cc: Gen. Files

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

23-67-02

Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

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

DATE: OCT 19 1965

OUR FILE REF.

IN REPLY TO ...

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Maidstone Township Road
Conc. VIII, Underpass, Lot 18,
Conc. 7 & 8, Twp. of Maidstone, Co.
of Essex, Hwy. #401, District #1.
W.J. 65-F-82 -- W.P. 129-64

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

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

K. Y. Lo,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Sterm..c,
PRINCIPAL FOUNDATION ENGR.

KYL/MdeF
Attach.
cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
A. Cater
F. C. Brown
J. Roy
A. Watt

Foundations Office
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Proposed Maidstone Township Road
Conc. VIII, Underpass, Lot 18,
Conc. 7 & 8, Twp. of Maidstone, Co.
of Essex, Hwy. #401, District #1.
W.J. 65-F-82 -- W.P. 129-64

1. INTRODUCTION:

A foundation investigation for the proposed underpass at Hwy. #401 and Maidstone Twp. Rd. Con. VIII, was requested by Mr. G. Scott, Regional Bridge Location Engineer, in a memorandum dated April 2, 1965.

Following this request, a field investigation was subsequently carried out by the Foundation Section, to determine the subsoil conditions existing at the proposed bridge site.

This report contains the information resulting from the field investigations, together with recommendations pertaining to the design of the proposed bridge foundations.

2. DESCRIPTION OF THE SITE:

The proposed bridge site (No. 6-237) is located at the intersection of Hwy. #401 and Maidstone Twp. Rd. Con. VIII, County of Essex.

The surrounding area is flat, cultivated farmland. Physiographically, the site is located in the area referred to as the Essex Clay Plain, which is part of the St. Clair Clay Plains Region.

cont'd. /2 ...

3. FIELD INVESTIGATION PROCEDURE:

The field work consisted of five sampled boreholes. Boring was achieved by means of conventional diamond drilling equipment adapted for soil sampling purposes. During the field investigation, disturbed and 'undisturbed' samples were obtained at various intervals. Disturbed samples were recovered by a split-spoon sampler and the number of blows required to drive it were recorded. The energy used in driving it, conformed to the requirements of the Standard Penetration Test.

'Undisturbed' samples were obtained by means of 2-inch I.D. Shelby tubes which were pushed into the soil by hand. In-situ vane tests were carried out wherever possible, at elevations 12 inches below the various sample depths.

The locations and elevations are shown on Dwg. 65-F-82A which forms part of this report.

4. LABORATORY TESTS:

The samples were visually examined and classified at the site as well as in the laboratory. Tests were carried out in the laboratory for classification and shear strength determination purposes. These tests consisted of natural moisture content, Atterberg limits, bulk density, grain size distribution and unconfined shear strength determinations. The test results are shown on the Borehole Record sheets.

cont'd. /3 ...

5. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.2) Clayey Silt with some Sand and traces of Gravel: (cont'd.) ... stratum which appears to be desiccated between El. 607 and El. 602, ranges from hard in the desiccated zone to firm at about El. 560 with some random variation. Standard Penetration Tests carried out in the hard zone gave 'N' values of 28 to 71 blows per foot.

Physical properties of the material as determined from field and laboratory tests, are as follows:

Natural Moisture Content	:	11 to 28%
Liquid Limit	:	28 to 35%
Plastic Limit	:	15 to 19%
Bulk Density	:	122 to 138 p.c.f.
Unconfined Shear Strength	:	584 to 3,645 p.s.f.
Field Vane Shear Strength	:	1,040 to 2,000 p.s.f.

Typical grain size distribution curves are included in the Appendix of this report.

5.3) Silty Sand with traces of Gravel and Clay:

This material was encountered in boreholes No. 1 and No. 2, between elevation 571' and Elev. 563', and also in borehole No. 2 between Elev. 551 and Elev. 544'. The chief components were found to be sand and silt with the following average proportions: sand: 52%, silt: 28%, clay: 14%, and gravel: 5%. The 'N' values ranged from 6 to 37 blows per foot.

5.4) Silty Clay with Sand:

This stratum was found to underlie the clayey silt and silty sand deposits at the boring locations between Elev. 544' and Elev. 524'.

cont'd. /5 ...

5. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.4) Silty Clay with Sand: (cont'd.) ...

The material consists mainly of clay and silt with sand. The consistency is classified as stiff.

5.5) Glacial Till:

The clayey silt deposit is underlain by a very dense heterogeneous mixture of gravel, sand, silt, and clay glacial till material. The lower boundary was not determined since the borings were terminated in this layer.

6. GROUND WATER CONDITIONS:

The following water levels were observed in the boreholes:

#1	--	2.0'	Below Ground Level
#2	--	6.0'	" " "
#3	--	2.1'	" " "
#4	--	8.5'	" " "
#5	--	0.6'	" " "

7. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct an underpass at the intersection of Hwy. #401 and Maidstone Twp. Con. Rd. VIII. At the present time, this is a level crossing. The traffic on the Township Road will be carried over the intersection by means of a four-span, single structure, constructed along the centreline of Maidstone Twp. Con. Rd. VIII. It was observed from the preliminary general plan that the present gradeline of the Township Road will be elevated to an approx. maximum height of 20 ft.

cont'd. /6 ...

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

The investigation has revealed that the shear strength of the clayey silt material in the upper layers is adequate to provide suitable support for spread footing type foundations.

