

Our Ref. 2453-C-3a

March 9th, 1962

Mr. J. Gruspier,
Regional Office,
Department of Highways of Ontario,
Kingston, Ontario.

Dear Mr. Gruspier:

Re: Ottawa Queensway - W.P. 943-59
Contract Plans

We are enclosing herewith one print each of the Contract Plans, Sheets 4, 5, 6, 7, 8 and 9, for the Bell Street to O'Connor Street Contract.

You may wish to review these in advance of the Regional Contract Review Meeting to be held here at the District Office on Wednesday morning March 14th.

You will note that we have shown the locations, depths and limits of the areas where there is muskeg excavation according to McRostie & Associates Report SF-594, two copies of which are enclosed.

Yours very truly,

DE LEUW, CATHER & CO. OF CANADA LIMITED


G. G. Stewart
Project Manager

GGS:rm

Encls.

MCROSTIE & ASSOCIATES LTD.

CONSULTING ENGINEERS
OTTAWA 1

CANADA

G. C. MCROSTIE, B.A.Sc., O.L.S., P. ENG., M.E.I.C.
ASSOCIATES
SETO, E. ENG., P. ENG., M.E.I.C.
A. L. GENEST, B. ENG., M. ENG., P. ENG.
W. J. MACLEARN, B.A., D.L.S., O.L.S.393 BELL STREET
TELEPHONE CE. 2-5334REPORT ON THE QUEENSWAY EMBANKMENT FOUNDATION
BETWEEN BRONSON AND ELGIN STREETS, OTTAWA1. TABLE OF REFERENCE

We were requested by the Ottawa office of De Leuw Cather and Company of Canada Limited during a meeting held on January 25, 1962, at which Mr. J. Gruespier of the Department of Highways of Ontario and Mr. G. Stewart of De Leuw Cather and Company were present, to determine the longitudinal and lateral limits of sub-excavation required for the removal of organic material detrimental to the future Queensway embankment between Bronson and Elgin streets in Ottawa. The field program was to include a test trench to identify the basic type of organic material present and to evaluate the workability of this deposit with usual excavating equipment.

2. CONCLUSIONS AND RECOMMENDATIONS2.1 Removal of organic material based on compressibility criterion

The longitudinal boundaries of sub-excavation required along the Queensway to remove the organic deposit that could be detrimental to the embankment were chosen within the limits where the thickness of the in-situ fill was less than twice the thickness of the underlying organic material. This criterion was chosen because it is felt that for this thickness of compressible layer at least the primary consolidation will be completed within 12 to 16 months after the embankment is constructed, and since paving operations will be scheduled to begin only after that time has elapsed.

To comply with the compressibility criterion the longitudinal limits of sub-excavation required for the removal of organic material may be generalized as follows: between stations 369+00 and 381+00 near Percy Street; between stations 397+00 and 403+00 near O'Connor Street; between stations 404+00 and 413+00 near Metcalfe Street. Plates No. 1-B, 1-D, 1-E indicate the approximate boundaries established from factual results of boreholes and test pits and from some interpretation made between boreholes and pits. The subsoil data obtained from boreholes and test pits and used as basis for this study has been previously submitted in our report No. SF-562, Queensway Embankment, Bell to Elgin Streets, and in Golder and Associates report No. 6146 made available to us.

2.2 Removal of organic material based on stability criterion

The lateral limits of sub-excavation required along the Queensway for the removal of the organic deposit that would cause instability of embankment slopes and embankment retaining walls were determined as follows:

In the case where an embankment retaining wall foundation (including those on piles) is located at an elevation above the organic material, slip circle analyses were made to determine the factor of safety against shear failure through the underlying organic layer. When the factor of safety determined is less than the accepted 1.5, removal of the organic layer to at least the toe of the retaining wall is recommended, but in most cases removal of the organic layer should

should extend to the Queensway right-of-way to secure a factor of safety against shear failure of about 1.4. Near station 376+00 the excavation of the organic material up to the Queensway right-of-way may necessitate underpinning of the Dominion Rubber Company Limited building. However, the organic material can remain in areas where an embankment retaining wall foundation (whether on piles or footings) is located at an elevation lower than the underside of the organic layer.

In the case where an embankment slope is located above the organic material, slip circle analyses were made to determine the factor of safety against shear failure through the underlying organic layer. Embankment slopes of 2 horizontal to 1 vertical were generally assumed but in areas where flatter slopes and berms have been tentatively designed the true sections made available to us were used in the slip analyses. When the factor of safety against shear failure is less than the conventional 1.5, removal of the organic layer is recommended. The excavation of the organic material would extend in the north or south direction, with respect to the Queensway centreline, to a point on the existing grade where, when projected vertically downwards to the underside of the organic layer, this point would fall on a line passing through the crest of the embankment on a 1 to 1 slope. When the fulfilment of this criterion fail to yield a factor of safety of 1.5, removal of the organic material on a 2 horizontal to 1 vertical slope, from the crest of the embankment to the underside of the organic layer, is necessary. However, this case has been found to occur wherever existing shallow fill overlies a few feet of organic material. The fulfilment of the appropriate criterion will yield an adequate factor of safety against shear failure for various embankment slopes proposed at these sites.

