

G.I.-30 SEPT. 1976

GEOCRES No. 31D-250DIST. 5 REGION W.P. No. 162-75-03CONT. No. 79-92W. O. No. STR. SITE No. 30-79HWY. No. 11LOCATION C.W.R. OverheadNo. of PAGES -=====OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

DIST No 5
CONT No
WP No 162-75-03

HIGHWAY II WIDENING OVER C.N.R.
0.3 MILES NORTH OF NORTH JUNCTION
OF HIGHWAY II AND HIGHWAY II
GENERAL LAYOUT

MAKSYMEC &
ASSOCIATES LIMITED
TORONTO SUDBURY

CONSULTING
PROFESSIONAL
ENGINEERS
CANADA

NOTES

CLASS OF CONCRETE:

CONCRETE IN DECK — 4000 PSI.
BARRIER WALLS — 4000 PSI.
RETAINING WALLS — 4000 PSI.
FOOTINGS (RET'G WALLS) — 5000 PSI.

MASS CONCRETE — 2000 PSI.

CLEAR COVER TO REINF. STEEL:

TOP OF DECK SLAB — 2"
BOTTOM OF DECK SLAB — 1 1/2"
FOOTINGS — 3"
BACK AND FRONT FACE —
RETAINING WALLS — 4"
OR AS NOTED ON DRAWINGS

REINFORCING STEEL:

GRADE 400 REINFORCING STEEL.
REINFORCING BARS WITH THE DESIGNATION 'C'
AT THE END OF BAR MARKS SHALL BE COATED BARS.
CONSTRUCTION NOTES:

BACKFILL TO DISTURBED AREAS AT EACH
END OF SLAB WIDENING TO BE
COMPACTED GRANULAR 15'
DIMENSIONS OF EXISTING STRUCTURE
ARE TO BE CHECKED IN FIELD

CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED BELOW
FOR THE APPROPRIATE CONCRETE LUMP
SUM TENDER ITEMS

	CU. YD.
CONCRETE IN DECK 4000 PSI. 2000 *	81 10
CONCRETE IN NEW RETAINING WALLS, AND CAPPING TO EXISTING RETAINING WALLS	61
CONCRETE IN BARRIER WALLS	11

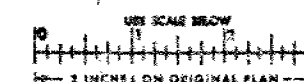
LIST OF DRAWINGS

- DWG NO. 1. GENERAL LAYOUT.
2. BOREHOLE LOCATIONS & SOIL STRATA.
3. DECK WIDENING DETAILS.
4. RETAINING WALLS - LAYOUT & REINF.
5. BARRIER WALL
6. STEEL RAILING (SINGLE TUBE)
7. STANDARD DETAILS
8. TRAFFIC DIVERSION DURING CONSTRUCTION

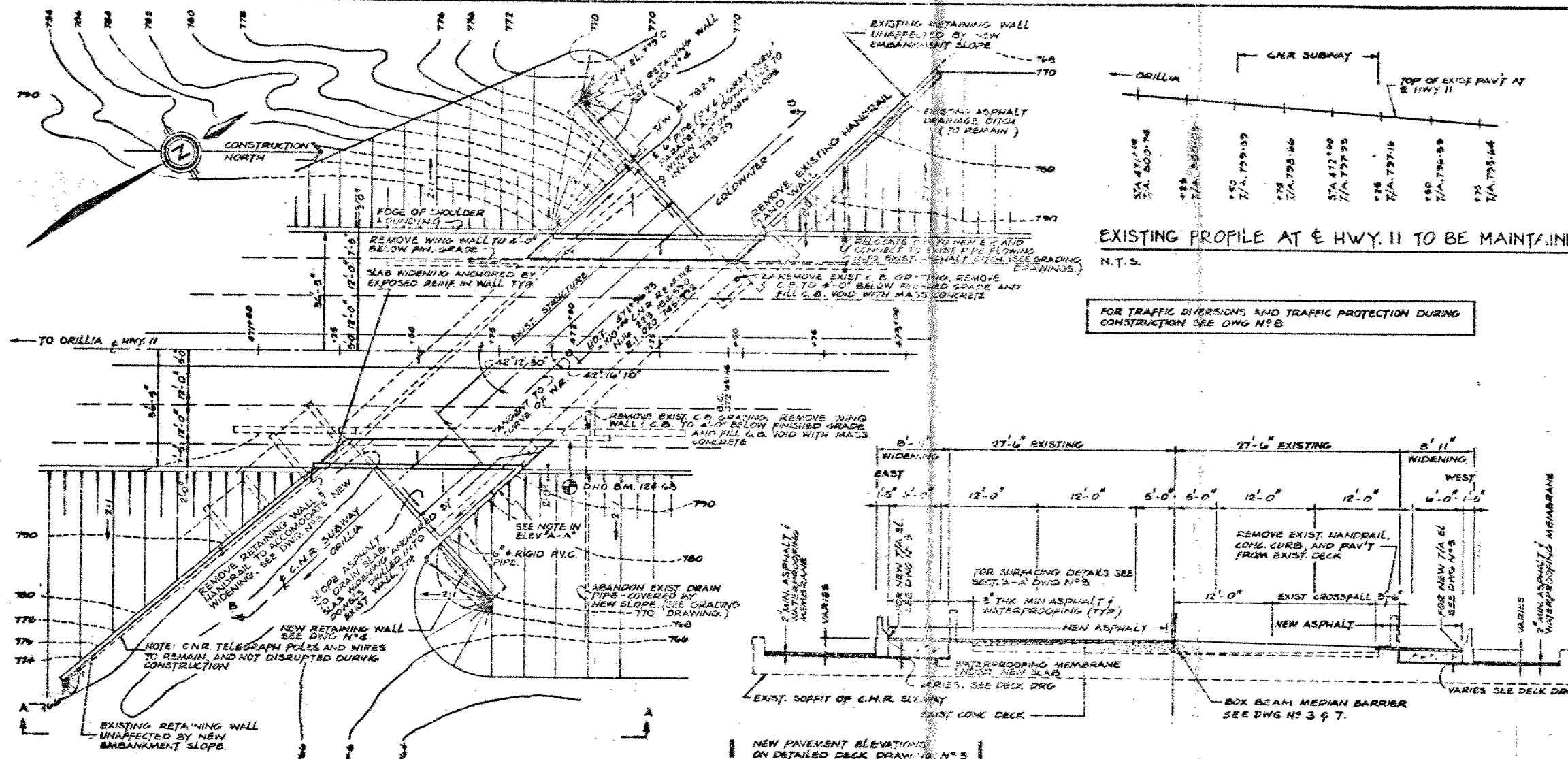
D.H.O. B.M. 124-65 ~ EL 796.234'
TABLET IN EAST FACE OF NORTH ABUTMENT OF C.N.R. BRIDGE
27-4' RIGHT AT STA. 47+97
ROUTE 52 ORILLIA.



