

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundation Engineer,
Downsview, Ontario.

FROM: Bridge Section,
Kingston, Ontario.

3165-99

GEOCRE No.

ATTENTION:

DATE: March 31, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 438-64-00, Site 3-288,
Interchange Underpass at Connection to Hwy. 15,
Highway 417, District 9 - Ottawa

71-11-030

We are sending herewith two prints of Bridge Site Plan E-5208-1 on which we have marked the proposed location of the above structure. Also enclosed are two copies of your Field Reconnaissance Report.

We would be pleased if you will make arrangements for the necessary foundation investigation and to have your report, the scheduled date for which is June 9, 1971.

A. VanDalen
A. VanDalen

For: T. C. Kingsland
Regional Bridge Planning Engineer

AV/TCK/hl

Encls.

c.c. (with encl.)

Mr. S. McCombie

c.c. Mr R. Forrest

Mr Mike Sudy
Cap Peter
Barry McInch
Bills

Just in 58 04
11-11

city limit
- 828 - 2741

MEMORANDUM

31G5-99

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

FROM: Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

ATTENTION: Mr. S. McCombie

DATE: May 14, 1971

OUR FILE REF.

IN REPLY TO

MAY 28 1971

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Underpass Structure at the
Crossing of Hwy. #417 and Hwy. #7
Connection -- Township of Huntley
Reg. Mun. of Ottawa - Carleton
District No. 9 (Ottawa)
W.O. 71-11030 -- W.P. 438-64-00

31G5-99

GEOCRES No.

CONT - 74-151

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

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis
F. G. Allen
D. W. Farren
S. J. Markiewicz
J. E. Callaghan
T. C. Kingsland (2)
M. R. Ernesaks (2)
J. E. Gruspler
B. J. Giroux
B. A. Singh

Foundations Files
Gen. Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. DESCRIPTION OF THE SITE AND GEOLOGY.
 3. FIELD AND LABORATORY WORK.
 4. SUBSOIL AND BEDROCK CONDITIONS:
 - 4.1) General.
 - 4.2) Peat.
 - 4.3) Granular Deposit.
 - 4.4) Silt.
 - 4.5) Glacial Till.
 - 4.6) Limestone Bedrock.
 5. GROUNDWATER CONDITIONS.
 6. DISCUSSION AND RECOMMENDATIONS:
 - 6.1) General.
 - 6.2) Approach Embankments.
 - 6.3) Structure Foundations:
 - 6.3.1) Pier Foundation
 - 6.3.2) Abutment Foundations
 7. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Proposed Underpass Structure at the
Crossing of Hwy. #417 and Hwy. #7
Connection -- Township of Huntley
Reg. Mun. of Ottawa - Carleton
-- District No. 9 (Ottawa)
W.O. 71-11030 -- W.P. 438-64-00

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation for the proposed underpass structure at the crossing of Hwy. #417 and Hwy. #7 connection in the Township of Huntley, Regional Municipality of Ottawa-Carleton. The request was contained in a memo from Mr. T. C. Kingsland, Regional Bridge Planning Engineer, Eastern Region, dated March 31, 1971. An investigation was subsequently carried out by this Section to determine the subsoil and groundwater conditions at this site.

This report contains the results of the investigation, together with the recommendations pertaining to the foundations of the proposed structure as well as the stability and settlement considerations associated with the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is within a heavily forested area located approximately 1-3/4 miles northwest of the Village of Stittsville, in Huntley Township, Regional Municipality of Ottawa-Carleton. The trees in this forest are generally either ash or cedar. The terrain, which is flat to gently undulating in relief between elevations 420 and 424, is poorly drained, and this has led to formation of a surficial organic cover. During the period of the investigation (April, 1971), the most westerly portion of the site was covered by approximately 6 to 8 inches of water.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

Physiographically the site is situated in the region known as the "Smith Falls Limestone Plain". This region is characterized by shallow overburden deposits (typically 4 to 8 feet thick) resting on bedrock. The upper portion of the overburden is formed of remnants of old marine beaches primarily composed of sand intermixed with limestone of the Trenton-Black River formations, Ordovician Period.

3. FIELD AND LABORATORY WORK:

Nine sampled boreholes were put down during the course of the field investigation. The overburden was sampled and penetrated using a continuous flight power auger (Penndrill) adapted for soil sampling purposes. At six of the boring locations bedrock was proven by obtaining BX size rock core samples; this was accomplished by employing a diamond drill rig.

Samples of the overburden were obtained, at specified intervals, in a 2" O.D. split-spoon sampler, which was hammered into the soil in accordance with the specifications for the Standard Penetration Test.

The groundwater level conditions across the site were determined, during the period of the investigation, by recording the water levels in the open boreholes.

The stratigraphical sequence encountered at the individual boring locations are described on the Record of Borelog sheets appended to this report.

The locations and elevations of all the borings were surveyed in the field by personnel from the Kingston Regional Engineering Surveys Section; they are shown on Drawing No. W.O. 71-11030A, together with an estimated stratigraphical profile across the site.

All the samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this inspection, laboratory tests were carried out

3. FIELD AND LABORATORY WORK: (cont'd.) ...

on certain samples to determine the engineering properties of the various soil types, namely:

Natural Moisture Content

Grain-size Distribution

Atterberg Limits

The results of the laboratory testing are plotted on the Record of Borelog sheets and summarized on Figures #1, 2 and 3, all contained in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The site is surficially covered by between 0.5 and 1.5 feet of peat. The peat is underlain by a 2 to 4 foot thick compact to dense granular deposit. In the northern portion of the site the granular deposit is underlain by a thin (2 to 3.5 feet thick) compact silt which, in turn, is followed by 1 to 2 feet of competent glacial till.

The thin overburden mantle is directly underlain by limestone bedrock.

The boundaries between the various deposits, as determined in the boreholes, are shown on the accompanying borelog sheets. The stratigraphical profile, shown on Drawing No. W.O. 71-11030A, has been inferred from this data.

From ground surface downward, the various soil types encountered are described as follows:

4.2) Peat:

The site is covered with a 0.5 to 1.5 feet thick soft black peat.

4.3) Granular Deposit:

The peat is underlain by between 2 and 4 feet of compact to dense ('N' values 12 to 50 blows/ft.) brown granular soil.

4. SUBSOIL AND BEDROCK CONDITIONS: (cont'd.) ...

4.3) Granular Deposit: (cont'd.) ...

The upper portion of the granular deposit is composed of silty sand to sandy silt; this upper zone transitionally changes to a gravelly sand to sandy gravel with some silt. Occasional pockets of clayey silt, up to 1/2 inch in size are present randomly throughout this deposit. Further, boulders are often present near the base of the deposit; these boulders are up to 5 inches in size. Grain-size distribution curves for samples obtained within the two distinct zones are plotted separately on Figure #1, in the Appendix of this report.

4.4) Silt:

In the northern portion of the area under investigation the granular subsoil is underlain by a 2 to 3.5 foot thick layer of grey silt with some clay. Numerous random layers and pockets of clayey silt, up to 8 inches in thickness, are present throughout the deposit. The cohesive zones have a plasticity in the low range. Grain-size distribution curves for typical samples from the silt deposit are plotted on Figure #2.

Standard penetration testing, carried out within the subsoil, gave 'N' values which range from 17 to 44 blows/ft. These results would indicate that the relative density of the deposit varies from compact to dense.

A limited number of laboratory and field undrained shear strength tests were performed within the cohesive zones within the deposit. Based on this testing, it is estimated that clayey silt zones have a consistency in the very stiff range.