To comply with the stability criterion the lateral limits of sub-excavation required for the removal of organic material have been drawn where necessary in the neighbourhood of Percy Street, O'Connor Street and Metcalfe Street, and can be seen on the accompanying plates No. 1-B, 1-D, 1-E. The lateral extent of the organic deposit at various locations under the proposed Queensway embankment has been established from factual results of boreholes and test pits and from some interpretation made between boreholes and pits. The subsoil data obtained from boreholes and test pits and used as basis for this study has been previously submitted in our report No. SF 562, Queensway Embankment, Bell to Elgin Streets, and in Golder and Associates report No. 6146 made available to us.

3. SITE INVESTIGATION

3.1 Field Work

Three trenches, 3 feet wide by about 20 feet long, were dug with a backhoe in an area where a thick layer of organic material had been detected in a previous investigation (report No. SF-562). The trench locations are shown on the accompanying Plate No. 1-B. Two of the test pits were excavated down to the underlying in-situ cohesive stratum while the third pit was excavated down to only the underside of the organic layer. Classification of the subsoil was made from within the trenches in order to determine the thickness and nature of the organic layer underlying an existing fill deposit, and to detect any variations in these layers. Tube samples were recovered from the organic stratum and brought to our laboratory for examination and testing.

3.2 Laboratory Testing

Specific gravity and unit weight determinations were made on tube samples recovered from trench No. 2. An in-situ density determination was also carried out; water contents and visual classifications were performed on all samples.

3.3 Observations

The subsoil profile as revealed by the test pits is shown on the accompanying plates No. 2, 3, 4. The subsoil may be generalized as consisting of about 5 feet of fill underlain by approximately 3 feet of organic material overlying silt and sand.

The fill deposit is chiefly composed of cinders, sand and gravel and remained stable during excavation. The organic stratum at the trench sites is essentially fibrous, only partially decomposed, has a specific gravity of 1.60 and a dry unit weight of 14.9 p.c.f. The in-situ density of the organic material was determined as 58.5 p.c.f. and the present water content was 292%. The excavation revealed that the organic stratum could be removed by usual excavating equipment. The groundwater level was found to be lower than the underside of the organic layer at the time of excavation, but it is felt that because the organic layer is fibrous in nature higher groundwater levels should not render much more difficult the excavation of this organic material. The four walls of the trenches and in particular the middle of the walls in the longer direction remained stable for at least 24 hours after completion of the trenches. Sub-zero weather at the time of excavation causing the walls to freeze somewhat could have contributed to this stability, but we are of the opinion however, that the organic layer should still remain stable during excavation.

The nature and workability of the organic material described above may vary with the locations of the organic layers. Any variation in nature or workability of the organic material encountered during construction should be brought to the attention of the supervising authority without delay.

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QUEENSWAY EMBANKMENT
TRENCH

NEAR STATION 376+00

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 223.0

DATE JAN. 30, 1962.

SECRET

REMARKS

TREACH
No. 1

DUG WITH POWER DIGGER

[illegible]

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OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QUEENSWAY EMBANKMENT
TRENCH
NEAR STATION 576+00

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 225.0'

DATE FEB. 1 1962

NOLETC

REMARKS NO WATER SEEPAGE & NO CAVING-IN

TRENC
No. 2

DUG BY POWER DIGGERS

[illegible]

EMBANKMENT

$$\gamma_T = 120 \text{ #/FT}^3$$
$$\phi = 28^\circ$$

$$\gamma_T = 100 \text{ #/FT}^3$$
$$\phi = 28^\circ$$

FILL

$$\gamma_T = 60 \text{ #/FT}^3$$

SHEAR STRENGTH = 0

ORGANIC MATERIAL

SAND & SILT

STATION 376+00 NORTH SIDE

235

222

215

210

R-38.1'