FOR REDUCED PLAN

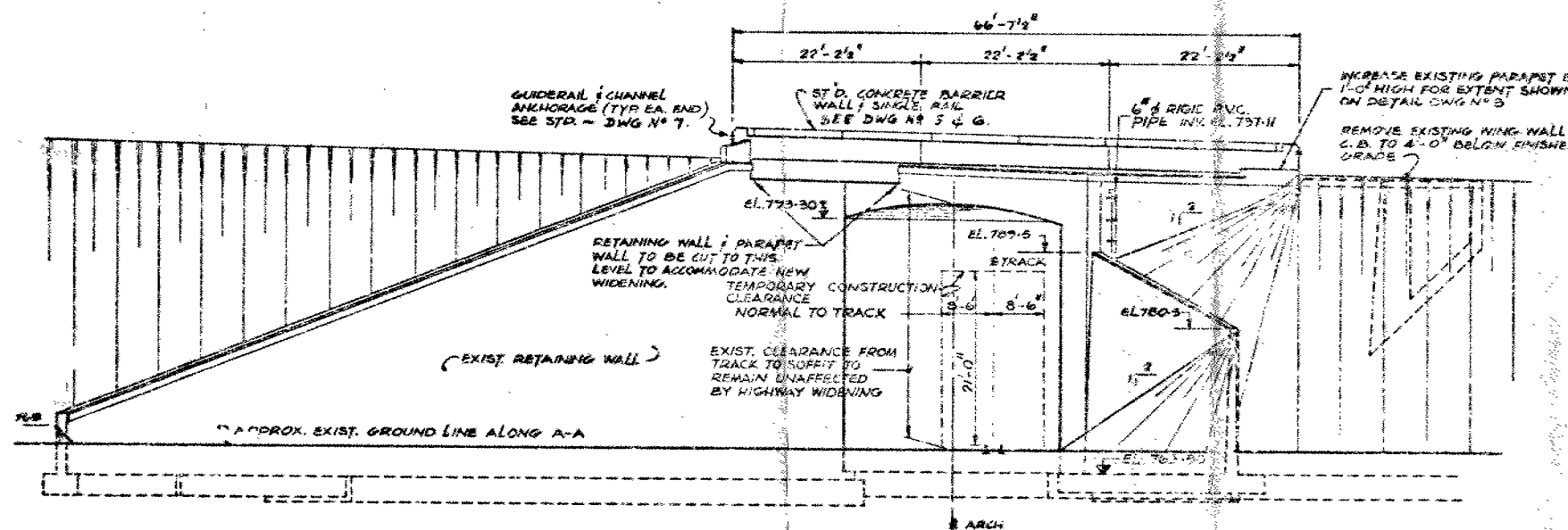


DATE	BY	DESCRIPTION
1975	10/1	REVISION
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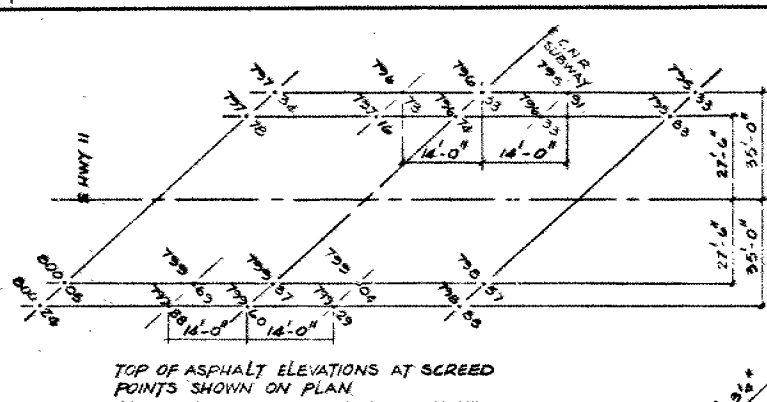


PLAN
SCALE 1" = 20'-0"

SECTION B-B
SCALE 1/8" = 1'-0"



ELEVATION A-A
SCALE 1" = 10'-0"



STA.	EXIST'G T.A. AT E' TO REMAIN	NEW T.A. AT 17'-0" RIGHT	EXIST'G T.A. AT 17'-0" RIGHT
471+25	800.35	800.35	799.72
471+50	799.35	799.45	799.07
471+75	798.45	798.55	798.38
472+00	797.55	798.21	797.66
472+25	797.16	797.53	797.01
472+50	796.35	796.55	796.35

6" RIGID P.V.C. PIPE FASTENED TO WALL BY 3 RIGID P.V.C. PIPE STRAPS @ 4'-0" C. INV. EL. 795.29

CONSTRUCTION NORTH.

