

DOCUMENT MICROFILMING IDENTIFICATION

GEOCREs No. 40P10-22

DIST. 3 REGION Southwestern

W.P. No. 281-66-06

CONT. No. 74-60

W. O. No. 71-F-106

STR. SITE No. 33-291

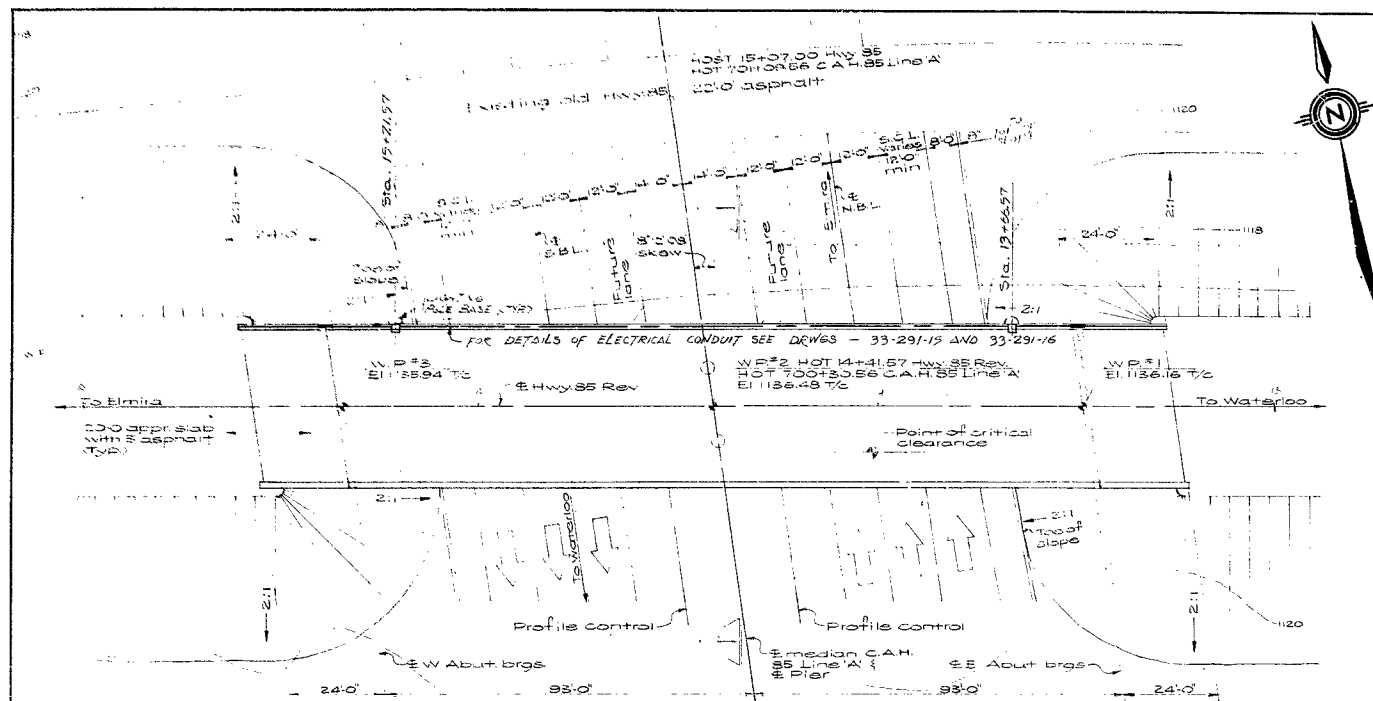
HWY. No. 85 N

LOCATION Exist Hwy 85 Underpass

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: DOCUMENT TO BE UNFOLDED

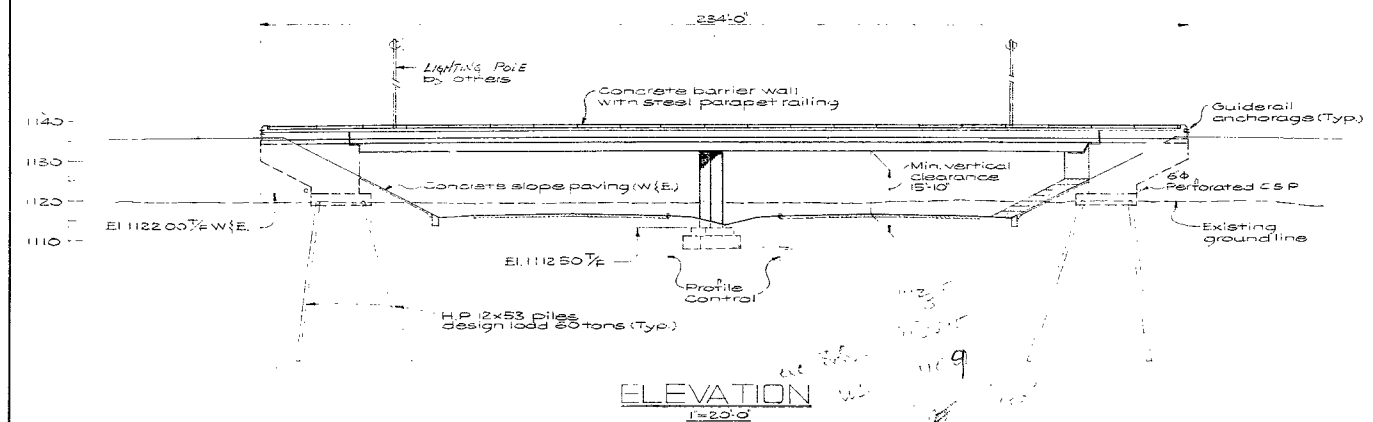
BEFORE MICROFILM



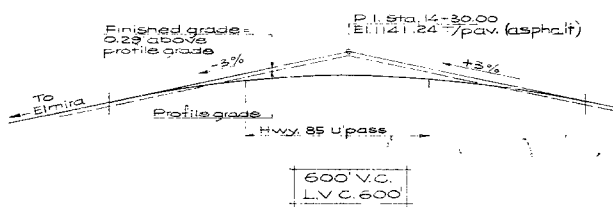
Function of
S. 12.09' Skew
S. 13.426673
Cos 10.9587707
Tan 10.451418
Sec 1.0103350

