

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 31G-47

DIST. 9 REGION

W.P. No. 35-66-25

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 138

LOCATION Hwy 417, Russell Co. Rd. 7

To 2.9km E of Hwy 138

No. of PAGES -

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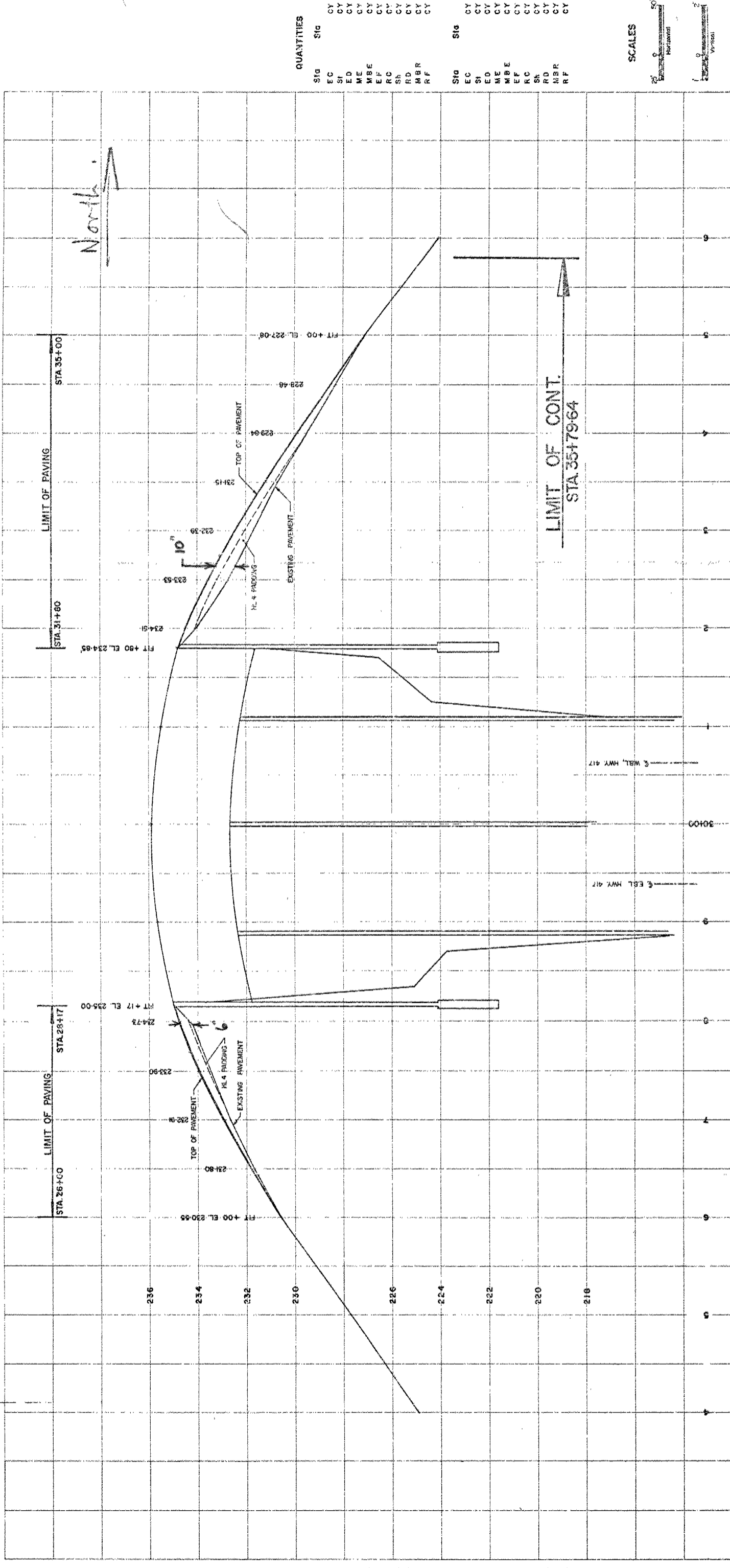
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

# PROFILE OF HWY. 138

LIMIT OF CONSTRUCTION  
STA. 24 + 20.36

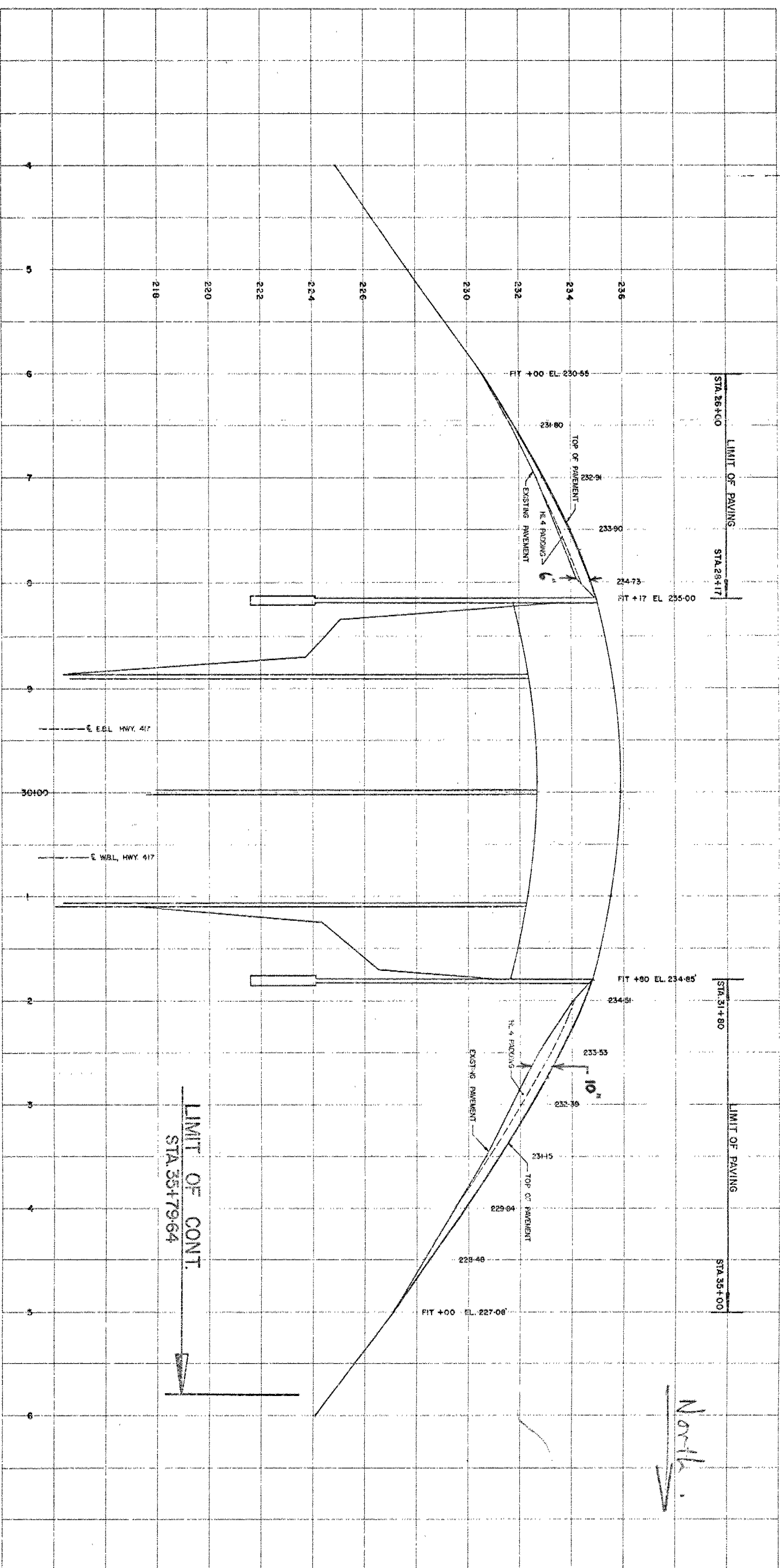
1976



1976

# PROFILE OF HWY. 138

LIMIT OF CONSTRUCTION  
STA. 24 + 20.36



North

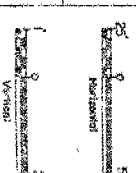
**QUANTITIES**

EC	CY	
ED	CI	
ME	CY	
MBE	CY	
EF	CY	
RC	CY	
SN	CY	
RD	CY	
MR	CY	
RF	CY	
EC	CY	
SI	CY	
ED	CY	
ME	CI	
MBE	CY	
EF	CY	
RC	CY	
SN	CY	
RD	CY	
MR	CY	
RF	CY	

**QUANTITIES**

S10		S1d	
EC	C	EC	C
SI	C	SI	C
ED	C	ED	C
ME	C	ME	C
MBE	C	MBE	C
EF	C	EF	C
KC	C	KC	C
SH	C	SH	C
RD	C	RD	C
MSR	C	MSR	C
RF	C	RF	C

## SCALES



FIELD RECONNAISSANCE REPORT  
REQUIRED BY FOUNDATION SECTION  
FOR

70-F-3

FF-69  
SEPT. 1968

W.P. NO. 35-66-16 HIGHWAY NO. 417 DISTRICT 9 SITE PLAN NO. E-4683-1 PROFILE NO. C-327-3-4  
RIVER CROSSING ☐ GRADE SEPERATION ☒ R.R.X. ☐ OTHER (SPECIFY) \_\_\_\_\_  
ALTERNATE SCHEME (IF ANY) \_\_\_\_\_

