

REMARKS: _____

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 125-66-17

DIST 4

HWY QEW

STR SITE 10-286

QEW Over Ford Drive

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FOUNDATION INVESTIGATION REPORT

For

QEW Over Ford Drive
W.P. 125-66-17, Site 10-286
QEW, District 4, Hamilton

INTRODUCTION

This report contains the results of a foundation investigation carried out for the above project. It is based on 4 boreholes which were advanced during the period March 21 to 23, 1977 for adjacent structures under Work Projects 125-66-16/18. These boreholes were advanced into the shale bedrock employing solid stem augers, and then BXL core samples were obtained from each borehole.

SITE DESCRIPTION

This site is located on the QEW approximately 900 feet south of the existing Ford Drive underpass structure. At this location the QEW consists of 6 traffic lanes plus paved shoulders and median. The ground surface in this area slopes gently towards Joshua Creek which is located some 500 feet to the south. Land use in the area is in transition from being predominantly agricultural to being industrial and residential.

SUBSURFACE CONDITIONS

The overburden in the area consists of a 7 to 8 foot layer of clayey silt to silty clay. It has a very stiff to hard consistency with Standard Penetration 'N' values ranging from 16 to 50 blows per foot. Moisture content varies between 10 and 20 percent with an average of about 15 percent.

The clayey silt to silty clay overburden is underlain by shale bedrock of the Meaford Dundas Formation. It is interbedded with layers of shaley limestone and limestone up to 1.5 feet in thickness. The shale is grey and fissile exhibiting thin horizontal bedding. An upper zone up to 7 feet in thickness shows considerable deterioration and is shown on the sections and logsheets as weathered. Detailed descriptions of the cores recovered are given on the Record of Borehole Sheets located in the Appendix of this report.

Groundwater levels in the open boreholes were recorded during the period of the fieldwork. They indicate the groundwater level was from 4 to 6 feet below the ground surface.

DISCUSSION AND RECOMMENDATIONS

General

It is proposed that in the new interchange the QEW will pass over a depressed Ford Drive on a single span structure 130 feet in length. This structure will be flanked on either side by similar structures carrying ramps between the QEW and Hwy. 403. The construction of the ramp structures will precede that of the QEW structure.

Spread Footings

The structure should be supported on spread footings. Where the footings bear on sound shale an allowable load up to 10 tons per square foot may be used. In cases where footings are founded on shale described as weathered the allowable load should be reduced to 5 tons per square foot. Any footings founded in the clayey silt to silty clay overburden may be loaded to a maximum of 2 tons per square foot. To prevent deterioration of the shale due to exposure to air and water the footing base should be covered by 6 inches of mass concrete within 3 hours of it being excavated to grade.

Frost Protection

Since the shale is susceptible to frost action the underside of the footings should be provided with 4 feet of cover.


Dewatering

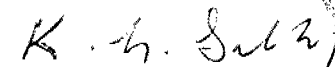
No unwatering problems are anticipated in excavations for footings. Any seepage water should be pumped from summs.

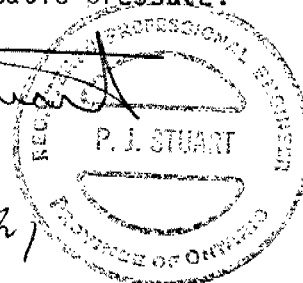
MISCELLANEOUS

Resistance to sliding of the footing on the shale bedrock may be calculated using a coefficient of friction of .50.

The abutment walls should be backfilled with free draining granular material and weep holes should be provided to prevent a buildup of hydrostatic pressure.


P.J. Stuart, P. Eng.
Project Engineer


K.G. Selby, P. Eng.
Supervising Engineer



APPENDIX

RECORD OF BOREHOLE No 3

W P L25-06-17 LOCATION Co-ords N 15 803 724; E 954 012 ORIGINATED BY CTJ
 DIST 4 HWY Q.E.W. BOREHOLE TYPE Solid Stem Auger, BXL Core COMPILED BY CTJ
 DATUM Geodetic DATE March 23, 1977 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH								WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL						
422.0	Ground Level							20 40 60 80 100								
0.0	Clayey Silt To Silty Clay, Some Sand, Trace Of Gravel		1	SS	46		420									
414.5	Hard		2	SS	32											
412.3	(Weathered)		3	SS	112											
9.5	(Sound)		4	BXL	91% REC		410								RQD 30%	
	Shale Bedrock (See Below)*		5	BXL	100% REC		400								RQD 63%	
392.3																
29.7	End Of Borehole															
	*Intermittent shale, shaly limestone & limestone, fine tex- ture, soft to med.hard light grey, shale is fissile, thin bedding with Limestone (med. hard, fine texture, light grey, fossil- iferous) seams from 12'8" to 13'6" 19'6" to 20'2" 25'3" to 26'2"															

RECORD OF BOREHOLE No 4

W P 125-66-17 LOCATION Co-ords N 15 803 823; E 954 023 ORIGINATED BY CTJ
 DIST 4 HWY Q.E.W. BOREHOLE TYPE Solid Stem Auger, BXL Core COMPILED BY CTJ
 DATUM Geodetic DATE March 22, 1977 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE										10 20 30		
427.1	Ground Level																			
0.0	Clayey Silt To Silty Clay, Some Sand Traces Of Gravel (Reworked) Very Stiff		1	SS	16		420								o	5 31 39 25				
420.0			2	SS	111/8"															
7.1	(Weathered)		3	SS	131/9"															
417.1			4	BXL	84% REC		410									RQD 25%				
10.0	(Sound)		5	BXL	100% REC											RQD 15%				
	Shale Bedrock (See Below)*		6	BXL	97% REC											RQD 60%				
397.9							400													
29.2	End Of Borehole																			
	*Intermittent Shale, Shaly Limestone & Limestone Beds, Soft To Hard, Fine Texture, Shale ls Fissile, Light Grey Colour, Thin hori- zontal Bedding With Limestone (Hard, Fine Texture fossiliferous) seams from 11'10" to 12'4" 13' 6" to 14'2" 22' 2" to 22'6" 23' 0" to 23'10" 28'10" to 29'2"																			