PLAN
1"=20'-0"

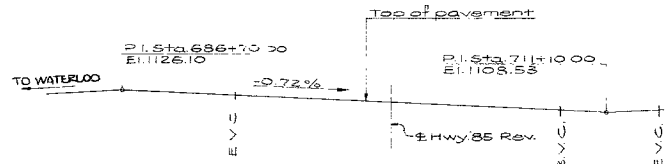
W.P. = Working point
T/C = stop of concrete



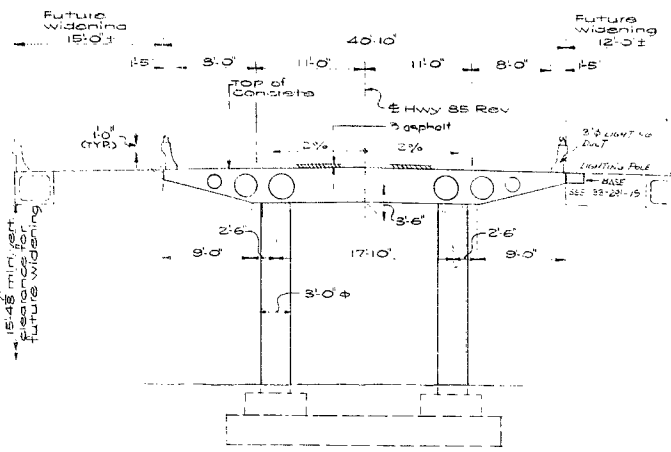
ELEVATION
1"=20'-0"



PROFILE AT CROWN OF HWY. 85 REV.
N.T.S.



PROFILE AT PROFILE CONTROL
OF C.A.H. 85 LINE 'A'
N.T.S.



LIST OF DRAWINGS

1. GENERAL PLAN
2. BORE HOLE LOCATION AND SOIL STRATA
3. FOOTING LAYOUT AND ABUTMENT FOOTING DETAILS
4. ABUTMENTS
5. PIER COILS AND FOOTING
6. DECK DETAILS AND BEARINGS
7. DECK REINFORCING
8. LONGITUDINAL CABLE DETAILS
9. TRANSVERSE
10. CONCRETE BARRIER WALL
11. PARAPET RAILING
12. CONCRETE SLOPE PAVING
13. APPROACH SLABS
14. STANDARD DETAILS I
15. STANDARD DETAILS II
16. BRIDGE ELECTRICAL DETAILS

NOTES

- CLASS OF CONCRETE
DECK, BARRIER WALLS, COLUMNS 5000 PSI.
REMAINER 3000 PSI.
- CLEAR COVER ON REIN. STEEL:
FOOTINGS 3"
ABUTMENTS 3"
PIER COLUMNS 25" NOTED
DECK TOP 2"
DECK BOTTOM 1 1/2"
BARRIER WALLS 1 1/2"

CONSTRUCTION NOTES:

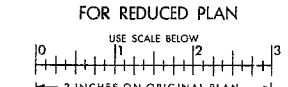
- THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BRIDGE DECK AS SHOWN ON THE DRAWINGS AND FOR THE PROTECTION OF THE BRIDGE DECK FROM DAMAGE DURING CONSTRUCTION.
- NO CONCRETE SHALL BE PLACED AGAINST THE BRIDGE DECK OR AGAINST THE BRIDGE PIER OR AGAINST THE BRIDGE ABUTMENT UNLESS IT IS STRESSED AND CURED.