4.5) Glacial Till:

The silt deposit, where encountered, is underlain by a thin (1 to 2-foot thick) competent grey glacial till sheet. The glacial till is primarily cohesive in nature - i.e., composed of clayey silt binding sand and gravel. There are, however, random areas throughout where the matrix of the glacial till is

4. SUBSOIL AND BEDROCK CONDITIONS: (cont'd.) ...

4.5) Glacial Till: (cont'd.) ...

granular, being composed of silt and sand binding gravel. Occasionally boulders, up to 6 inches in size, are present immediately above bedrock. Grain-size distribution curves for typical samples of the till are plotted on Figure #3.

Standard penetration testing carried out within the till gave 'N' values which range from 32 blows/ft. to 80 blows for 8 inches. The consistency of the cohesive portion of the deposit is, therefore, inferred to be hard, while the relative density of the granular areas is in the dense to very dense range.

4.6) Limestone Bedrock:

Bedrock underlies the granular deposit in the southern portion of the area and the glacial till in the northern. Bedrock was proven in 6 of the boreholes by obtaining between 4.5 and 14.5 feet of BX size rock core samples. The surface of the bedrock was found to vary from elevations 414.5 to 416.5.

The bedrock is composed of a grey limestone with irregular shaley seams up to 1/4 inch in thickness. In general, bedrock is sound throughout; however, some signs of fracturing and jointing were observed in the upper 1 to 1.5 feet at a few of the boring locations.

5. GROUNDWATER CONDITIONS:

Groundwater level observations have been carried out, during the period of the investigation, in the open boreholes. The results are plotted on the Record of Borelog sheets and summarized on Drawing No. W.O. 71-11030A. These observations indicate that the groundwater level was at, or in close proximity to, the existing ground surface.

During the period of the investigation (April, 1971), it was found that, between Stations 153+50 and 155+25, the site

5. GROUNDWATER CONDITIONS: (cont'd.) ...

was covered by up to 8 inches of water. In discussions with local residents, it was found that this is a yearly occurrence; this ponded water dries up in the summer months. It is inferred, therefore, that this water is derived from melting snow; the water has been trapped in this low-lying, poorly drained area.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an underpass structure to carry the proposed Hwy. #7 Connection over the East and Westbound lanes of Hwy. #417, in the Township of Huntley, Regional Municipality of Ottawa-Carleton. Present proposals call for a 34-foot wide, two-span structure (147' - 147'); the structure will be skewed approximately 28-1/2° in relation to the alignment of Hwy. #417.

The proposed profile grade of the Hwy. #7 Connection, in the vicinity of the crossing, will vary between elevations 444 to 445. At this grade the approach embankments will have heights which range from 23 to 25 feet above existing ground surface. The embankments will have a crest width of 46 feet.

Limestone bedrock is encountered at depths of between 3.5 and 7.5 feet below existing ground surface. The overburden in the southern part of the site consists of fibrous peat overlying a compact to dense granular deposit. In the northern area, where the overburden is thickest, the aforementioned soil sequence is underlain by a compact silt layer followed, in turn, by competent glacial till. The site is low-lying and poorly drained, which has given rise to a high groundwater table (at ground surface during April, 1971).

6.2) Approach Embankments:

As discussed previously, the maximum height of fills will be of the order of 25 feet. The fills will be placed directly

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) Approach Embankments: (cont'd.) ...

on shallow overburden (maximum 7 feet) consisting of a peat cover (0.5 to 1.5 feet thick) followed by competent inorganic deposits. No stability problems are anticipated for embankments constructed of properly compacted fill with standard 2:1 slopes, provided the peat cover is removed. In this regard, it is recommended that the peat be completely stripped from within the plan limits of the proposed approaches.

Settlement will be induced in the foundation subsoil by the fill loading. Due to the competent nature of the subsoil deposits and the limited thickness of the overburden, this settlement will be elastic in nature and negligible in magnitude.

6.3) Structure Foundations:

6.3.1) Pier Foundation - (Refer to B.H.'s #3 and 4) -

Limestone bedrock is encountered at a shallow depth (4 to 5 feet) below ground surface in this area. The pier, therefore, can be supported on a spread footing located on or within sound bedrock, namely, between elevations 415 and 416. A footing, founded as recommended, could be designed using an allowable bearing value of up to 20.0 t.s.f. in design.

The footing excavation will extend through the overburden, which is basically granular in nature; further, it will be carried out below the groundwater level recorded during the period of the investigation. Some groundwater seepage will, therefore, occur in the excavation. This could readily be controlled by pumping.

6.3.2) Abutment Foundations - (Refer to B.H.'s #1, 2, 5
and 6) -

The proposed abutments will be 'perched' within the approach fills. The abutments may be supported on spread footings

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.3) Structure Foundations: (cont'd.) ...

6.3.2) Abutment Foundations - (Refer to B.H.'s #1, 2, 5
----- and 6): -----

(cont'd.) ...

placed within the fills. The fill material, below the tops of the footings, should consist of well compacted G.B.C. Class 'A' material, and should extend to a horizontal distance of at least 10 feet from the footing edges in the plane of the footing tops. This portion of the fill should be constructed with side slopes no steeper than 2:1. The remainder of the fill should be completed to about profile grade for a distance of 50 feet behind the abutments before re-excavation for the abutment footings. An allowable bearing pressure of 2.0 t.s.f. may be used in design.

If the abutments are supported on spread footings, there will be differential settlement between the abutments and adjacent pier. Providing the fill, in the immediate vicinity of the abutment footings, is well compacted this settlement should not exceed 1 inch. Since the major portion of the settlement will occur within the fill itself it would be advantageous, if scheduling permits, to build the fills to as high a height as feasible and leave them in place for a period of time prior to constructing the abutments. This would reduce the differential settlement to a value less than that quoted above. It is recommended that a period of 6 months would be ideal for this purpose.

As an alternative, the abutments may be supported on end-bearing piles driven to bedrock. For estimating purposes the pile tips may be located at the following elevations:

North Abutment (B.H.'s #5 and 6) -- Elev. 414 to 415

South Abutment (B.H.'s #1 and 2) -- Elev. 415 to 416

The aforementioned piles could be designed for the ultimate capacity of the pile section chosen - e.g., 14 BP 74

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.3) Structure Foundations: (cont'd.) ...

6.3.2) Abutment Foundations - (Refer to B.H.'s #1, 2, 5
----- and 6): -----

(cont'd.)

steel H-piles could be designed for 95 tons/pile.

No rock or bouldery fill should be placed in areas
where piles are to be driven.

7. MISCELLANEOUS:

The field work, performed during the period of
April 23 to 29, 1971, was carried out under the supervision
of Mr. B. T. Darch, Senior Foundation Engineer.

The equipment used was owned and operated by
Dominion Soil Investigation Limited, Toronto.

This report was written by Mr. Darch and reviewed by
Mr. M. Davata, Supervising Foundation Engineer.

May, 1971

APPENDIX I

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71-11030

LOCATION Sta. 153 + 76, o/s 17' Lt. (Hwy. 17 Conn.)

ORIGINATED BY BTD.

W.P. L38-64-00

BORING DATE April 23 & 28, 1971

COMPILED BY BTD

DATUM Geodetic

BOREHOLE TYPE Auger-Washboring, BX Casing, BX Rock Core

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT %			
							<input type="radio"/> UNCONFINED + FIELD VANE <input checked="" type="radio"/> QUICK TRIAXIAL x LAB. VANE		w_p — w — w_L			
420.6	Water Level					420				10 20 30		
420.1	Water											
419.1	Peat (Black) Soft		1	SS	10							
1.5	Silty Sand, Compact		2	SS	27							
	Gravelly sand, trace of silt. Compact to Dense		3	SS	207							
415.8	Bouldery zone (boulders up to 4" in size)		4	BX	100%	415						
4.8	Limestone Bedrock		5	BX	100%							
	thin seams of shale throughout		6	BX	94%	410						
	Grey		7	BX	91%							
403.7	Sound					405						
16.9	End of Borehole					400						

0 52 (48)

FOUNDATION SECTION

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 71-11030

LOCATION Sta. 156 + 21 o/s 17' Lt. (Hwy.#7 Conn.)