In view of the foregoing, it is recommended that the proposed piers be founded on spread footings at or below elevation 606', where a safe bearing pressure of 2.5 t.s.f. may be assumed for design purposes. The proposed abutments may be constructed within the approach fills and supported on 12¾" Ø steel tube piles driven through the fill, into original ground, where a safe bearing capacity of 35 tons per pile should be achieved. These piles should not be driven below Elev. 605.0' since the strength of the soil decreases with depth below this level.

No stability problems are anticipated for the proposed 20-ft. high approach fills provided standard 2:1 slopes are constructed.

The topsoil stripping should be in accordance with D.H.O. Standards.

8. SUMMARY:

A foundation investigation at the site of the proposed underpass at Hwy. #401 and Maidstone Twp. Road Con. VIII, is reported.

Subsoil at the site consists of about 71 feet of hard to firm clayey silt with some sand and traces of gravel, underlain by a stiff silty clay with sand deposit, underlain by a very dense glacial till deposit.

cont'd. /7 ...

8. SUMMARY: (cont'd.) ...

It is recommended that the proposed piers be supported on spread footings, with a design load of 2.5 t.s.f. and that the proposed abutments be constructed within the approach fills and be supported on 12¾" Ø steel tube piles with a design load of 35 tons per pile.

No stability problems are anticipated.

9. MISCELLANEOUS:

The field investigation was carried out from July 15 to July 22, 1965. The equipment used was owned and operated by Dominion Soil Investigation Ltd., and Master Soil Investigation Ltd.

The field work was supervised by Mr. P. Payer, Project Foundation Engineer, who also prepared this report, under the general supervision of Mr. K. G. Selby, Senior Foundation Engineer.

October 1965

APPENDIX I

FORM DB-MT-126 (FORMERLY DB-ML-126)
65-1831

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 65-F-82 LOCATION Sta. 15+98; 21' Lt. ORIGINATED BY P.P.
W.P. 129-64 BORING DATE July 15, 1965. COMPILED BY P.P.
DATUM Geodetic BOREHOLE TYPE Washboring - NX Casing. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BULK DENSITY γ P.C.F.	REMARKS
614.4	Groundlevel							
0.0	Clayey silt with some sand and traces of gravel. Occasional layers of silty clay. Firm to hard. Brown to grey.		1	SS	6	610		
			2	SS	36			Gr 0% Sa 17% Si 44% Cl 39%
			3	SS	67			
			4	SS	35	600		
			5	SS	17			
			6	TW	PM			
			7	SS	15	590		
			8	TW	PM		130	
			9	TW	PM		129	
			10	TW	PM	580	127	Gr 0% Sa 17% Si 42% Cl 41%
571.0			11	TW	PM		128	
43.4	Silty sand with traces of clay and gravel. Compact.		12	TW	PM	570		Gr 6% Sa 63% Si 24% Cl 7%
			13	SS	27			Gr 3% Sa 37% Si 32% Cl 28%
559.4						560		
55.0	End of borehole.					550		

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F. 1000 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 10 20 30

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 65-F-82 LOCATION Sta. 15+63; 22' Rt. ORIGINATED BY P.P.
W.P. 129-64 BORING DATE July 19 & 20, 1965. COMPILED BY P.P.
DATUM Geodetic BOREHOLE TYPE Washboring - NX Casing. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BULK DENSITY γ P.C.F.	REMARKS
615.8 / 0.0	Groundlevel							
	Clayey silt with some sand and traces of gravel. Occasional layers of silty clay. Brown to grey. Firm to hard.		1	SS	13	610		Gr 3% Sa 15% Si 41% Cl 41%
			2	SS	45			
			3	SS	71			
			4	SS	71			
			5	SS	27	600		
			6	SS	16			Gr 2% Sa 16% Si 38% Cl 44%
			7	TW	PM	590	130	
			8	TW	PM		129	
			9	TW	PM	580	128	Gr 7% Sa 19% Si 38% Cl 36%
			10	TW	PM		128	
571.3 / 44.5	Silty sand with traces of gravel & clay Loose to compact.		11	SS	37	570		Gr 6% Sa 57% Si 30% Cl 7%
			12	SS	6			
562.6 / 53.2	Clayey silt with some sand and traces of gravel. Grey Stiff		13	SS	8			
			14	TW	PM	560	124	
550.5 / 65.3	Silty sand with traces of gravel. Silt and clay.		15	TW	PM	550		
544.3 / 71.5	Silty clay. Grey. Stiff.		16	TW	PM	540	121	
			17	TW	PM	530		
91.6	Sandy till - V. dense							
93.1	End of borehole.					520		

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH F.S.F. 1000 2000
LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 10 20 30

FORM DB-MT-126 (FORMERLY DB-ML-126)
65-1331

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 65-F-82 LOCATION Sta. 14/38: Off-Set 25' Lt. ORIGINATED BY P.P.
W.P. 129-64 BORING DATE July 19 & 20, 1965. COMPILED BY P.P.
DATUM Geodetic BOREHOLE TYPE Washbore-NX Casing. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BULK DENSITY γ P.C.F.	REMARKS
615.6	Groundlevel							
0.0	Clayey silt with some sand and traces of gravel. Occasional layers of silty clay. Brown and grey. Firm to hard.		1	SS	9	610		Gr 1% Sa 18% Si 42% Cl 39%
			2	TW	PM			
			3	SS	49			
			4	SS	55			
			5	SS	39	600		
			6	SS	22			
			7	TW	PM			
			8	TW	PM	590	130	Gr 0% Sa 17% Si 42% Cl 41%
			9	TW	PM		125	
			10	TW	PM	580	126	
			11	TW	PM		128	
			12	TW	PM	570	125	
			13	TW	PM		128	Gr 1% Sa 20% Si 40% Cl 39%
			14	TW	PM	560		
555.6			15	SS	10			
60.0	End of borehole.					550		