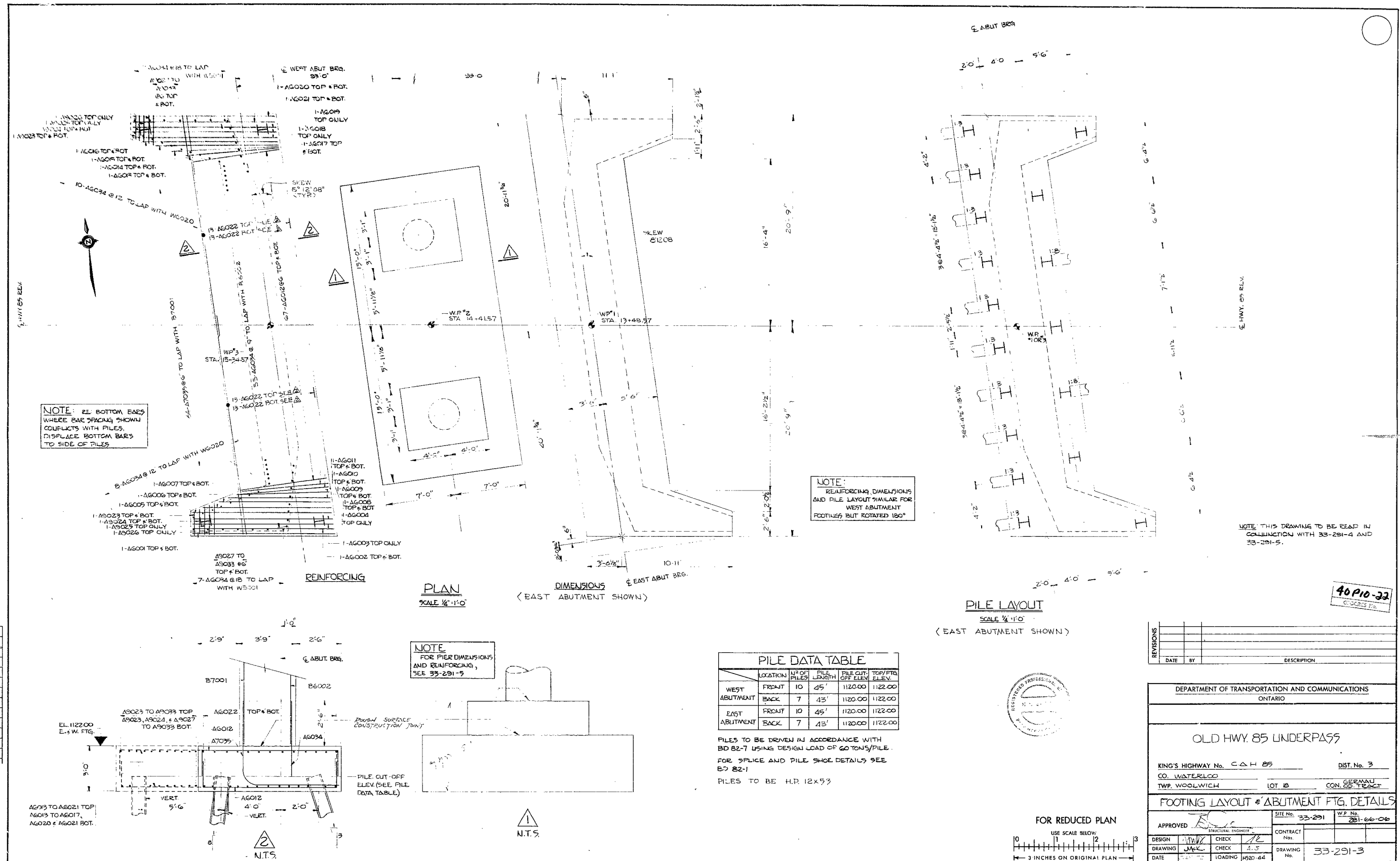
3.14.120.79
Cut across on E corner of 8' step of 2' 3/4" B.H.B.
35' x 2' 7/8"

40P10-32

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS ONTARIO			
OLD HWY. 85 UNDERPASS At existing Highway 85 revision			
KING'S HIGHWAY No. C.A.H. 85		DIST. No. 3	
CO. Waterloo		CONTRACT	
TWP. Woolwich		LOT 18	
GENERAL PLAN			
APPROVED		SITE No. 33-291 W.P. No. 281-66-06	
DESIGN J. K.		CHECK J. K.	
DRAWING D. C.		CHECK J. K.	
DATE July 1972		LOADING 15-20-41	
DRAWING No.		33-291-1	



[illegible]

FIELD RECONNAISSANCE REPORT REQUIRED BY FOUNDATION SECTION FOR

FF-69
SEPT. 1968

W.P. NO. 281-CC 06 HIGHWAY NO. CAN 85 DISTRICT 3 SITE PLAN NO. E-5311-1 PROFILE NO. C 267-85-1
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" ☐ HARVESTED
ROCK OUTCROP (SPECIFY LOCATIONS) NONE

UNDERGROUND UTILITIES: UTILITY COMPANY TELEPHONE NO. FOR DEFINITE LOCATION

- ON SHANTZ PROPERTY 1 BELL CANADA - KITCHENER 611 CABLE LOCATE SERVICE
ON SITE 2 UNION GAS - WATERLOO 743-3676 {24 HR. NOTICE REQ'D}
3 HYDRO - ONTARIO AREA OFFICE QUELPH - 225 EDINBURGH, QUELPH 658-9386
4 GRAND RIVER CABLE VISION 48 PRESTON ST. KITCHENER 576-9870
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): _____

	NAME	ADDRESS	TELEPHONE NO.
1	MRS ANNA SHANTZ	SITE	WATERLOO 742-4588
2	MRS SHANTZ WOULD LIKE TO BE CONTACTED BEFORE ENTRY.		
3			
4			

WHO WILL OBTAIN NECESSARY PERMISSION? _____
HAS SITE BEEN SURVEYED & STAKED? YES ☐ NO ☐ IF YES, DATE OF MOST RECENT SURVEY MARCH 70
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) SHANTZ FARM OR WATERLOO

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: WATERLOO

OTHER COMMENTS: MRS SHANTZ SUGGESTS NO FIELD TILE AT SITE

DATE OCT 4, 1970

REGIONAL BRIDGE LOCATION ENGINEER A. P. WATT

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

71-1106

TO: Mr. A.G. Stermac,
Prin. Foundation Engineer,
Foundation Office, Design
Services Branch, Downsview.

FROM: A.P. Watt,
Reg. Bridge Planning Engr.,
Southwestern Region.

ATTENTION:

DATE: October 4th, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 281-66-06, Bridge Site 33-291,
Old Hwy. 85 Interchange Underpass,
C.A.H. 85, District 3 - Stratford.

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed two copies of the bridge site plan E-5311-1 with the probable footings for the structure marked in red.

A field reconnaissance report is enclosed for your use.

A. P. Watt

A.P. Watt
Reg. Bridge Planning Engineer,
Southwestern Region.

APW/ss
Encl.

c.c. C. Grebski.
J. Anderson.
A. Crowley.

DEC. 15/71.

Mr. F. E. Loscombe,
Reg. Super't of Eng. Surveys,
Southwestern Region,
LONDON, Ontario.