RECORD OF BOREHOLE No 5

W P 125-66-17 LOCATION Co-ords N 15 803 726; E 953 841 ORIGINATED BY VK
DIST 4 HWY Q.E.W. BOREHOLE TYPE Solid Stem Auger, BXL Core & Cone Test COMPILED BY VK
DATUM Geodetic DATE March 22, 1977 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
422.7	Ground Level													
0.0	Clayey Silt To Silty Clay, Trace Of Sand Very Stiff Brown To Hard Grey		1	SS	16		420							
414.7			2	SS	37									
8.0			3	SS	100									
411.7	(Weathered)													
11.0	(Sound)		4	BXL	100% REC		410							RQD 0%
	Shale Bedrock* (See Below)		5	BXL	100% REC									RQD 0%
			6	BXL	100% REC		400							RQD 70%
			7	BXL	90% REC									RQD 20%
391.7	End Of Borehole													
31.0	*Intermittent Thin Beds Of Shale, Shaly Limestone & Limestone (Dark Grey Colour, Fine Texture, Soft To Hard, Shale Is Fissile, Thin Horizontal Bed- ding) With Limestone Seams (Light Grey, Fine Texture, Hard) From 14'4" to 15'4" 17'3" to 18'6" 21'0" to 21'9" 26'0" to 27'6"													

RECORD OF BOREHOLE No 6

W P 125-66-17 LOCATION Co-ords N 15 803 824; E 953 833 ORIGINATED BY VK
 DIST 4 HWY Q.E.W. BOREHOLE TYPE Solid Stem Auger, BXL Core & Cone Test COMPILED BY VK
 DATUM Geodetic DATE March 21, 1977 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100								SHEAR STRENGTH			WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE													
428.5	Ground Level																				
0.0	Clayey Silt To Silty Clay, Trace Of Sand Occ. Cobbles Hard, Brown		1	SS	37																
421.5			2	SS	113																
7.0	Shale Bedrock * (See Below)		3	SS	100	5"	420														
414.0	(Weathered)		4	SS	136	11"															
14.5	(Sound)		5	BXL	100% REC		410														
			6	BXL	75% REC																
			7	BXL	100% REC																
			8	BXL	100% REC		400														
398.5															RQD 15%						
30.0	End Of Borehole																				
	*Intermittent Shale, Shaly Limestone And Shale Beds (Soft To Med. Hard, Fine Texture Shale is Fissile, Thin Horizontal Bedding With Limestone Seams (Med. Hard, Fine Texture, Light Grey Colour, Fossiliferous, Shale Seams Present) 21'3" to 24'2" 26'3" to 27'5"																				
From	Note: Waterlevel not established																				

EXPLANATION OF TERMS USED IN REPORT

'N' VALUE: AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS N_c .

DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 350 FT-LB IMPACTS ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOIL QUALITY: SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH AS FOLLOWS:

S_u (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF SPT 'N' VALUES AS FOLLOWS:

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCK QUALITY: ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH DRILLED IN THAT CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4"+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS & SYMBOLS

LABORATORY TESTING

TRIAXIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U) ISOTROPICALLY (I) OR NOT (A) AND SHEARED DRAINED (D) OR UNDRAINED (U) WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS) EG. $\bar{C}\bar{U}$ = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

FIELD SAMPLING

S S SPLIT SPOON
W S WASH SAMPLE
S T SLOTTED TUBE SAMPLE
B S BLOCK SAMPLE
C S CHUNK SAMPLE
T W THINWALL OPEN
T P THINWALL PISTON
O S OSTERBERG SAMPLE
F S FOIL SAMPLE
R C ROCK CORE
P H T.W. ADVANCED HYDRAULICALLY
P M T.W. ADVANCED MANUALLY

EARTH PRESSURE TERMS

μ COEFFICIENT OF FRICTION
 δ ANGLE OF WALL FRICTION
 k_o COEFFICIENT OF EARTH PRESSURE AT REST
 k_A COEFFICIENT OF ACTIVE EARTH PRESSURE
 k_P COEFFICIENT OF PASSIVE EARTH PRESSURE
 i ANGLE OF INCLINATION OF SURCHARGE
 w SLOPE ANGLE-BACKFACE OF WALL
 β ANGLE OF SLOPE
 N_q, N_c BEARING CAPACITY FACTORS
 D_f DEPTH OF FOOTING
 B, L FOOTING DIMENSIONS

INDEX PROPERTIES

γ UNIT WEIGHT OF SOIL (BULK DENSITY)
 γ_w UNIT WEIGHT OF WATER
 γ_d UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
 γ' UNIT WEIGHT OF SUBMERGED SOIL
 G_s SPECIFIC GRAVITY OF SOLIDS
 e VOIDS RATIO
 e_o INITIAL VOIDS RATIO
 e_{max} e IN LOOSEST STATE
 e_{min} e IN DENSEST STATE
 D_r RELATIVE DENSITY = $\frac{e_{max} - e}{e_{max} - e_{min}}$
 n POROSITY
 w WATER CONTENT
 w_L LIQUID LIMIT
 w_p PLASTIC LIMIT
 w_s SHRINKAGE LIMIT
 I_p PLASTICITY INDEX = $w_L - w_p$
 I_L LIQUIDITY INDEX = $\frac{w - w_p}{w_L - w_p}$
 I_c CONSISTENCY INDEX = $\frac{w_L - w}{w_L - w_p}$
 A_c ACTIVITY = $\frac{I_p \text{ of soil}}{I_p \text{ of } 2 \mu m \text{ Soil Fraction}}$
 O_m ORGANIC MATTER CONTENT
 S_r DEGREE OF SATURATION
 S SENSITIVITY = $\frac{S_u \text{ (undisturbed)}}{S_u \text{ (remoulded)}}$