EMBANKMENT

$$\gamma_T = 120 \text{ #/FT}^3$$
$$\phi = 28^\circ$$

$$\gamma_T = 100 \text{ #/FT}^3$$
$$\phi = 28^\circ$$

FILL

$$\gamma_T = 60 \text{ #/FT}^3$$

SHEAR STRENGTH = 0

ORGANIC MATERIAL

SILT & SAND

STATION 376+00 SOUTH SIDE

241

228

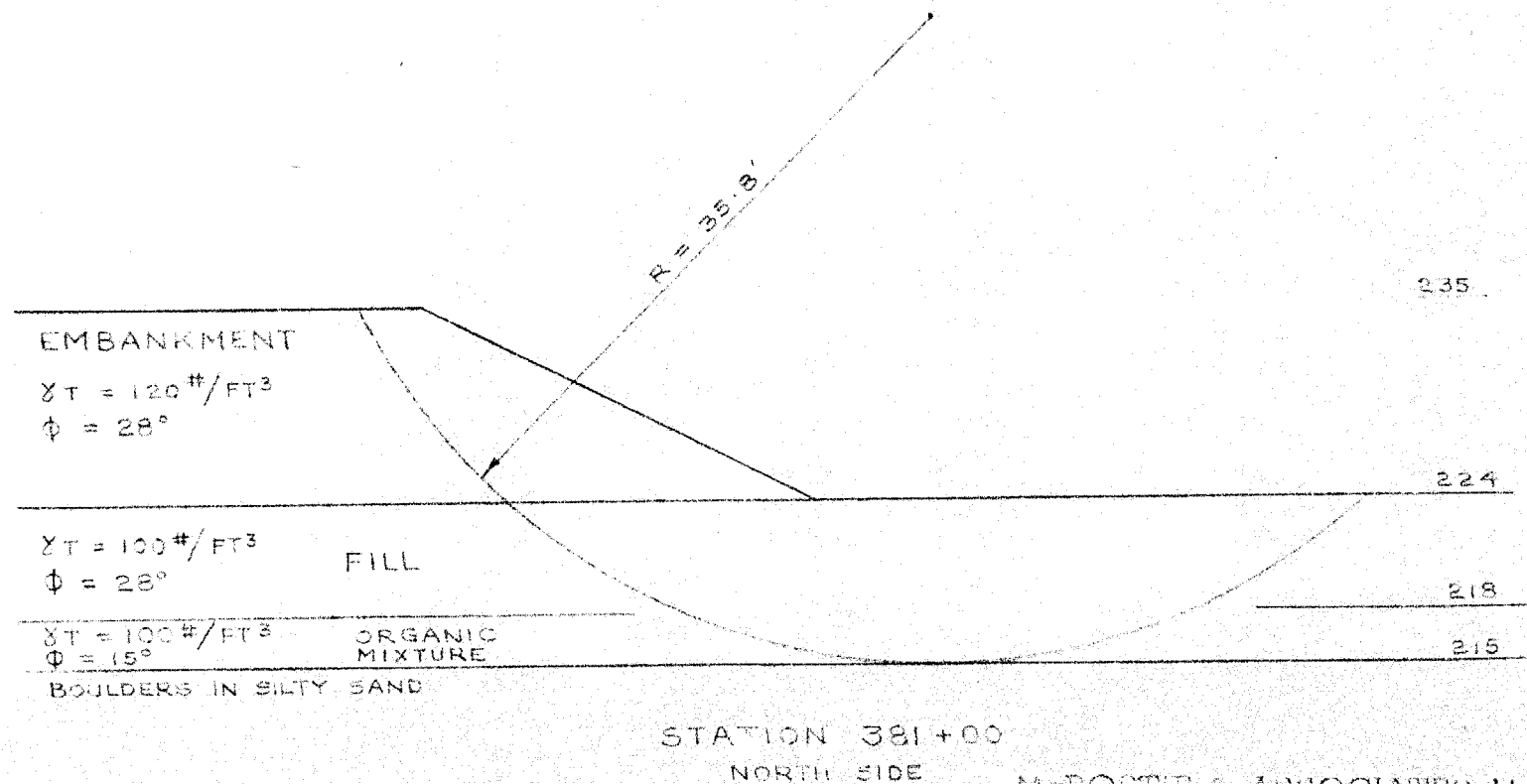
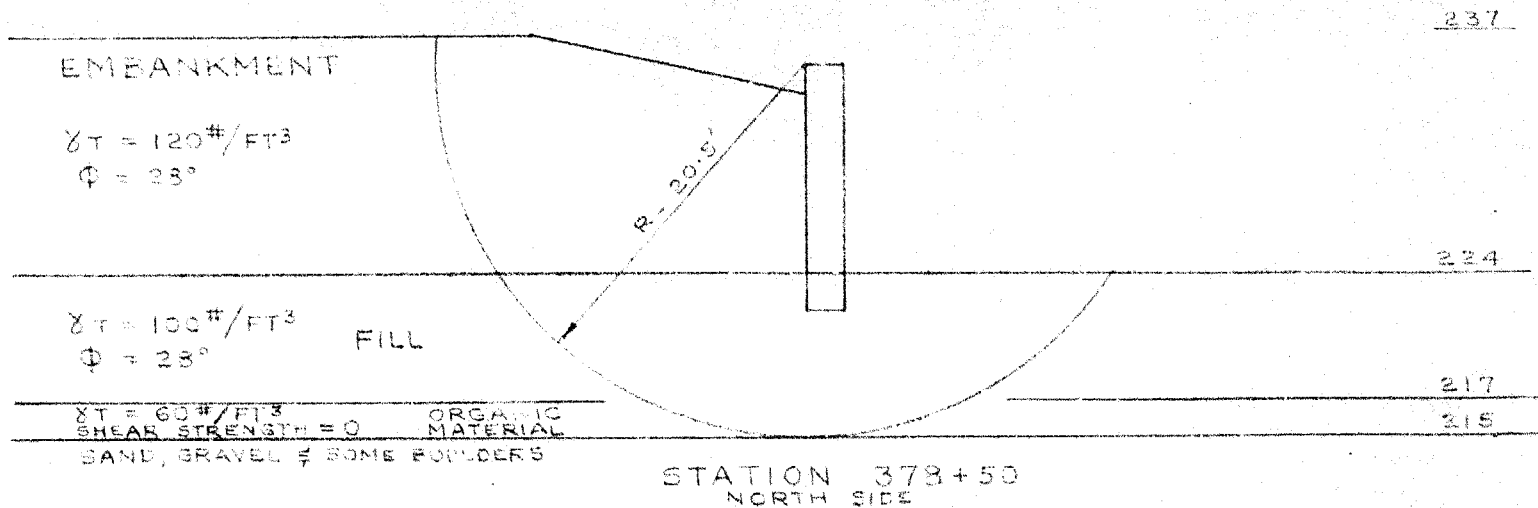
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