P. J. Rule

Mr. W. R. Agnew,
Field Supervisors,
Engineering Surveys,
LONDON, Ontario.
October 22, 1971

RE: W.P. 281-66-06, Job 100-70, Hwy. 85N
Twp. Woolwich, County of Waterloo,
District No. 3, Stratford

This is to inform you that a request dated October 15, 1971 from
A. K. Barsvary, Senior Foundations Engineer, Foundations Section has been
carried out and completed on October 20, 1971 by R. E. Davidson and party.

This request was for locating, staking and ground elevations
at various bore holes shown on plan. The bore holes were laid out from
alignment information shown on Bridge site plan and the ground elevations are
to Bench Mark Datum. The notes were reduced, checked and left with
site engineer. I am, not, therefore submitting any field information.

W. R. Agnew
W. R. Agnew,
Field Supervisor.

WRA:ww

c.c. Mr. K. Selby, Att. A. K. Barsvary,
Mr. J. Roy, Att. J. Forster,
Mr. A. Crowley.

Department of Transportation and Communications

XXXXXXXXXXXXXXXXXXXXXXX

MEMORANDUM

40P10-22

TO: Mr. A. P. Watt, (2)
Regional Bridge Planning Engineer,
Southwestern Region,
London, Ontario.

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

ATTENTION:

DATE: November 22, 1971.

OUR FILE REF.

IN REPLY TO

NOV 29 1971

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

The Proposed Bridge of Hwy. #85 Rev.
Over Proposed C.A.H. #85, Line A
District #3 (Stratford)
W.O. 71-11106 - W.P. 281-66-06

CONT. 74-60

SITE 32-291

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/no
Attach.

cc: Messrs. D. W. Farren
B. R. Davis
A. Rutka
W. A. Zonnenberg
W. D. Neillipovitz
B. J. Giroux
J. R. Roy
G. A. Wrong
B. A. Singh

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

Foundations Office
Documents

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FOUNDATION INVESTIGATION REPORT
For
The Proposed Bridge of Hwy. #85 Rev.
Over Proposed C.A.H. #85, Line A
District #3 (Stratford)
W.O. 71-11106 - W.P. 281-66-06

1. INTRODUCTION:

The results of a foundation investigation for the crossing of Hwy. #85 Rev. and proposed C.A.H. #85 are reported. The investigation was requested by Mr. A. P. Watt, Regional Bridge Planning Engineer, Southwestern Region, in a memo dated October 4, 1971.

The field and laboratory investigations were supervised by this Office, while the boreholes were staked out and surveyed by personnel of the Engineering Surveys Division, Southwestern Region.

A summary of the investigations, together with recommendations concerning foundations follow.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The revised line of Hwy. #85 at the location of the crossing is some 80-90 ft. south of the existing highway. The site is fairly flat cultivated farmland.

Geologically, the area belongs to what is known to be the Waterloo Hills physiographic region. It is made up of sandy hills, some of them ridges of sandy till and other kames, with outwash sand occupying the intervening hollows. A peculiar characteristic of the region is the preponderance of fine sand.

3. FIELD AND LABORATORY INVESTIGATIONS:

The field investigation consisted of five sampled boreholes and three dynamic cone penetration tests, placed adjacent to B.H.'s #1, 3 and 5. Borings were carried out by means of a conventional diamond drill rig, adapted for soil sampling purposes. Split-spoon samples were taken at frequent intervals, advancing the samples by a 140 lb. hammer, falling freely from a distance of 30 inches. The number of hammer blows necessary to drive the sampler 12 inches into the soils are recorded as Standard Penetration 'N' Values.

Visual identifications of the samples were carried out upon recovery, and again in the laboratory. Physical properties of the subsoils were determined by performing laboratory tests such as natural moisture contents, Atterberg limits and grain size analyses. The results of the field and laboratory tests are summarized on the attached Records of Boreholes. The locations and elevations of the borings as well as the estimated stratigraphical profile along the centre line of Hwy. #85 Rev. are presented on Drawing #71-1106A.

4. SUBSOIL CONDITIONS:

4.1) General:

Beneath a 4-5 ft. deep topsoil and organic silt, deposits of sandy silts, sandy gravels and gravelly silts were encountered at every borehole. Underlying the granular layers clayey silts with traces of sand were found, extending to the bottom of boreholes. A brief summary of the subsoils is given below.

4.2) Organic Silts, Sandy Silts, Sandy Gravels:

The granular deposits were found to extend to 24-26 ft. below ground at the locations of the proposed east abutment and pier, and to approx. 14 ft. below ground at the rest of the footings. The surficial 4-5 ft. portion of the deposits are contaminated with organic matter, making the soils slightly plastic. This uppermost soil has consistencies ranging from soft to stiff, corresponding to N values of 3 blows per ft. to 10 blows per ft.

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

4.2) Organic Silts, Sandy Silts, Sandy Gravels: (cont'd) ..

The major portion of the granular layers were identified to be sandy silts with traces of clay and gravel. At around elevation 1105 ft. - 1111 ft. a sandy gravel layer intercepts the sandy silts, having some 3-5 ft. thickness. The relative density of the granulars is generally dense to very dense with penetration N values of 30 blows per ft. to over 100 blows per ft. Laboratory grain size analyses yielded some 0-41% gravel, 15-64% sand, 21-53% silt and 3-17% clay size particles within the specimens tested.

4.3) Clayey Silt, Traces of Sand:

Beneath the granular layers a deposit of clayey silt with traces of sand (glacial till) was recorded, extending to the end of boreholes, some 36.5 ft. below ground level (elevation 1082.5 ft.). High penetration resistances were measured within this stratum, all of the N values being higher than 30 blows per ft. Accordingly the clayey silts were classified to have hard consistencies. Natural moisture contents of the samples vary between 15% and 22%, at or slightly above the plastic limits, indicating the overconsolidated state of the deposit. The range of plastic limits is 12% - 21% and those of liquid limits 21% - 35%.