- NOTES:
- SLAB DEPTH IS EXTENDED THRU' END OF BARRIER WALL TO ANCHOR BARRIER WALL REINFORCEMENT.
 - SLAB WIDENING IS TO BE ANCHORED BY 20 MM THREADED STUDS DRILLED INTO EXISTING WALL (1'-3" PROTECTION) SEE QUANTITY AND SPACING BELOW.
 - PARAPET WALL ADDITION. DRILL EXISTING WALL FOR M20 SYNTHETIC REINCAPSULES TO RECEIVE 20 MM THREADED STUDS. (3" PROTECTION) SEE

DIST No 5
CONT No
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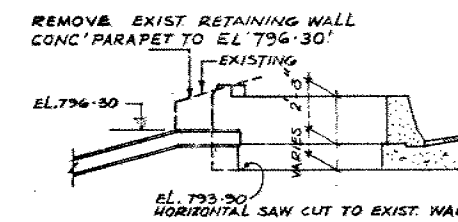
HIGHWAY II WIDENING OVER C.N.R.
 0.3 MILES NORTH OF NORTH JUNCTION OF HIGHWAY II B AND HIGHWAY II
 DECK WIDENING DETAILS

MAKSYMIEC & ASSOCIATES LIMITED
 CONSULTING PROFESSIONAL ENGINEERS
 TORONTO SUDBURY CANADA

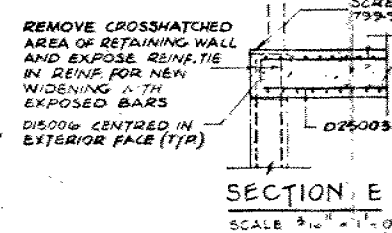
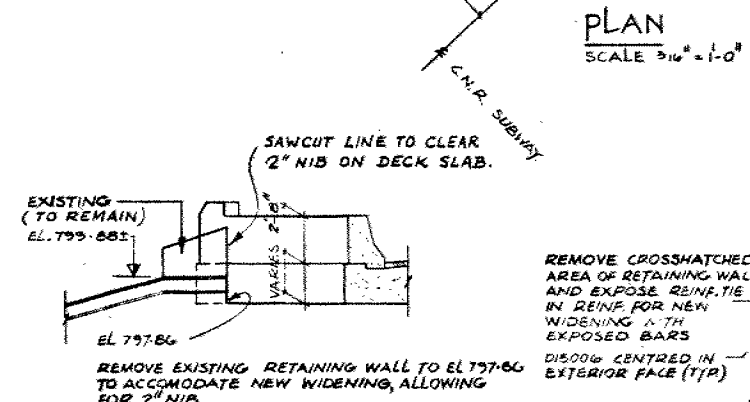
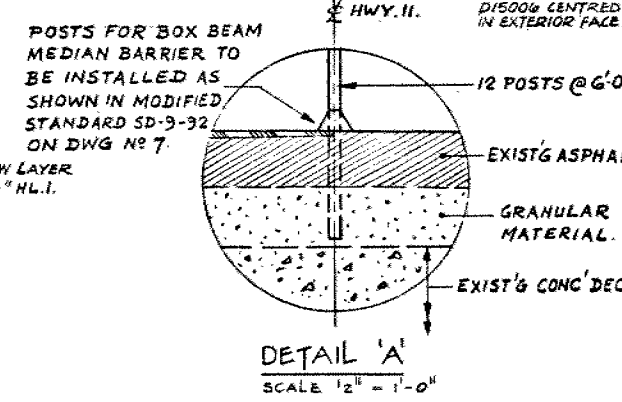
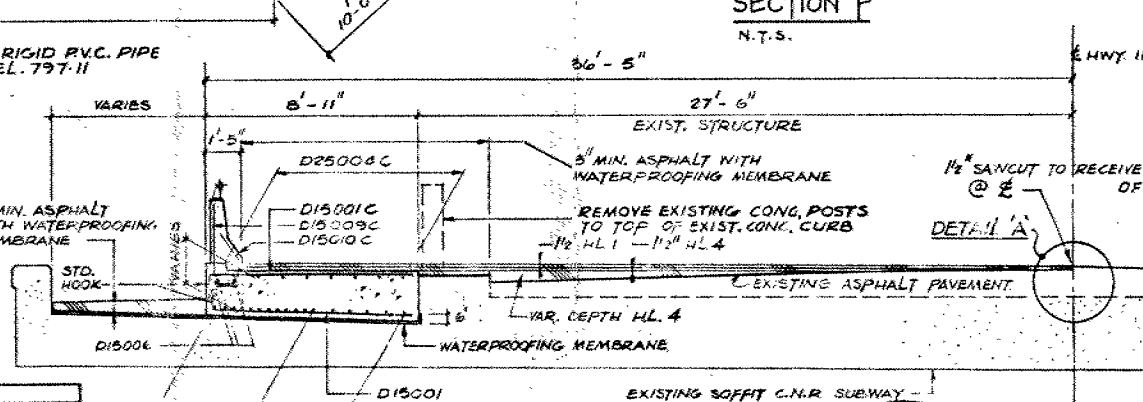
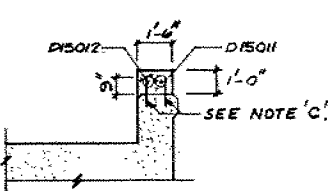
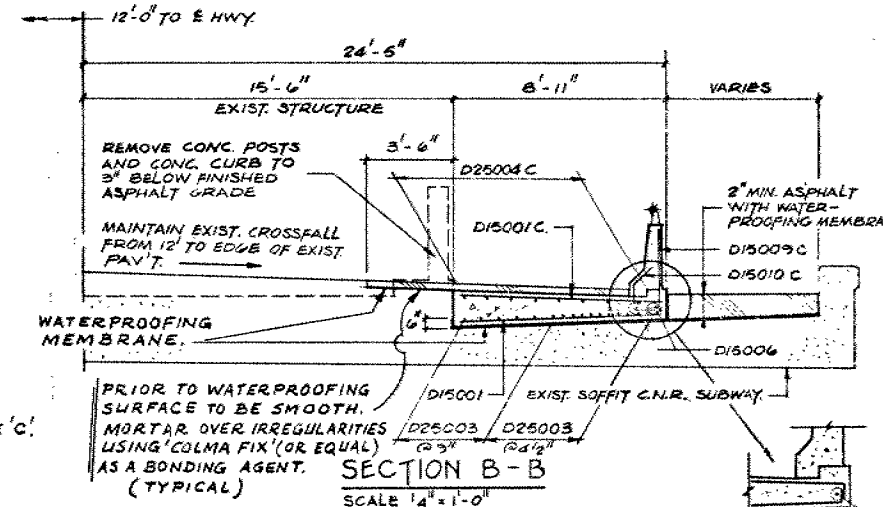
M20 SYNTHETIC RESIN CAPSULES AND 20 MM Ø THREADED STUDS.
 DECK SLABS - TOTAL = 32 @ 18" (1'-9" LONG)
 PARAPET - TOTAL = 10 @ 24" (1'-3" LONG.)