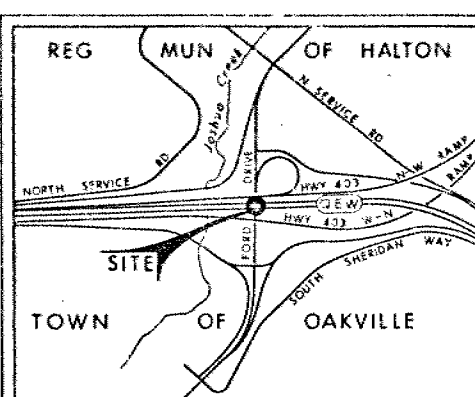
STRENGTH PARAMETERS

ϕ ANGLE OF SHEARING RESISTANCE
 τ_f PEAK SHEAR STRENGTH
 τ_R RESIDUAL SHEAR STRENGTH
 c COHESION INTERCEPT
 $\sigma_1, \sigma_2, \sigma_3$ NORMAL PRINCIPAL STRESSES
 u PORE WATER PRESSURE
 u_e EXCESS u
 r_u PORE PRESSURE RATIO
 q_u UNCONFINED COMPRESSIVE STRENGTH
 s_u UNDRAINED SHEAR STRENGTH
 ϵ LINEAR STRAIN
 γ SHEAR STRAIN
 ν POISSON'S RATIO
 E MODULUS OF ELASTICITY
 G MODULUS OF SHEAR DEFORMATION
 k_s MODULUS OF SUBGRADE REACTION
 m, n STABILITY COEFFICIENTS
 A, B PORE PRESSURE COEFFICIENTS

HYDRAULIC TERMS

h HYDRAULIC HEAD OR POTENTIAL
 q RATE OF DISCHARGE
 v VELOCITY OF FLOW
 i HYDRAULIC GRADIENT
 j SEEPAGE FORCE PER UNIT VOLUME
 η COEFFICIENT OF VISCOSITY
 k COEFFICIENT OF HYDRAULIC CONDUCTIVITY
 k_h k IN HORIZONTAL DIRECTION
 k_v k IN VERTICAL DIRECTION
 m_v COEFFICIENT OF VOLUME CHANGE
 c_v COEFFICIENT OF CONSOLIDATION
 C_c COMPRESSION INDEX
 C_r RECOMPRESSION INDEX
 d DRAINAGE PATH DISTANCE
 T_v TIME FACTOR
 U DEGREE OF CONSOLIDATION
 O_r OVERCONSOLIDATION RATIO (OCR)

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS:
 ϕ' = EFFECTIVE ANGLE OF SHEARING RESISTANCE;
 σ' = EFFECTIVE NORMAL STRESS



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊙ Bore Hole & Cone
- N' Blows/ft (Std Pen Test 350 ft lbs energy)
- CONE Blows/ft (60° Cone, 350 ft lbs energy)
- W/L at time of investigation March/77
- W/L NOT Established in B H #6