EXISTING SITE CONDITIONS

DESCRIPTION:

TOPOGRAPHY: HILLY ☐ ROLLING ☐ VALLEY ☐ GULLIED ☐ FLAT ☒  
VEGETATION: TREES ☐ BRUSH ☐ GRASS ☒ SWAMP ☐ FARM CROPS ☐ CLEARED ☐  
SNOW COVER: 0"-6" ☐ 6"-12" ☐ >12" ☐  
ROCK OUTCROP (SPECIFY LOCATIONS) none visible

UNDERGROUND UTILITIES: UTILITY COMPANY TELEPHONE NO. FOR DEFINITE LOCATION

1 None

2 \_\_\_\_\_

Aerial 3 Telephone & Hydro wires along Co. Rd. 7

4 \_\_\_\_\_

5 \_\_\_\_\_

EXISTING STRUCTURE(S): N/A

FOUNDATIONS: SPREAD FOUNDATIONS ☐ SIZE \_\_\_\_\_ ELEVATION(S) \_\_\_\_\_  
PILES ☐ TYPE \_\_\_\_\_ LENGTH(S) \_\_\_\_\_  
DESIGN LOAD \_\_\_\_\_ T.S.F. \_\_\_\_\_ TONS / PILE \_\_\_\_\_  
CONDITION OF STRUCTURE \_\_\_\_\_

APPROACHES: CUT ☐ FILL ☐ SIDE SLOPES \_\_\_\_\_  
BERMS YES ☐ NO ☐

OTHER OBSERVATIONS (USE BACK OF SHEET TO DESCRIBE ANY FAILURES IN AREA, PAST PERFORMANCE OF  
EXISTING APPROACHES & STRUCTURE, ETC.)

ACCESSIBILITY

IS STRUCTURE LOCATED ON D.H.O. RIGHT OF WAY? YES ☐ NO ☒ IF NO,  
HAS PERMISSION BEEN OBTAINED TO ENTER PROPERTY? YES ☒ & NO ☒ IF NO,

PROPERTY OWNER(S):

* Survey only	NAME	ADDRESS	TELEPHONE NO.
(Co. Rd. 7)	1 <u>Leo Paul LaFleche</u>		<u>764-2163</u>
	2 <u>Claude Gagne</u>	<u>St. Euphemie</u>	<u>764-2803</u>
	3 <u>The Corp. of the United Counties of Prescott &amp; Russell</u>		
	4 _____		

WHO WILL OBTAIN NECESSARY PERMISSION? Property Section, Eastern Region

HAS SITE BEEN SURVEYED & STAKED? YES ☒ NO ☐ IF YES, DATE OF MOST RECENT SURVEY \_\_\_\_\_

WILL CLEARING BE NECESSARY TO ENTER SITE AREA? YES ☐ NO ☒

IS SITE ACCESSIBLE TO WHEELED VEHICLES? YES ☒ NO ☐

IF RIVER CROSSING:

WILL A RAFT BE NECESSARY? YES ☐ NO ☐ IF YES, GIVE MAX. DEPTH OF WATER \_\_\_\_\_ FT.

CURRENT: SWIFT ☐ MODERATE ☐ SLOW ☐

DRILLING OPERATIONS

NEAREST SOURCE OF WATER (GIVE HAULING DISTANCE, IF KNOWN) Creek at site

ADDITIONAL INVESTIGATION REQUIRED FOR THE FOLLOWING PURPOSES:

ALTERNATE SCHEME: YES ☐ NO ☐ IF YES, SPECIFY \_\_\_\_\_

HYDROLOGIC REASONS: YES ☐ NO ☐ IF YES, SPECIFY (SCOUR, ETC.) \_\_\_\_\_

REMARKS

NEAREST AVAILABLE ACCOMODATION: Hotels in Castelman

OTHER COMMENTS: \_\_\_\_\_

DATE December 4, 1969

REGIONAL BRIDGE LOCATION ENGINEER Planning

*H. King-Lewis*

## MEMORANDUM

CRM 112 CAB. 2-4-73

72-173

31G-47

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

ATTENTION: Mr. S. McCombie

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

DATE: February 17, 1970

OUR FILE REF.

IN REPLY TO

FEB 19 1970

SUBJECT:

FOUNDATION INVESTIGATION REPORT  
For  
Proposed Crossing  
New Hwy. #417 and County Road #7  
Twp. of Cambridge, Co. of Russell  
Lot 9 Conc. 7  
District No. 9 (Ottawa)  
W.J. 70-F-3 -- W.P. 35-66-16

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 feel free to contact our Office.

AGS/ndcF  
Attach.

cc: Messrs. B. R. Davis  
H. A. Tregaskes  
D. W. Farren  
S. J. Markiewicz  
C. R. Robertson  
T. C. Kingsland (2)  
J. E. Cruspier  
B. A. Singh

*A. G. Stermac*  
A. G. Stermac  
PRINCIPAL FOUNDATION ENGINEER

Foundations Files ✓  
Gen. Files

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FOUNDATION INVESTIGATION REPORT  
For  
Proposed Crossing  
New Hwy. #417 and County Road #7  
Twp. of Cambridge, Co. of Russell  
Lot 9 Conc. 7  
District No. 9 (Ottawa)  
W.J. 70-P-3 -- W.P. 35-66-16

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1. INTRODUCTION:

A request dated December 4, 1969, for a foundation investigation at the site of the above mentioned proposed crossing, was received by this Section from Mr. T. C. Kingsland, Regional Bridge Planning Engineer, Kingston Region. A field investigation was subsequently carried out by this Section in order to determine the subsoil and groundwater conditions at the site. This report presents the results of this investigation, together with our recommendations pertaining to the design of foundations of the proposed structure and the stability of the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located about 1 mile south of Casselman near the existing crossing of County Rd. #7 and Butternut Creek. At this site the terrain is generally flat-lying and used chiefly for agricultural purposes. Butternut Creek at this site, is a shallow stream which flows beneath County Rd. #7 through an open type 10' x 5' x 27' concrete culvert. During the time of this investigation, the creek was dry except for a thin cover of ice.

Physiographically, the area is located within the "Winchester Clay Plains" physiographic region. Marine clay deposits, which cover a major portion of this physiographic region elsewhere, are absent at this site. The overburden consists of a glacial till overlying shaley limestone bedrock of the Trenton formation.

### 3. FIELD AND LABORATORY WORK:

A total of 3 sampled boreholes and six dynamic cone penetration tests was carried out during the course of the field investigation, using a conventional diamond drill adapted for soil sampling purposes.

Samples in the overburden were obtained using a 2" O.D. split-spoon soil sampler driven according to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests.

The locations and elevations of all boreholes were surveyed by personnel from the Kingston Region Engineering Surveys Section, and are shown on Dwg. 70-F-3A at the rear of this report.

The samples were visually examined in the field and subsequently in the laboratory. Following this examination, laboratory tests were carried out on selected samples to determine the various physical properties of the subsoil, namely:

Atterberg Limits  
Moisture Contents  
Grain-size Distributions

The laboratory test results are plotted on the individual Record of Borelog sheets, as well as on Figure 1 in the Appendix.

### 4. SUBSOIL CONDITIONS:

#### 4.1) General:

The subsoil conditions at this site were found to be generally uniform. Underlying 3.5 to 5 ft. of fill material is a glacial till deposit of 12 to 15 ft. thickness, followed by shaley limestone bedrock.

#### 4.2) Heterogeneous Mixture of Silt, Sand and Gravel with a Trace of Clay:

Underlying a thin cover of topsoil or 3-1/2 - 5 ft. of roadway fill material, a deposit of glacial till ranging in

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

4.2) Heterogeneous Mixture of Silt, Sand and Gravel with a Trace of Clay: (cont'd.) ...

thickness between 12 and 15 ft., was encountered across the site. The glacial till is composed of a heterogeneous mixture of silt, sand and gravel with a trace of clay. Occasional boulders up to 16 inches in size were encountered at random within this deposit.

Laboratory tests on representative samples indicate the moisture content of the overall deposit to range between 2 and 11 percent. Atterberg limit tests on slightly cohesive samples indicate liquid and plastic limits of about 14 and 12 percent, respectively. The grain-size distributions of the glacial till are shown in the Appendix on Figure 1.

Relative densities in this deposit, as determined by the Standard Penetration Resistance, ranged from compact to very dense, with the 'N' values varying from 14 to 163 blows/ft., and generally increasing with depth.

4.3) Bedrock:

Bedrock was encountered at this site at a depth of about 19 ft. below the ground surface - i.e., between elevations 191 and 194. The bedrock is identified as a shaley limestone. Core recoveries were 100 percent, indicating that the bedrock is generally sound.

5. GROUNDWATER CONDITIONS:

Water level observations were carried out in the open boreholes during the period of this investigation. These observations indicate that the groundwater level across the site is located at about elevation 207 - 208.5 - i.e., some 2 to 4.5 ft. below the ground surface.