LOCATION	POINT	PT. B	PT. C	PT. D	PT. E	PT. F
DEPTH OF ASPHALT	+2 1/2"	+2 1/2"	+2 1/2"	+2 1/2"	+2 1/2"	+10 1/2"

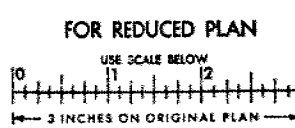
LENGTH OF BARRIER WALL AFFECTED BY CURVE IN HWY. = 12'-5 1/2"
 OFFSET LENGTH AT END OF WALL = 9'-8" - WALL TO CONTINUE STRAIGHT THROUGHOUT LENGTH - IGNORE OFFSET



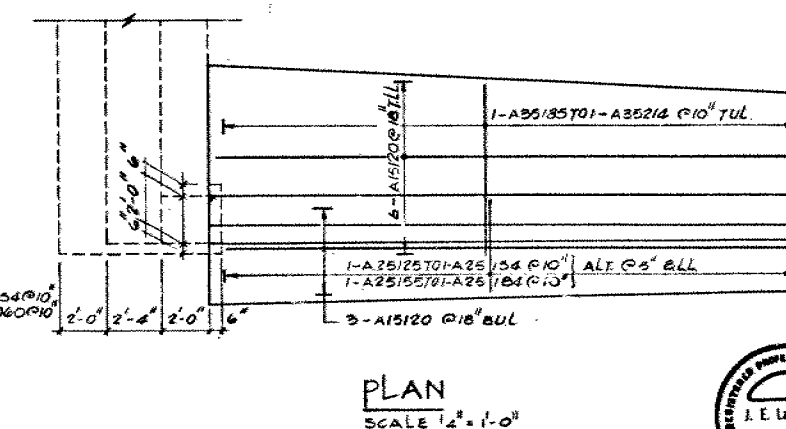
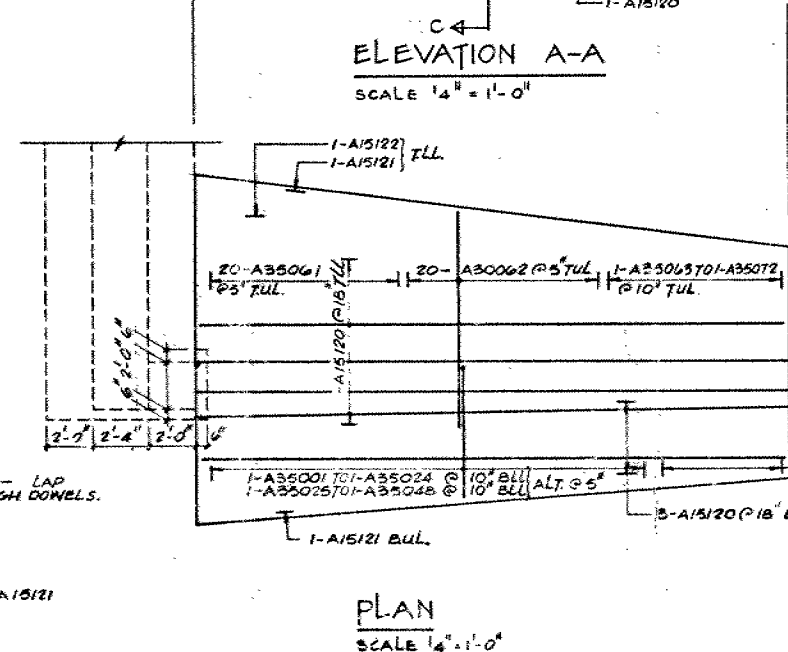
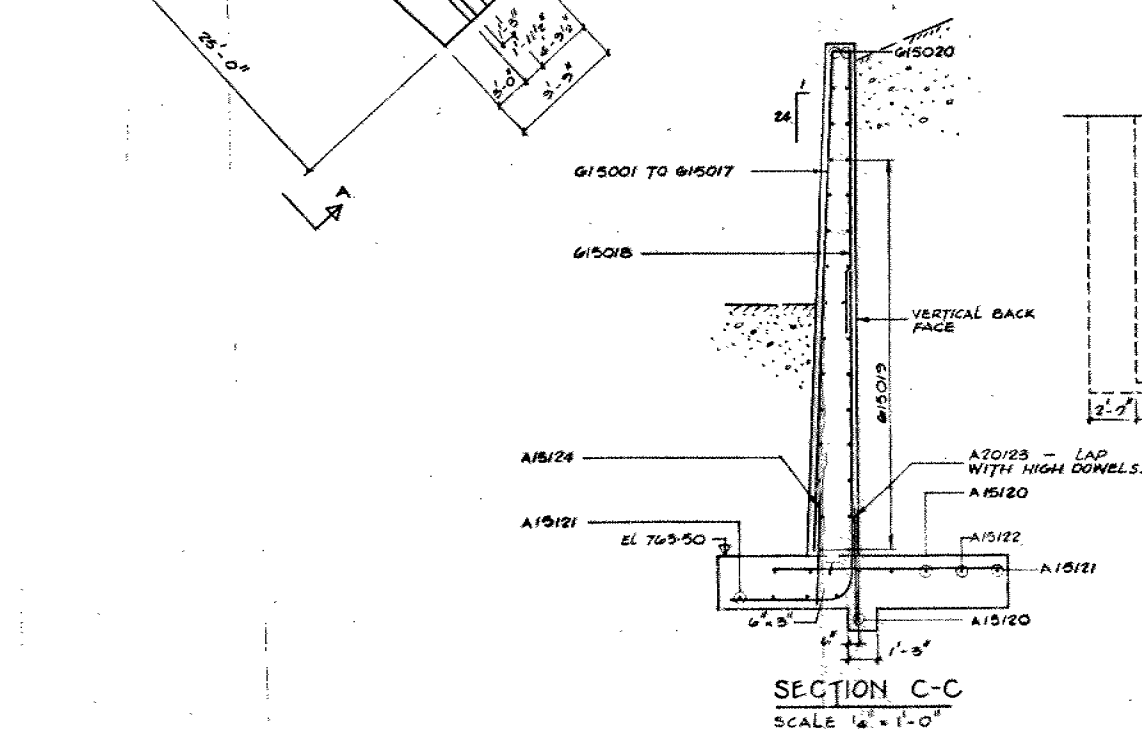
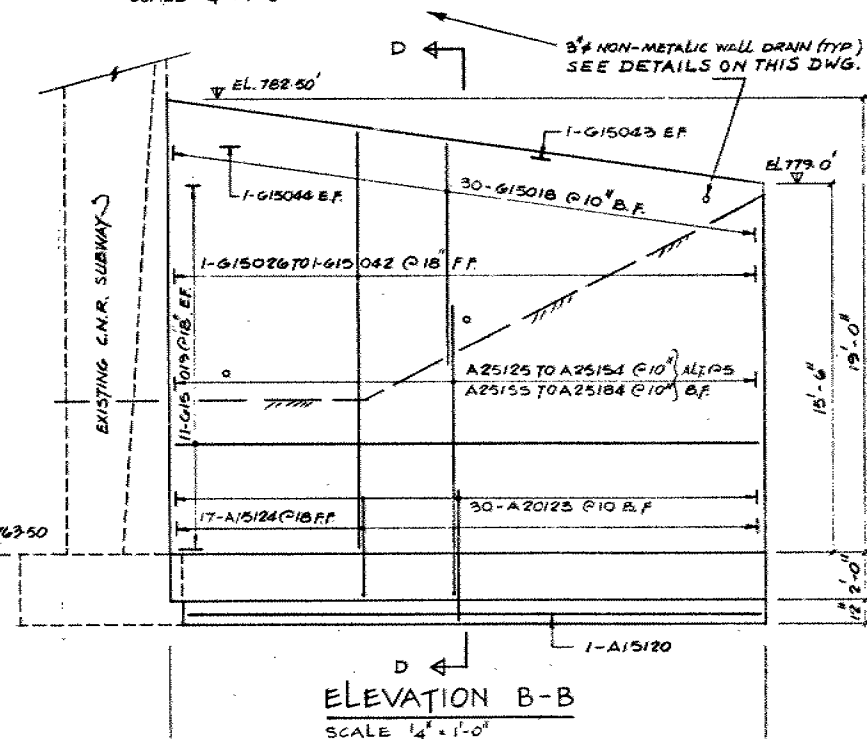
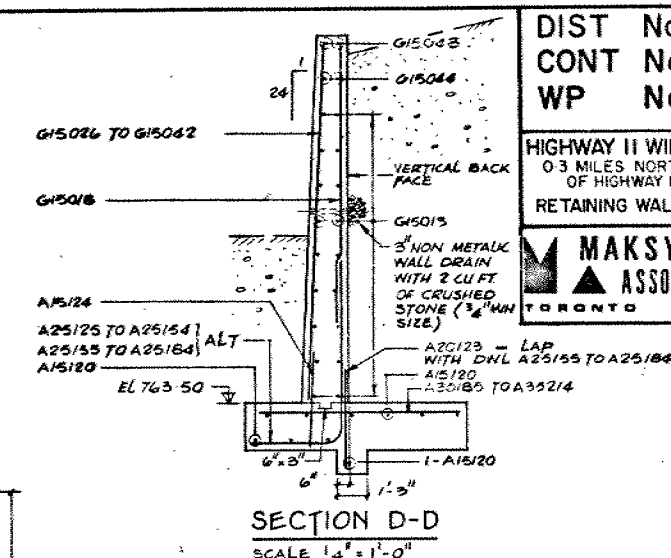
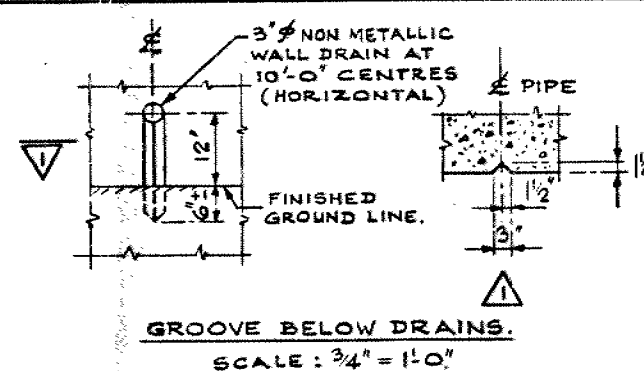
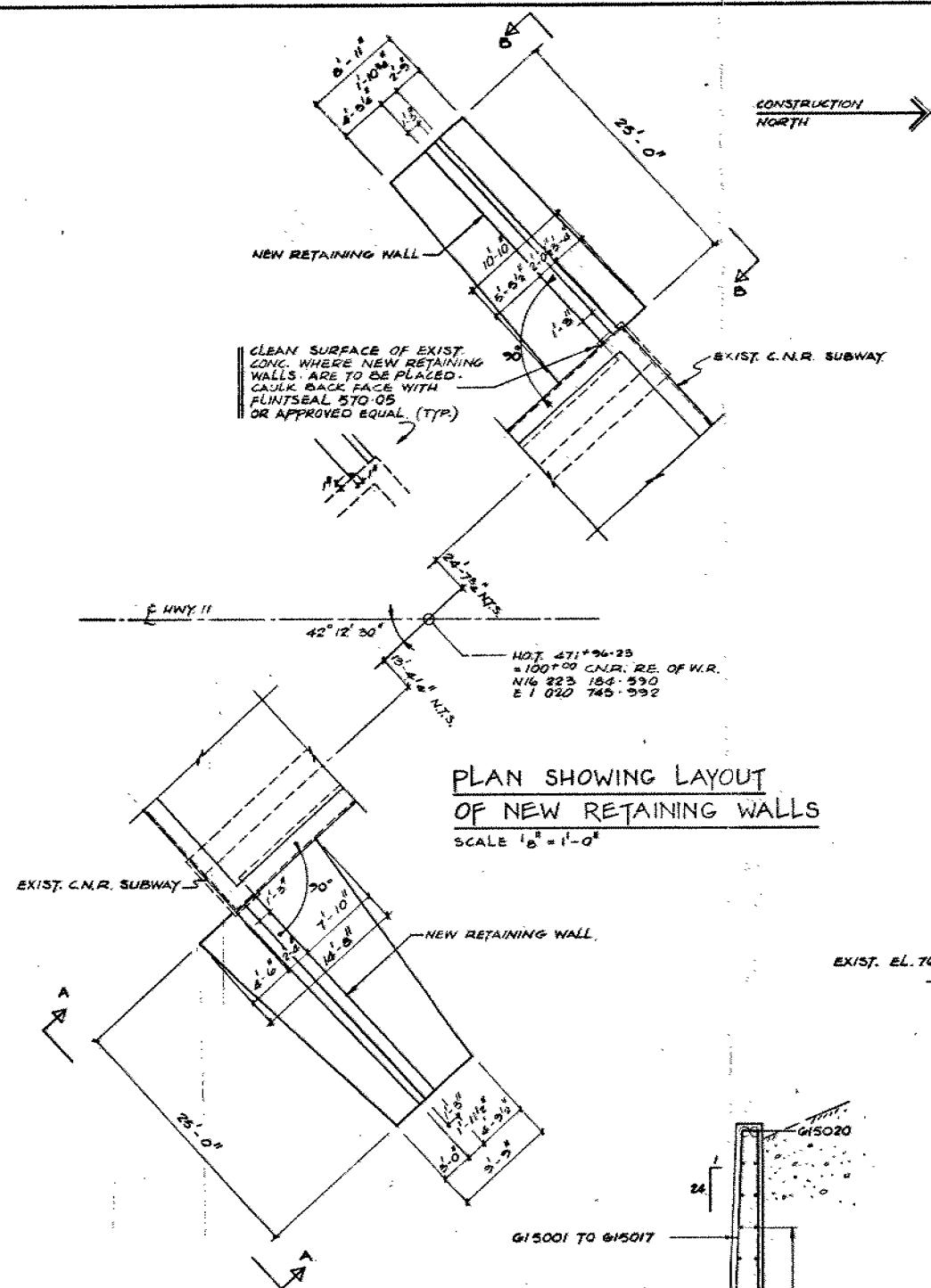
SECTION D
 SCALE 3/16" = 1'-0"