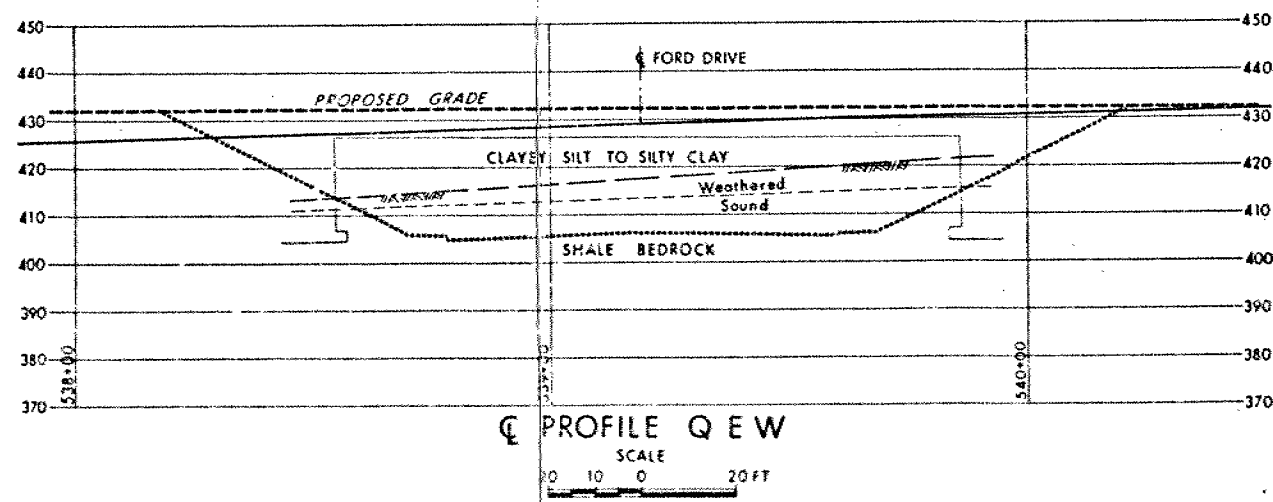
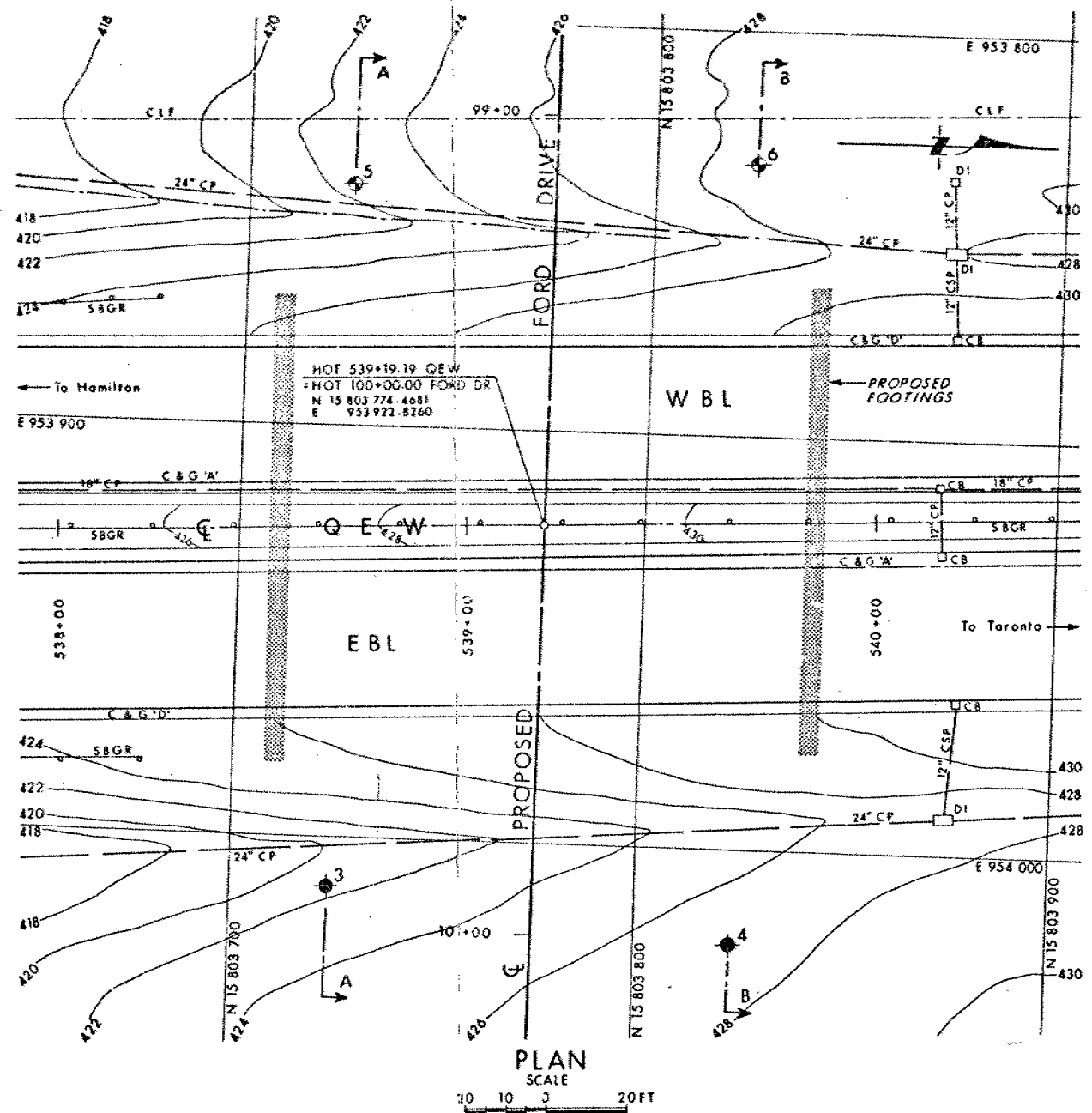
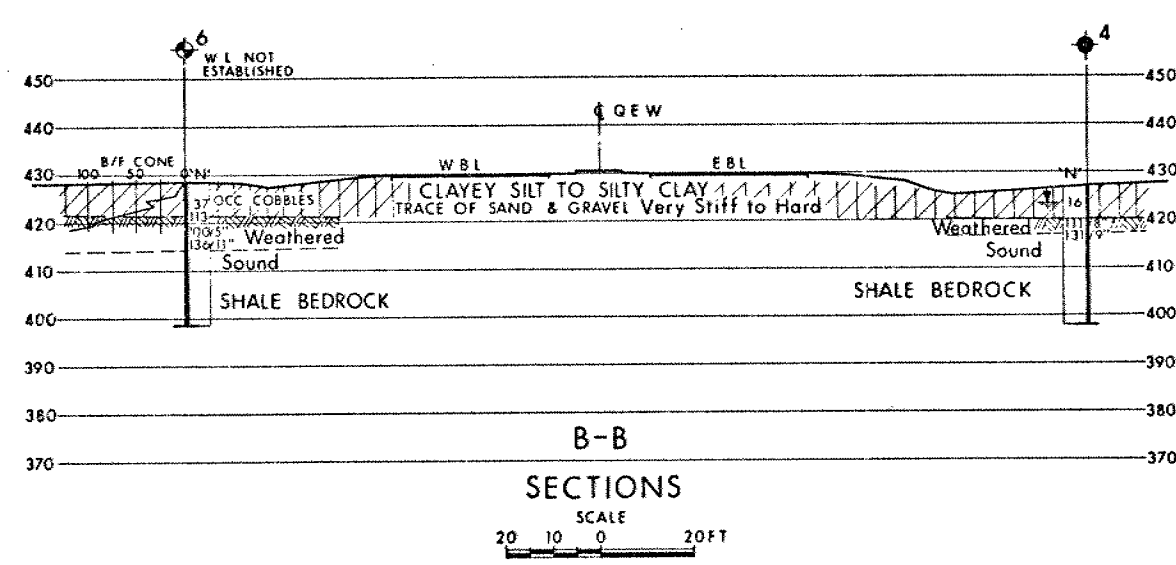
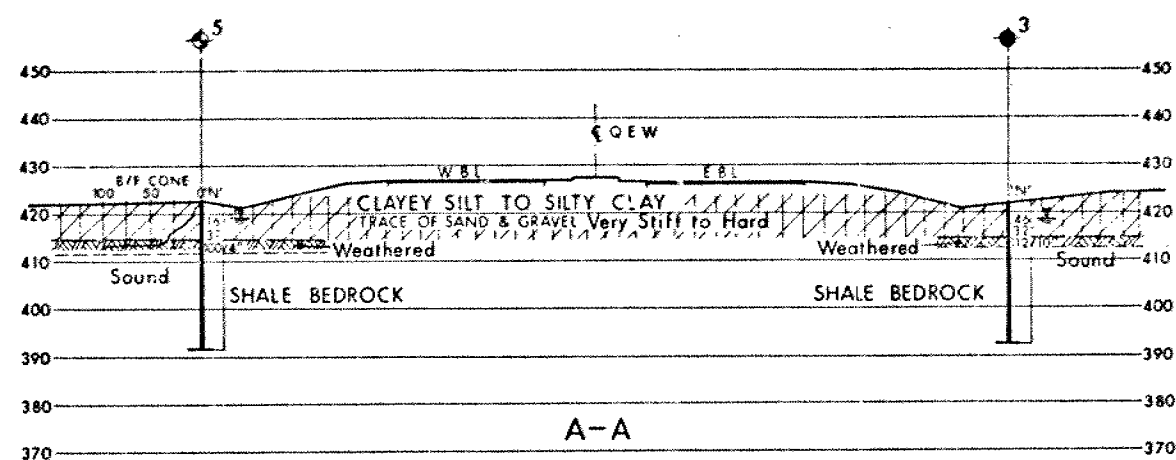
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
3	422.0	15 803 724	954 012
4	427.1	15 803 823	954 023
5	422.7	15 803 726	953 841
6	428.5	15 803 824	953 833