## 6. DISCUSSION AND RECOMMENDATIONS:

### 6.1) General:

It is proposed to construct an underpass to carry County Rd. No. 7 over the East and Westbound lanes of Hwy. #417, approximately 1 mile south of Casselman. The underpass will be a two-span structure (123' - 123') with a deck width of 34 ft. The profile grade of County Rd. #7 will be at about elevation 232, resulting in fill heights at the approaches of about 20 ft.

The investigation revealed that below a surficial cover of fill material of 3.5 to 5 ft. thickness, the natural overburden at the site consists of a glacial till deposit composed of a heterogeneous mixture of silt, sand and gravel with a trace of clay. This deposit is some 12 to 15 ft. in thickness and is directly underlain, at about elevations 191 - 194 by sound shaley limestone bedrock.

### 6.2) Structure Foundations:

The subsoil conditions at this site are favourable for the use of spread footing type foundations. Details are as follows:

#### 6.2.1) Centre Pier:

The proposed centre pier may be founded on a spread footing located within the glacial till stratum at or below elevation 200 and designed for a safe allowable bearing pressure of up to 3 TSF. Settlement of such a pier footing should be negligible since the subsoil is relatively incompressible.

Dewatering problems may be expected since the footing excavation will be carried out below the prevailing groundwater level within the granular type of glacial till stratum. A dewatering scheme may therefore be necessary in order to prevent boiling of the foundation subsoil.

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

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

6.2.1) Centre Pier: (cont'd.) ...

Alternatively, the proposed pier may be supported on end-bearing steel H-piles driven to bedrock. The allowable load will depend on the section chosen; e.g., 12 BP 74 steel H-piles may be designed for 90 Tons/pile. A minimum earth cover of 5 ft. should be provided to the underside of the pile cap for frost protection.

6.2.2) Abutments:

The proposed abutments may be 'perched' within the approach fills. These may be supported on spread footings founded within a zone of well-compacted granular fill using a safe bearing pressure of 2 TSF. The fill material below the tops of the footings should consist of well-compacted G.B.C. Class 'A' material and should extend for a horizontal distance of at least 10 ft. from the footing edges in the plane of the footing tops. This portion of the fill should be built with side slopes of 2:1. The remainder of the fill should be completed to about profile grade for a distance of about 50 ft. behind the abutments before re-excavating for the abutment footings.

Alternatively, the abutments may be supported on end-bearing steel H-piles driven to the surface of the sound bedrock between elevations 191 and 194. The allowable loads will depend on the pile section chosen (e.g., 12 BP 74 piles may be designed for 90 Tons/pile).

No rock or bouldery fill should be placed within the plan limits of the piles. All pile caps should be provided with a minimum soil cover of 5 ft. for frost protection.

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

6.3) Approaches:

As discussed previously, up to 20 ft. of fill will be required in order to achieve the proposed profile grade for County Rd. #7 at this crossing. No stability problems are anticipated for fills constructed with standard 2:1 slopes.

7. MISCELLANEOUS:

The field work, performed during the period January 16 - 30, 1970, together with the preparation of this report, was undertaken by Mr. H. Szymanski, Foundation Report Technician.

Equipment used was owned and operated by F. E. Johnston Drilling Co. Ltd.

General supervision of the project and review of the report were undertaken by Mr. M. Devata, Supervising Foundation Engineer.

February, 1970

APPENDIX I

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-F-3

LOCATION Sta. 31 + 90 @ Co. Rd. #7 o/s 17' Lt.

ORIGINATED BY HS

W.P. 35-66-16

BORING DATE Jan. 27, 1970

COMPILED BY HS

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing; Cone

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT	20	40	60	80	100	PLASTIC LIMIT — $w_p$		
212.1	Ground Level												WATER CONTENT — $w$		
0.0	Fill Material (clayey silt with trace sand.)												$w_p$ — $w$ — $w_L$		
208.1	Stiff		1	SS	13								WATER CONTENT %		
4.0	Glacial Till		1A	SS	39/6"								20 40 60	P.C.F.	GR SA SI CL
	Het. mix. of silt, sand & gravel with trace of clay		2	SS	70										
			3	SS	14										
	Compact - very dense Grey		4	SS	120/5"										
	occ. boulders up to 16" in size at random		5	SS	116										
193.6															
18.5	Shaley limestone														
	Bedrock		6	AXT	100%										
189.9	Sound														
22.2	End of Borehole														

207.5

29 37 28 6

125/10"

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-F-3

LOCATION Sta. 31 + 79 @ Co. Rd. #7 o/s 20' Rt.

ORIGINATED BY HS

W.P. 35-66-16

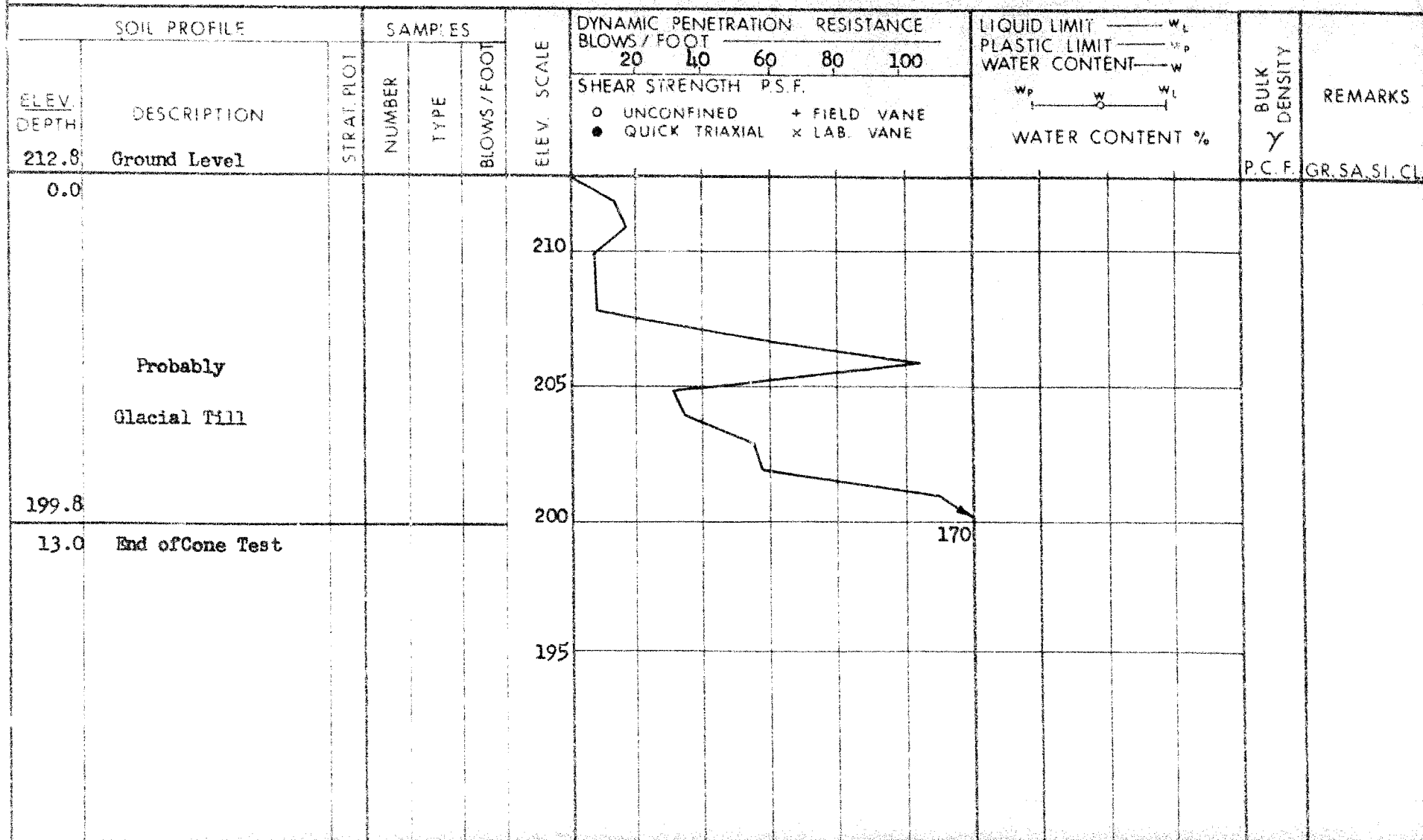
BORING DATE January 16, 1970

COMPILED BY HS

DATUM Geodetic

BOREHOLE TYPE Dynamic Cone Penetration Test only

CHECKED BY



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-F-3

LOCATION Sta. 30 + 67  $\frac{1}{2}$  Co. Rd. #7 o/s 17' Lt.