UT	OUTSIDE FACE
IF	INSIDE FACE
CB	CATCH BASIN
E	EAST
W	WEST
M	MIDLINE
BL	BASELINE
PL	PLAN
TL	TOP LAYER
BL	BOTTOM LAYER
TL	TOP LAYER
BL	BOTTOM LAYER

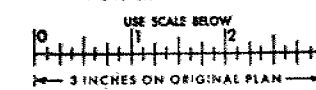


REVISIONS	DATE	BY	DESCRIPTION
DESIGN	16	CHECK	LOADING HS 20-44 DATE SEP 78
DRAWING	16	CHECK	CHECK SITE No 33-79 DWG 3



BLL	BOTTOM LOWER LAYER
BUL	BOTTOM UPPER LAYER
RLI	TOP LOWER LAYER
RUL	TOP UPPER LAYER
BP	FRONT FACE
BP	BACK FACE
ALT	ALTERNATE

FOR REDUCED PLAN



REVISIONS				
	DATE BY	DESCRIPTION		
DESIGN	<u>10</u>	CHECK	LOADING HS 20-44	DATE SEP
DRAWING	<u>1</u>	CHECK <u>7</u>	SITE No BC-79	DWG 4

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 162-75-03

DIST 5

HWY 11

STR SITE 30-79

CONT 79-92

C.N.R. Overhead Widening
0.3 Miles North of North Junction
Hwy. 11B and Hwy. 11

DISTRIBUTION

A.P. Watt (2)
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A. Wittenberg
J.H. Blevins (2)

A.E. McKim
G.A. Wrong
B.J. Giroux
R.S. Pillar

R. Hore

A. Crowley)
J. Anderson) cover only
G. Sloan)

Files ✓

SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	78-01-07	<i>leaf</i>
TUBES	—	—
ROCK CORES	—	—

FOUNDATION INVESTIGATION REPORT

For
C.N.R. Overhead Widening
0.3 Miles North of North Junction
Hwy. 11B and Hwy. 11
Hwy. 11, District 5, Owen Sound
W.P. 162-75-03 Site 30-79

INTRODUCTION

A subsurface investigation was carried out at the existing C.N.R. overhead north of Orillia on the 22nd and 23rd of September, 1977. Fieldwork was completed by using a muskeg vehicle mounted continuous flight auger.

SITE DESCRIPTION

The site is located 0.35 miles north of the north junction of Hwy. 11 and 11B in the Township of Orillia.

A mixture of deciduous and coniferous trees make up the vegetation of the surrounding area.

Physiographically the site lies in the gently rolling sand plains of the Simcoe Lowlands.

SUBSURFACE CONDITIONS

Clayey Silt With Sand, Some Gravel

Clayey silt with sand, some gravel extends from original ground to around 36 feet, the depth of exploration. Standard Penetration 'N' values range from 74 blows to 100 blows for 5 inches of penetration. Within the deposit, sand and gravel layers are present from 20 feet downward and occasional boulders from 20 to 26 feet. Moisture contents range from 8% to 9% throughout the deposit.

An estimated stratigraphic profile, Drawing No. 1627503-A, has been prepared on the basis of the appended Record of Borehole Sheet.

Groundwater

Groundwater was observed in B.H. 1 at elevation 752. Some surface water was present west of the C.N.R. tracks under the existing structure. Large amounts of rain had fallen prior to field investigation.