ORIGINATED BY BTD

W.P. 438-64-00

BORING DATE April 23 & 29, 1971

COMPILED BY BTD

DATUM Geodetic

BOREHOLE TYPE Auger-Washboring-BX Casing-BX Rock Core

CHECKED BY

SOIL PROFILE

SAMPLES

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOTLIQUID LIMIT — w_L
PLASTIC LIMIT — w_p
WATER CONTENT — w

SHEAR STRENGTH P.S.F.

- UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB. VANE

 w_p — w — w_L

WATER CONTENT %

10 20 30

BULK
DENSITY
 γ

REMARKS

P.C.F. GR. SA. SI. CL.

ELEV.
DEPTH

DESCRIPTION

STRAT. PLOT

NUMBER

TYPE

BLOWS / FOOT

ELEV. SCALE

420.5

Ground Level

1

SS

5

420

0.8

Peat (Black) Soft
Sand to sandy silt,
clayey silt seams to
1/2" thick. Comp. - Dense

2

SS

48

415.7

Sandy gravel, some silt
Brown. Dense

3

SS

30

4.8

Fractured

4

BX

100%

415

Limestone Bedrock, thin
interbeds of shale
throughout.

5

BX

100%

Grey

6

BX

100%

410

Sound

407.8

12.7

End of Borehole

405

17 55 26 2

WL in open

BH Apr. 29/71

FOUNDATION SECTION

ORIGINATED BY BTB

COMPILED BY BTD

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT % w_p ——— w ——— w_L			
420.6	Ground Level										
0.0	Peat (Black) Soft		1	SS	10	420					WL in open
1.0	Silty sand, Brown Compact		2	SS	26						BH Apr. 29/71
416.3	Sandy gravel, pockets of clayey silt. Brown Compact to Dense		3	SS	42/10"						
4.3	Limestone Bedrock thin seams of shale throughout.		4	BX	100%	415					
	Grey		5	BX	100%						
	Sound		6	BX	100%	410					
407.7											
12.9	End of Borehole					405					

FOUNDATION SECTION

FOUNDATION SECTION

ORIGINATED BY BTB

COMPILED BY BTD

CHECKED BY *[Signature]*

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO

MATERIALS & TESTING OFFICE

JOB 71-11030

LOCATION Sta. 157 + 91 o/s 17' Rt. (Hwy. 7 Conn.)

ORIGINATED BY BTB

W.P. 438-64-00

BORING DATE April 23 & 27, 1971

COMPILED BY BTD

DATUM Geodetic

BOREHOLE TYPE Auger-Washboring, BX Casing, BX Rock Core

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 71-11030

LOCATION Sta. 153 + 36 @ (Hwy.#7 Conn.)

ORIGINATED BY BTD

W.P. 438-64-00

BORING DATE April 27, 1971

COMPILED BY BTD

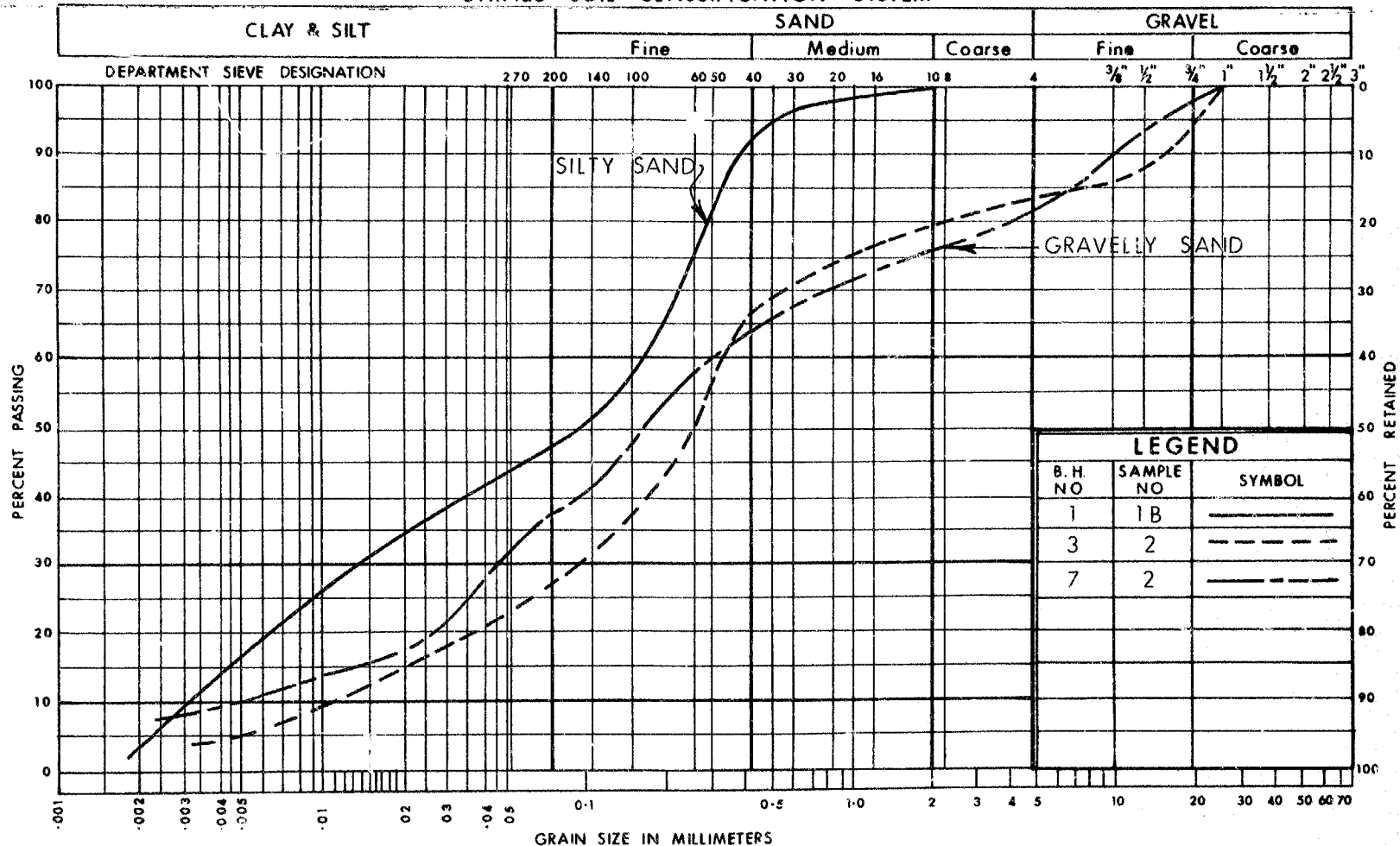
DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				w_p — w — w_L WATER CONTENT % 10 20 30					
20.0	Ground Level															
0.0	Peat (Black) Soft		1	SS	7											
1.0	Gravelly sand, some silt pockets of clayey silt		2	SS	10/10"										19 44 30	
16.5	Compact														WL in open	
3.5	End of Borehole Practical refusal probably Bedrock														BH Apr. 27/	
						415										
						410										

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
**MATERIALS and
TESTING
DIVISION**