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
o Unconfined
+ Field Vane Test
1000 2000

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
WATER CONTENT % 10 20 30

FORM 08-MT-126 (FORMERLY 08-ML-126) OFFICE REPORT ON SOIL EXPLORATION
65-1831

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 65-F-82 LOCATION Sta. 14+02; Off-set 17' Rt. ORIGINATED BY P.P.
W.P. 129-64 BORING DATE July 20, 21 & 22, 1965 COMPILED BY P.P.
DATUM Geodetic BOREHOLE TYPE Washbore-NX Casing. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BULK DENSITY γ P.C.F.	REMARKS
614.4	Groundlevel							
0.0	Clayey silt with some sand and traces of gravel. Occasional layers of silty clay. Brown and grey. Firm to hard.		1	SS	12	610		Gr 1% Sa 17% Si 42% Cl 40%
			2	SS	16			
			3	SS	28			
			4	SS	56			
			5	SS	65	600		
			6	SS	36			
			7	TW	PH			
			8	TW	PH		130	
			9	TW	PH	590	129	
			10	TW	PH		129	
			11	TW	PH	580	129	
			12	TW	PH		127	
			13	TW	PH	570	125	
			14	TW	PH		122	
			15	TW	PH	560	124	
			16	TW	PH			
			17	TW	PH	550		Gr 4% Sa 40% Si) Cl) 56%
542.9								
71.5	Silty clay with sand. Grey. Stiff		18	TW	PH	540		
						530		
524.9								
89.5	Sandy till		19	SS	28			Gr 16% Sa 57% Si 23% Cl 4%
519.8	V. dense		20	SS	62/9"	520		
94.6	End of borehole.							

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
o Unconfined
+ Field Vane Test
1000 2000

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
WATER CONTENT %
10 20 30

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

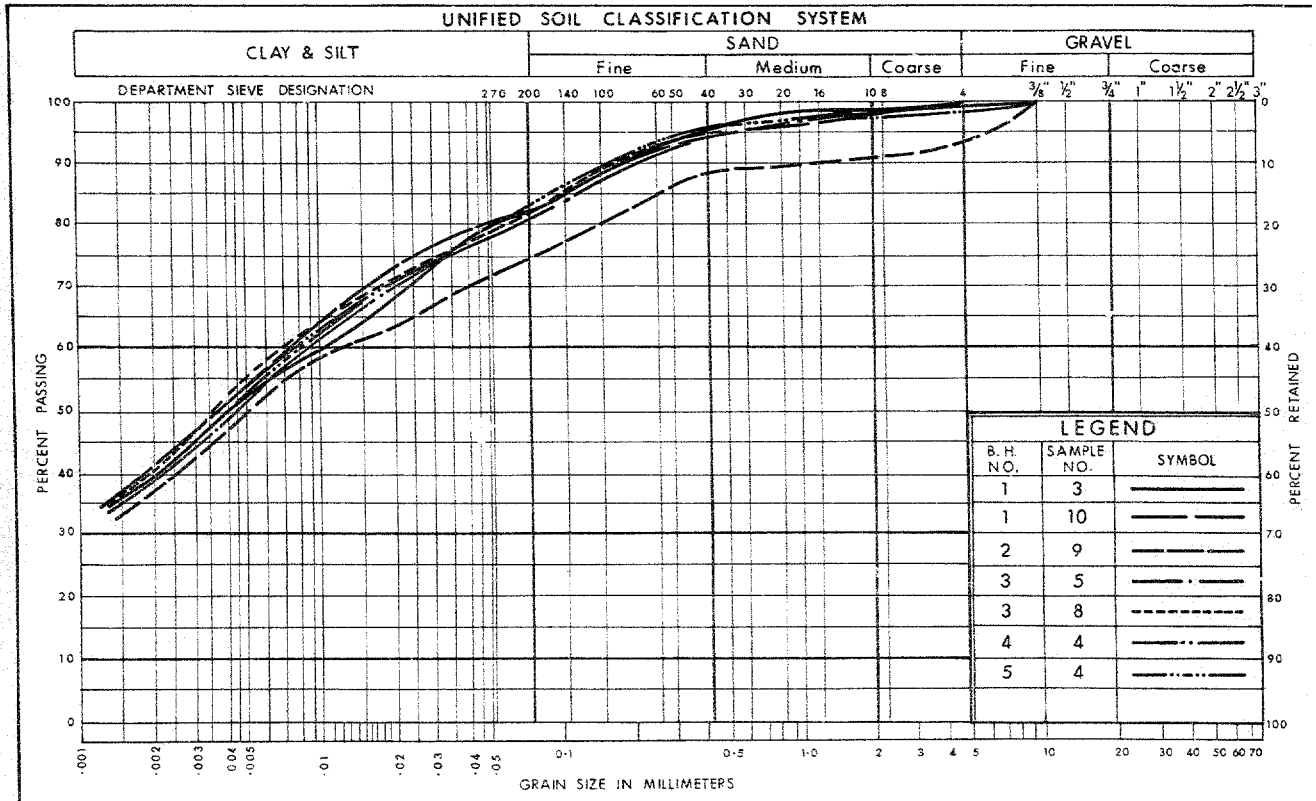
JOB 65-F-82 LOCATION Sta. 15+00; Off-set 30' Lt. ORIGINATED BY P.P.
W.P. 129-64 BORING DATE July 22, 1965 COMPILED BY P.P.
DATUM Geodetic BOREHOLE TYPE Washbore-NX Casing. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BULK DENSITY γ P.C.F.	REMARKS
615.7	Groundlevel							
0.0	Clayey silt with some sand. Occasional layers of silty clay. Brown to grey. Firm to hard.		1	SS	13	610		Gr 0% Sa 16% Si 44% Cl 40%
			2	SS	32			
			3	SS	179			
			4	SS	67			
			5	SS	20	600		
			6	TW	PM		130	
			7	TW	PM	590	129	
			8	TW	PM		128	
			9	TW	PM	580	138	
574.2			10	SS	13			
41.5	End of borehole.					570		