ORIGINATED BY HS

W.P. 35-66-16

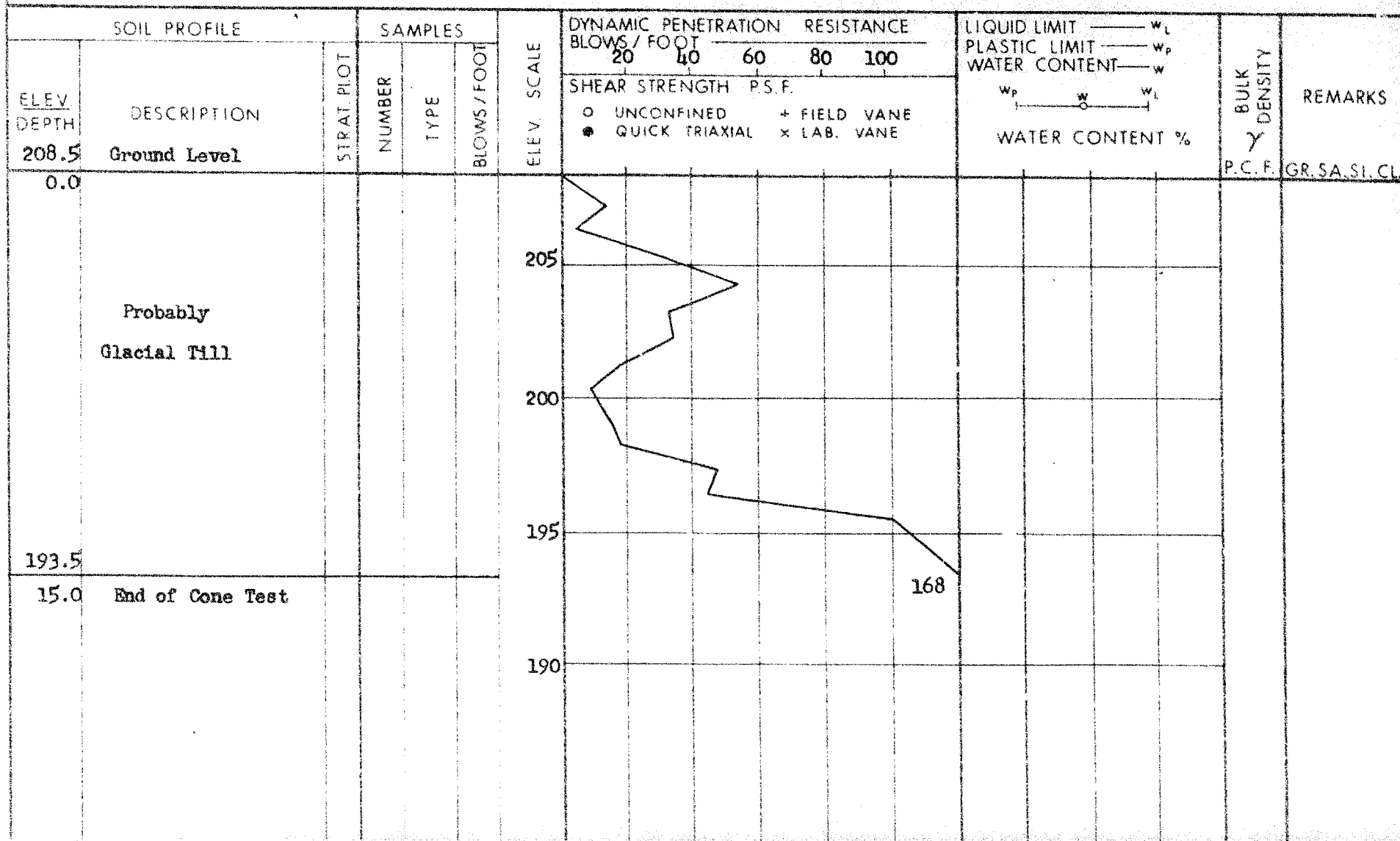
BORING DATE Jan. 16, 1970

COMPILED BY HS

DATUM Geodetic

BOREHOLE TYPE Dynamic Cone Test

CHECKED BY



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 70-F-3

LOCATION Sta. 30 + 57 @ Co. Rd. #7 o/s 20' Rt.

ORIGINATED BY **HS**

W. P. 35-66-16

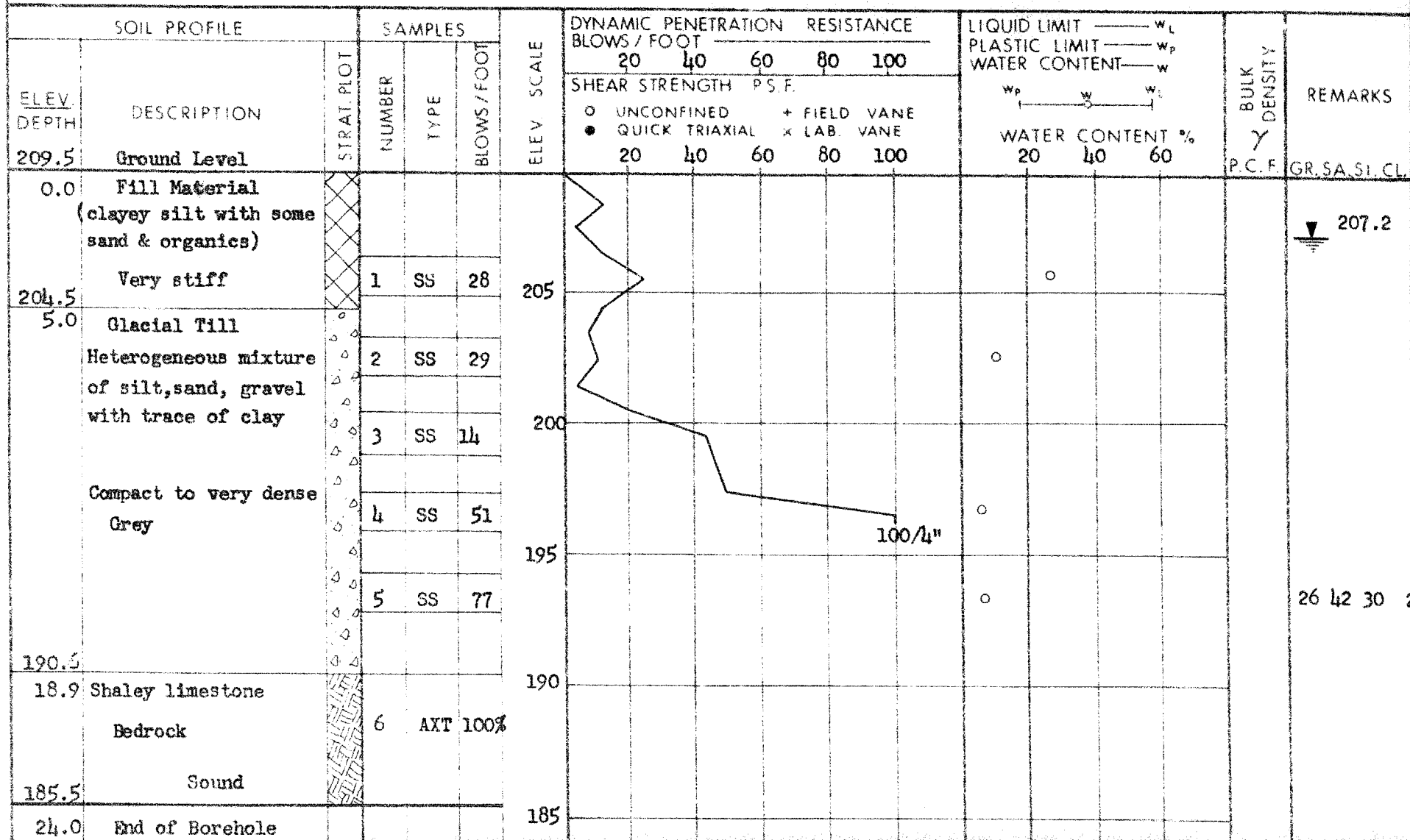
BORING DATE Jan. 30, 1970

COMPILED BY **HES**

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing; Cone

CHECKED BY



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 70-F-3

LOCATION Sta. 29 + 44 @ Co. Rd. #7 o/s 10' Lt.