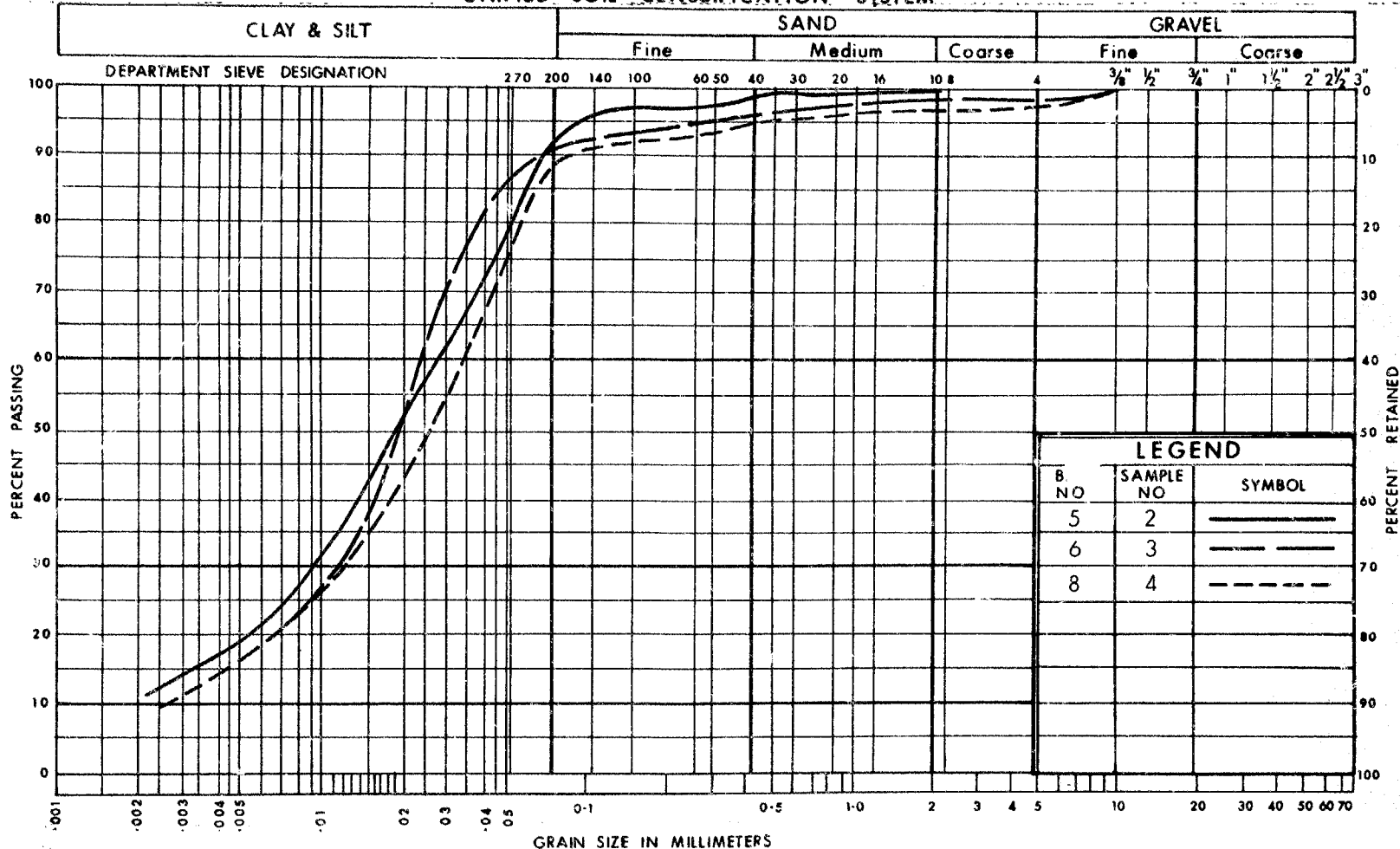
GRAIN SIZE DISTRIBUTION

W.P. No. 438-64-00

JOB No. 71-11030

FIG. 1

UNIFIED SOIL CLASSIFICATION SYSTEM



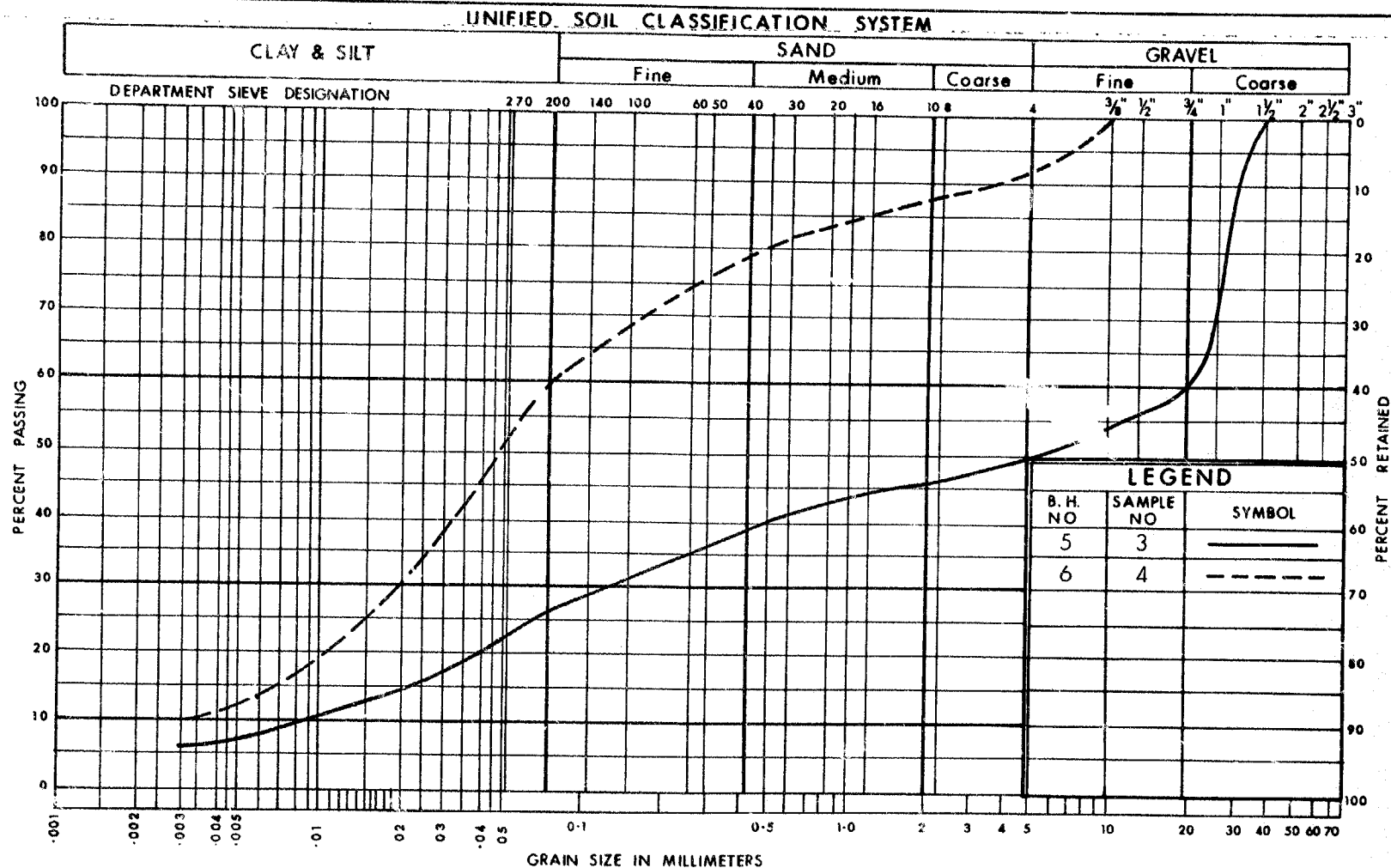
DEPARTMENT OF HIGHWAYS
**MATERIALS and
TESTING
DIVISION**