4.4) Groundwater Conditions:

Groundwater levels in the boreholes were established to be some 10 - 15 ft. below ground surface, between elevation 1104 ft. and elevation 1109 ft. A very slight artesian pressure was measured in B.H. #1, in reaching elevation 1082.5 ft., some 36.5 ft. below ground level. Due to this artesian pressure it was decided that the hole be terminated at this depth.

5. DISCUSSION AND RECOMMENDATIONS:

5.1) General:

It is proposed to construct a four-span structure at the crossing of existing Hwy. #85 Rev. and proposed C.A.H. #85 Line A.

5. DISCUSSION AND RECOMMENDATIONS: (Cont'd) ...

5.1) General: (cont'd) ...

The grade of C.A.H. #85 at the crossing is designed to be around elevation 1116 ft. some 3 ft. below existing ground surface.

The grade of Hwy. #85 Rev. will be at elevation 1136 ft. consequently fills of 20 ft. height will be required at the approaches.

Under a 4-5 ft. thick topsoil and organic silt, dense to very dense sandy silts and gravelly sands were noted, which in turn is underlain by clayey silt glacial till of hard consistency.

5.2) Foundations:

The granular layers below elevation 1110 ft. are considered to possess sufficient shear strength to support the structure economically on spread foundations. Footings should be placed at or below elevation 1110 ft. employing safe design loads on the base of the footings of 3 t.s.f. It is assumed, that settlements not exceeding one inch may occur under such footings. The rate of settlements is expected to be quite fast.

Perched abutments may also be supported on piles, driven through the approach fills. Steel tubular or H piles might be the most economical; piles to be driven to 60 ton per pile capacity, by using the Hiley formula (DTC Standard DD-1218 & 1219). It is estimated that above safe loads may be reached around elevation 1080 ft. In order to facilitate pile driving bouldery fill should not be placed at the locations of the abutments.

No stability problems are anticipated for the approach fills, provided they are built with two horizontal to 1 vertical slopes. No special dewatering scheme will likely be required for the excavations.

6. MISCELLANEOUS:

The field work carried out during October 20-25, 1971, was supervised by Mr. P. Korgemagi, Project Foundation Engineer.

6. MISCELLANEOUS: (cont'd) ...

Equipment used was owned and operated by Canadian Longyear Ltd., Toronto.

This report was written by Mr. A. K. Barsvary, Senior Foundation Engineer, and reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

A. K. Barsvary
A. K. Barsvary, P. Eng.

K. G. Selby
K. G. Selby, P. Eng.

AKB/ao
November 17, 1971.



APPENDIX I

FOUNDATION SECT.

ORIGINATED BY

COMPILED BY

CHECKED BY E. J. G. M.

[illegible]

FOUNDATION SECTION

ORIGINATED BY 

COMPILED BY AFD

CHECKED BY J. S. Smith

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 71-11106 LOCATION Sta. 34 + 37 @ Hwy. 25 RevisionORIGINATED BY TKW.P. 21-66-66 BORING DATE Oct. 21, 22, 1971COMPILED BY AKPDATUM Geodetic BOREHOLE TYPE Weathering BY DesignCHECKED BY F. Dundas

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F. GR. SA. SI.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS/FOOT	20 40 60 80 100	20 40 60 80 100	10 20 30		
1112.5	Ground Level											
0.0	Topsoil & organic silt. Firm	SSSS	1	SS	8							
1114.5	Sandy silt, some gravel, trace of clay. Compact to Very Dense		2	SS	14							
1114.0	Brown		3	SS	100							
1114.5	Clayey silt, some sand. Hard		4	SS	51							
1087.0	Grey		5	SS	37							
31.5	End of Borehole		6	SS	36							
			7	SS	38							
			8	SS	50							

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71-11106

LOCATION Sta. 15 + 12 11' Rt. Hwy. 85 Revision

ORIGINATED BY : **RM**

W.P. 251-66-06

BOHRING DATE Oct. 22, 25, 1971

COMPILED BY AXB

DATUM 60000000

BOREHOLE TYPE Washboring BX Casing

CHECKED BY ED

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 71-11106 LOCATION Sta. 15 + 43 18' Int. Hwy. 35 Revision

ORIGINATED BY 

W.P. 281-66-06 BORING DATE October 25, 1971

COMPILED BY **AKG**

DATUM Oradetic BOREHOLE TYPE Washburn EX Cos'm

CHECKED BY EDMUND

[illegible]

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
I_P	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
C_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{C_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
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

