

GEOCRES No. 31E-64

DIST. 11 REGION NORTHERN

W.P. No. 52-66-02

CONT. No. 74-15

W. O. No. 72-11117

STR. SITE No. _____

HWY. No. 69

LOCATION Realignment of Hwy 69
in Huntsville

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. ☐

REMARKS: _____

MEMORANDUM

31E-64

TO: Mr. G. A. Wrong,
Principal Soils Engineer,
Design Services Branch,
West Bldg., Downsview.

FROM: Foundations Office,
Design Services Branch.

ATTENTION:

DATE: December 22, 1972.

OUR FILE REF.

IN REPLY TO

SUBJECT: *Subsurface Investigation, Swampy Area
(Stations 402+40 to 406+50), Proposed
Realigned Hwy. #69 (Line "T"), Twp. of
Medora, District of Muskoka, District #11
(Huntsville), W.O. 72-11117 - W.P. 52-66-02*

1. INTRODUCTION:

The Foundations Office was requested to put down two boreholes in the aforementioned swampy area, in order to define the type and thickness of the surficial organic material as well as the composition of the underlying stratum. The request was contained in a memo from Mr. G. A. Wrong, Principal Soils Engineer, Soils Office, dated October 18, 1972. An investigation was subsequently carried out by this Office. In this memo the subsoil and groundwater conditions encountered are presented.

2. SUBSOIL AND GROUNDWATER CONDITIONS:

Two boreholes were put down in this area on November 15 and 16, 1972, using a hydraulically powered continuous flight auger machine (C.M.E. machine). The subsoil conditions encountered are shown on the Record of Corelog sheets appended to this memo. The location and elevation of the borings are shown on the attached plan, along with an inferred stratigraphical profile in this area. A resume of the subsoil conditions encountered is presented in the paragraphs to follow.

The site is surficially covered by a 4.5 to 5 feet thick very soft black decayed vegetation with silty sand and some clay. This surficial material is underlain by a 13 to 20 feet thick deposit of very soft (undrained shear strength (C_u) ranging between 150 and 300 p.s.f.) inorganic clay with ^u pockets of sandy silt throughout.

The inorganic material is underlain by a dense to very dense ('N' values 46 and 92 blows/ft.) silty sand with gravel with boulders up to 10 inches in size throughout. The borings were terminated within this stratum after penetrating it for a depth of up to 16.5 feet.

December 22, 1972.

The groundwater level was reached in the open boreholes during the period of the investigation. The results indicate that the groundwater level is at existing ground surface.

We believe that the factual data presented in this letter will prove adequate for your requirements. Should additional information be required, please contact this Office.

M. Devata

M. Devata,
SUPERVISING FOUNDATIONS ENGINEER.

MD/ao

cc: S. McCombie
R. P. Northwood
Foundations Office ✓
Documents



APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

JOB 72-11117

LOCATION Hwy. 69 Line 'T' Sta. 404 + 00 @ Glen Orchard

ORIGINATED BY VK

W.P. 52-66-02

BORING DATE Nov. 15, 1972

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger and sample with CME Machine

CHECKED BY *SK*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT w_L			BULK DENSITY	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT			PLASTIC LIMIT w_p						
							20	40	60	80	100	WATER CONTENT w				
												w_p			w	w_L
						SHEAR STRENGTH P.S.F.			WATER CONTENT %							
						○ UNCONFINED + FIELD VANE										
						● QUICK TRIAXIAL x LAB VANE										
						400	800	1200	1600	2000						
751.8	Ground Level															
0.0	Black decayed vegetation with silty sand and some clay		1	SS	PM	750										
747.3	Clay with pockets of sandy silt		2	SS	PM	740										
4.5	Very Soft		3	SS	PM	730										
739.3	Silty sand with gravel & boulders of max. 10" size.		4	SS	92	720								Org. cont. 0.2%		
22.5	Very Dense															
719.3	Boulders		5	BXL	70%	710										
32.5	End of Borehole															
716.8																
35.0																

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 2

JOB 72-11117

LOCATION Hwy. 69 Line 'T' Sta. 404 + 00 30' Lt. of Glen Orchard

ORIGINATED BY VK

W.P. 52-66-02

BORING DATE Nov. 16, 1972

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger and sample with CME machine

CHECKED BY *M*

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P — w — w_L	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE					
752.0	Ground Level								
0.0	Black decayed vegetation with silty sand and some clay.								
747.0									
5.0	Clay with pockets of sandy silt.		1	SS	PM				
736.0	Very Soft								
16.0	Silty sand with gravel and boulders of max. 10" size.		2	SS	46				
719.5	Dense to Very Dense								
32.5	End of Borehole								