GRAIN SIZE DISTRIBUTION
SILT - SOME CLAY

W.P. No. 438-64-00

JOB No: 71-11030

FIG. 2



DEPARTMENT OF HIGHWAYS
**MATERIALS and
TESTING
DIVISION**

GRAIN SIZE DISTRIBUTION
GLACIAL TILL
HET. MIXT. OF SILT, SAND & GRAVEL WITH SOME CLAY

W.P. No. 438-64-00

JOB No: 71-11030

FIG. 3

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_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
$\bar{\sigma}$	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

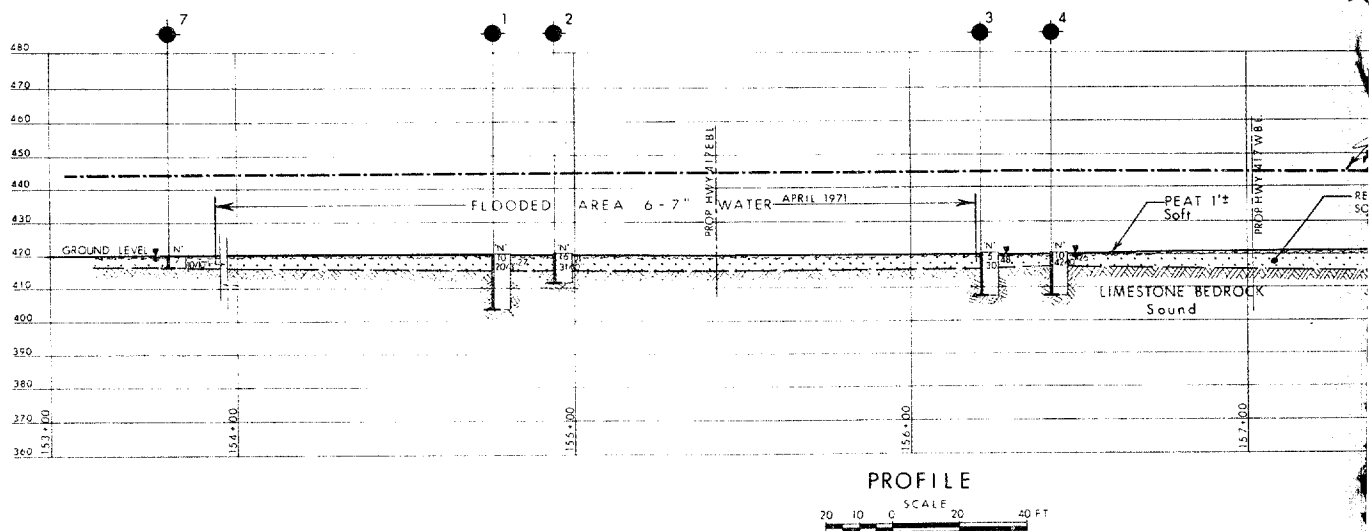
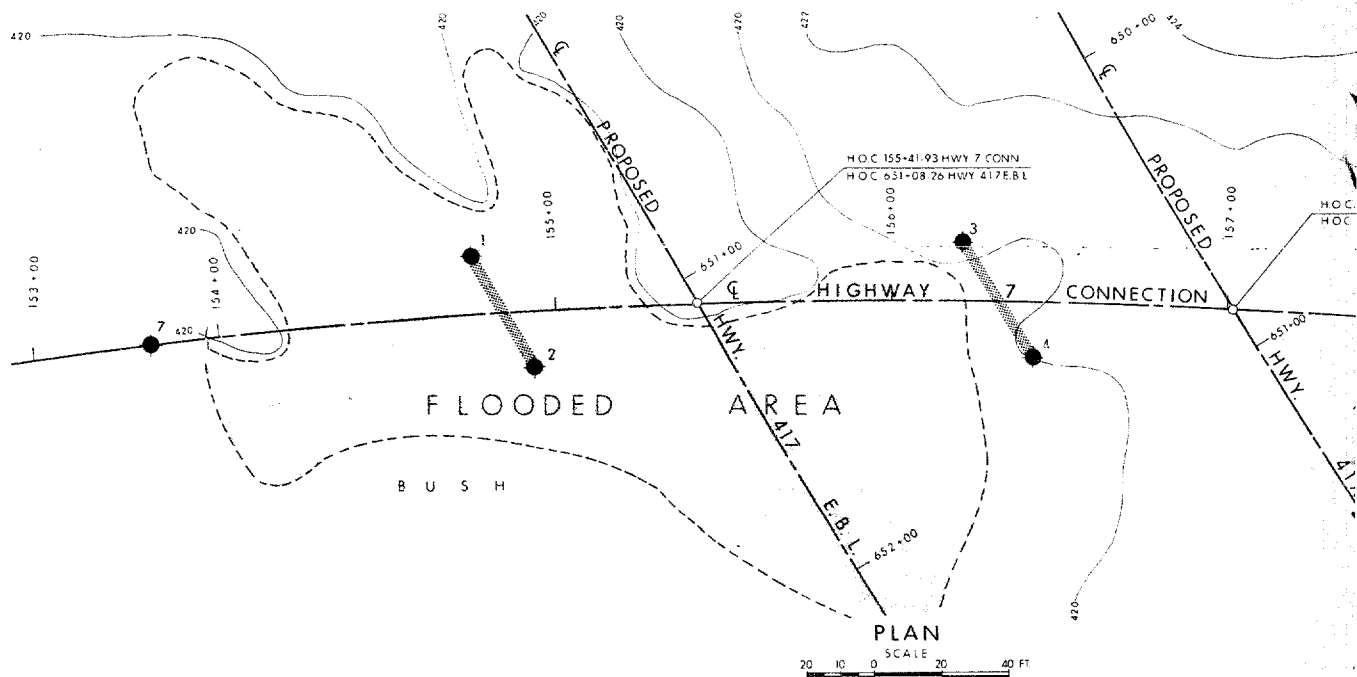
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

