080$ P.S.F. <u>51.4 KPa</u> REMOLD. $20(16+16)1/4 = 160$ P.S.F. <u>S = 6.8</u>		



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 4
DRILLER ORLA GROUND ELEV. 98.3m JOB No. W.P. 166-77-01
ENGINEER C. McLOUG CASING SIZE H.S. AUGERS DATE 83/07/11
SITE LOCATION 2.93 km EA #11 on #101 @ "CARDINERS HILL.
HOLE LOCATION STA 13+061 ; 2.4 m L A E
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
20'	23'	AUGER (1)		
23'	24.5'	S.S. CLAY TR. SILT <u>CL-CL</u> OCCASIONAL SILT LAYERS	S.S. 11	1-2-2
24.5'	26'	VANE TEST		
		UNDIST. 20 (26+26) 1 = 1040 P.S.F.		
			49.5 KPa	
		REMOLD. 20 (16+16) 1/2 = 320 P.S.F.		
		S = 3 1/4		
23'	26'	AUGER		
26'	28'	2" SHELBY TUBE	T.W. 12	PH.
28'	29.5'	VANE TEST		
		UNDIST. 20 (32+32) 1 = 1280 P.S.F.		
			61 KPa	
		REMOLD. 20 (16+16) 1/2 = 320 P.S.F.		
		S = 4.0		
26'	29.5'	AUGER (2)		
29.5'	31'	S.S. CLAY OCCASIONAL SILT LAYERS <u>CL-CL</u> -DISCARDED	S.S. 13	2-3-3
31'	32.5'	VANE TEST:		
		UNDIST. 20 (24+24) 1 = 960 P.S.F.		
			45.8 KPa	
		REMOLD. 20 (28+30) 1/4 = 290 P.S.F.		
		S = 3.3		



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 4
DRILLER ORLA.T. GROUND ELEV. 98.3 m JOB No. W.P. 166-77-01
ENGINEER C. McLORG CASING SIZE 4.5 AUGERS DATE 83/07/11
SITE LOCATION 2.93 km E of #11 on #101 @ "GARDINERS' HILL"
HOLE LOCATION STA 13+061 ; 2.4 m L of C
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
29.5	32.5	AUGER <u>⊙</u>	S.S. 14	2-2-2
32.5	34	S.S. <u>⊙</u> CLAY TR. SILT <u>CL</u> - DISCARDED		
34	35.5	VANE TEST: UNDIST $20(30+32)/1 = 1240$ P.S.F. 59 KPa REMOLD: $20(12+16)/2 = 280$ P.S.F. S = 4.4		
32.5	35.5	AUGER <u>⊙</u>		
35.5	37	S.S. <u>⊙</u> CLAY TR. SILT <u>CL</u>	S.S. 15	2-2-3
37	38.5	VANE TEST: UNDIST: $20(36+36)/1 = 1440$ P.S.F. 68.6 KPa REMOLD: $20(14+16)/2 = 300$ P.S.F. S = 4.1		
35.5	38.5	AUGER		
38.5	40.5	2" SHELVY TUBE	T.W. 16	PH
40.5	42	VANE TEST UNDIST $20(40+40)/1 = 1600$ P.S.F. 76.2 KPa REMOLD $20(18+20)/2 = 380$ P.S.F. S = 4.2		
38.5	42	AUGER	S.S. 17	2-4-3
42	43.5	S.S. <u>⊙</u> CLAY TR/SOME SILT <u>CL</u>		