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
1000 2000
3645

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT %
10 20 30

REV. APR. 1965
65-414



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION
ONTARIO

GRAIN SIZE DISTRIBUTION

W.P. No. 129 - 64
JOB No. 65 - F - 82

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 :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.
VERY SOFT	0 - 2	0 - 250
SOFT	2 - 4	250 - 500
FIRM	4 - 8	500 - 1000
STIFF	8 - 15	1000 - 2000
VERY STIFF	15 - 30	2000 - 4000
HARD	> 30	> 4000

DENSENESS	'N' BLOWS / FT.
VERY LOOSE	0 - 4
LOOSE	4 - 10
COMPACT	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

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
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3·1416
e	BASE OF NATURAL LOGARITHMS 2·7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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
σ'	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 (YOUNGS 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_o	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

65-F-82

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107,
Lab. Building.

From: Bridge Division,
Downsview, Ontario.

Date: April 2, 1965.

65-F-82

Our File Ref.

In reply to

Subject: W.P. 129-64 Site # 6-237
Maidstone Twp. Road Underpass
Highway # 401 District # 1.

We are sending to you herewith two prints of Bridge Site Plan E-4346-1 on which we have marked in red the proposed location of the above structure.

The bridge site is readily accessible. It is 21 miles west of West Junction Highway 2 Interchange. No problems are anticipated regarding the accommodation.

Please make the necessary arrangement for foundation investigation. We will be pleased to have your report in due course.

N. Zoltay,
for G. Scott,
Regional Bridge Location Engineer.

NZ/kp
c.c. S. McCombie
G. Scott
N.D. Smith
W. Kinnear

FOUND. REP. DUE NOV. 17, 1965.

Bridge Division,
Downsview, Ontario,
November 1, 1965.

MEMORANDUM:

To File

RE: Proposed structures on Hwy. 401, located 0.6 miles to 8.9 miles East of Hwy. 98.
District No. 1, Chatham.
W.P. 127-64, 128-64, 129-64, 131-64, 132-64, 309-64, 310-64, 669-64 and 670-64.

At a meeting between Mr. M. Devata of Foundations Branch and K. Bassi of Bridge Division, concerning the above structures held on October 28, 1965 at the Bridge Office, it was agreed that:

1. The spread footings for all the piers can be designed for a bearing capacity of 2½ tons/ft.^{2}.

2. The abutment piles for all the structures if driven in accordance with the recommendations given in the individual Foundation Reports, can be designed to carry 30 Tons/pile.

3. The structures should be designed to tolerate a maximum differential settlement between the abutments and shoulder piers in the order of 1 to 1½ inches.

KGB/eg
c.c. A. G. Stermac
G. Scott

K. G. Bassi,
Bridge Project Engineer.

65-F-22

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107,
Lab. Building.

From: Bridge Division,
Downsview, Ontario.

Date: April 2, 1965.

Our File Ref.

In reply to

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Highway # 401 District # 1.

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The bridge site is readily accessible. It is 21 miles west of West Junction Highway 2 Interchange. No problems are anticipated regarding the accommodation.

Please make the necessary arrangement for foundation investigation. We will be pleased to have your report in due course.

N. Zeltay.

N. Zeltay,
for G. Scott,
Regional Bridge Location Engineer.

NZ/kp
c.c. S. McCombie
G. Scott
N.D. Smith
W. Kinnear

FOUND. REP. DUE NOV. 17. 1965.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

From: Bridge Division,
Downsview, Ontario.

Date: December 3, 1965.

Our File Ref.

In reply to

Subject: W.P. 129-64, Site 6-237,
Maidstone Twp. Rd. Concession VIII,
Underpass,
6.3 miles east of Hwy. 98,
Hwy. 401, District 1.

We are sending to you herewith one print of Preliminary Plan D 5840-P1 of the above structure.

Would you please let us have your written comments.

N. Zoltay

NZ/ag
c.c. S. McCombie
G. Scott

N. Zoltay,
for G. Scott,
Regional Bridge Location Engineer.

cc: Foundations Office(Rm. 110)

Mr. S. McCombie,
Bridge Planning Engineer,
Bridge Division.

Attn: Mr. G. Scott

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

December 14, 1965

Preliminary Review of the Bridge Plans for the Proposed Structures on Hwy. 401, located 0.6 miles to 8.9 miles East of Hwy. 98, Hwy. 401, District No. 1 (Chatham) - W.P. 127-64, 128-64, 129-64, 309-64, 310-64, 669-64, and 670-64.

We have reviewed the preliminary bridge drawings for the above-mentioned structures. The foundation design for each structure appears to comply with recommendations contained in our foundation reports.

M. Devata,
SENIOR FOUNDATION ENGINEER
For:
A. D. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Office
Mr. Files

Foundations
Offi

Mr. F. C. Brown,
District Engineer,
Chatham, Ontario.

Attn: Mr. P. Peacock.

Materials & Testing Division.

April 5, 1966.