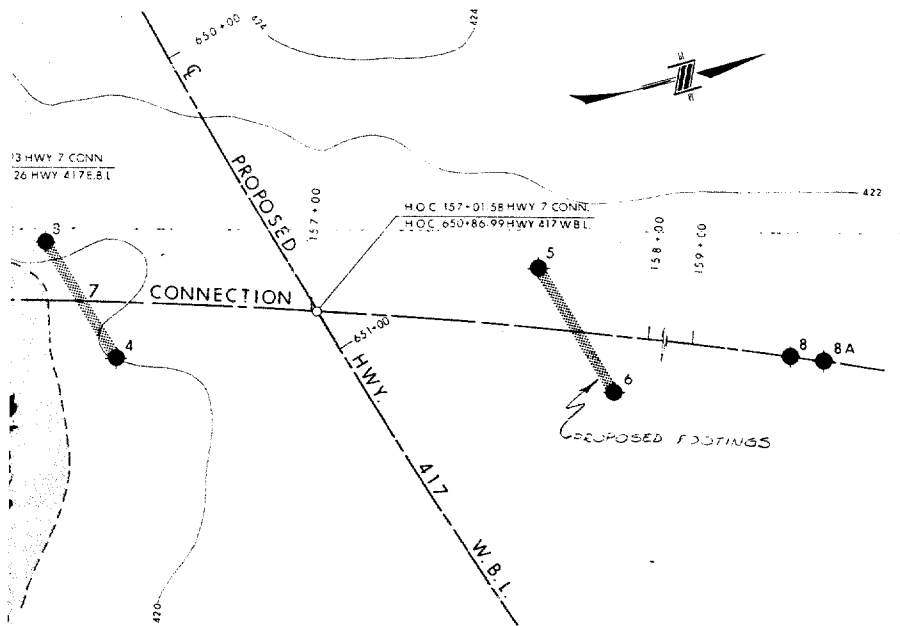
FOUNDATIONS

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

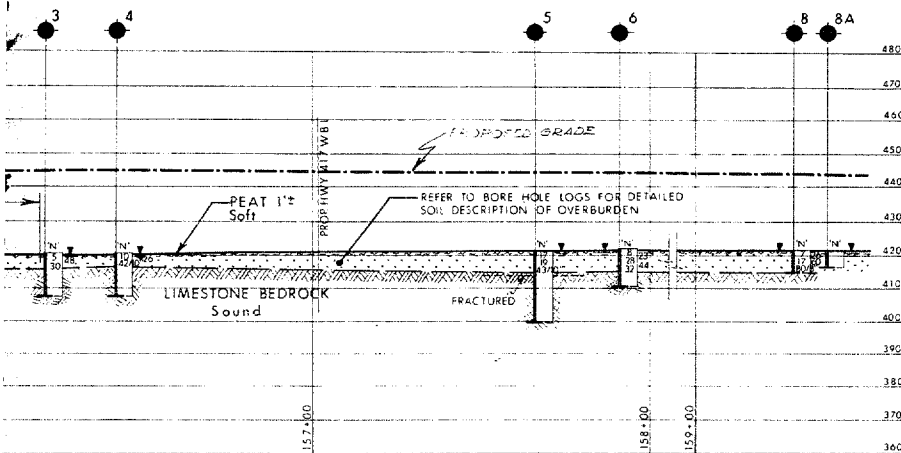
SLOPES

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

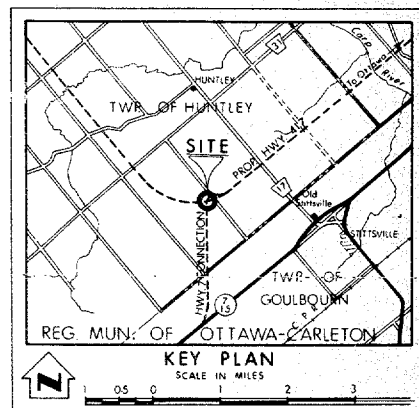




20 40 FT.



20 40 FT.



LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, APRIL, 1971

NO.	ELEVATION	STATION	OFFSET
1	420.6	154+76	17' LT
2	420.4	154+94	17' RT
3	420.5	156+21	17' LT
4	420.6	156+42	17' RT
5	421.5	157+66	17' LT
6	422.0	157+91	17' RT
7	420.0	153+35	€
8	421.5	159+29	€
8 A	421.5	159+39	€

— NOTE —

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS-ONTARIO
MATERIALS & TESTING OFFICE-FOUNDATION SECTION

HIGHWAY 7 CONNECTION

HIGHWAY NO 417 E.B.L. & W.B.L. DIST. NO. 9
REG. MUN. OF OTTAWA-CARLETON
TWP. HUNTLEY LOT 3 CON. 4

BORE HOLE LOCATIONS & SOIL STRATA

SUBWD. B.T.D. CHECKED <input checked="" type="checkbox"/>	W.P. NO. 438-64-00	M&T DRAWING NO.
DRAWN <input checked="" type="checkbox"/>	JOB NO. 71-11030	71-11030A
DATE MAY 12, 1971	SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>[Signature]</i>	CONF. NO.	

REF. NO. E-5208-1

3165-99

GEOCREs No.

Geological Survey of Canada. (1962)

- Glacial till: bet. mixt. of material of all sizes from clay to large boulders, but generally sandy; includes much reworked material that grades downward into unmodified till.
- to the north (north of site)
- high terrace alluvium: med. to fine sand, buff, non-calcareous, non-fossiliferous; associated with abandoned river channels and mottled clay.

D.H.O. Aerial Survey. (1954).

- basically granular glacial till. - very coarse.
- could be overlain by thin sand mantle.
- not a cohesive material.

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac
Mr. T. C. Kingsland,
Regional Bridge Planning
Engineer,
Eastern Region, Kingston.

Structural Office,
Downsview.

August 27, 1971.

Highway #7 Connection
Interchange Underpass,
W.P. 438-64-00, Site #3-288,
Highway #417, District #9.

71-11-030

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-7072-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$260,000 which includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

C. S. Grebski,
Structural Design Engineer.

CSG/mh

ENCL*

cc: A. McKim,
B. Davis,
A. Stermac,
J. Anderson,
R. Forrest.

In the vicinity of B.A. #3 the bedrock in the upper portion is fractured and we suggest the following methods:

- a) Remove all fractured rock and replace with mass concrete.
- b) Alternatively reduce the allowable bearing pressure to 10 t.s.f.

M. Devata
Aug 30 / 71.

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

~~Mr. P. C. Kingsland,~~
Regional Bridge Planning
Engineer,
Eastern Region, Kingston.

Structural Office,
West Building, Downsview.

November 2, 1971.

Highway #7 Connection I/C Underpass,
W.P. #438-64-80, Site #3-288,
Highway #417, District #9.

71-11-030

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-7072-P2 for the above-mentioned structure.

The estimated cost of the proposed structure is
\$275,000 which includes tender, materials, engineering
and sundry construction.

Any comments or revisions you may have should be
submitted within three weeks.

C. S. Grebski,
Structural Design Engineer.

CSG/mh

ENCL*

cc: A. McKim,
B. Davis,
A. Stermac (2),
J. Anderson,
R. Forrest.

no comments
Nov. 9/71
M. Dirata
Nov 9/71

CHECKING PILE LENGTHS

71-11030

ABUTMENTS

BATTER

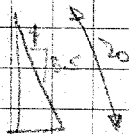
PILE CUT-OFF ELEV.

432.50

VERTICAL PROJECT LENGTH

19.2 feet

$$\sqrt{3.5^2 + 1^2} = 3.65$$



$$\frac{3.5}{3.65} \times 20 = 19.2$$

tip elevation

413.30

WING WALL

PILE CUT-OFF ELEV.

435.0

VERTICAL PROJ.

22.7

$$\frac{3}{\sqrt{10}} \times 24 = 22.7$$

tip elev

412.3

pile lengths
OK

SMH
May 2/52

FOUNDATION OFFICE

.....

..... 938-64-00
 W.C. 71-110.30

Foundation Report By: .. B.T. Dorch
 Review of Design Drawings By: .. S.A. Ahmad
 Design Drawing No.'s: .. D-7072-1 and D-7072-3

1. Does footing design comply with our report or subsequent memos? Yes
2. If answer to 1. is No, is present design acceptable? N/A
3. Has sufficient field work been done? Yes
4. Are estimated pile lengths shown on Drawings correct? YES
 If not, make a new list. See attached sheet
5. If excavation of unsuitable soil is recommended, is this shown on Drawings? No
6. Are approaches designed in accordance with our report? Check slopes and berm lengths. Yes
7. Do you anticipate any construction problems? i.e. dewatering, stability of temporary slopes or excavations.
8. Summarize your comments on separate sheet if necessary.

We have reviewed the final Bridge Drawings D-7072-1 and D-7072-3 and submit the following comments:—

- i) our comments of August 30/71 are still applicable
- ii) No mention is made of the removal of soft peat, as advised in our foundation Reports 71-11030. Hope the systems Design Drawings

Drawings Received .. April 28 1972 ..
 Reviewed .. May 7 1972 ..

Signed .. Shaker Ahmad

MEMORANDUM

To: A. Stermac,
Principal Foundation Engineer,
Room 107, Central Bldg.

FROM: Structural Office,
West Bldg., Downsview.

ATTENTION:

DATE: April 26, 1972.

OUR FILE REF.

IN REPLY TO


SUBJECT:

Re: Hwy. #7 Connection Interch. U'Pass,
Approx. 1 Mile West of Regional Road 5,
W.P. 438-64-00, Site 3-288,
Hwy. 417, District #9.