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 4
DRILLER ORLA GROUND ELEV. 98.3 JOB No. W.P. 166-77-01
ENGINEER C. McLORG CASING SIZE H.S. AUGERS DATE 83/07/11
SITE LOCATION 2.93 km E of #11 on #101 @ "CARDINERS HILL."
HOLE LOCATION STA B + 0.61; 2.4 m L of E
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
43.5'	45'	VANE TEST		
		UNDIST. $20(36+34)1 = 1400$ P.S.F.		
			68.6 kPa	
		REMOLD $20(22+22)1/2 = 440$ P.S.F.		
		S = 3.2		
42'	45'	AUGER @		
45'	46.5'	S.S. SILT some CLAY <u>ML-CL</u>	S.S. 19	5-5-8
46.5'	48'	VANE TEST		
		UNDIST. $20(22+28)1 = 1120$ P.S.F.		
			53.3 kPa	
		REMOLD: $20(24+24)1/2 = 480$ P.S.F.		
		S = 2.3		
45'	48'	AUGER		
48'	49.5'	S.S. SILT TRACE some CLAY <u>ML</u>	S.S. 19	2-5-6
49.5'	51'	VANE TEST		
		UNDIST: $20(34+34)1 = 1360$ P.S.F.		
		REMOLD: $20(30+30)1/2 = 600$ P.S.F.		
48'	51'	AUGER	S = 2.3	64.8 kPa
51'	53'	2" SHELBY TUBE	T.W. 20	PH.
		ONLY went ONE FOOT - GOT HARD.		
		... NO SAMPLE		
51'	52'	AUGER		
52'	53.5'	S.S. OTTAWA SAND with SILT	S.S. 21	5-6-3/4



FIELD BORING LOG

SOIL MECHANICS SECTION

DRILLING CO. ATCOST DATUM ELEV. ARBITRARY B.H. No. 4
DRILLER ORLA. T. GROUND ELEV. 98.3 JOB No. W.P. 166-77-01
ENGINEER C. McLORG CASING SIZE H.S. AUGERS DATE 83/07/11
SITE LOCATION 2.93 km EA #11 on #101,
HOLE LOCATION STA 13 + 061 ; 2.4 m LA #
REMARKS _____

DEPTH		DESCRIPTION	SAMPLE TYPE, No. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
52'	53.5'	AUGER. (H.G.)		
53.5'	55'	S.S. OTTAWA SAND WITH SILT.	S.S. 22	6-60 1/2"
53.5'	55'	AUGER	S.S. 23	23- 43
55'	56.5'	S.S. (SAND, SILT) TRACE/SOME CLAY BORDERLINE C.		
55'	56.5'	AUGER	S.S. 24	11-10-6
56.5'	58'	S.S. AS FOR S.S. 23		
		END BORE HOLE.		

RECORD OF BOREHOLE No 3

METRIC

W P 166-77-01 LOCATION STA: 12+954; o/s 4m RT.
 DIST 14 HWY 101 BOREHOLE TYPE CONT. FLIGHT AUGER
 DATUM ASSUMED DATE 83 07 08

ORIGINATED BY CM
 COMPILED BY DP
 CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT <u>2</u>					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
94.0	GROUND LEVEL																
0.0	SAND & GRAVEL																
92.9	FILL MATERIAL																
1.1			1	SS	31												35.5 55 1.5 2
			2	SS	9												
			3	SS	3												
			4	TW PH													
			5	SS	2											18.7	
			6	SS	2												
			7	SS	3												
			8	TW PH												17.3	0 0 40.5 59.5
			9	SS	3												
			10	SS	5												
			11	SS	6												
			12	TW PH												18.5	
			13	SS	5												
			14	SS	7												
			15	SS	8												
			16	TW PH												19.6	0 0 16 84 0 0 96 4
			17	SS	11												
			18	SS	16												
			19	SS	16												
98.2			20	SS	19												
16.8	SAND		21	SS	26												17.5 40.5 36 5.5
			22	SS	30												
			23	SS	13												22.5 62 13 2.5
95.1			24	SS	17												
18.9	END OF BOREHOLE																