DISCUSSION AND RECOMMENDATIONS

General

It is proposed to widen the C.N.R. overhead 0.35 miles north of the north junction of Hwy. 11 and Hwy. 11B by 9'5" on both sides. The existing structure is a 38 foot span rigid frame founded on spread footings at elevation 760.75. Counterfort retaining walls extend 87 feet from the northeast corner and 115 feet from the southwest corner. Both retaining walls are supported on footings placed around elevation 760.

Subsoil at the site consists of highway fill material up to 33 feet in height.

Original ground is made up of clayey silt with sand, some gravel. This till material extends to the limit of the bore-hole (EL.732±). Within this deposit sand and gravel layers extend downward from elevation 748 with a bouldery zone from elevation 747 to around elevation 742. Water level measurements indicate groundwater at elevation 752 and perched seasonally fluctuating surficial water at elevation 765.

Structure Foundations

It is recommended that the structural extensions be founded on spread footings within the hard original ground material. The nature of the subsoil indicates that very minor settlements, less than 1 inch, will take place. Spread footings should be founded at elevation 760 with at least 6 feet of cover for frost protection. A bearing capacity for design of 5.0 t.s.f. is recommended.

Several alternatives are available concerning the placement of abutments at the retaining wall locations. Firstly, the existing retaining walls could be used as abutments. If required, a new abutment wall may be constructed in front of the existing wall. Alternatively, the required lengths of wall could be removed, leaving the footing base to be used as the base for the new abutment. Road protection will be required if this method is used.

A braced sheet piling system will be acceptable. As a second alternative, complete sections of retaining wall could be removed and footings placed at elevation 760. Again a road protection system will be required. Excavations for the eastern abutment extensions will also require railway protection. No unwatering problems are anticipated but pumping will be required if surface water is present.

Embankment Widening

Widened embankments will be stable if well compacted, acceptable material is used at a slope of 2:1. Slopes should be benched according to Standard DD 414.

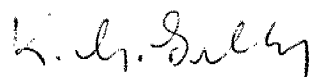
The existing retaining walls can accommodate the widened embankments and maintain a 2:1 slope.

Short-term slopes of $1\frac{1}{2}$:1 will be stable.

MISCELLANEOUS

Drilling at this site was completed using equipment supplied by Atcost Drilling Inc. This report was prepared by J. Murray who also supervised field operations.


J. Murray
Student Technician


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

JM/KGS/eh
January, 1978

APPENDIX

RECORD OF BOREHOLE No 1

W P 162-75-03 LOCATION Co-ords N 16 223 118; E 1 020 795 ORIGINATED BY JM
 DIST 5 HWY 11 BOREHOLE TYPE Continuous Flight Auger COMPILED BY JM
 DATUM Geodetic DATE September 22, 23, 1977 CHECKED BY

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 (%)		
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										
768.0	Ground Level													10	20	30	GR SA SI CL		
0.0	Clayey Silt with Sand Some Gravel		1	AS										○			5 45 38 12		
			2	SS	74														
			3	SS	74											○			17 39 30 14
			4	SS	88														
			5	SS	98											I			
	Occasional Boulders		6	SS	50/	3"								○			8 59 24 9		
			7	SS	100/	5"									○			32 50 (18)	
	Sand and Gravel Layers		8	SS	80									I					
731.8			Hard	9	SS	100/	8"								○			24 60 (16)	
36.2	End of Borehole																		
						</													

+³, x⁵: Numbers refer to
Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

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. $\bar{C}TU$ = 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_c, N_q, N_γ 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 = $\frac{w - w_P}{p}$
 I_c CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
 A_c ACTIVITY = $\frac{I_p \text{ of soil}}{I_p \text{ of } 2\mu m \text{ Soil Fraction}}$
 Om 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_c 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