Handwritten notes and diagrams:
 - At 740' elevation, a horizontal line with a circle at the right end is drawn.
 - At 730' elevation, a horizontal line with a circle at the right end is drawn.
 - A vertical line is drawn at 740' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 740' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 730' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 719.5' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 710' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 700' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 690' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 680' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 670' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 660' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 650' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 640' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 630' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 620' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 610' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 600' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 590' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 580' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 570' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 560' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 550' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 540' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 530' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 520' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 510' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 500' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 490' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 480' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 470' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 460' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 450' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 440' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 430' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 420' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 410' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 400' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 390' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 380' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 370' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 360' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 350' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 340' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 330' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 320' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 310' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 300' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 290' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 280' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 270' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 260' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 250' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 240' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 230' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 220' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 210' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 200' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 190' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 180' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 170' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 160' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 150' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 140' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 130' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 120' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 110' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 100' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 90' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 80' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 70' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 60' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 50' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 40' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 30' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 20' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 10' elevation, extending from 752.0 to 719.5.
 - A horizontal line is drawn at 0' elevation, extending from 752.0 to 719.5.

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
I_P	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_i	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

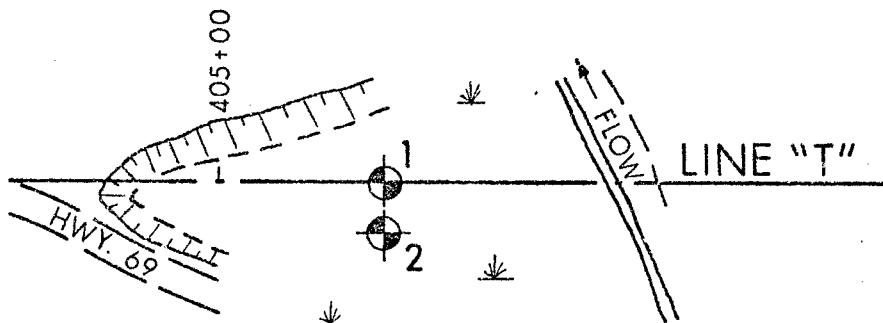
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

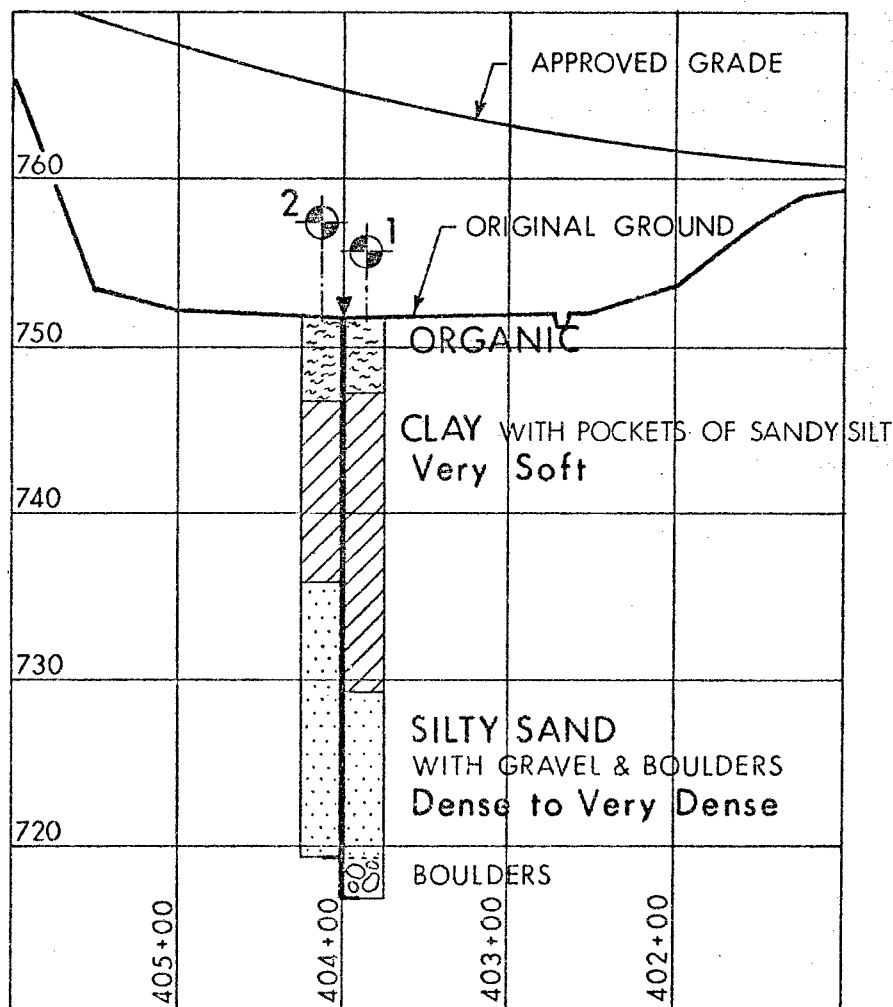
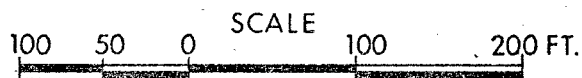
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



PLAN



PROFILE

WP 52-66-02
W.O. 72-11117

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundations Engineer,
Foundations Office, West Bldg.