Installation of Settlement Plates at the Approach fill locations on Hwy. 401, Dist. #1.

Further to our telephone conversation, we are enclosing the list of various structure which are scheduled to be built in your district. We may wish to instrument some of these projects and request you to advise us at least two weeks prior to the commencement of approach fill construction of each project.

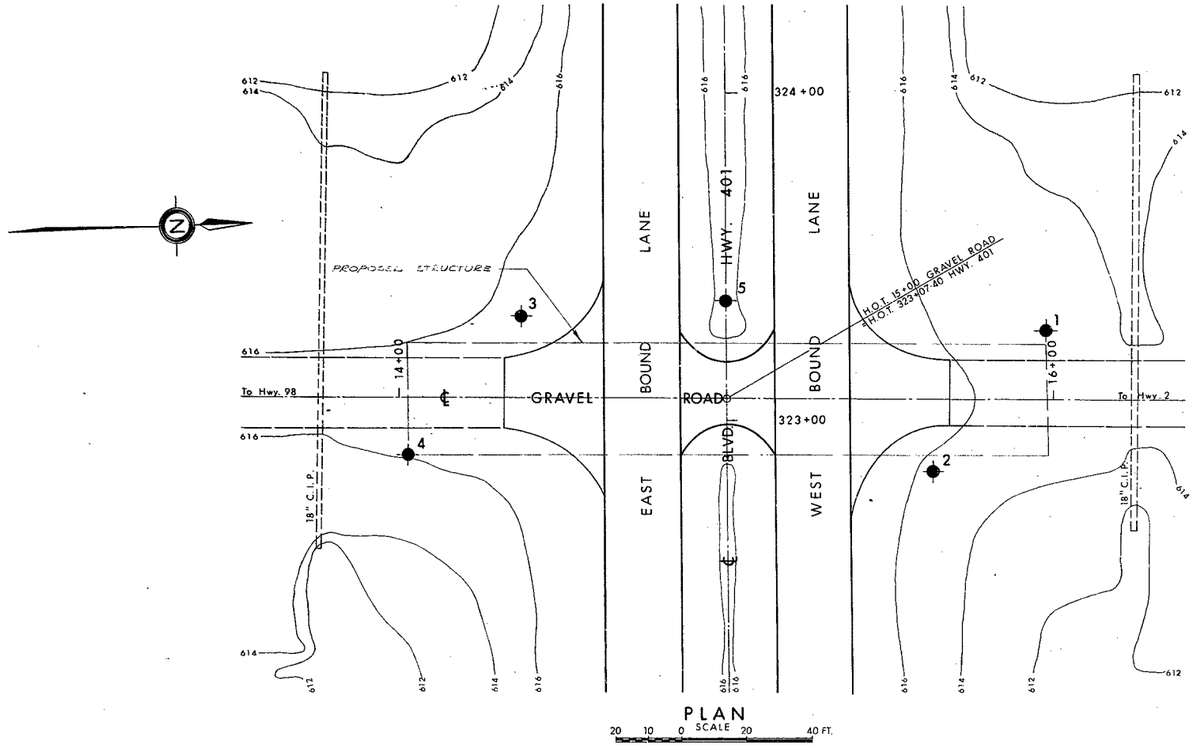
WP127-64	County Rd. to Puce Interchange No. 4 8.9 Miles East of Hwy. 98.
WP131-64	Sandwich S. Twp. Rd., Concession XI, Underpass 3.2 Miles East of Hwy. 98.
WP132-64	Essex County Rd. 27 Underpass 1.5 Miles East of Hwy. 98.
WP309-64	Maidstone Twp. Rd. Concession VII Underpass 7.1 Miles East of Hwy. 98.
WP310-64	Maidstone Twp. Rd. Concession IX Underpass 5.4 Miles East of Hwy. 98.
WP128-64	Maidstone Twp. Rd. Concession VI Underpass 8.0 Miles East of Hwy. 98.
WP129-64	Maidstone Twp. Rd. Concession XII Underpass 6.3 Miles East of Hwy. 98. 66-1-12
WP569-64	Sandwich S. Twp. Rd. Concession X Underpass 2.3 Miles East of Hwy. 98.
WP570-64	Sandwich S. Twp. Rd. Concession XII Underpass 0.6 Miles East of Hwy. 98.