+3, x5: Numbers refer to
Sensitivity

20
15-5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 4

METRIC

W P 166-77-01 LOCATION STA: 12+939; 9/5 2.4 LT ORIGINATED BY CM
 DIST 14 HWY 101 BOREHOLE TYPE CONT. FLIGHT AUGER (H.S.) COMPILED BY PP
 DATUM ASSUMED DATE 83 07 11 CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT <u>2</u>					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
93.3	GROUND LEVEL																
0.0	SAND & GRAVEL SOME SILT & CLAY TRACE OF ASPHALT U. DENSE TO COMPACT		1	SS	73												29 64 6 1
91.9			2	SS	15												4.5 2 39 54.5
1.4			3	SS	9												
			4	SS	9												
			5	SS	7												
			6	SS	9												
			7	SS	5												
			8	TW PH												17.0	0 0 16 84
			9	SS	2												
			10	SS	2												
			11	SS	4												
			12	TW PH												17.9	
			13	SS	6												
			14	SS	4												
			15	SS	5												
			16	TW PH												18.5	0 0 10.5 84.5 0 0.5 90.5 9
			17	SS	7												
			18	SS	13												
			19	SS	11												
77.5			20	TW PH													
15.8	SAND COMPACT TO U. DENSE		21	SS	36/32 dm												8.5 55.5 30.5 5.5
			22	SS	66/20 dm												28.5 47.5 21 3
75.6			23	SS	43												
17.7	END OF BOREHOLE		24	SS	16												

+³, x⁵: Numbers refer to
Sensitivity

20
15 0.5 (%) STRAIN AT FAILURE
10



Ontario

Ministry of
Transportation and
CommunicationsVISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT <u>166-77-01</u> SITE _____ BOREHOLE NO. <u>1</u> GROUND ELEVATION _____														
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL	SAND	SILT AND CLAY								
1													trace of organ. brown si clay of interm. plasticity	CI
2													trace of organ. - silt seams grey si clay of int. plast. + organic clay	OI + CI
4													grey si clay of interm. pl.	CI
5													ditto.	CI
7													ditto.	CI
8													varved clay / si cl. of high PL. + PL. + ML	CH
10													ditto. some sand	silt CI + ML
11													sandy gravel	GH

NOTE:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-



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Ministry of
Transportation and
CommunicationsVISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT		166-77-1		SITE		BOREHOLE NO.		2		GROUND ELEVATION					
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION				DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE											
GRAVEL	SAND			SILT AND CLAY											
14														varved clay grey si cl of high plast. + ML layers	ML CH
15														ditto.	ML CH
17														ditto.	ML CH
18														+ plastic silt varved clay, grey si cl of high pl.	ML CH
20														ditto.	ML CH
21														ditto.	ML CH
23														ditto.	ML CH
24														silt to si clay of low plasticity	CL-ML
26														ditto.	CL-ML

NOTE:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

27

28

29

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PR-CC-400 (FORMERLY OB-MT-318 78-01)

21 gravelly sand, some silt SM

sandy gravel, trace of fines GP
silt to si clay of low plasticity CL-ML
non-plastic silt and CL-ML ML+CL
gravelly sand with silt SM



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CommunicationsVISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT <u>W.P. 166 - 77-01</u>										SITE _____		BOREHOLE NO. <u>3</u>		GROUND ELEVATION _____		
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT AND CLAY										
S.S. 1	1-6' - 3-0'	20mm	ROUND	10	80	10		/	SLOW	/	EARTHY	GREY-BROWN	NONE	VERY DUNE	OTTAWA SAND TR. GRAY, TR. SAND	SW
S.S. 2	3-0' - 4-5'	/	/		15	85		DULL	NONE	MED.	"	"	MILD	STIFF	SILTY CLAY TR. OTTAWA SAND	CL
S.S. 3	4-5' - 6-0'				10	90		DULL SHINY	NONE	"	"	BROWN	MILD	FIRM	SILTY CLAY INTER. PLASTICITY	CL
S.S. 5	9-5' - 11-0'	/	/			100		SHINY	"	HIGH	"	GREY	NONE	VERY SOFT	CLAY TR. / NO SILT - HIGH PLASTICITY	CH
S.S. 7	15-5' - 17'	/	/			100		"	"	"	"	"	"	SOFT	GRAY VARIED SILTY CLAY - HIGH PLASTICITY	CH
S.S. 10	25' - 26-5'	/	/			100		"	"	"	"	"	NONE	FIRM	" " " " " "	CH
S.S. 11	28' - 29-5'	/	/			100		"	"	"	"	"	"	"	GRAY VARIED SILTY CLAY - HIGH to INTER. PLASTICITY SILT CONTENT IS INCREASING	CH CL
S.S. 15	40-5' - 42'	/	/			100		DULL SHINY	"	MID-HIGH	"	"	"	STIFF	GRAY SILTY CLAY - VARIED	CH CL
S.S. 17	46-5' - 48'	/	/			100		"	"	HIGH	"	"	"	STIFF	GRAY SILTY CLAY POSSIBLE TR. SAND	CH-CL