-NOTE-
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

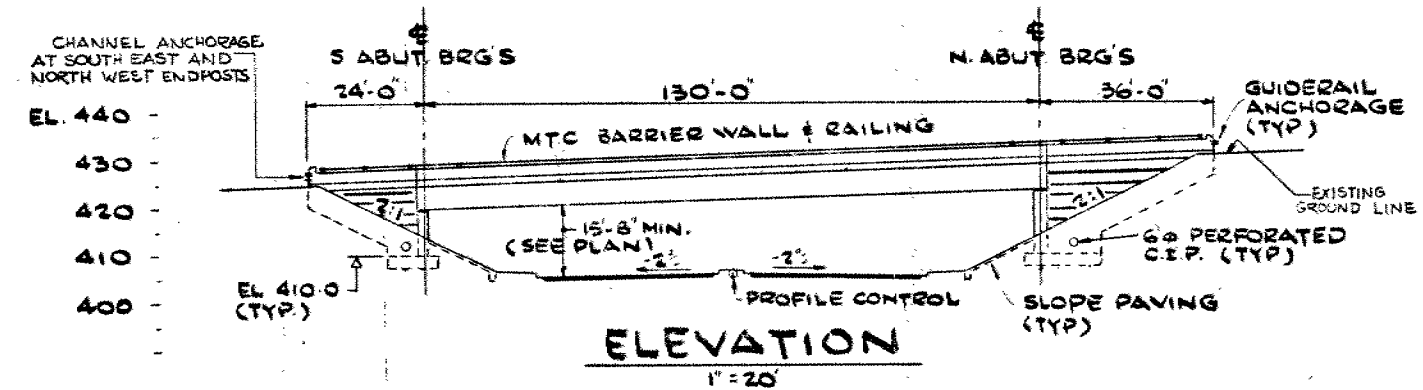
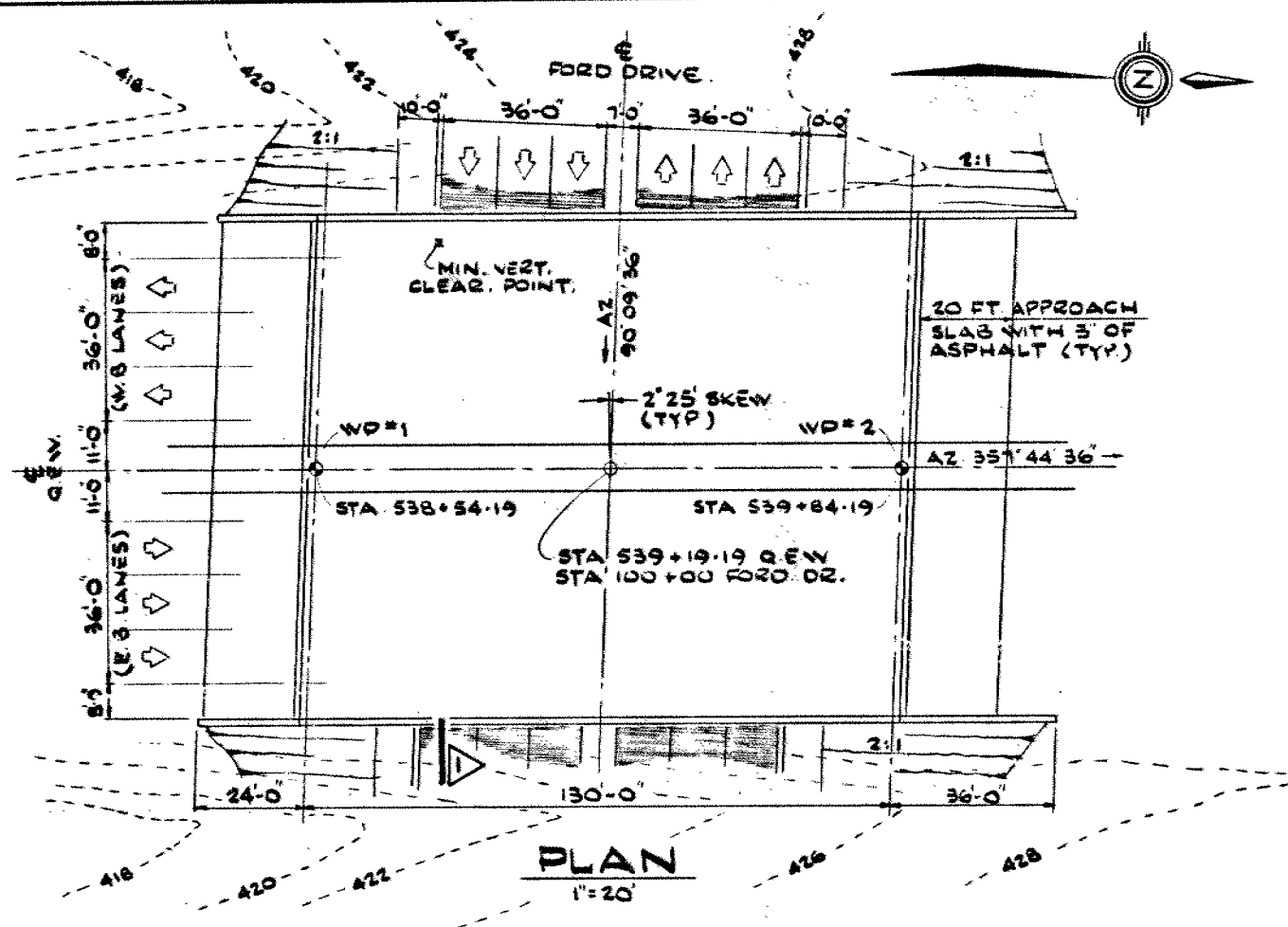
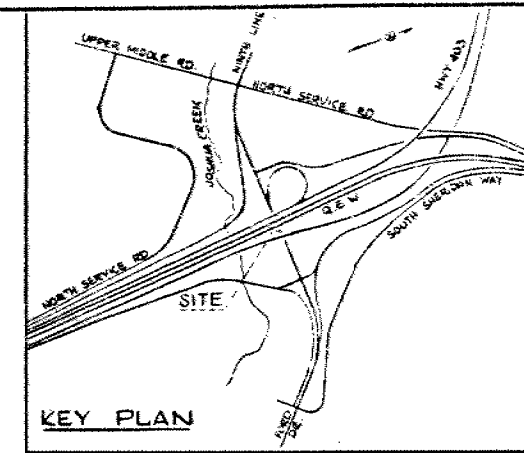
REVISIONS