7-11-030

Attached herewith we are submitting the final
bridge drawings which show the foundation design for
this structure.

Kindly give us your comments at your earliest
convenience.



C.S. Grebski,
Structural Design Engineer.

CSG:sr
Attach.

c.c. Foundation Office.

12 May 72
AK

12 May 72

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

TO: Mr. C. S. Grebski,
Structural Design Engineer,
Design Services Branch,
West Bldg., Downsview.

FROM: Foundations Office,
Design Services Branch,
Central Bldg., Downsview.

ATTENTION:

DATE: May 4, 1972.

OUR FILE REF.

IN REPLY TO

SUBJECT: Hwy. #7 Connection Interchange, Underpass,
Approximately 1 Mile West of Regional Road 5,
W.P. 438-64-00; Site 3-288, Hwy. #417,
District #9

71-11-030

We have reviewed the final bridge drawings for the above-mentioned structure and submit the following comments.

- i) The Foundation Office advised on August 30, 1971, that in the vicinity of B.H. #3 the bedrock in the upper portion is fractured and we suggest the following methods.
 - a) Remove all fractured rock and replace with mass concrete.
 - b) Alternatively reduce the allowable bearing pressure to 10 t.s.f.
- ii) It is recommended in our Foundation Report W.O. 71-11030 (page 7) that the peat be completely subexcavated from within the plan limits of the proposed approaches. It is expected that these details will be shown on the Systems Design Services.

Shaheen Ahmad

Shaheen Ahmad,
Project Foundations Engineer,
For: M. Devata,
Supervising Foundations Engineer.

CA/ao

cc: T. C. Kingsland
A. J. Percy
Foundations Files
Documents

MEMORANDUM

To: M. Devata,
Foundations Office,
Central Bldg.

FROM: Structural Office,
West Bldg., Downsview.

ATTENTION:

DATE: May 10, 1972.

OUR FILE REF.

IN REPLY TO

SUBJECT:

Hwy. #7 Connection Interchange U'Pass,
Site 3-288, W.P. 438-64-00,
Hwy. #417, District #9, Ottawa.

I refer to your memo of May 4, 1972.

The final bridge drawing D-7072-3, submitted to you for comments has a note, "All fractured rock in the vicinity of Pier Footing to be removed and footing to be embedded 6" into sound bedrock". This note is located above Section 2 on Drg. D7072-3. Please advise if this note is acceptable to you. For your information, the pier footing is designed for an allowable bearing pressure of 20 tons/ft. ².



K.G. Bassi,
Reg. Structural Design Engineer.

KGB:sr

c.c. T.C. Kingsland
A.J. Percy

Talked to K.G. Bassi on the phone and

called on matter.

SHA

May 15/72

3165-99

Mr. J.M. Childs,
District Engineer,
Ottawa.

Construction office,
Third Floor, Central Bldg.

Mr. W.A. Stewart,
District Construction Engineer.

March 7, 1975.

Contract 74-151, Hwy. #7 Connection Interchange U'Pass,
Site 3-288, W.P. 438-64-00, Hwy. 417, District 9.

This will confirm the conversation I had with W. Miller
on March 7, 1975 regarding the pier footing for the
above structure.

The rock elevation at the pier footing was found to
be 416.50 ft. and the bottom of footing elevation
required is 413.00 ft.

The rock must be excavated to elevation 413.00 ft.
because it is not possible to raise the footing elevation
or decrease the thickness of the footing.

The rock should be excavated by means other than the use
of explosives.

K.C. Carter

K.C. Carter,
Structural Inspection Engineer.

KCC/JC

c.c. B. Davis
M. Devata. —



→ m.d.
What kind
of rock is it?
Any possibilities
of design?
Discussed with
Mr C. M. and
m.d. problem and
everything according
to design. m.d.

Transmitted by 10 # 71-110400

Date May 15, 1974

APPROVED SCHEDULE FOR 1974 = 75

Page 16 of 18PROGRAM OF CONSTRUCTION
DISTRICT No. 9, OTTAWA

W.P. No.	HWY. No.	Type of work	LOCATION	Date of		Tend. open.	CONT. No.
				Advert.	Award.		
352-65 616-70-01	31	G. D. GB. & Pav.	South Jct. Hwy. 43 N ^{ly} Incl. Village of Winchester 2.5 Mi.	June 5/74	July 10/74	15	74-96
433-64-01 433-64-02 433-64-03 →	417 8 7N	G.D.B. str.	4.5 mi W of Hwy 117 (Kanata) W. by to Hwy 44 6.3 mi Hwy 7 Interchange V Pass & Hwy 7 N Cam. 6 Hwy 7 W. of Sh ^{er} ville 2.1 mi	Nov 13/74	Dec 14/74	38	74-157
				Awarded Dec 24/74 to George Wimpey		\$2876,202	