FROM: Soils Office,
1st Floor, West Building.

ATTENTION: Mr. M. Devata.

DATE: October 18, 1972.

OUR FILE REF.

IN REPLY TO

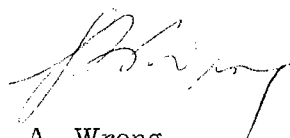
SUBJECT:

W. P. 52-66-02
Highway #69
0.35 Miles South of Highway #118 Northerly
to 0.3 Miles South of Highway #103
District 11 - Huntsville

As discussed with you in your office yesterday, there is some concern that arching may occur in the rock fill to be constructed over the swamp located between Station 402+40 and Station 405+50 (Line "T"), Township of Medora.

The soundings undertaken by the Regional Soils staff with peat samplers suggest that boulders will be located at approximately twenty feet. We would very much like to obtain some factual data as to the depth to firm bottom in this swamp location.

Would you please arrange to have two bore holes placed along centre-line through this organic deposit whenever you have equipment in this area. Mr. R. Northwood, Senior Soils Engineer in North Bay has been requested to forward to your office a copy of soils profile 69N11-1 as well as the plan showing the location of the swamp area.


G. A. Wrong,
Principal Soils Engineer.

GAW/sd

cc:- A. Rutka
R. Northwood
S. Cant

Design Services Branch,
1201 Wilson Avenue,
Downsview 464, Ontario.

December 6, 1972.

Telephone: 248-3282.

Master Soil Investigation Ltd.,
104 Kenhar Drive,
Woodbridge, Ontario.

Dear Sirs:

This letter confirms our request of November 2, 1972,
for the supply of a C.M.E. auger machine together with all
necessary equipment, as specified under the terms of our
Contract Agreement, at Glen Orchard, Ontario and Hwy. #69
on November 7, 1972.

Mobilization will be from the yard at Toronto, Ontario.

Our Project Number is W.O. 72-11117.

Yours truly,

MD/ao

cc: W. W. Fry
(Attn: Mrs. W. Andrews) For:

Foundations Files
Documents

M. Devata,
Supervising Foundations Engineer,
A. G. Stermac,
Principal Foundations Engineer.

File 149

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

Copy for the information of

Mr. R. S. Chapman,
District Engineer, Huntsville.

Materials & Testing,
Northern Region.

Mr. W. Ham

16 August 1974.

Contract 74-15,
Slippage of Fill,
Station 337 to 341,
Huntsville District.

At the request of Mr. Bill Muckler I visited the above contract on August 15, 1974 to observe and make recommendations for remedial measures for a construction problem that was occurring from the placement of fill over the muskeg deposit Station 337+ to 341+.

After visiting the site and discussion with Mr. Glen Hill, the Project Supervisor the following points were discussed and observed:

1) (i) The muskeg deposit was excavated to 12' below original ground level and back filled with rock as per design recommendations.

(ii) Earth fill was placed over the rock to a height of 4 to 5 feet above original ground.

(iii) On August 13, 1974 in the afternoon longitudinal cracks were observed on the surface between Station 337 and 341.

(iv) On August 14, 1974 the fill displaced towards the east in two stages. The maximum deep of fill displacement was 8 feet.

(v) The fill in the failed area was built back up to 4 to 5 feet above original ground.

2) Mr. Hill and the writer observed the following on August 15, 1974.

(i) Longitudinal cracks had developed on the surface of the rebuilt fill.

(ii) The muskeg cast to the east from the excavation was showing signs of rotating towards the east.



After discussions with Mr. Hill of possible remedial measures it was recommended that:

- (i) A surcharge fill be built to height of two feet above finished pavement grade between Station 336 and 341.
- (ii) The width of the surcharge at the top should be 38 feet.
- (iii) The surcharge would be left on for a period of one month.
- (iv) The fill will be monitored for movements by the District Construction Staff and if any movements occur this office should be contacted.

WJP/sm

c.c. -W. R. Bennett
-C. Mirza✓
-J. E. Gruspier
-J. Buckle



W.J. Peck,
Senior Soils Engineer.