MD/tt
cc: Foundations Office
Gen. Files

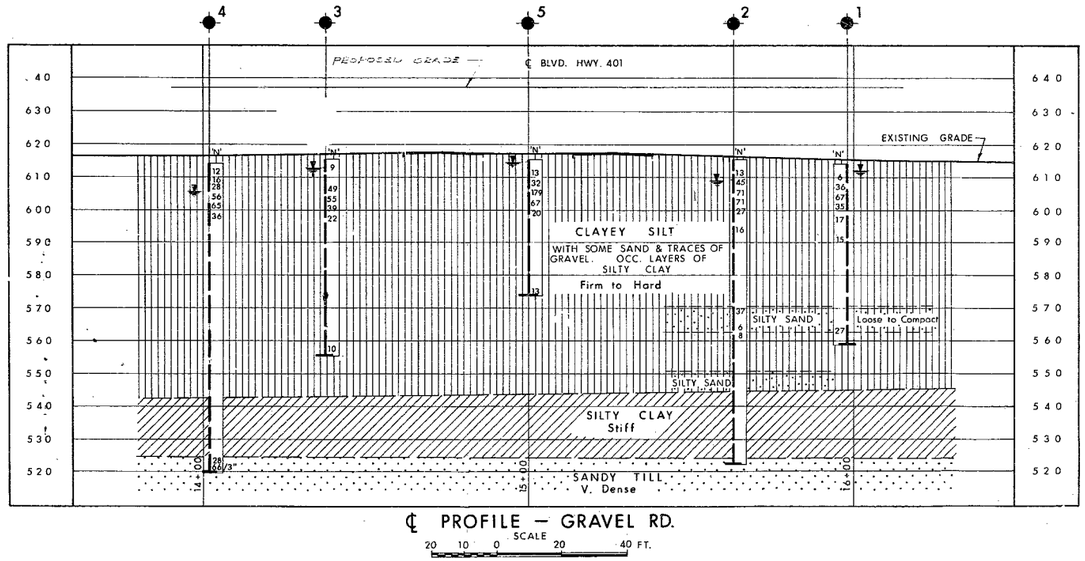
M. Devata
SENIOR FOUNDATION ENGINEER

For: A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

65-F-82
W.P.# 129-64
HWY. # 401 &
MAIDSTONE
TWP. RD.

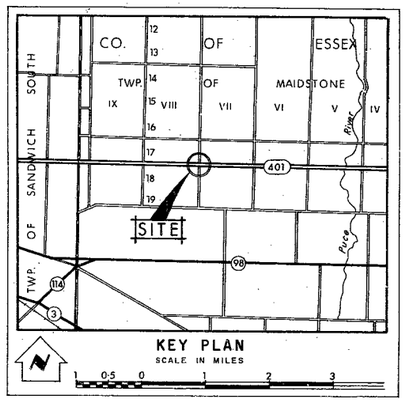


PLAN
20 10 0 SCALE 20 40 FT.



℄ PROFILE — GRAVEL RD.
SCALE
20 10 0 20 40 FT.

REF. NO. E-4346-1



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. (AUG. 1965)

NO.	ELEVATION	STATION	OFFSET
1	614·4	15+98	21' LT.
2	615·8	15+63	22' RT.
3	615·6	14+38	25' LT.
4	614·4	14+02	17' RT.
5	615·7	15+00	30' 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.

PRINT RECORD		
NO.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

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

MAIDSTONE TWP. RD. - CON. VIII

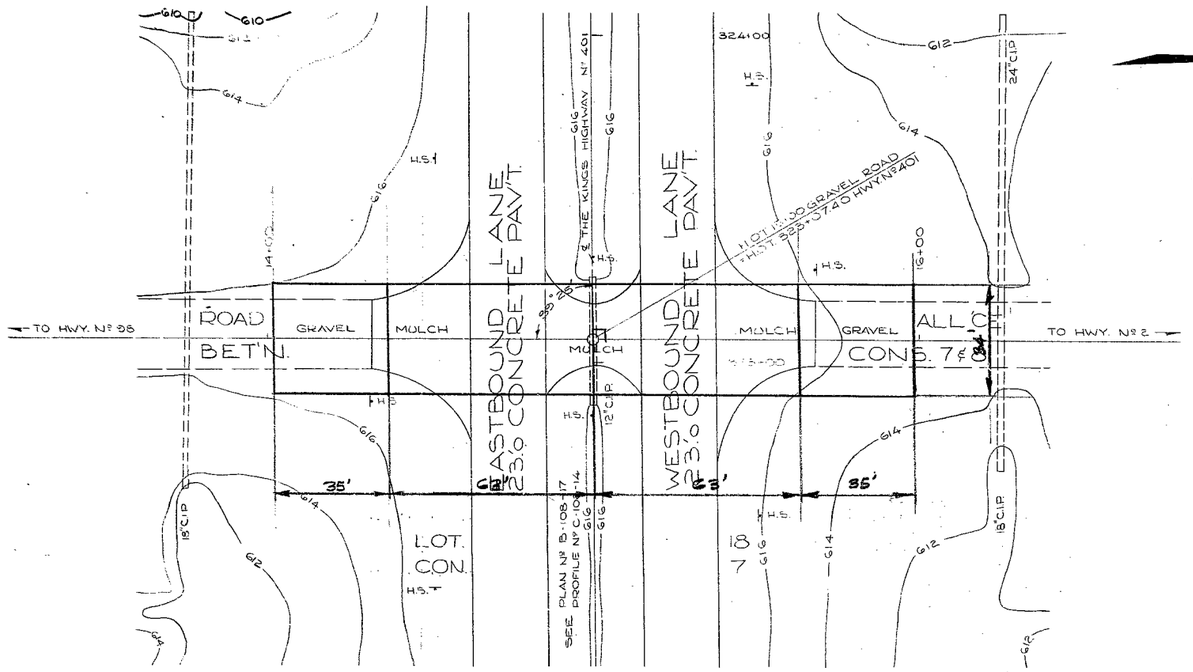
KING'S HIGHWAY NO. 401 DIST. NO. 1
CO. ESSEX
TWP. MAIDSTONE LOT 18 CON. VII & VIII

