

66-F-41

W.P. # 110-66-3

PROPOSED

COMMUTER STN.

PEDESTRIAN

UNDERPASS

OAKVILLE

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. W. D. Ratz,
Superintendent of Land Surveys,
Right-of-Way Division,
Admin. Bldg.

From: Foundation Section,
Materials and Testing Division,
Room 107, Lab. Bldg.

Attn: Mr. B. Wright,
Drafting Chief Inspector.

Date: May 17, 1966

Our File Ref.

In Reply To

MAY 27 1966

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

Proposed Commuter Station
Pedestrian Underpass - Oakville
District #4 (Hamilton)
W.J. 66-F-41 -- W.P. 110-66-3

Attached, we are forwarding to you, our foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that you will find the factual data and recommendations contained therein, adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

AGS/MdeF
Attach.

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. W. D. Ratz (4)
H. Greenland
T. J. Kovich
Foundations Office
Gen. Files

FOUNDATION INVESTIGATION REPORT
For
Proposed Commuter Station
Pedestrian Underpass - Oakville
District #4 (Hamilton)

W.J. 66-F-41

W.P. 110-66-3

A request for the investigation of the foundation conditions at the location of the above underpass, was received by this Section in a memo dated April 15, 1966, from Mr. B. Wright, Chief Inspector of Surveys. Subsequently an investigation, consisting of two sampled boreholes, was carried out at this site. Presented in this report are the field data and our recommendations pertaining to the structure foundations.

The site is generally flat, with little vegetation in the immediate vicinity. The surrounding area, with the exception of buildings associated with a railway station, is only lightly developed.

A surface layer of loose fill, about 4 ft. to 5 ft. thick, was found in both boreholes. This fill is a heterogeneous mixture of debris, sand and clayey silt. The fill layer is underlain by a shallow deposit of clayey silt with sand, approximately 3 ft. thick. One Standard Penetration test was performed within the stratum giving a value of 14 blows/ft. The clayey silt stratum in turn, rests on shale bedrock. The upper 12 inches of the rock is generally weathered. Below this, the bedrock is presumed to be sound. Water level observations carried out in the boreholes during the time of the investigation, showed the ground water to be at approximate elevation 325, some 2 ft. to 3 ft. below ground surface.

At the time of this writing, details of the proposed underpass structure are not available, except that it will be located some 11 ft. below the rails. In such a case the footings can be founded on sound shale bedrock with a safe design load of 10 t.s.f.

cont'd. /2

The field investigation, performed in May 1966, together with the preparation of this report, was undertaken by Mr. R. Magi, Project Foundation Engineer. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

Equipment was owned and operated by Dominion Soil Investigation Ltd. of Toronto.

May 1966

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 66-F-47

LOCATION C.N.R. Oakville Station (See DWG)

ORIGINATED BY RM

W. P. 110-66-3

BORING DATE: May 5, 1966

COMPILED BY RM

DATUM Geodetic

BOREHOLE TYPE Penn Auger

CHECKED BY

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 2

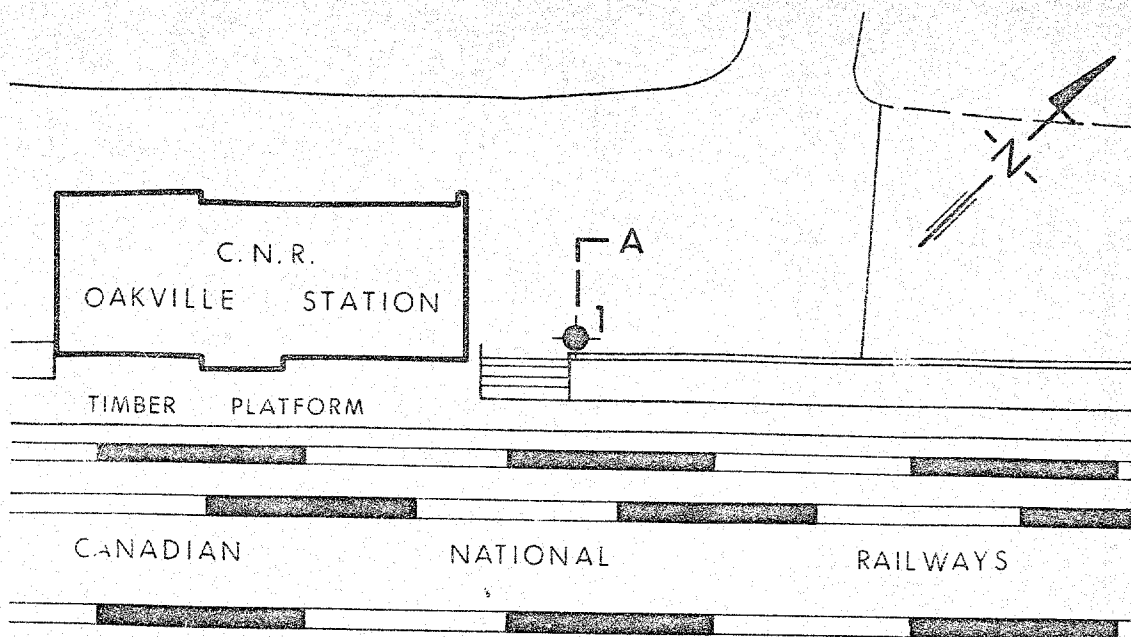
FOUNDATION SECTION

JOB 66-F-41 LOCATION C.N.R. Oakville Station (See DWG) ORIGINATED BY RM
W.P. 110-66-3 BORING DATE May 5, 1966 COMPILED BY RM
DATUM Geodetic BOREHOLE TYPE m Penn Auger CHECKED BY CR