DATE	BY	DESCRIPTION

Geocres No 30M5-116
MAY No Q E W
SLASH P15 CHECKED DATE Jan 20, 1978 SITE 10-286
DRAWN BY CHECKED BY APPROVED BY
DWG 1256617-A

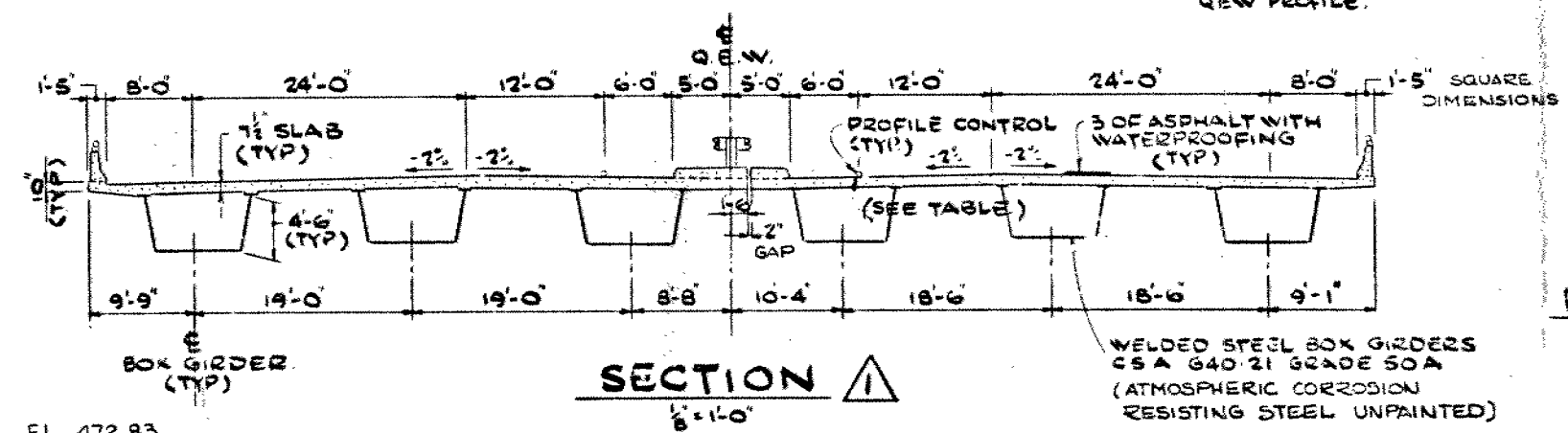


MINISTRY OF TRANSPORTATION AND COMMUNICATIONS



* PROFILE OF Q.E.W. (T/A)		
STATION	PROFILE CONTROL	
	E.B.L.	W.B.L.
538+25	425.62	426.00
+50	426.38	426.76
+75	427.12	427.50
539+00	427.89	428.27
+25	428.62	429.00
+50	429.39	429.77
+75	430.16	430.54
540+00	430.92	431.30
+25	431.67	432.08

* PROFILE OF Q.E.W. IS EXISTING Q.E.W. PROFILE.



B.M. EL. 472.83
BENCH MARK IS LOCATED ON TOP OF NE CORNER OF CONCRETE PORCH ON N. FACE OF HOUSE 520 FT. LT., STA. 551+90 Q.E.W..

LIST OF DRAWINGS

1. GENERAL PLAN
2. BOREHOLE LOCATIONS & SOIL STRATA
3. FOOTING DETAILS
4. NORTH ABUTMENT
5. SOUTH ABUTMENT
6. STRUCTURAL STEEL
7. DECK REINFORCING
8. DECK LAYOUT & SCREED ELEVATIONS
9. BARRIER WALL
10. STEEL RAILING (SINGLE TUBE)
11. 20 FT. APPROACH SLAB
12. DETAILS OF CONC. SLOPE PAVING
13. STANDARD DETAILS I
14. STANDARD DETAILS II
15. STANDARD DETAILS III
16. AS CONSTRUCTED ELEV. & DIM.

GENERAL NOTES

CLASS OF CONCRETE
DECK & BARRIER WALLS : 4000 R.S.I.
REMAINDER : 3000 R.S.I.