ORIGINATED BY HS

W.P. 35-66-16

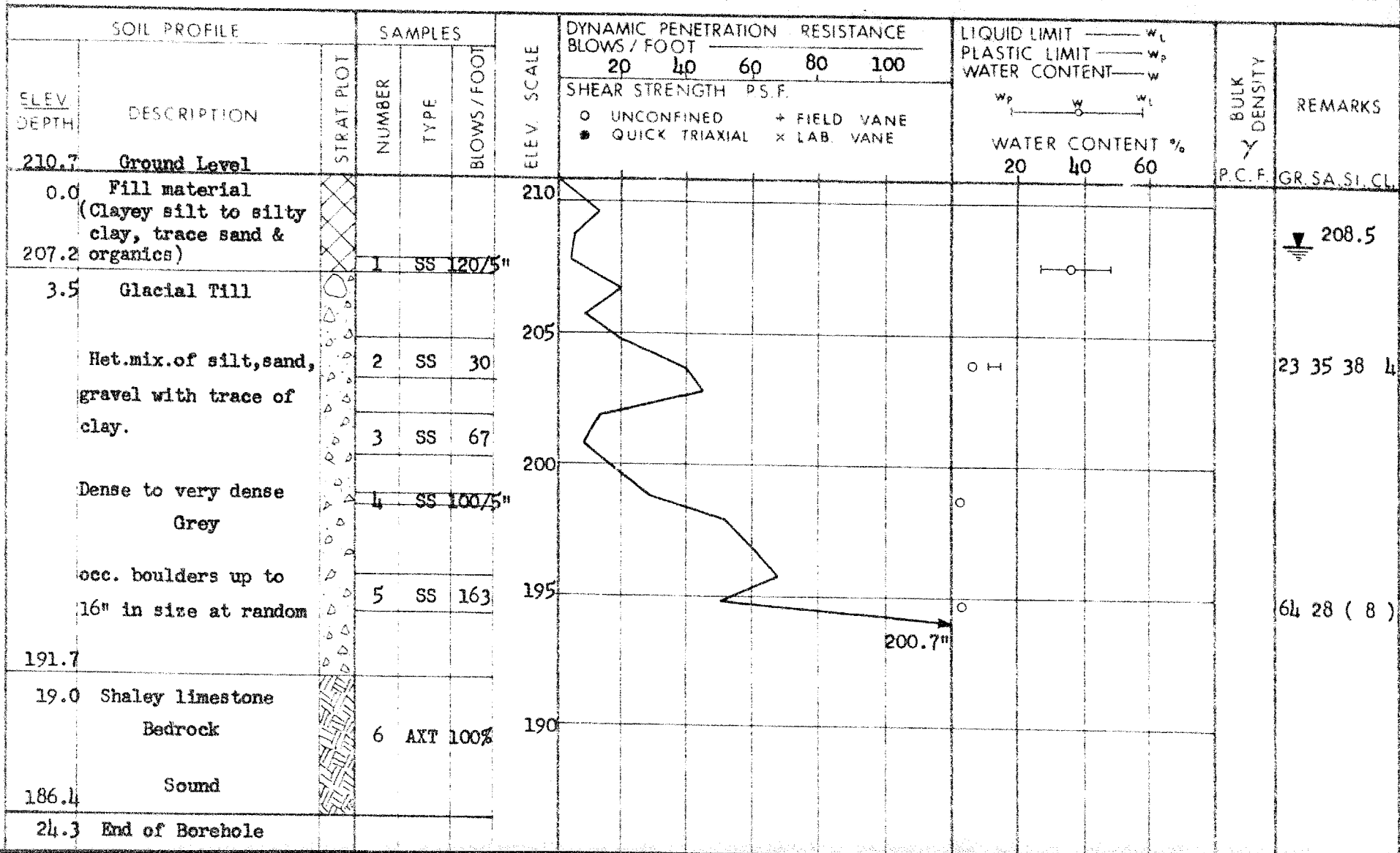
BORING DATE January 28, 1970

COMPILED BY HS

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing Cone

CHECKED BY



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 70-F-3

LOCATION Sta. 29 + 34 @ Co. Rd. #7 o/s 20' Rt.

ORIGINATED BY HS

W.P. 35-66-16

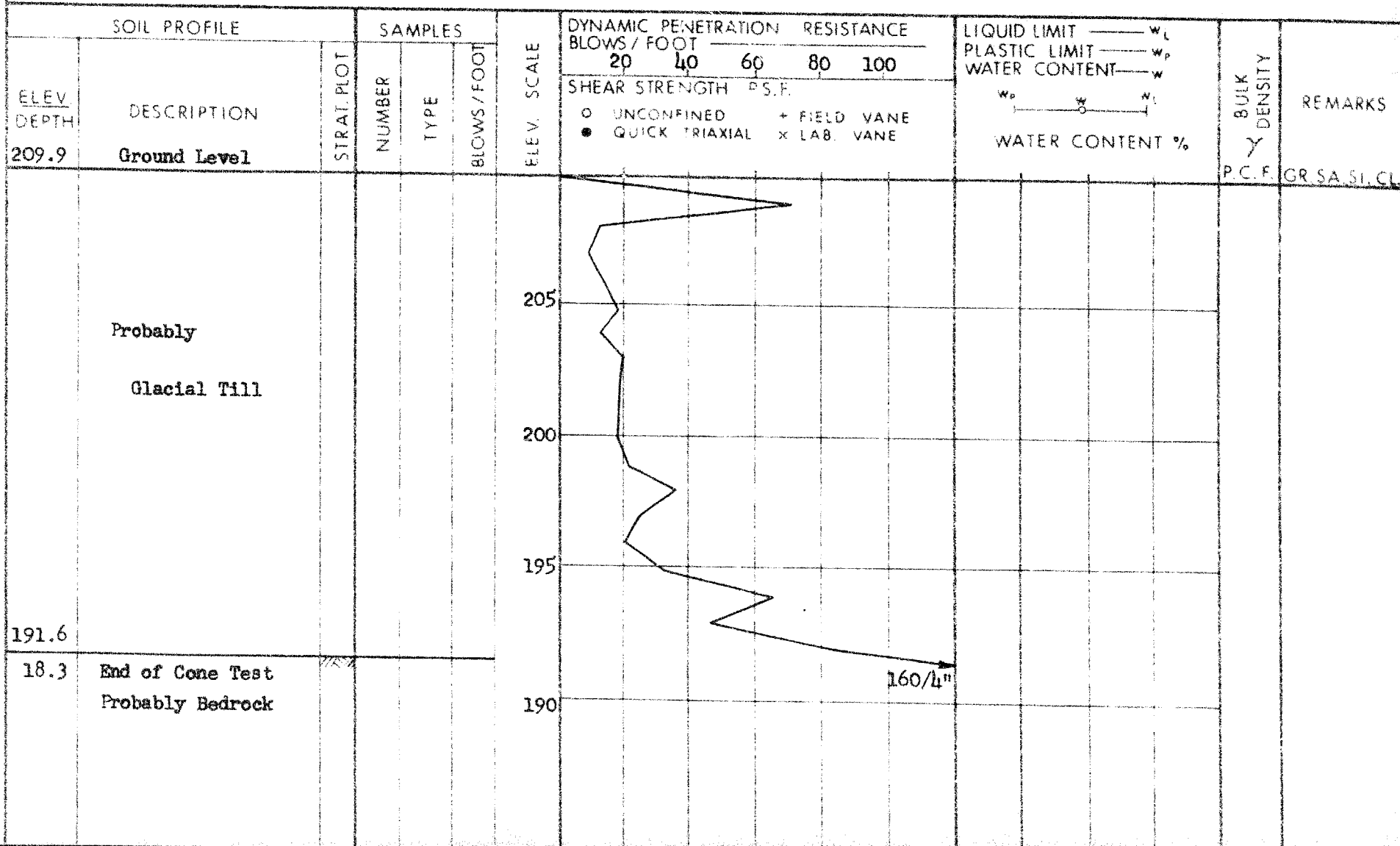
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COMPILED BY HS

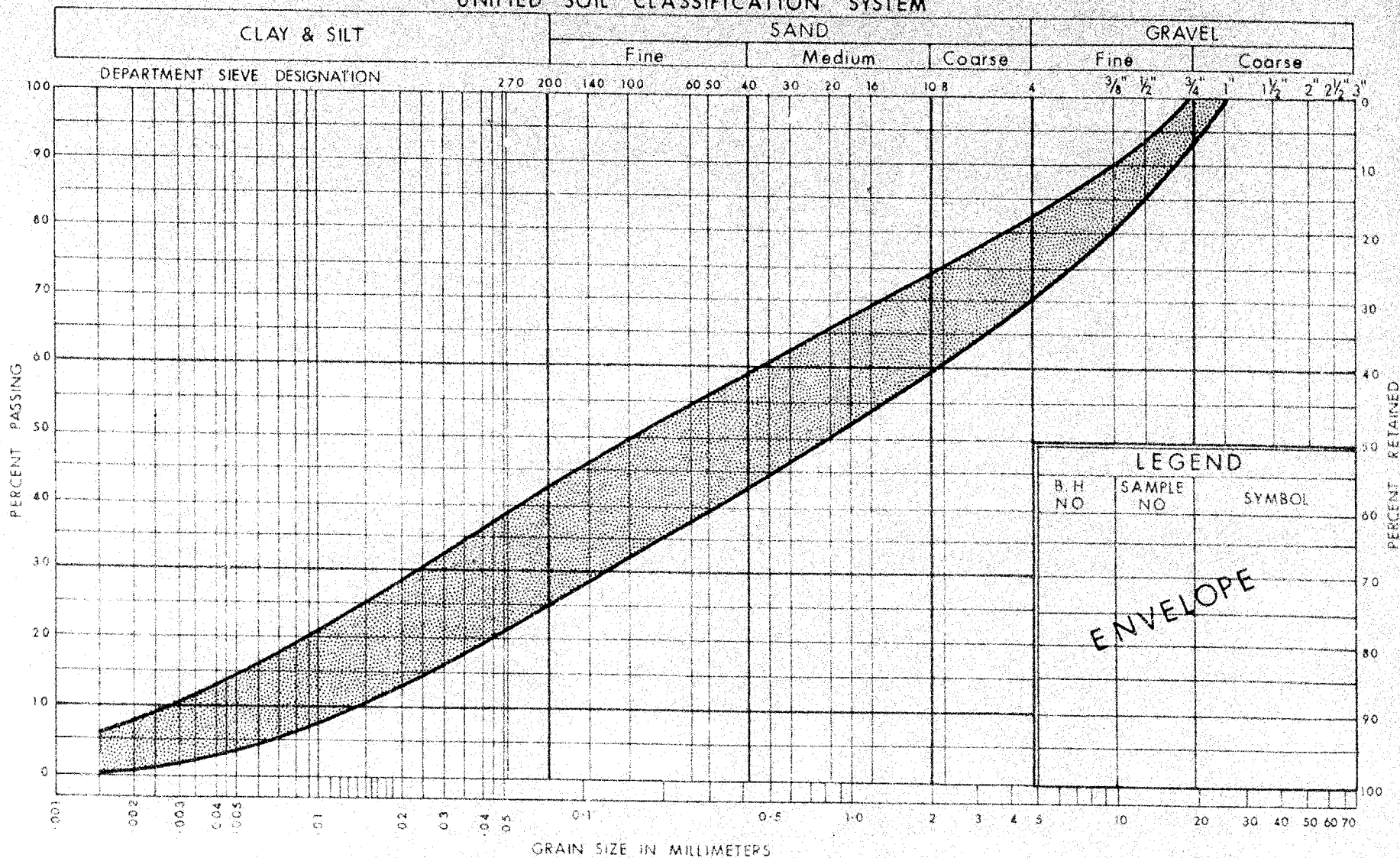
DATUM Geodetic

BOREHOLE TYPE Dynamic Cone Test

CHECKED BY



# UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND		
B. H. NO.	SAMPLE NO.	SYMBOL

ENVELOPE



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

GRAIN SIZE DISTRIBUTION  
GLACIAL TILL

W.P. No. 35-66-16  
JOB No. 70-F-3  
Fig. NO. 1

## 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

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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 $= \frac{-\Delta e}{(1+e)\Delta\sigma}$
$c_c$	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
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION INTERCEPT
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