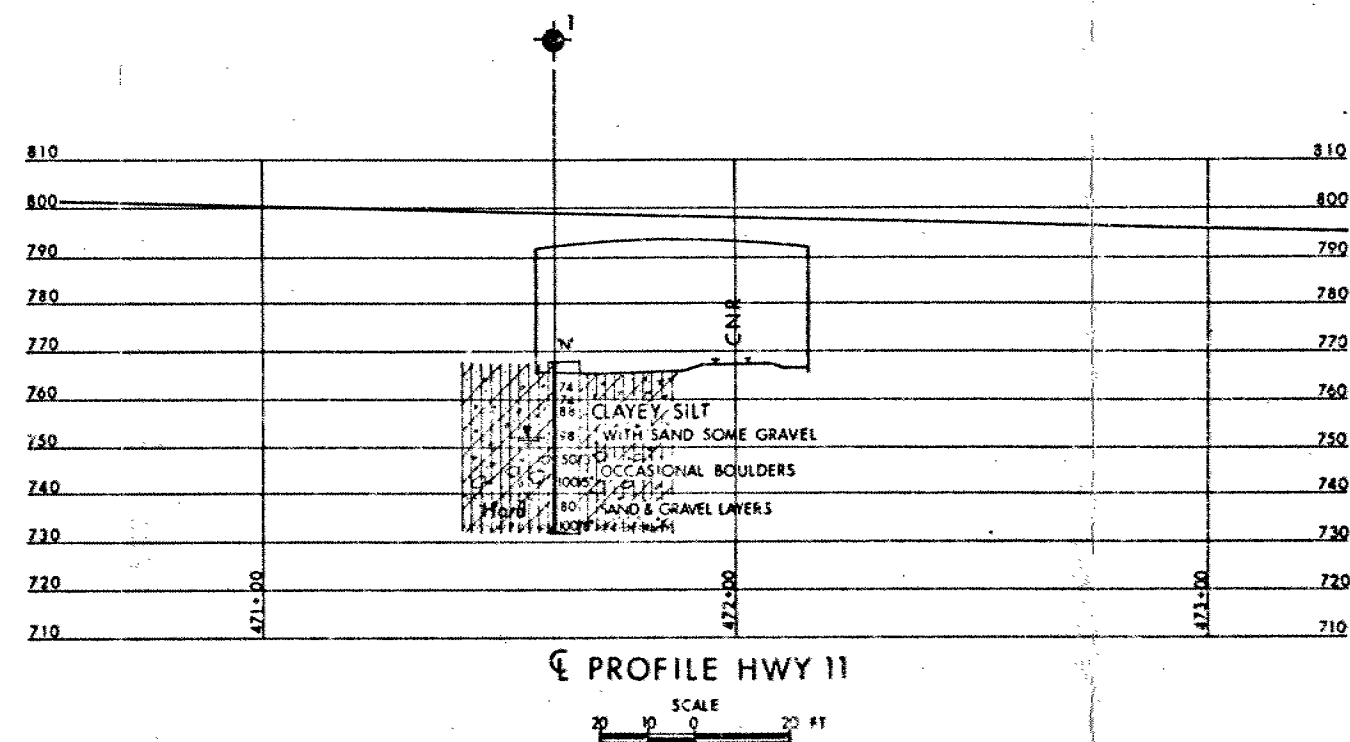
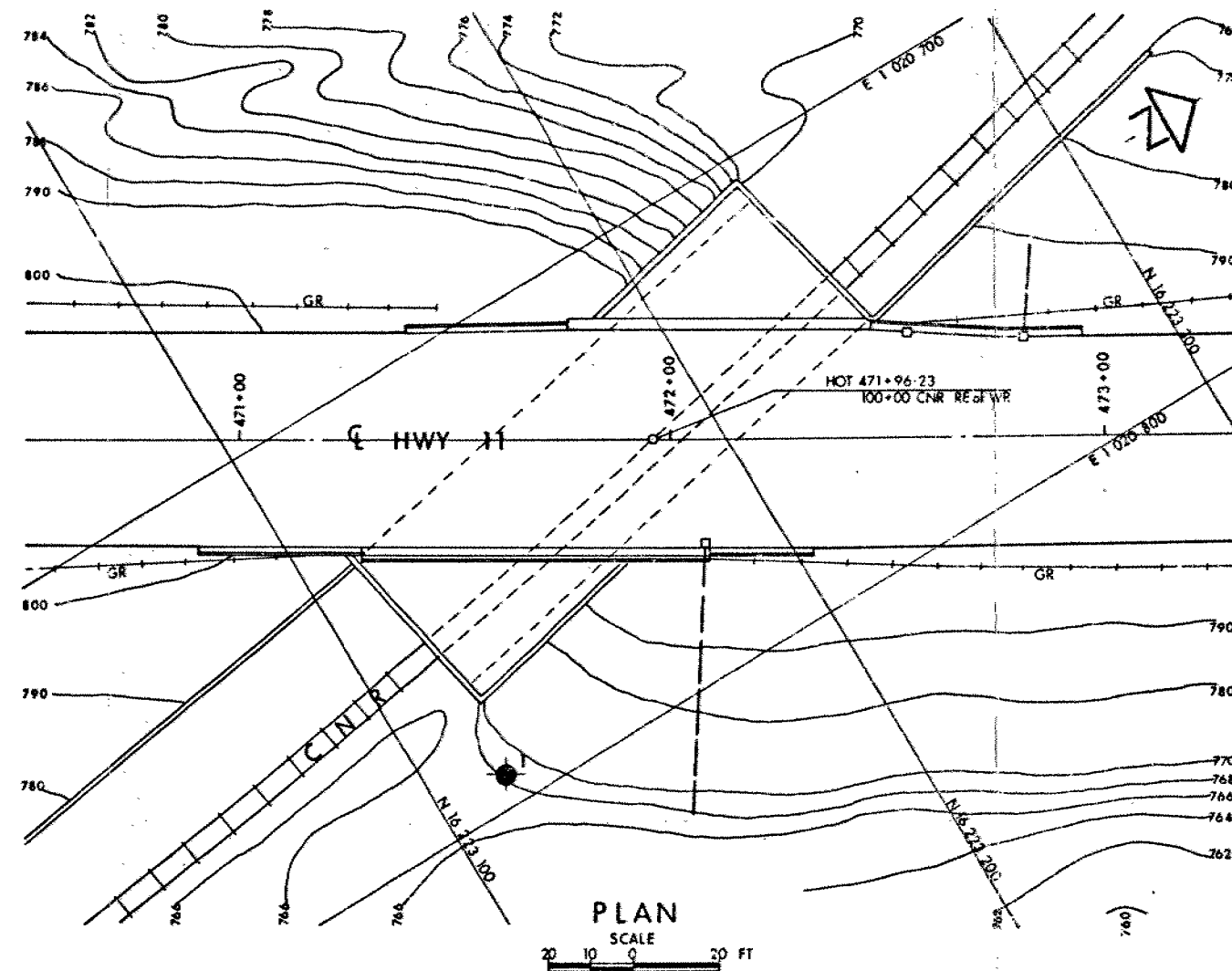
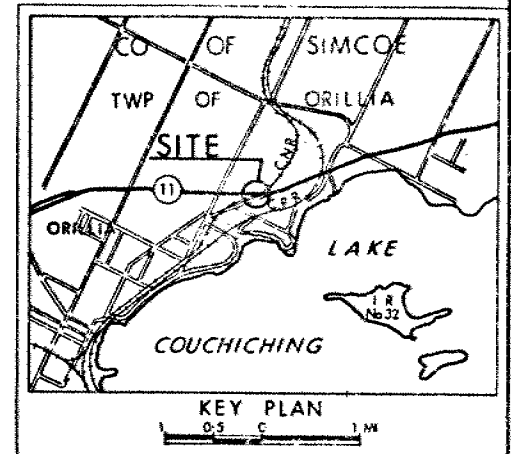
CONT No
WP No 162-75-03

CROSSING CNR & HWY 11

BORE HOLE LOCATIONS & SOIL STRATA



SHEET



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)
- ↓ WL at time of investigation
SEPT 23 1977

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	768.0	16 223 118	1 020 795

-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

REF. PLAN E-5516-1

DATE 29 DEC 1977
DRAWN BY J. M. CHECKED BY J. M. DATE 30-79
CNS 1627503-A