CONCRETE QUANTITIES
ABUTMENTS & WINGWALLS = 525 CUYDS
DECK = 411 " "
BARRIER WALLS = 29 " "
APPROACH SLABS = 147 " "
SLOPE PAVING = 74 " "

STRUCTURAL STEEL QUANTITIES - 202 TONNES

CLEAR COVER TO REINFORCING STEEL
FOOTINGS & ABUTMENTS 3"
DECK 2" TOP; 1" BOT.
BARRIER WALLS 1 1/2" (EXCEPT AS NOTED)
APPROACH SLABS 2" (NOTED)
COATED BARS HAVE A SUFFIX 'C'
TO ACHIEVE THE MIN. CLEAR COVER OF 2"
SPECIFIED, THE TOP LAYER OF DECK STEEL SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF 2 1/2" ± 1/2" TOLERANCE.

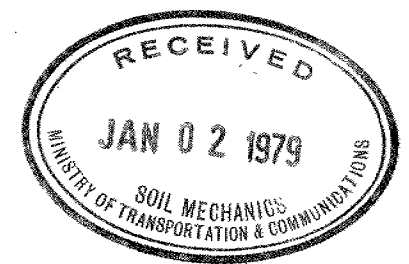
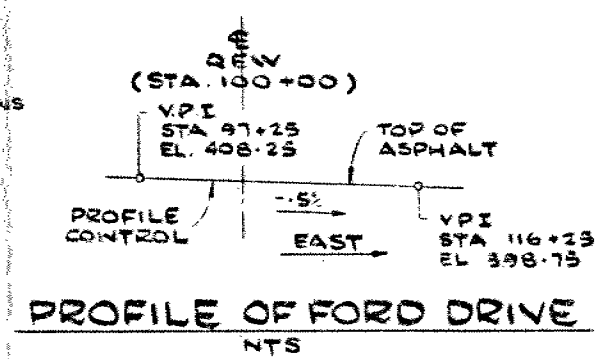
REINFORCING STEEL : GRADE 400

CONSTRUCTION NOTES

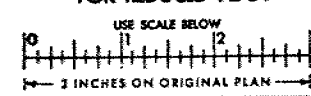
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

FORMWORK BETWEEN THE DECK AND BALLAST WALL SHALL BE REMOVED.