## GENERAL

$\pi$	= 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
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

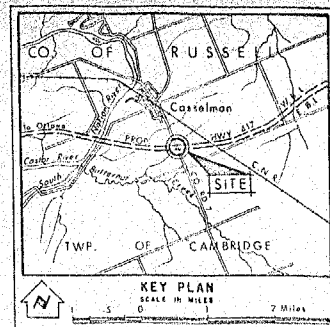
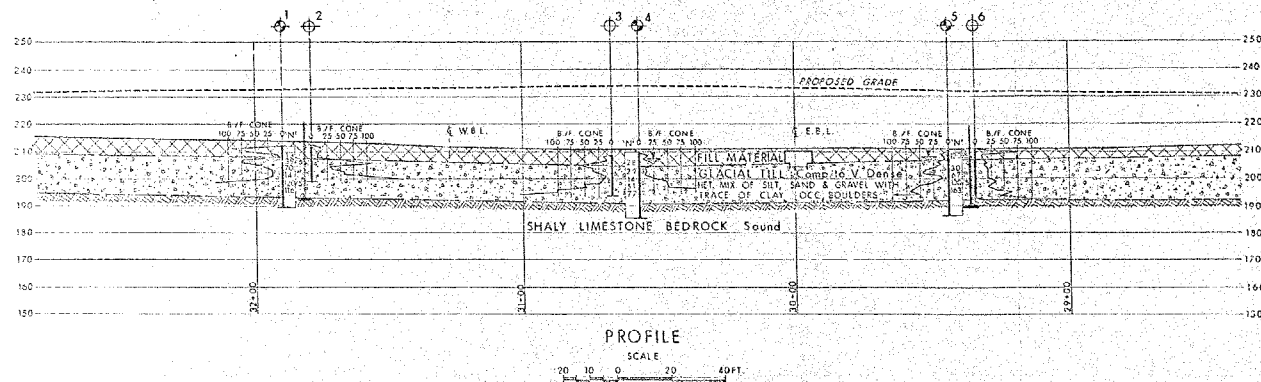
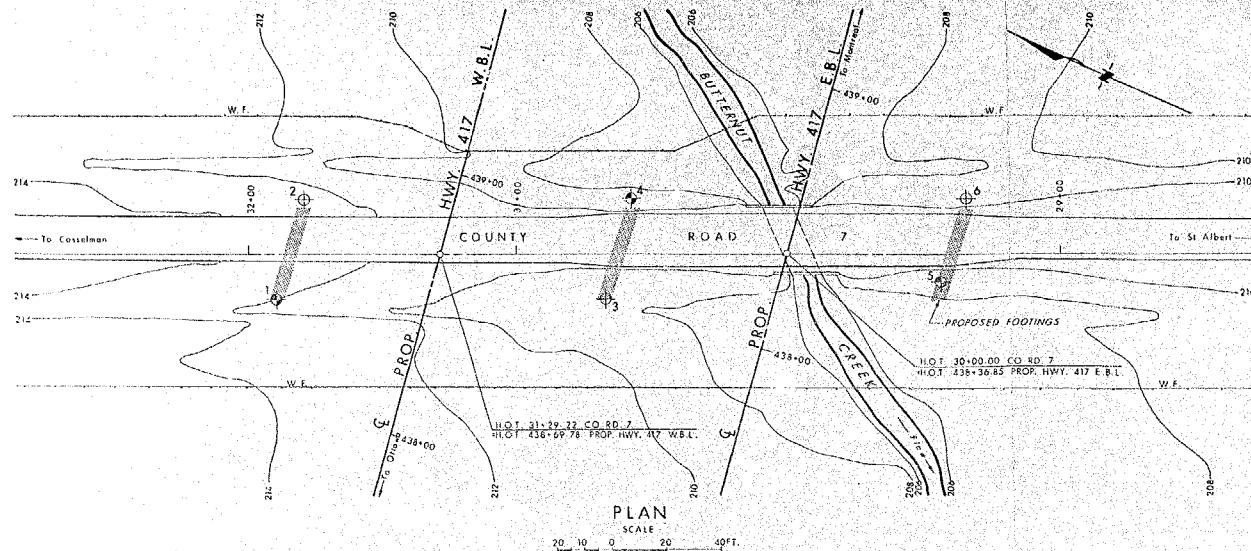
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

## 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
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation, Jan. 1970		
NO.	ELEVATION	STATION	OFFSET
1	212.1	31+90	17' LT.
2	212.8	31+79	20' RT.
3	208.5	30+67	17' LT.
4	209.5	30+57	20' RT.
5	210.7	29+44	10' LT.
6	209.9	29+34	20' RT.

**NOTE**  
The boundaries between soil strata have been established only of 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

**COUNTY ROAD 7**

KING'S HIGHWAY NO. 417 E.B.L. & W.B.L. DIST. NO. 9  
CO. RUSSELL  
TWP. CAMBRIDGE LOT 9 CON. VII

**BORE HOLE LOCATIONS & SOIL STRATA**

DESIGNED BY C. M. CHECKED BY	W.P. NO. 35-66-10	W.B.T. DRAWINGS NO.
DRAWN BY G. F. CHECKED BY	209 NO. 70 - F-3	<b>70-F-3A</b>
DATE Feb. 10, 1970	SITE NO.	BRIDGE DRAWING NO.
APPROVED BY <i>[Signature]</i>	INCHES	

Copy for the information of  
Mr. A. Stearns, Principal Foundation Engineer,  
Room 107, 1st Fl., Bldg.

Bridge Office,  
Tomball

Mr. F. C. Hargrave,  
Reg. Bridge Planning Engineer,  
Houston Regional Office,  
Houston, Texas

July 20, 1970

County Rd. 47 Interchange Underpass  
1.0 Mile South of Junction  
Rt. 29-26-10, Mile 27-28  
Highway 47, District 27, 2

Attached herewith are plans of the Preliminary Bridge Plan  
Drawing 1-1000-1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$170,000.  
This cost includes vendor, materials, engineering and utility  
coordination.

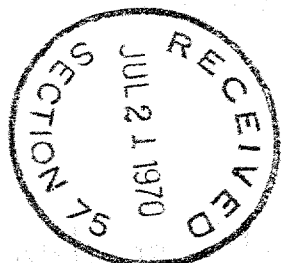
Any comments or revisions you may have should be submitted  
within three weeks.

C. E. Grawick,  
Bridge Design Engineer

cc:ing

attach.

1. Anderson  
2. Stearns (7)  
3. Hargrave



## MEMORANDUM

TO: Mr. A. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Bldg.

FROM: C.S. Grebski,  
Bridge Office

ATTENTION:

DATE: October 19, 1970

OUR FILE REF.

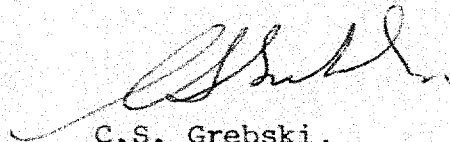
IN REPLY TO

SUBJECT: County Rd. #7 Interchange Underpass  
1.0 Mile South of Casselman  
W.P. 35-66-16, Site 27-211  
Highway 417, District No. 9

70-F-3

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,  
Bridge Design Engineer

CSG:rd

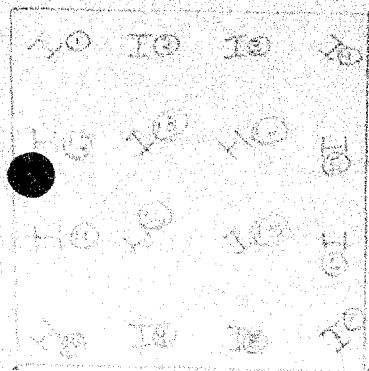
Attach.

c.c. Foundation Office

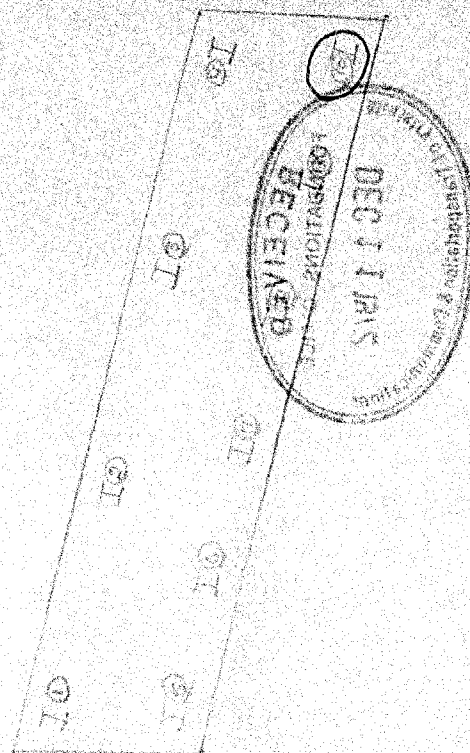
Advised Mr. Bassi with regard to file lengths.