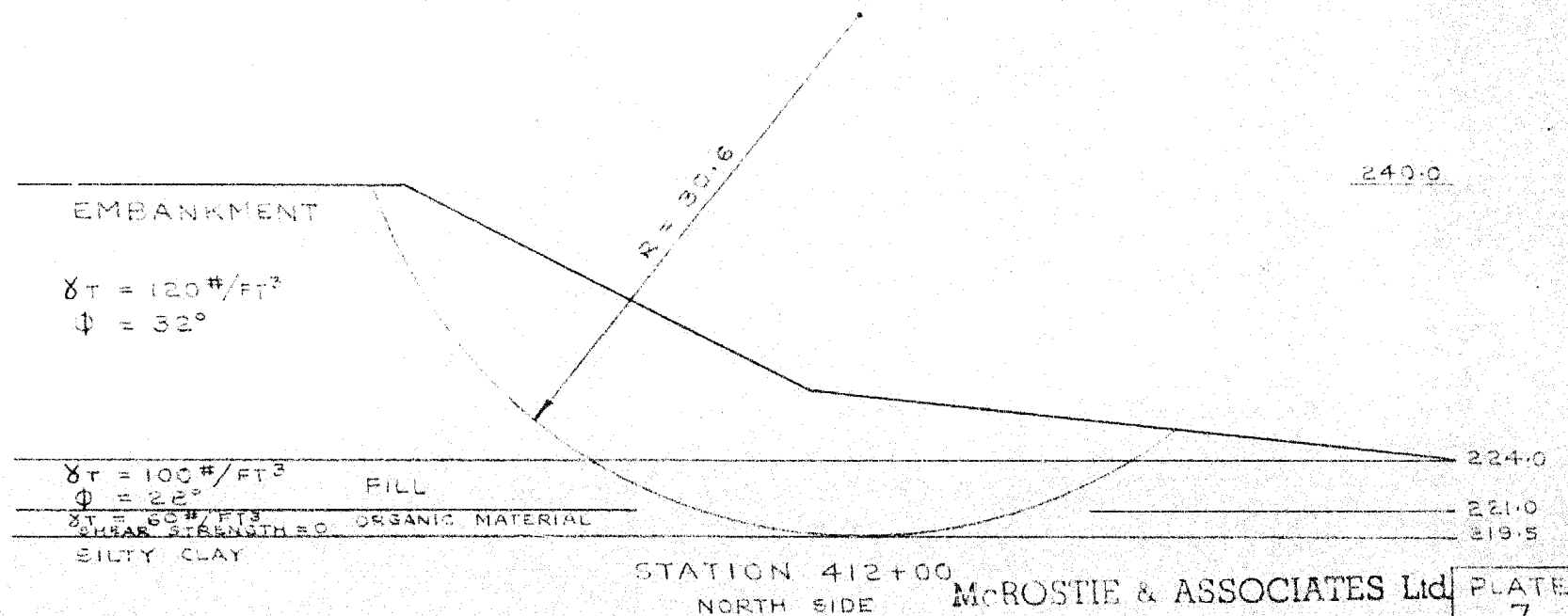
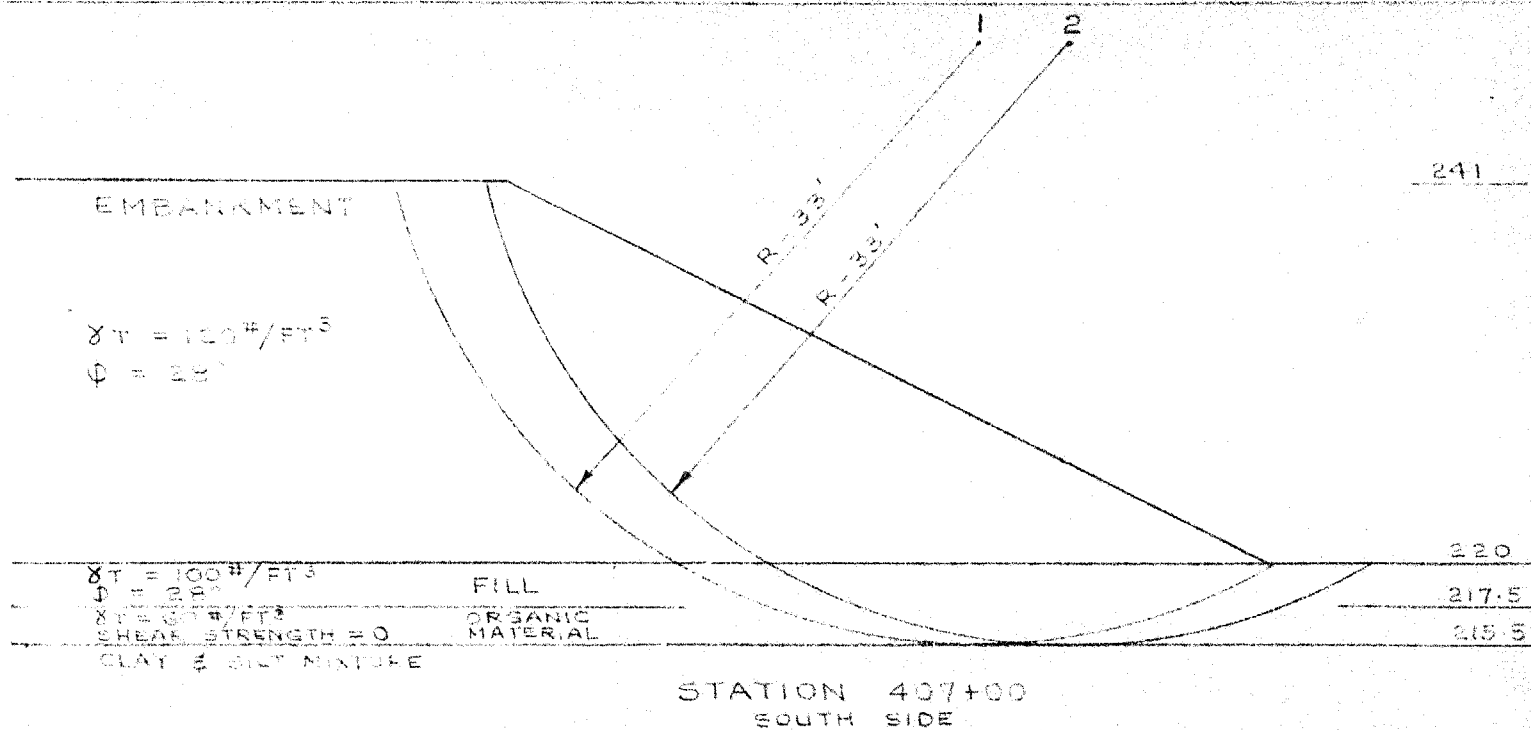
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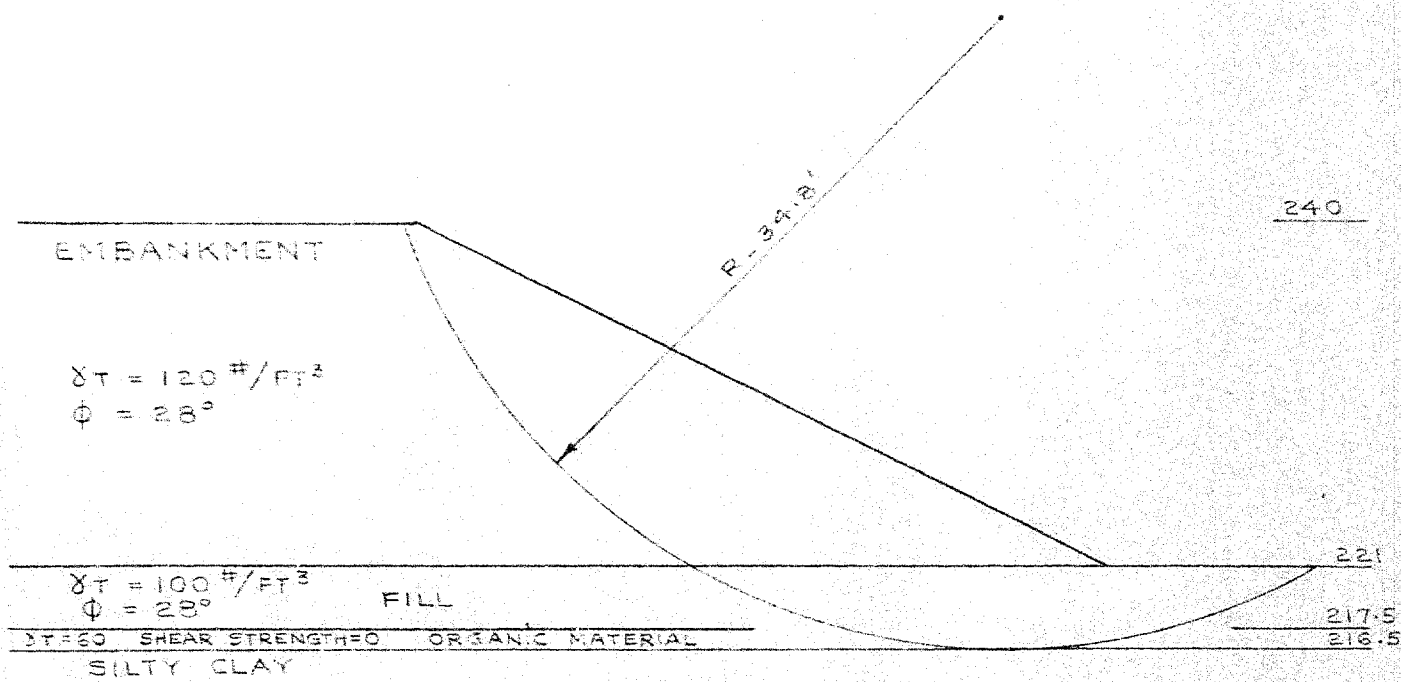
R-34.7