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REMARKS:-



Ontario

Ministry of
Transportation and
CommunicationsVISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT <u>00-166-77-01</u> SITE _____ BOREHOLE NO. <u>3</u> GROUND ELEVATION _____																
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYM/BCL
		LARGEST GRAIN SIZE	SHAPE	GRAVEL	SAND	SILT AND CLAY										
35-19	52'-53.5'	/	/		10	90		NONE	NONE	NONE to SLIGHT	EARTHY	GRY	NONE	VERY STIFF	(10) SILT WITH CLAY to CLAY WITH SILT - LT.	ML CL
35-21	55.5'-57'	/	/		70	30		FINE	SLOW to QUICK	"	"	"	NONE	HARD	(30) <u>BOGOMLINEC</u> MED. to FINE SAND SOME CLAY TR. SILT.	SC
35-22	59'-60.5'	8 mm	SUB-ANGULAR	15	75	10		/	"	/	"	GRY / BLACK	"	COMPACT	(40) OTTAWA SAND, SOME GRAVEL, TR/SOME SILT.	SM

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REMARKS:-



Ontario

VISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT <u>166-77-01</u>		SITE _____		BOREHOLE NO. <u>2</u>		GROUND ELEVATION _____										
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
GRAVEL	SAND			SILT AND CLAY												
1															gravelly sand, some lumps of Cl	SP
2															gravelly sand + si cl of int. pl. + CI	SP
3															some organics - pockets of silt grey and brown si cl of int. pl.	CI
5															also, traces of organics	CI
6															brown si cl of int. plast.	CI
8															grey si cl of high plasticity and brown si cl. of int. pl.	CI + CH
9															grey si cl of high pl.	CH
11															also	CH
12															varved clay / si cl of high pl. + plast. + silt	CH

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REMARKS:-



Ontario

Ministry of
Transportation and
CommunicationsVISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT <u>W.P. 166-77-01</u>										SITE _____		BOREHOLE NO. <u>B.H. 4</u>		GROUND ELEVATION _____		
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION				DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL	
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT AND CLAY										
S.S. 1	1.5' - 3.0'	7mm	ROUNDED SUB-ROUNDED	5	85	10		/	MEDIUM TO QUICK	/	EARTHY	BROWN	NONE	VERY DENSE	(N/C) WELL GRADED BROWN SAND TRACE SILT, TRACE GRAVEL SOME ASPHALT (POSSIBLE CONTAMINATION) - GRAN. 'C'	SW
S.S. 3	4.5' - 6.0'	/	/		10	90		DULL	NONE	MED.	ORGANIC	GREY	SLIGHT TO MED.	STIFF	(C) GREY SILTY CLAY OF LOW PLASTICITY TR/SOME ORGANICS	CL
S.S. 6	9.0' - 10.5'	/	/			100		SHINY-DULL	NONE	SLIGHT MED.	EARTHY	MOTTLED	MILD.	STIFF	(C) SILTY CLAY OF INTERMEDIATE PLASTICITY	CI
S.S. 9	17' - 18.5'	/	/			100		SHINY	NONE	HIGH	"	GREY	NONE	VERY SOFT	(C) CLAY TR. SILT TO SILTY CLAY OF HIGH PLASTICITY MAY BE VARIED.	CH
S.S. 11	23' - 24.5'	/	/			100		SHINY-DULL	"	HIGH	"	"	MILD.	SOFT	(C) GREY VARIED SILTY CLAY OF HIGH PLASTICITY	CH
S.S. 15	35.5' - 37'	/	/			100		SHINY	"	"	"	"	"		(C) GREY VARIED SILTY CLAY OF HIGH PLASTICITY	CH
S.S. 17	47' - 43.5'	/	/			100		SHINY-DULL	"	MED-HIGH	"	"	NONE	FIRM	(C) SILTY CLAY - HIGH PLASTICITY (C) GREY SILTY CLAY OF HIGH PLASTICITY	CH
S.S. 18	45' - 46.5'	/	/			100		"	SLOW	SLIGHT	EARTHY	"	"	STIFF	(C) WET SILT (TR. CLAY) OF INT. PLASTICITY	MI
S.S. 21	52' - 53.5'	2mm	SUB-ANGULAR		90	10		/	QUICK	/	"	GREY, BLACK	"	DENSE	(N/C) OTTAWA SAND TR. SILT	SW