FOR REDUCED PLAN

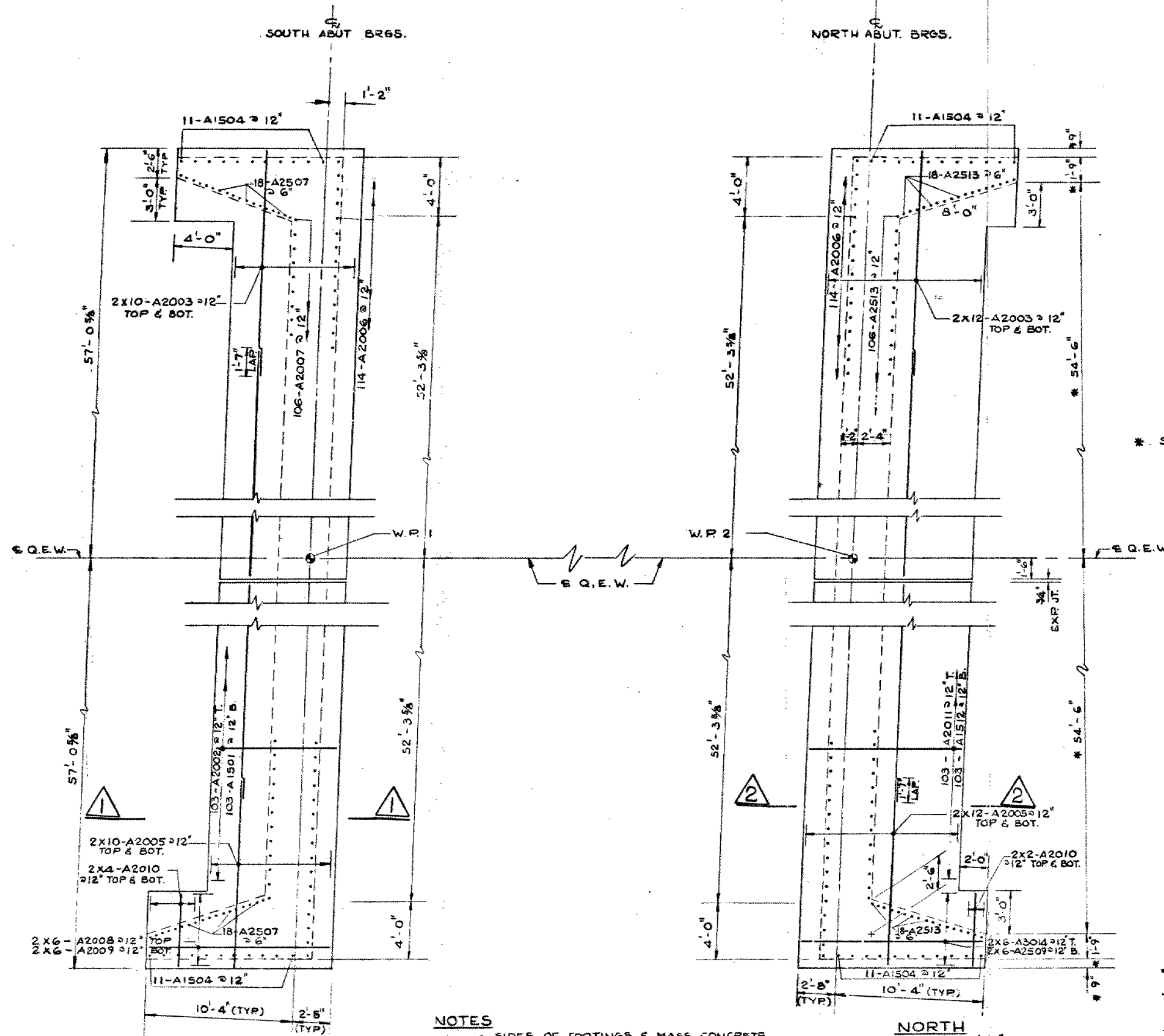


REVISIONS		DATE BY		DESCRIPTION	

CONT No
WP No 125-66-17

O.E.W.
OVER FORD DRIVE
FOOTING DETAILS

SHEET

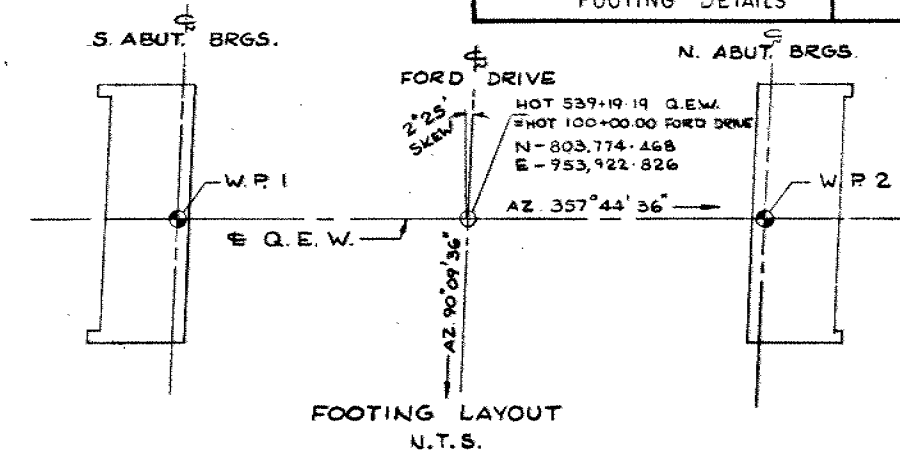


NOTES

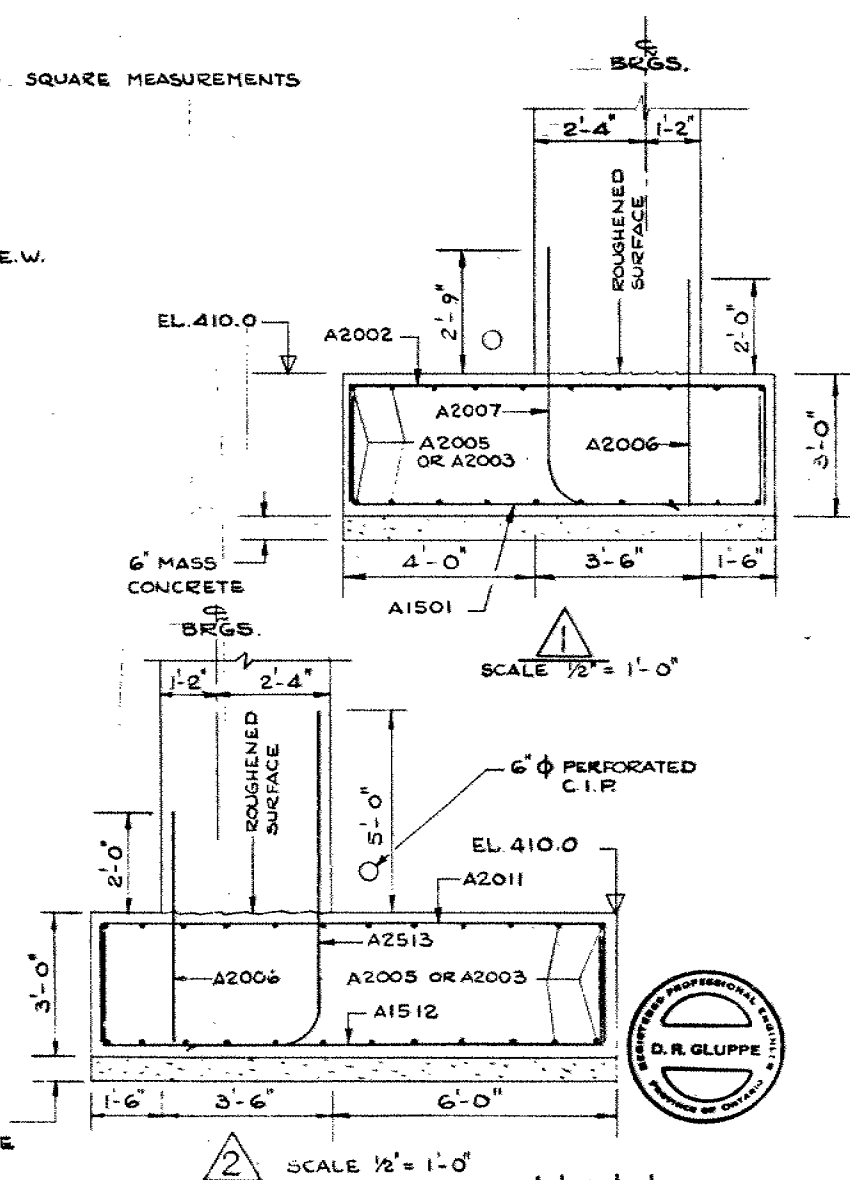
- * SIDES OF FOOTINGS & MASS CONCRETE TO BE CAST AGAINST UNDISTURBED MATERIAL.
- * MASS CONCRETE TO BE CAST WITHIN 3 HOURS AFTER FTG. EXCAVATION IS COMPLETED.

SOUTH
SCALE 1/4" = 1'-0"

NORTH
SCALE 1/4" = 1'-0"

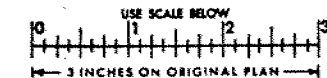


* SQUARE MEASUREMENTS



W.P. PROVINCIAL CO-ORDINATES			
W.P. STATIONS	CO-ORDINATES		
1	538+54.19	803,709.509	953,925.130
2	539+84.19	803,839.427	953,920.522

FOR REDUCED PLAN



REVISIONS			
DATE	BY	CHECK	DESCRIPTION