M. Devata  
Oct 23/70.

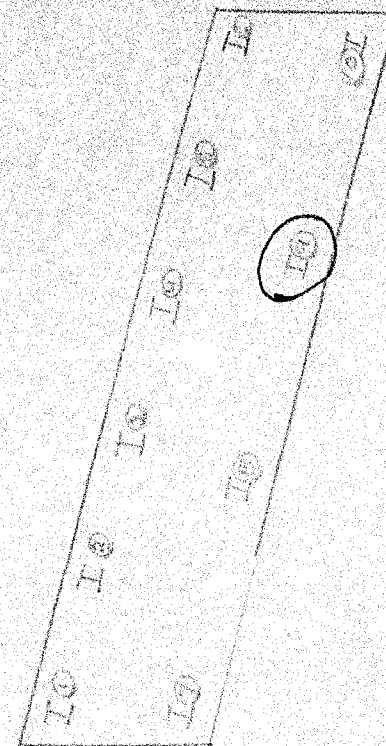




PIER F4g.

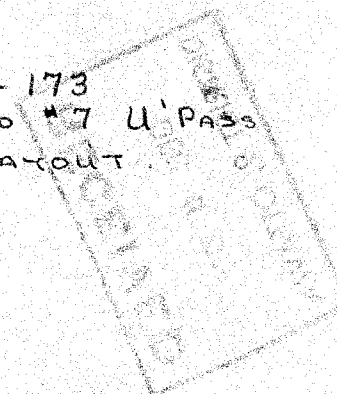


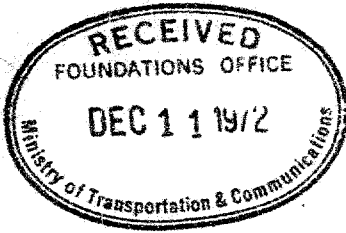
N. Abut



S. Abut

Cont 72-173  
County Rd #7 U'PASS  
PILING LAYOUT





OVER

Form OB-MT-285  
(REVISED NOV. 1971)

## DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

DESIGN SERVICES BRANCH

WP-35-66-04; 14; 15; 16 &amp; 17,

FOUNDATION OFFICE

22; 23 &amp; 24.

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173STRUCTURE COUNTY ROAD #7CONTRACTOR C. A. PITTS LTD.DESIGN LOAD OF PILE DRIVEN TO REFUSAL.HAMMER DETAILS: TYPE DALMAC D-12WEIGHT 1.38 HEIGHT OF FALL OR ENERGYTYPE OF ANVIL OR CAP STEELWEIGHT OF ANVIL OR CAP 1.25 TON.PILE DETAILS 12 B.P. 74PILE NO. 10 LOCATION NORTH ABUTDATE DRIVEN DEC 4, 1972

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
32'0"	1	3		26	24		51			76	
	2	2		27	22		52			77	
	3	2		28'10"	38		53			78	
	4	2		29			54			79	
	5	3		30			55			80	
	6	4		31			56			81	
	7	3		32			57			82	
	8	10		33	NOTE		58			83	
	9	7		34	Piles drive relative easy and refusal is 16ft without any noticeable firmness prior to refusal.		59			84	
	10	6		35			60			85	
	11	6		36			61			86	
	12	6		37			62			87	
	13	4		38			63			88	
	14	12		39			64			89	
	15	12		40			65			90	
	16	20		41			66			91	
	17	13		42			67			92	
	18	21		43			68			93	
	19	9		44			69			94	
	20	9		45			70			95	
	21	12		46			71			96	
	22	19		47			72			97	
	23	24		48			73			98	
	24	42		49			74			99	
	25	33		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION

1

2

3

4

5

6

BLOWS PER INCH

MEASURED REBOUND IN INCHES

FINAL LENGTH OF PILE

28' 10"

FINAL CUT OFF ELEVATION

221.50

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

at all 221.5  
length 22.9  
typical 192.6  
NORTH ABUT.

SIGNED

NAME (PRINT) JAMES FAWCETTDATE DEC 4, 1972

ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

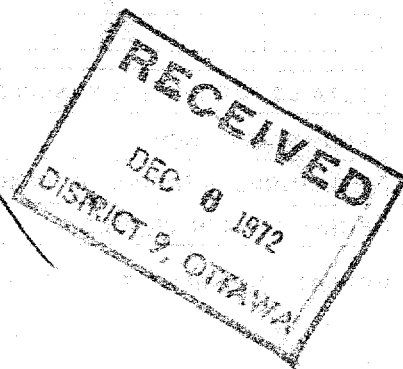
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



# BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD No 7

CONTRACTOR C.A. PITTS LTD DESIGN LOAD OF PILE DRIVEN TO REFUSAL

HAMMER DETAILS: TYPE DALMEG D-12 WEIGHT 138 HEIGHT OF FALL OR ENERGY

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP 25 TON

PILE DETAILS 12 B.P. 74

PILE NO. 9 LOCATION SOUTH ABUT DATE DRIVEN DEC 5, 1972

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
32'0"	1		26	13		51			76		
	2		27	14		52			77		
	3		28	26		53			78		
	4		29	44		54			79		
	5	6	30	33		55			80		
	6	8	31	50		56			81		
	7	6	32			57			82		
	8	9	33			58			83		
	9	11	34			59			84		
	10	14	35			60			85		
	11	20	36			61			86		
	12	29	37			62			87		
	13	27	38			63			88		
	14	14	39			64			89		
	15	14	40			65			90		
	16	14	41			66			91		
	17	17	42			67			92		
	18	19	43			68			93		
	19	19	44			69			94		
	20	12	45			70			95		
	21	16	46			71			96		
	22	18	47			72			97		
	23	20	48			73			98		
	24	14	49			74			99		
	25	17	50			75			100		

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE <u>31'2"</u>	FINAL CUT OFF ELEVATION <u>221'0</u>					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED James Fawcett  
NAME (PRINT) JAMES FAWCETT  
DATE DEC 5, 1972  
ATTACH SKETCH OF PILE NUMBERING SYSTEM

✓

✓

[illegible]