BORE HOLE LOCATIONS & SOIL STRATA

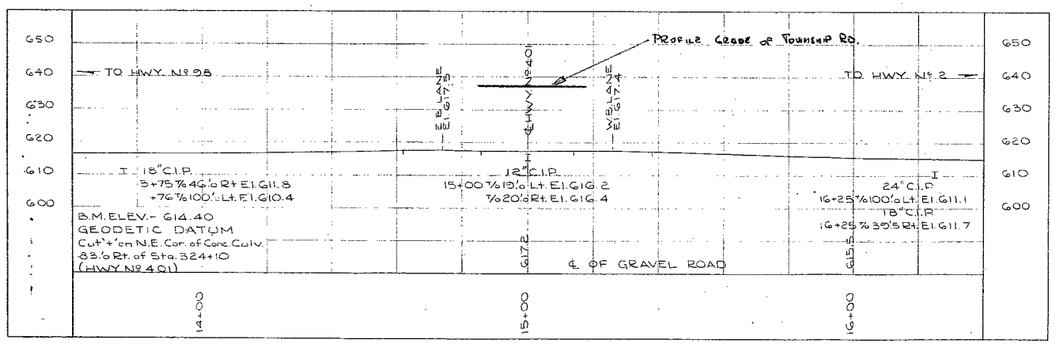
SUBM'D. P. P.	CHECKED W.S.	W.P. NO. 129-64	M.B.T. DRAWING NO. 65-F-82 A
DRAWN S. O.	CHECKED A.C.	JOB NO. 65-F-82	
DATE 3 OCT. 1965		SITE NO.	BRIDGE DRAWING NO.
APPROVED A.G. Wormald PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	

E-4346-1

COUNTY OF ESSEX
TOWNSHIP OF MAIDSTONE
CON. 8
LOT. 18



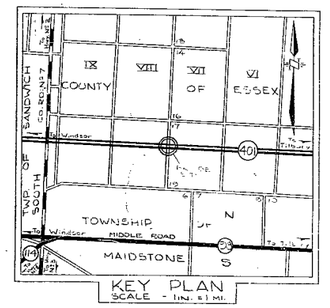
PLAN
SCALE - 1 IN. = 20 FT.



PROFILE
HOT MIX GRAVEL ROAD ON ℄ OF HWY Nº 401
SCALE HOR. - 1 IN. = 20 FT.
VER.

FILE COPY

NOTE: SKETCH SHOWS PROPOSED LOCATION OF BRIDGE AS SUBMITTED TO FOUNDATION INVESTIGATION APRIL 2. 65.



G.B.M. Nº 2072 Elev. 625.942
Roman Catholic Church, 1874. Tablet in stone foundation of northwest side wall, 16 feet from front corner and in first course below brickwork. Publication Nº 19. "MAIDSTONE"

W.P. 129-64

DATE	REVISIONS & ADDITIONS	BY	CH'KD

DEPARTMENT OF HIGHWAYS-ONTARIO
DESIGN BRANCH
ENGINEERING SURVEYS DIVISION

BRIDGE SITE

PROPOSED CROSSING
AT
THE KING'S HIGHWAY Nº 401
AND
ROAD ALL'CE BET'N. CON. 7 & 8

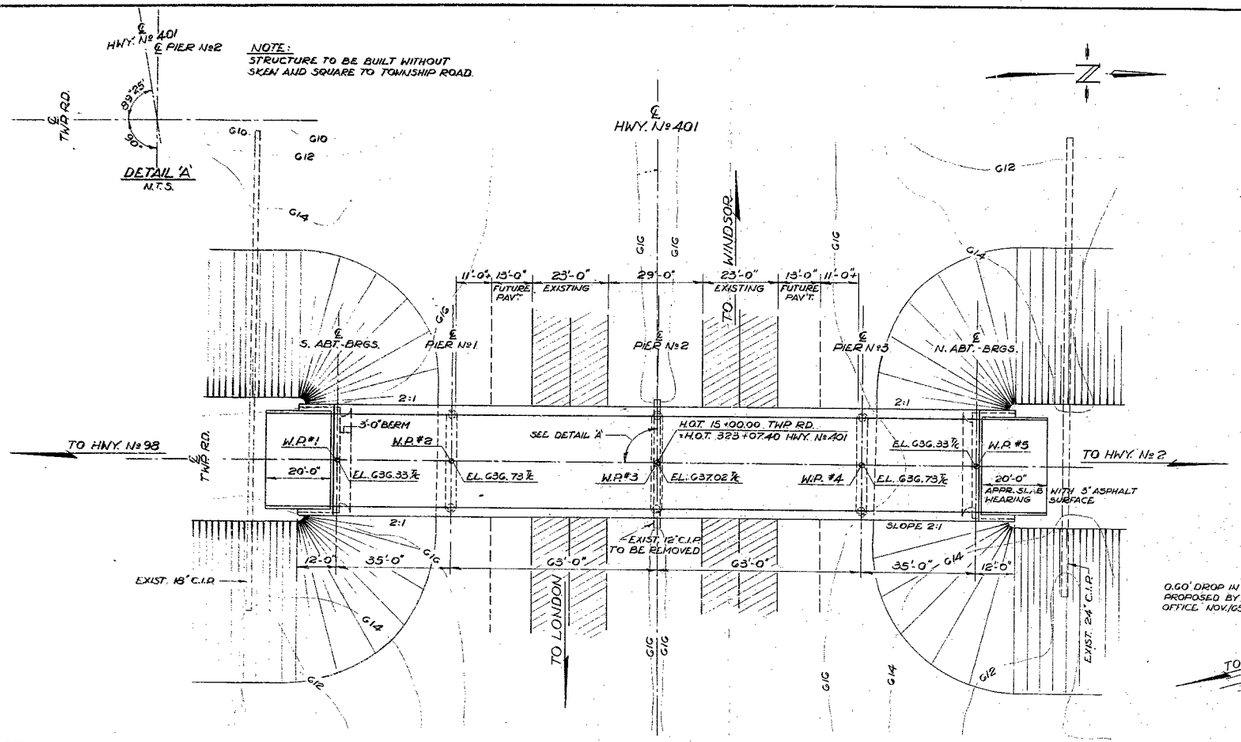
LOT 18 — CON. 7 & 8
TOWNSHIP OF MAIDSTONE — COUNTY OF ESSEX