PLATE
5

M. ROSTIC & ASSOCIATES, INC.







STATION 410+00
SOUTH SIDE

STATION	SIDE	SLIP No.	EMBANKMENT		EXISTING FILL		ORGANIC OR MIXTURE 8 T P.C.F.	FILL & ORGANIC REMOVED	F.S.
			ϕ	γ T P.C.F.	ϕ	γ T P.C.F.			
376+00	NORTH	1	28°	120	28°	100	60		<1
			32°	120	REPLACED BY EMBANKMENT MATERIAL			TO TOE OF RETAINING WALL	1.0
			32°	120	REPLACED BY EMBANKMENT MATERIAL			UP TO RIGHT OF WAY	1.4
376+00	SOUTH	1	28°	120	28°	100	60		<1
			32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 1:1	1.7
378+50	NORTH	1	28°	120	28°	100	60		<1
			32°	120	REPLACED BY EMBANKMENT MATERIAL			UP TO RIGHT OF WAY	1.6
381+00	NORTH	1	28°	120	28°	100	100		1.8
407+00	SOUTH	1	28°	120	28°	100	60		<1
		1	32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 1:1	1.5
		2	32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 1:1	1.0
			32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 2:1	1.6
410+00	SOUTH	1	28°	120	28°	100	60		<1
			32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 1:1	1.0
			32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 2:1	1.6
412+00	NORTH	1	28°	120	28°	100	60		<1
			32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 1:1	1.2
			32°	120	REPLACED BY EMBANKMENT MATERIAL			SLOPE 2:1	2.1