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REMARKS:-



Ontario

Ministry of
Transportation and
Communications

VISUAL CLASSIFICATION
SOILS MECHANICS OFFICE

PROJECT <u>W.P. 166-77-01</u> SITE _____ BOREHOLE NO. <u>B.H. 4</u> GROUND ELEVATION _____																
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT AND CLAY										
B.S. 22	53.5'-55'	4mm	Sub-Rounded		75	25		/	SLOWLY CURK	/	KARSTEN	GRDY	NONE	VERY DENSE	(H/C) WET OTTAWA SAND SOME SILT	SM
B.S. 23	55'-56.5'	/	/		75	25		/	"	"	"	"	"	"	(H/C) WET OTTAWA SAND SOME/WITH SILT	SM

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REMARKS:-



Ministry of
Transportation and
Communications

PROPERTY DAMAGE REPORT

REGION: NORTHERN DATE: 83/07/07

IDENTIFICATION OF

☒ OWNER

☐ TENANT

NAME: MR. CARMIN DOUGHTY

POST OFFICE ADDRESS:

LOCATION: DISTRICT 14 HIGHWAY 101

TOWNSHIP, LOT AND CONCESSION, ETC.,

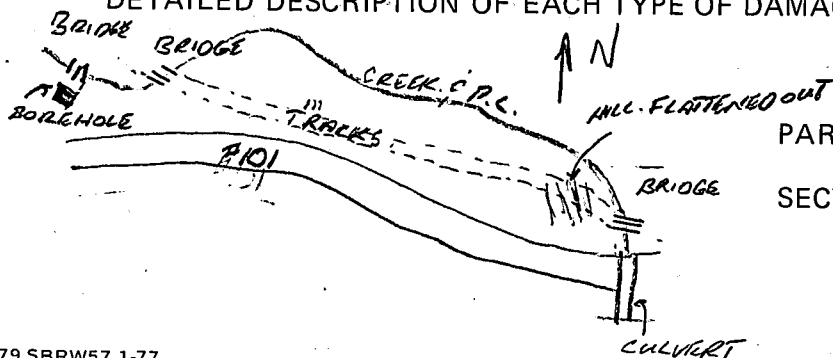
DETAIL OF DAMAGE:

DATE DAMAGE DONE: 83/07/05

- ONE BOREHOLE ADJACENT TO CREEK - PROPERLY BACKFILLED,
 - THE CREEK (WHICH IS THE PROPERTY LINE) WAS BRIDGED THREE TIMES. SOME DEADFALL WAS USED IN THE BRIDGING
- TYPE(S) OF DAMAGE: (CROP, TREES, FENCES, LAWNS, FLOWER BEDS, ORNAMENTAL PLANTINGS, ETC.)
- APPROXIMATELY 100' OF TRACK MARKS THROUGH LONG GRASS.
 - SOME HAND DIGGING OF TOPSOIL TO FLATTEN OUT A SMALL HILL.

OWNER INSPECTED, STATED "NO DAMAGE AS FAR AS I AM CONCERNED"

DETAILED DESCRIPTION OF EACH TYPE OF DAMAGE: (use added sheets if required.)