SCALE	DISTRICT	REGION
AS SHOWN	Nº 1 CHATHAM	SOUTH-WESTERN
W.O. 9392-64-107	Date of Survey JAN. 1965 Plan MAR. 1965	SITE Nº
SURVEY BY: Chief of Party - R. SCHAEFER; Supervisor - G. BAUN	DRAWN BY: Draftsman - J.C. ANDERSON; Supervisor - J. CAMILLERI	
CHECKED BY: Draftsman - P.J. RULLI; Supervisor - J. CAMILLERI	PLAN Nº E-4346-1	

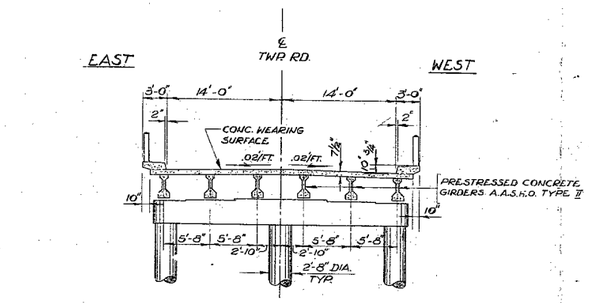
E-4346-1

348400 E
4677850N

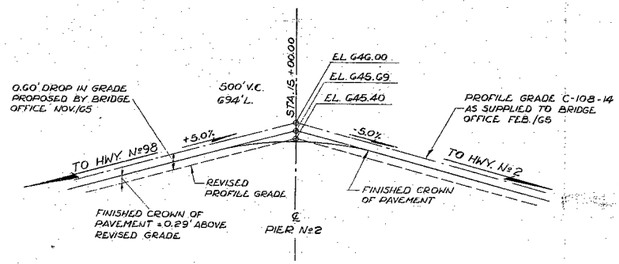
40 J 2 W



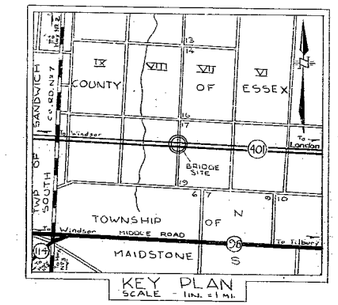
PLAN
SCALE: 1" = 20'-0"



TYP. DECK SECTION
SCALE: 1/8" = 1'-0"

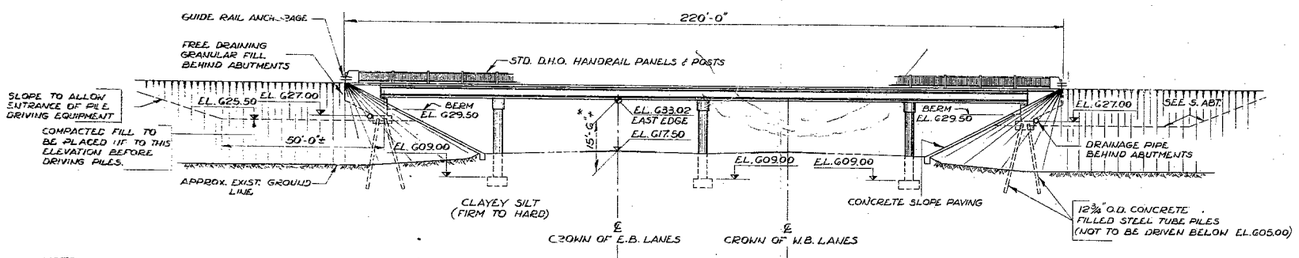


PROFILE OF TWP. RD.
N.T.S.



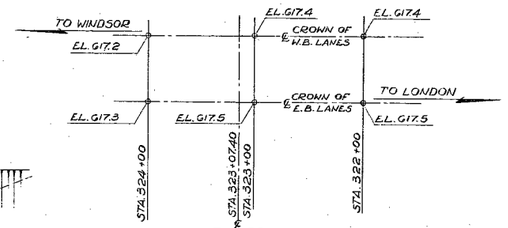
REFERENCE BENCH MARK
B.M. ELEV. 614.40 GEODETIC DATUM
CUT + ON N.E. CORNER OF CONC. CULV. 83.0' RT. OF STA. 324+10 (HWY. № 401)

NOTE:
℄ DENOTES ELEVATIONS ARE TO TOP OF CONCRETE WEARING SURFACE



ELEVATION
SCALE: 1" = 20'-0"

NOTE:
* CLEARANCE INCLUDES 3" ALLOWANCE FOR FUTURE RESURFACING OF HWY. № 401



EXIST. CROWN OF PAVEMENT ELEVATIONS
HWY. № 401
N.T.S.

PRINT RECORD

No.	FOR	DATE

REVISIONS

DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

MAIDSTONE TWP RD CONCESSION VIII
UNDERPASS
0.3 MILES EAST OF HWY. № 98

KING'S HIGHWAY No. M.C.F. (401) — DIST. No. 1
CO. ESSEX
TWP. MAIDSTONE — LOT 18 — CON. VIII / VII

PRELIMINARY PLAN

APPROVED _____ BRIDGE ENGINEER

DESIGN	K.G.B.	CHECK		SITE No.	G-237
DRAWING	A.A.	CHECK		W.P. No.	129-64
DATE	NOV/65	LOADING	M20-S16	CONTRACT Nos.	
				DRAWING No.	D-5840-P1

REGISTERED PROFESSIONAL ENGINEER
CIVIL
K.G. BASSI
PROVINCE OF ONTARIO