#62-F-232C

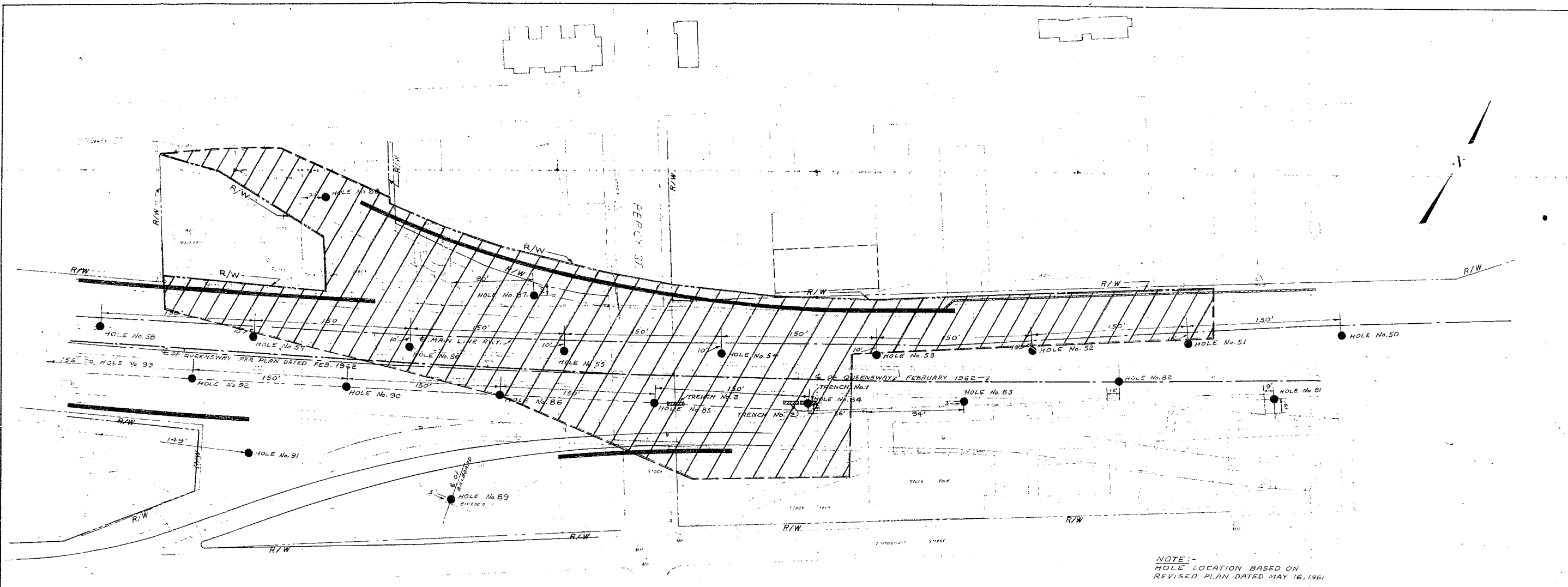
W.P. # 943-59

QUEENSWAY

OTTAWA

BRONSON &

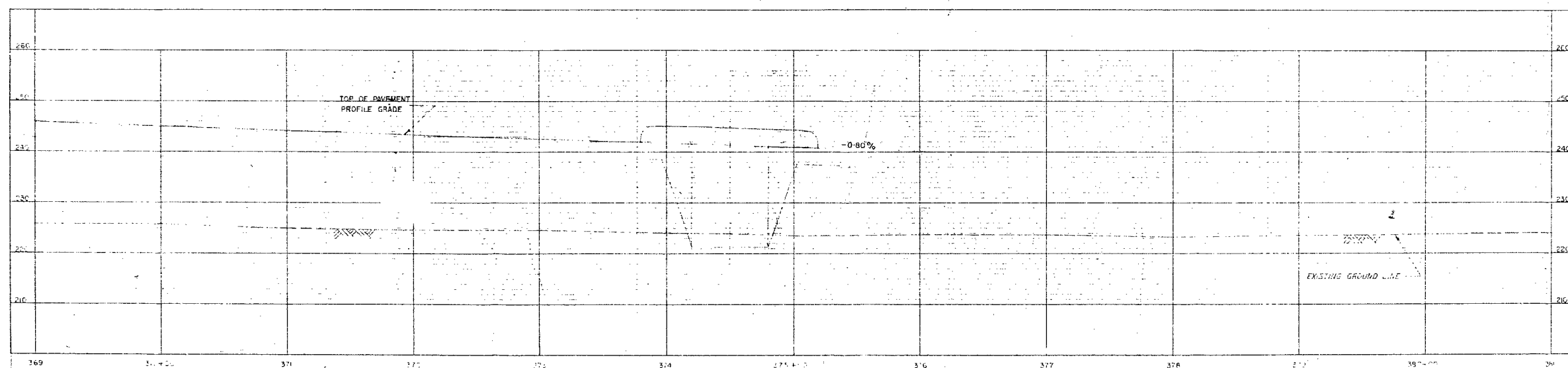
ELGIN STS.



PLAN

SCALE 1" = 40'