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 3165-99

W.P. No. 438-64-00

CONT. No. 74-151

W. O. No. 71-11030

STR. SITE No. 3-288

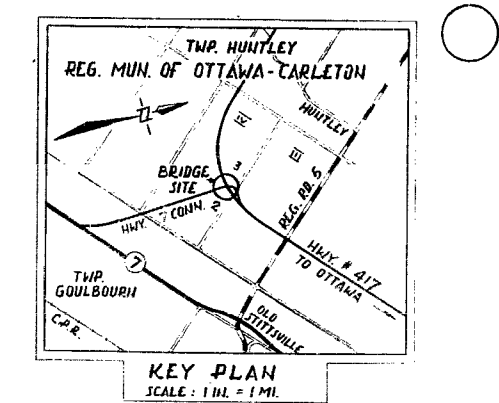
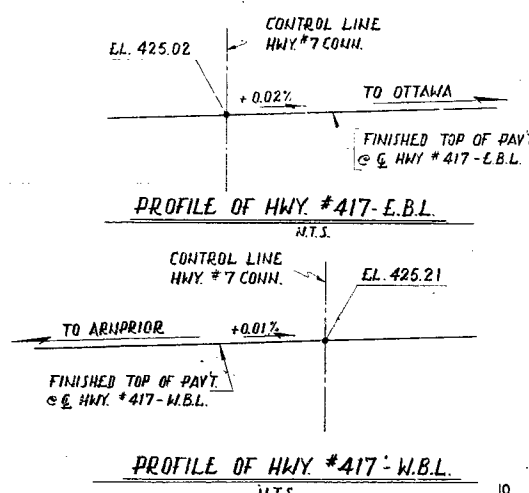
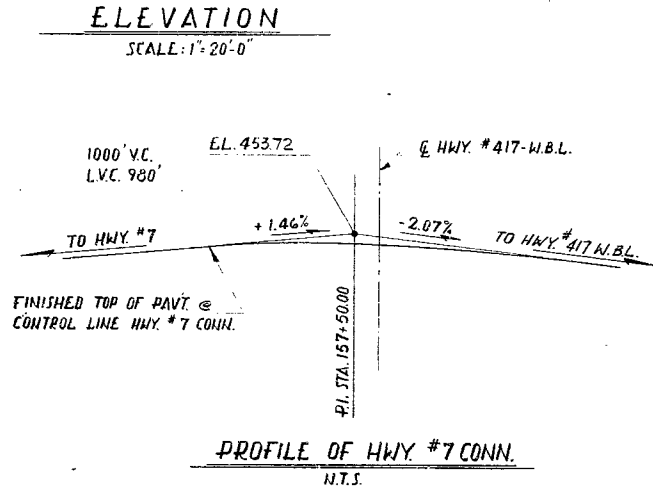
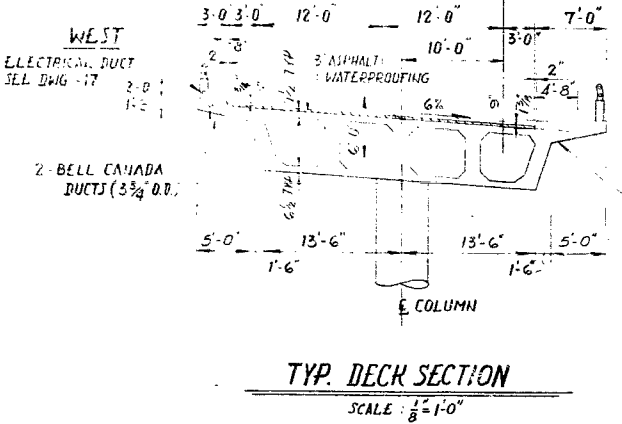
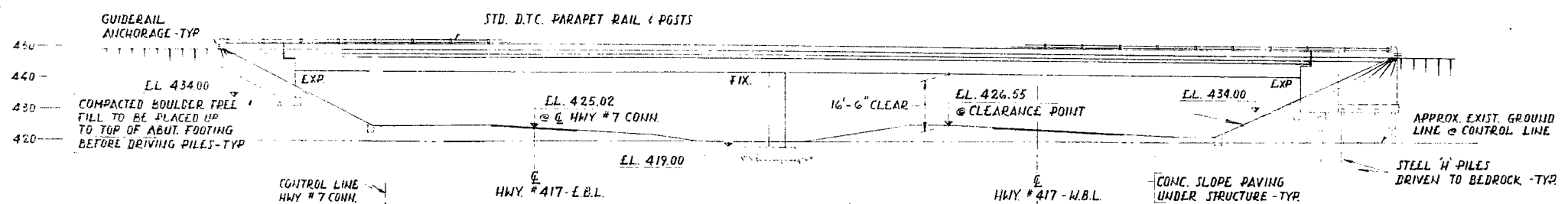
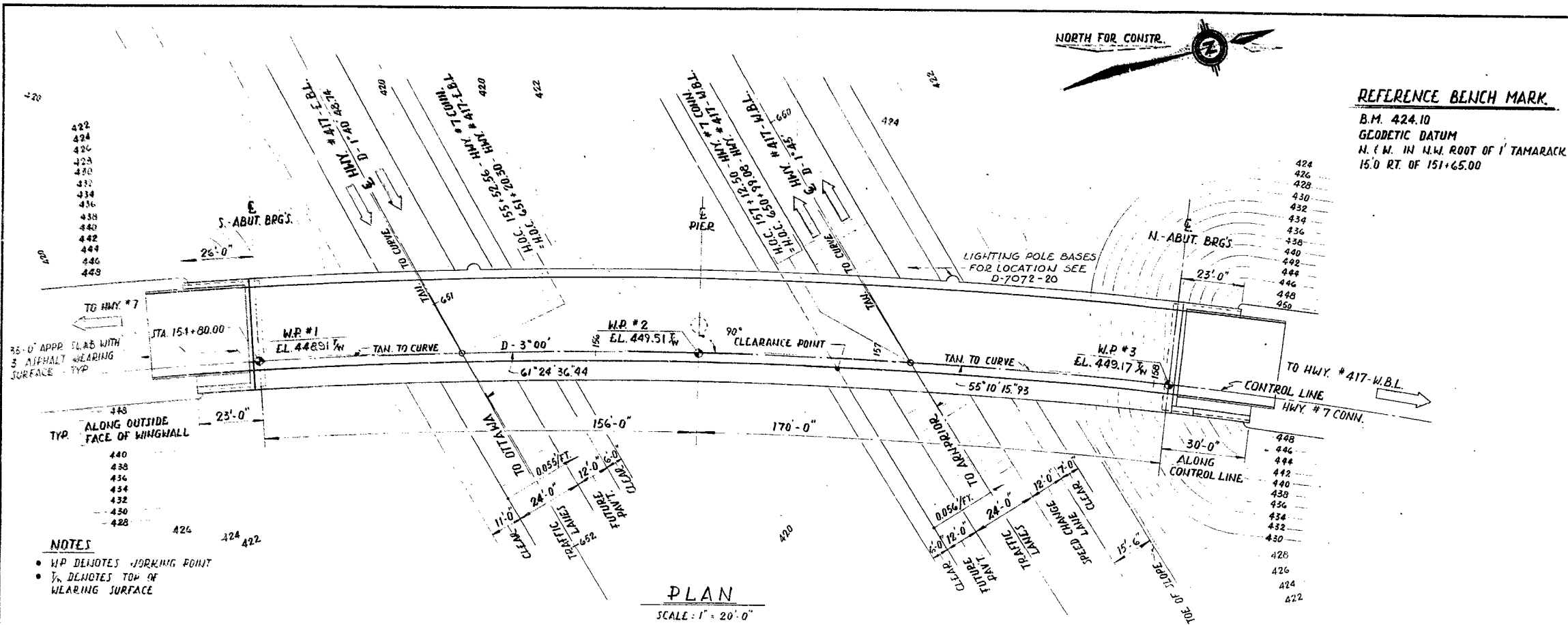
HWY. No. 417 DIST. 9

LOCATION HWY. 7 INTERCHANGE
U' PASS

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: _____

G.I.-30 SEPT. 1976



- LIST OF DRAWINGS**
- D-7072-1 GENERAL LAYOUT
 - 2 BORE HOLE LOCATIONS & SOIL STRATA
 - 3 FOUNDATION LAYOUT
 - 4 FOOTING REINFC & PIER
 - 5 SOUTH ABUTMENT
 - 6 NORTH ABUTMENT & N.E. RET. WALL
 - 7 DECK DETAILS & BEARINGS
 - 8 LONGITUDINAL CABLES
 - 9 TRANSVERSE CABLES
 - 10 DECK REINFORCEMENT I
 - 11 DECK REINFORCEMENT II
 - 12 DECK REINFORCEMENT III
 - 13 PARAPET WALL DETAILS
 - 14 STANDARD STEEL PARAPET RAIL
 - 15 35' APPROACH SLABS
 - 16 DETAILS OF CONC. SLOPE PAVING
 - 17 BRIDGE ELECTRICAL DETAILS
 - 18 STANDARD DETAILS I
 - 19 STANDARD DETAILS II
 - D-7072-20 BRIDGE ELECTRICAL EMBEDDED WORK

NOTES

CLASS OF CONCRETE
 DECK, CURBS & PARAPET WALLS - 5000 P.S.I.
 PIER COLUMN - 5000 P.S.I.
 REMAINDER - 3000 P.S.I.
 AND/OR AS NOTED

CLEAR COVER ON REINFC STEEL
 FOOTINGS, ABUTMENTS & RET. WALL - 3"
 PIERS, CURBS & APPROACH SLABS - 2"
 TOP OF DECK - 2", BOT. - 1 1/2"
 PARAPET WALLS - 1 1/2"

CONSTRUCTION NOTES
 THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8"
 NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED, STRESSED AND GROUTED.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
 ONTARIO

HWY #7 CONNECTION INTERCH. U/PASS
 APPROX. 1 MILE WEST OF REGIONAL ROAD 5

KING'S HIGHWAY No. 417 DIST. No. 9
 CO. REG. MUN. OTTAWA-CARLETON
 TWP. HUNTLEY LOT 3 CON. IV

GENERAL LAYOUT

SITE No. 3-288 W.P. No. 438-64-00

APPROVED: [Signature] BRIDGE ENGINEER
 DESIGN: W.K.E./A.M. CHECK: [Signature]
 DRAWING: A.A. CHECK: [Signature]
 DATE: MAR 1972 LOADING: HS20-44

CONTRACT No. [Blank]
 DRAWING No. D-7072-1