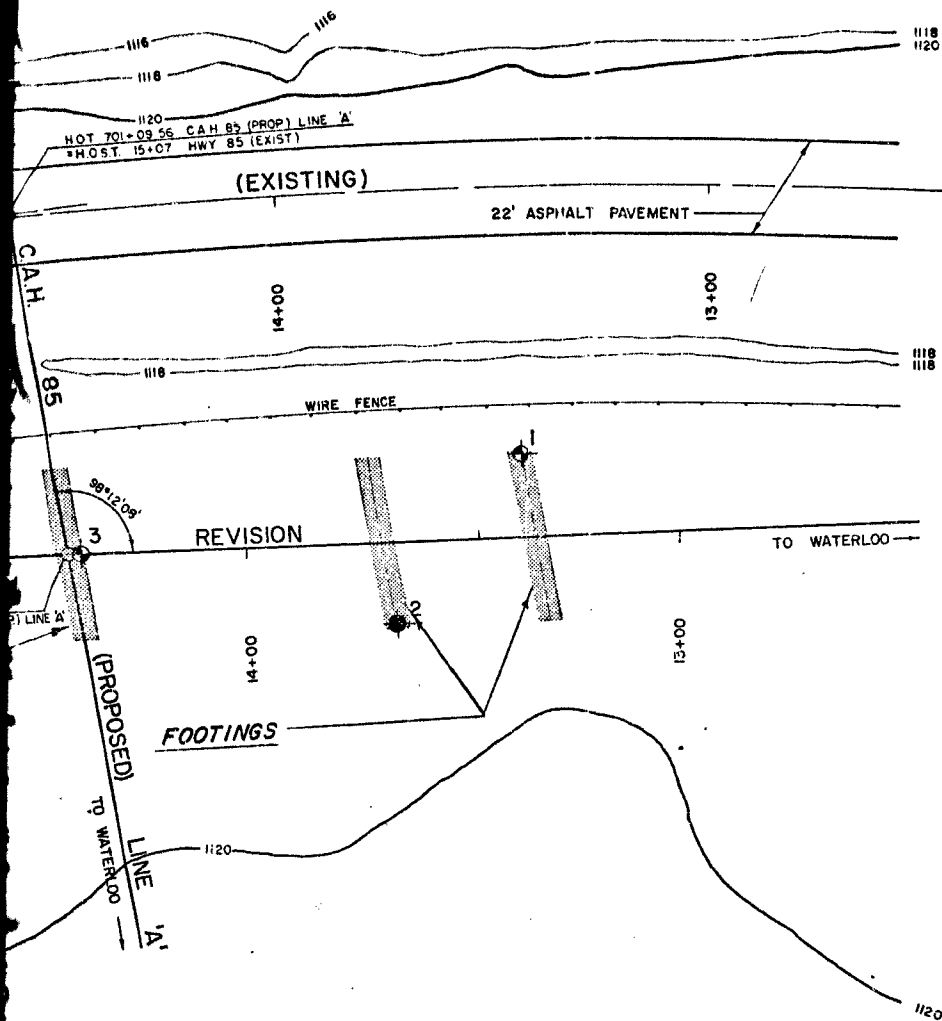
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

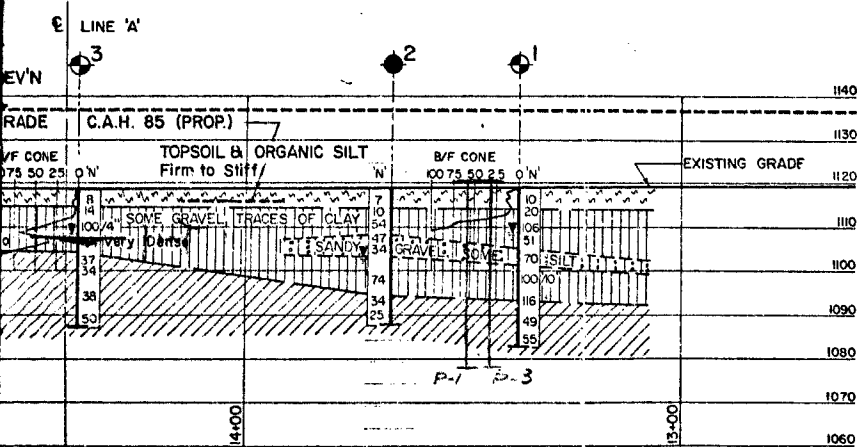
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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



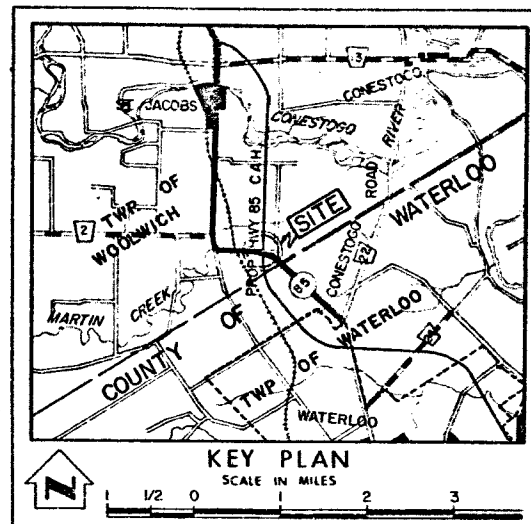
PLAN
SCALE
0 20 40 FT.



PROFILE
SCALE
0 20 40 FT.



REF. NO E-5341-1



LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. (Oct. 1971)

NO.	ELEVATION	STATION	OFFSET
1	1119.0	13+36	19' RT.
2	1118.9	13+66	18.5' LT.
3	1118.5	14+37	E
4	1119.2	15+12	11' RT.
5	1119.0	15+43	18' LT.

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.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS
DESIGN SERVICES BRANCH FOUNDATION OFFICE

HWY. 85 REVISION AND C.A.H. 85 (PROPOSED) LINE 'A'			
HIGHWAY NO. 85		DIST NO. 3	
CO. WATERLOO		TWP. WOOLWICH LOT 18 CON. G.C.T.	
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMD. A.B. CHECKED	M.P. NO. 281-66-06	DRAWING NO. 71-11106-A	
DRAWN D.L.K. CHECKED	JOB NO. 71-11106	BRIDGE DRAWING NO.	
DATE 22 / 11 / 71	SITE NO.	APPROVED <i>[Signature]</i> CONT. NO.	
PRINCIPAL FOUNDATION ENGINEER			

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Copy for the information of
A. Stermac

A.P. Watt,

Reg. Bridge Planning Engineer,
London Regional Office.

Structural Office,
West Bldg., Downview.

March 10, 1972.

Re: Old Hwy. 85 Underpass,
At existing Highway 85 revision,
W.P. # 281-66-06, Site # 33-291,
Highway #85, District #3.