PARTY CHIEF

SECTION PAVEMENT & FOUNDATION DESIGN
CHRIS MCLORE



PROPERTY DAMAGE REPORT

REGION: NORTHERN DATE: 8/3/07/07

IDENTIFICATION OF

☒ OWNER

☐ TENANT

NAME: MR. FLOYD DYER

POST OFFICE ADDRESS: B.R.2, MATHESON, ONT. POKINGO

LOCATION: DISTRICT 14 HIGHWAY 101

TOWNSHIP, LOT AND CONCESSION, ETC., NORTH HALF LOT 1, CONC. 1, CARR.

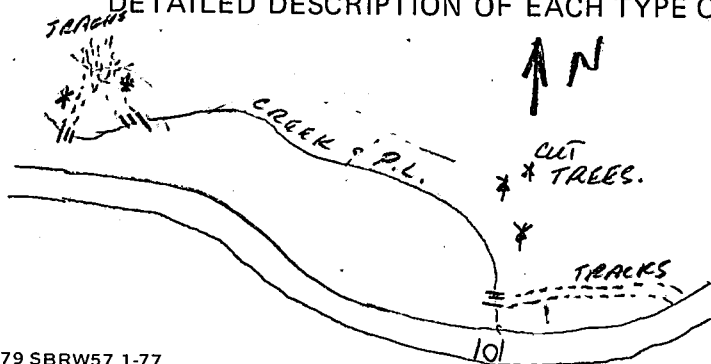
DETAIL OF DAMAGE:

DATE DAMAGE DONE: 8/3/07/05

- CREEK WAS BRIDGED 3 TIMES.
 - 7-8 TREES - MAX DIA = 12" - WERE CUT TO HELP BRIDGING
 - 100 FEET OF TRACK MARKS IN SCRUB & GRASS
- TYPE(S) OF DAMAGE: (CROP, TREES, FENCES, LAWNS, FLOWER BEDS,
ORNAMENTAL PLANTINGS, ETC.)
- SOME DEADFALL USED IN BRIDGING

- OWNER INSPECTED AND INDICATED DAMAGE WAS NO PROBLEM.

DETAILED DESCRIPTION OF EACH TYPE OF DAMAGE: (use added sheets if required.)



PARTY CHIEF

SECTION PAVEMENT & FOUNDATION DESIGN
CHRIS MCLEOD

CLEARANCES FOR SETTLEMENT PROBLEMS ON 101

WYORK - ALL ON THE POLE - HARVEY DURHAM

BELL - NORTHERN TELEPHONE - MET ON SITE @ 8:40 8/07/05,
ALL ON THE POLE.

MUNICIPAL - NOTHING OUT THERE * CLARK IN TOWNSHIP
OFFICE

GAS! NOTHING

PROPERTY:

CARMINE DOUGHTY: PERMISSION GIVEN - DID NOT
PERMIT TO CUT ANYTHING BIG.

- NOT PERMITTED TOO FAR WESTWARD.

- PERMISSION VALID FOR AREA WEST OF CREEK

FLOYD DYER - PERMISSION VALID FOR AREA EAST OF
CREEK

- MORE THAN HAPPY FOR USE TO CUT
ANYTHING OR RUN OVER ANYTHING WE
WANT - FURTHER SUGGESTS A RE-ALIGNMENT
OF 101 THROUGH HIS LAND.

memorandum



To: Mr. G. A. Wrong
Head, Pavement & Foundation
Design Section
Central Building
DOWNSVIEW

Date: 83 05 19

Attention: K. Selby

FROM: Geotechnical Section
Northern Region

RE: WP 166-77-01, HWY 101
FROM MATHESON EASTERLY
DISTRICT 14, NEW LISKEARD



This is to request recommendations from your office for remedial measures required for the correction of a settlement problem located on Highway 101, 2.93 km east of Hwy 11.

The problem occurs along the outer half of the pavement and in the shoulder along the north side of the highway approximately 90 metres west of the culvert where Black Creek flows across Highway 101.

Should further information be required, please contact this Office.

A handwritten signature in cursive script, appearing to read "K. L. Howe".

K. L. Howe
Pavement Design &
Evaluation Officer

KLH/ap

cc: S. McCombie
J. J. McNamee