01-30 SEP. 1978

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 316-47

DIST. 9 REGION Eastern

W.P. No. 35-66-16

CONT. No. 72-173

W. O. No. 70-F-003

STR. SITE No. 27-211

HWY. No. 417

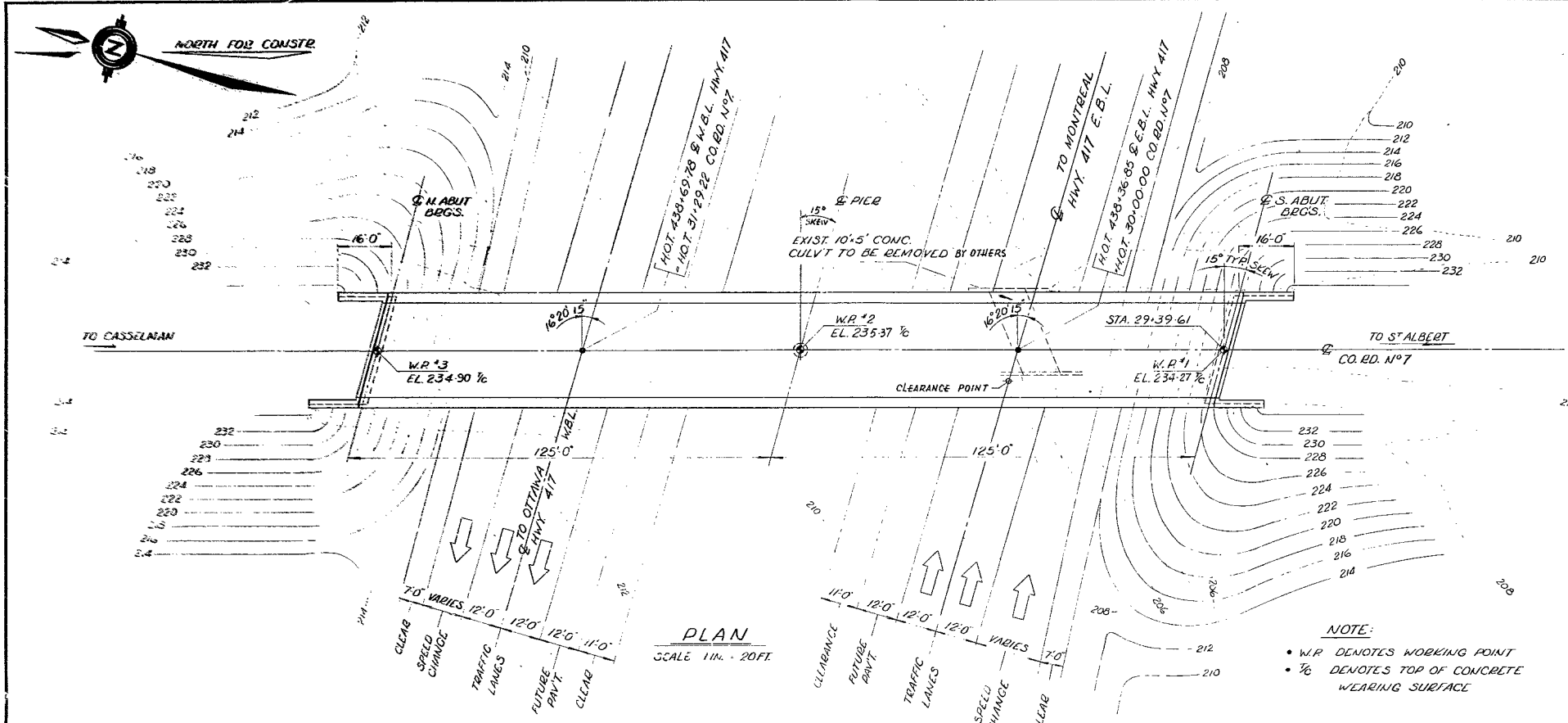
LOCATION RUSSEL CTY. Ro. #7

M'Pass STs #81

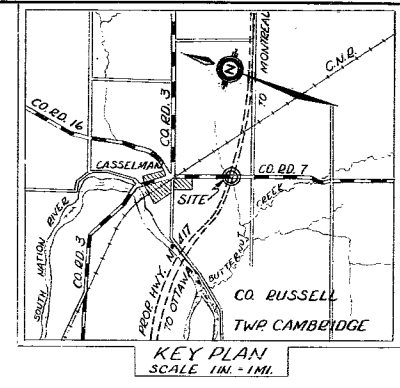
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: 1. DOCUMENT TO BE UNFOLDED

BEFORE MICRO FILM.



**SKREW DATA 15°**  
 SIN. 0.258819  
 COS. 0.965926  
 TAN. 0.267949  
 SEC. 1.035276



B.M. EL. 207.57  
 GEODETIC DATUM  
 N. & W. IN N. ROOT OF 1.5 TWIN ELM  
 292.0 RT. OF STA. 437+85 (W.B.L.)

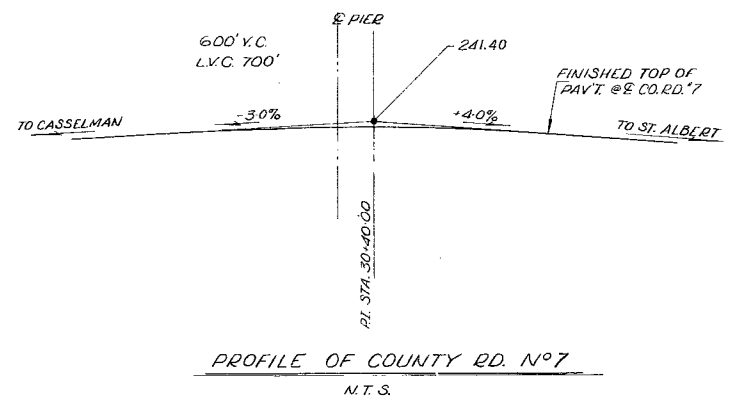
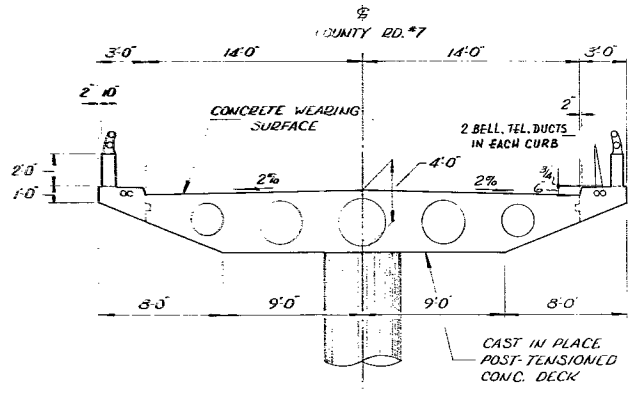
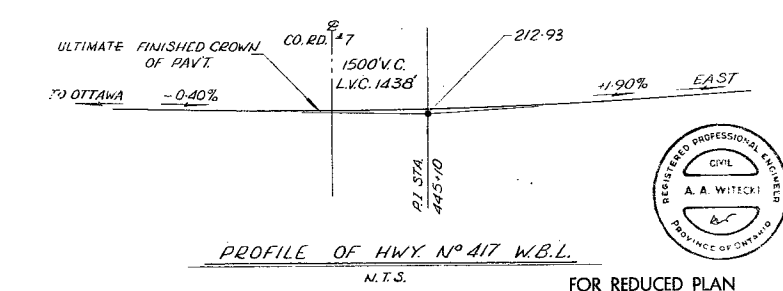
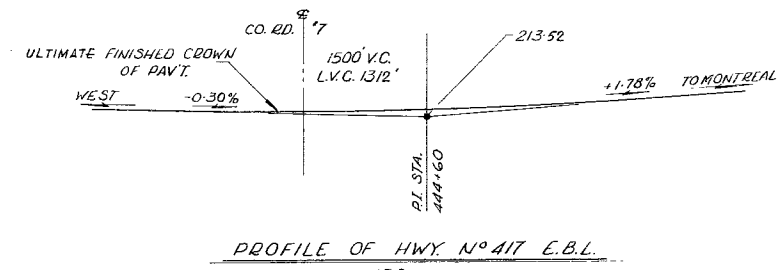
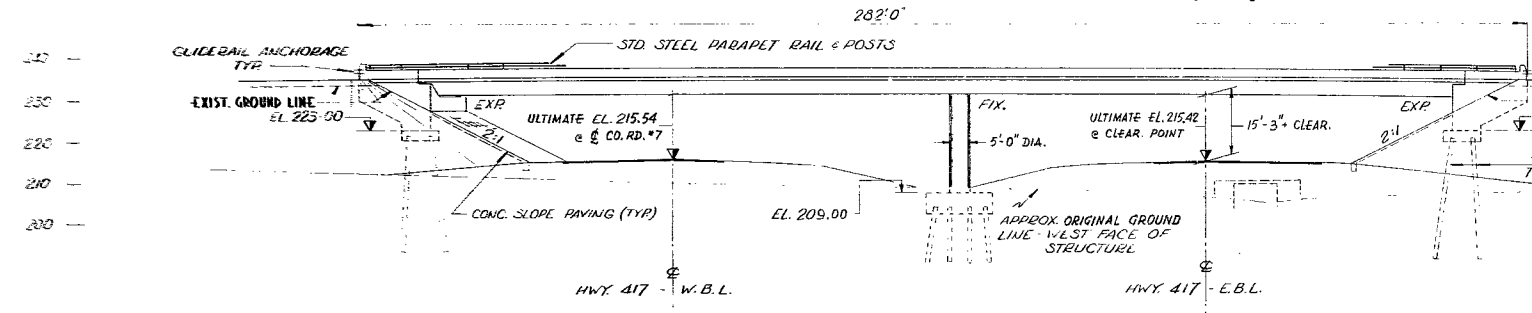
- LIST OF DRAWINGS**
- D-6825-1 GENERAL LAYOUT
  - 2 BORE HOLE LOCATIONS & SOIL STRATA
  - 3 FOUNDATION LAYOUT
  - 4 ABUTMENTS & PIER
  - 5 DECK DETAILS & BEARINGS
  - 6 CABLE DETAILS I
  - 7 CABLE DETAILS II
  - 8 DECK REINFORCEMENT I
  - 9 DECK REINFORCEMENT II
  - 10 PARAPET WALL DETAILS
  - 11 STANDARD STEEL PARAPET RAIL
  - 12 DETAILS OF CONC. SLOPE PAVING
  - 13 STANDARD DETAILS I
  - D-6825-14 STANDARD DETAILS II

**NOTES:**

**CLASS OF CONCRETE**  
 DECK, CURBS & PARAPET WALLS 5000 F.S.I.  
 PIER COLUMN 3000 F.S.I.  
 REMAINDER

**CLEAR COVER ON REIN. STEEL**  
 FOOTINGS & ABUTMENTS 3"  
 PIERS & CURBS 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.



**316-47**

**70-F-3**

**COUNTY RD. #7 INTERCHANGE U'PASS.**  
 (1.0 MILE SOUTH OF CASSELMAN)

KING'S HIGHWAY No. 417 DIST. No. 9  
 CO. RUSSELL  
 TWP. CAMBRIDGE LOT 9 CON. VII

**GENERAL LAYOUT**

APPROVED *[Signature]* SITE No. 27211 W.P. No. 35-66-16  
 DESIGN A.A. WITTECK  
 DRAWING H.L.O. CHECK G.B.  
 DATE OCT. 1970 LOADING 4320-44 CONTRACT No. DRAWING No. D-6825-1