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-33-291-P1 for the above mentioned structure.

The estimated cost of the proposed structure is
\$180,000.00, 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:ar
Attach.

C.C. A. McKim
B. Davis
A. Stermac (2)
J. Anderson
A. Crowley

No comments

K.L. Selby

March 23 1972

FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS:

W.P. 281-66-06

W.O. 71-11106

Foundation Report By: A. BARSVARY

Review of Design Drawings By: A. BARSVARY

Design Drawing No.'s: 332.91-P1

1. Does footing design comply with our report or subsequent memos?
2. If answer to 1. is No, is present design acceptable?
3. Has sufficient field work been done?
4. Are estimated pile lengths shown on Drawings correct? If not, make a new list.
5. If excavation of unsuitable soil is recommended, is this shown on Drawings?
6. Are approaches designed in accordance with our report? Check slopes and berm lengths.
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.

Drawings Received MARCH 22ND 1972

Reviewed 19.....

Signed

AL [Signature]

Department of Highways Ontario

Copy for the information of

FOUNDATION OFFICE

Mr. A. Stermac
Principal Foundation Engineer
Room 107, West Building

C.S. Grebski
Structural Design Engineer
Structural Office - West Bldg.

August 17, 1972

Old Hwy. 85 Underpass
at Existing Hwy. 85 Revision
W.P. 281-66-06 Site 33-291
Hwy. 85 District 3

71-11-106

We are submitting the final bridge drawings,
attached herewith, which show the foundation design
for this structure.

Kindly give us your comments at your earliest
convenience.

CSG/hvh
Encls.

C.S. Grebski
Structural Design Engineer

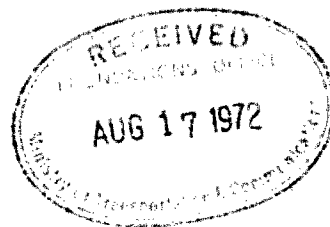
cc Foundation Office

NO COMMENTS.

A. H. Jamony

23. Aug. 72.

Reg. to B.C.
6 Dec 72
CHL



FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS:

W.P. 281-68-06

W.O. 71-1106

Foundation Report By: A. V. B.

Review of Design Drawings By: A. V. B.

Design Drawing No.'s: 33-291-1...33-5

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

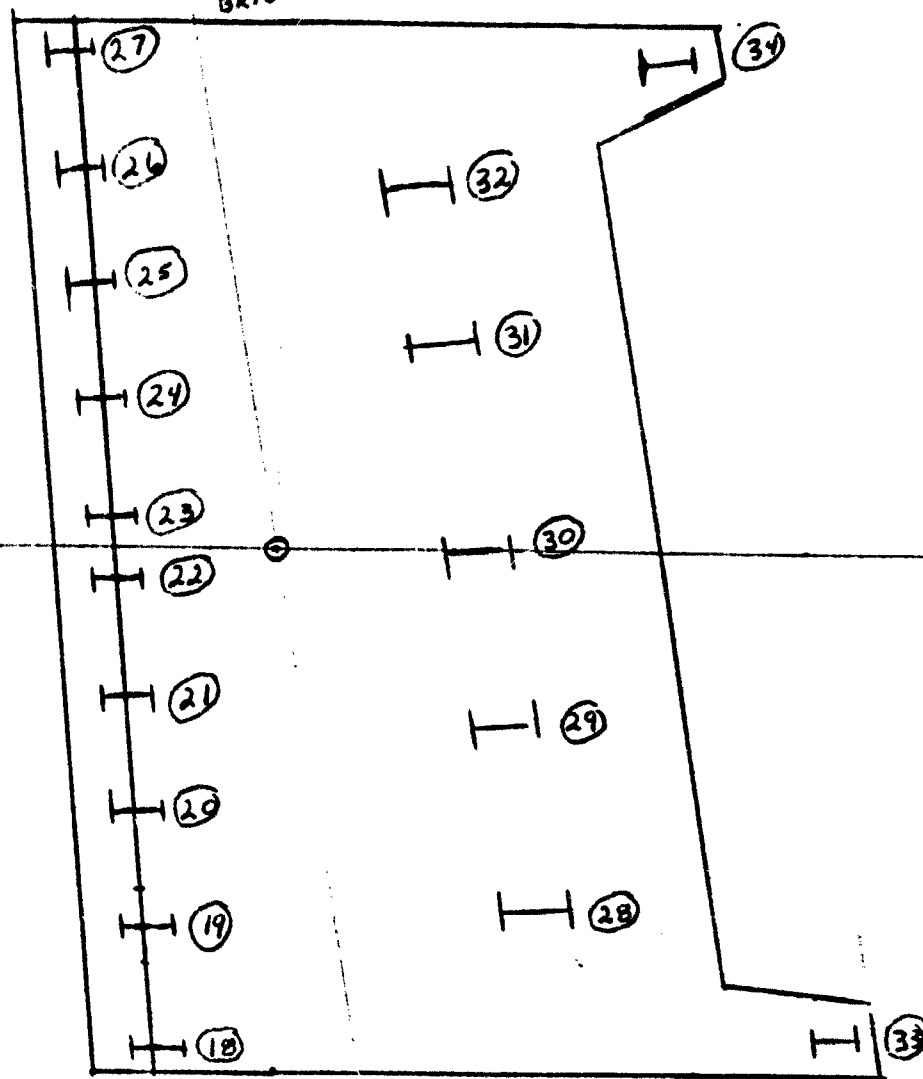
NO COMMENTS

Drawings Received 22 Aug 1972

Reviewed 23 Aug 1972

Signed A. K. Dancy

ABUT.
B.R.D.



WEST ABUTMENT
BRIDGE.