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				
							SHEAR STRENGTH P.S.F.					WATER CONTENT — w				
												w_p	w	w_L		
												WATER CONTENT %			P.C.F.	
328.2	Ground Level															
0	Fill (Mixt. of Debris Sand and Clayey Silt)					325										
	Loose		1	SS	7											
323.2																
5	Clayey Silt with Sand															
321.7																
320.7	Weathered Shale		2	SS	74	320										
7.5	Probably Sound Bedrock															
	End of Borehole															

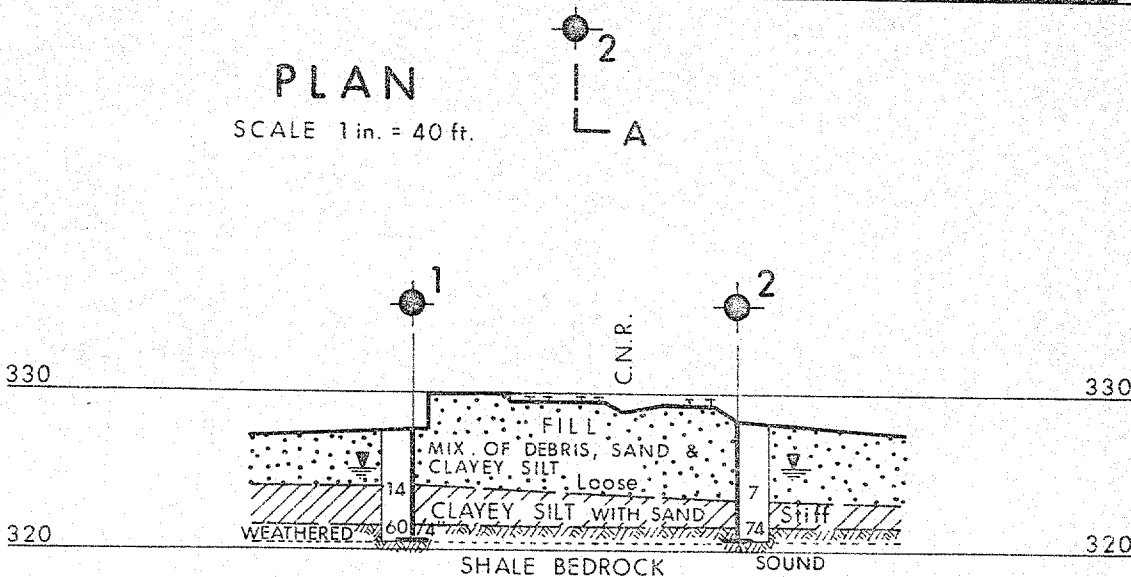
W.L. Elev. = 325.2

W.L. Elev
= 325.2



PLAN

SCALE 1 in. = 40 ft.



SECTION A-A

SCALES HOR. 1 in. = 40 ft.
VERT. 1 in. = 10 ft.

REF. NO. M-4112



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

ONTARIO

PROPOSED PEDESTRIAN UNDERPASS
OAKVILLE COMMUTER STATION
CANADIAN NATIONAL RAILWAYS

W.P. 110-66-3

DIST. 4

JOB 66-F-41

DATE 26 MAY 1966

APPROVED *[Signature]*

DRAWING NO. 66-F-41 A

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

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	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
	INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	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

66-8-41

DEPARTMENT OF HIGHWAYS ONTARIO

Harry Keire
278-1220

MEMORANDUM

To: Mr. A. Rutka
Materials and Testing Engineer
Materials and Testing Division

FROM: B. Wright

DATE: April 15, 1966

Attention: Mr. A. Stermac
OUR FILE REF. IN REPLY TO

SUBJECT:

Commuter Rail Project
Oakville Station

Enclosed herewith are two plans of the above mentioned site.

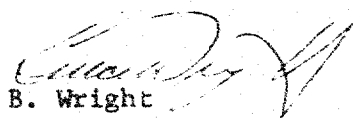
- (1) shows the soils tests required by LeLeuw Cather for the design and construction of a parking lot.
- (2) shows the soils tests required by the C.N.R. for the design and construction of pedestrian underpasses under the tracks.

The final reports can be compiled in one booklet to serve both organizations. Please forward three copies of the report to the writer for distribution.

The C.N.R. recommends that one of their trackmen be in attendance during the drilling operation on the railway right-of-way to eliminate any liability to this Department. If you want the trackmen, please contact Mr. Harry Keire at 365-3577 twenty-four hours in advance of your drilling time.

As I will be away from my office until May 1st, if you have any enquiries to make please contact Mr. W.T. Howard at local 2007.

BW:ld
Encl:


B. Wright
Chief Inspector of Surveys

cc: Mr. W.T. Howard