ENGINEERING SERVICES BRANCH
SOIL MECHANICS SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 24-60 STRUCTURE OLD HWY 85 UNDERPASS

CONTRACTOR BRAMMINGHAM DESIGN LOAD OF PILE 60 TON

HAMMER DETAILS: TYPE B400 WEIGHT 5000 HEIGHT OF FALL OR ENERGY 76000

TYPE OF ANVIL OR CAP B400 WEIGHT OF ANVIL OR CAP 1800 LBS

PILE DETAILS 13 1/2" x 33 1/2" 43' LONG VERTICAL NO SLANT

PILE NO. 30 LOCATION WEST ABUT RTE DATE DRIVEN SEPT 10/74

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	4	4	4	4	4	4
MEASURED REBOUND IN INCHES	3/8	3/8	3/8	1/8	1/8	3/8
FINAL LENGTH OF PILE	41.5			FINAL CUT OFF ELEVATION		
				1120		

REPORT TO BE SENT TO: - HEAD, SOIL MECHANICS SECTION
ENGINEERING SERVICES BRANCH
MINISTRY OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED Ken Payne
NAME (PRINT) Ken Payne
DATE SEPT 10/74
ATTACH SKETCH OF PILE NUMBERING SYSTEM

1120.0
41.5
TIP EL. 1078.5
08-MT-285 3-74



ENGINEERING SERVICES BRANCH
 SOIL MECHANICS SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 74-60 STRUCTURE OLD HWY 95 UNBARRIERS
 CONTRACTOR BERMINHAM DESIGN LOAD OF PILE 60 TON
 HAMMER DETAILS: TYPE BERMINHAM WEIGHT 5000 HEIGHT OF FALL OR ENERGY 46000
 TYPE OF ANVIL OR CAP BERM 13 400 WEIGHT OF ANVIL OR CAP 1800 LB
 PILE DETAILS 12 BP 53 43' LONG VERTICAL NO SHOE
 PILE NO. 33 LOCATION WEST ABUT ETC DATE DRIVEN SEPT 11/74

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	4	4	4	4	4	4
MEASURED REBOUND IN INCHES	3/8	3/8	3/8	3/8	3/8	3/8
FINAL LENGTH OF PILE	42'					
FINAL CUT OFF ELEVATION	1120					

REPORT TO BE SENT TO: - HEAD, SOIL MECHANICS SECTION
 ENGINEERING SERVICES BRANCH
 MINISTRY OF
 TRANSPORTATION AND
 COMMUNICATIONS
 DOWNSVIEW, ONTARIO

SIGNED Tom Payne
 NAME (PRINT) LOW PAYNE
 DATE SEPT 11/74
 ATTACH SKETCH OF PILE NUMBERING SYSTEM

1120
 42
 TIP EL. 1078
 08-MT-285 3-74



ENGINEERING SERVICES BRANCH
SOIL MECHANICS SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 74-60 STRUCTURE OLD HWY/ 95 UNDERPASS
CONTRACTOR BERMINCHAM DESIGN LOAD OF PILE 60 TON
HAMMER DETAILS: TYPE B400 WEIGHT 5000 HEIGHT OF FALL OR ENERGY 46000
TYPE OF ANVIL OR CAP ARM B400 WEIGHT OF ANVIL OR CAP 12000
PILE DETAILS 12 IN 53 43' LONG SECTION NO 5406
PILE NO. 34 LOCATION WEST ABUT PTC DATE DRIVEN SEPT 10/74

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	5	5	5	5	5	5
MEASURED REBOUND IN INCHES	1/4	1/4	1/4	1/4	1/4	1/4
FINAL LENGTH OF PILE	42'			FINAL CUT OFF ELEVATION		
				1120		

REPORT TO BE SENT TO: - HEAD, SOIL MECHANICS SECTION
ENGINEERING SERVICES BRANCH
MINISTRY OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED DW Coyne
NAME (PRINT) DW COYNE
DATE SEPT 10/74
ATTACH SKETCH OF PILE NUMBERING SYSTEM



SUMMARY OF PILE DRIVING RECORDS

W.O. 71-11106 W.P. 281-66-06 CONT. 74-60 DIST. 3

SITE OLD HWY. 85 UNDERPASS

DATE DRIVEN SEPT. 10-12 / 1974 WEIGHT OF ANVIL 1800 lb

HAMMER TYPE B-400 PISTON WEIGHT 5000 lb ENERGY 46000 FT/lb

[illegible]

A K Barroway

ENG

JOB TITLE Alld Hwy 85 UnderpassGEOCRES NO. 40P10-22 CONT. 74-60 SITE 33-291W.P. 281-66-06 W.O. 71-11106 HWY NO. CAH 85 DIST. 3TYPE OF STRUCTURE 2 span 93' 93'TYPE OF FOOTINGS Abutments supported on HP12x53 piles
pier on spread footingSTRATIGRAPHY
C. PIER.

SUBSOIL DESCRIPTION

C.L. 1120'

TOPSOIL & ORG. SILT. 1115'

1112.5'

SANDY SILT here to very dense
1106-5'
1104'

CLAYEY SILT.

3-5' of Topsoil Organics

over
5-10' of Sandy Siltover
5' of Sandy Gravel some silt.
(most B.H.s.) not a sandy pier

over 20' of Clayey Silt Hard

GROUNDWATER CONDITIONS 10-15' B.G.L.between elev. 1104' & 1109'
possible artesian conditionFINAL BRIDGE GENERAL & FOUND. PLAN Yes, in back of report
in Contract file.WERE DEWATERING PROBLEMS FORESEEN? RECOMMENDATIONS NoQUESTIONS TO BE INVESTIGATED Could be a problem at
Center pier see Alex
No dewatering suggested but one appears to be
borderline