HOLE LOCATIONS BY:
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OTTAWA



PROFILE

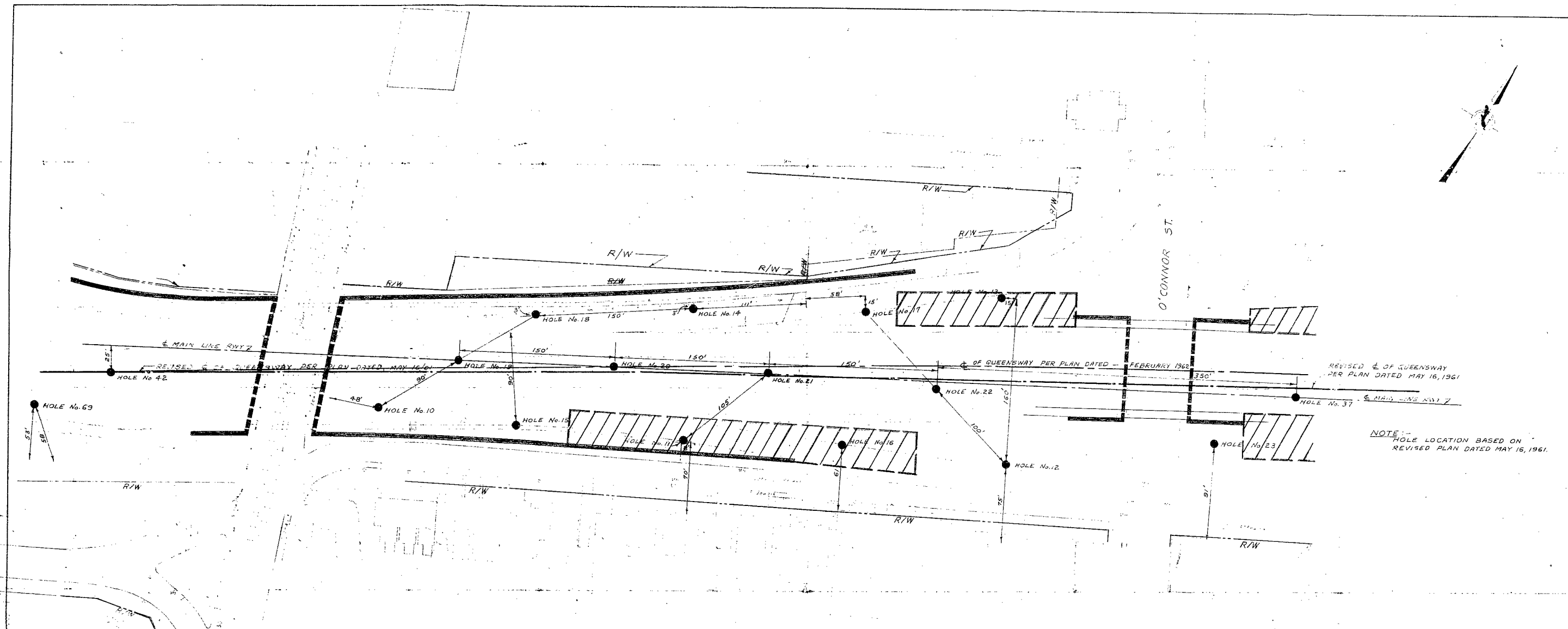
SCALE VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

No.	Revisions	By	Date
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DE LEUW, CATHY & CO. OF CANADA LIMITED Consulting Engineers		DEPT. OF HIGHWAYS OF ONTARIO Director of Planning & Design	
Designed By	Date	DWG. No.	
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W.J.W.		III-A-23	

PLATE 1-B

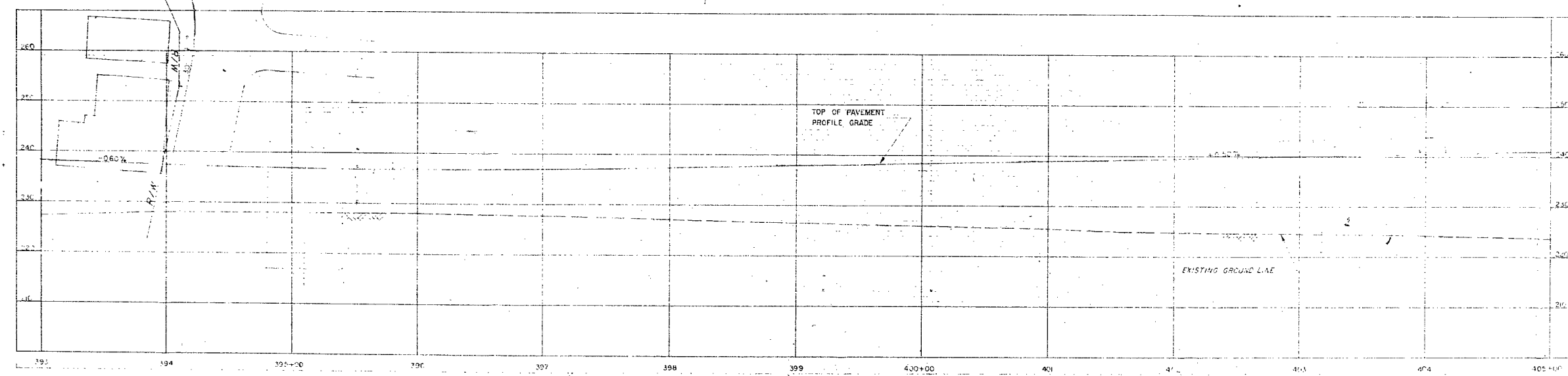
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TO CONDITION OF ORIGINAL DOCUMENTS



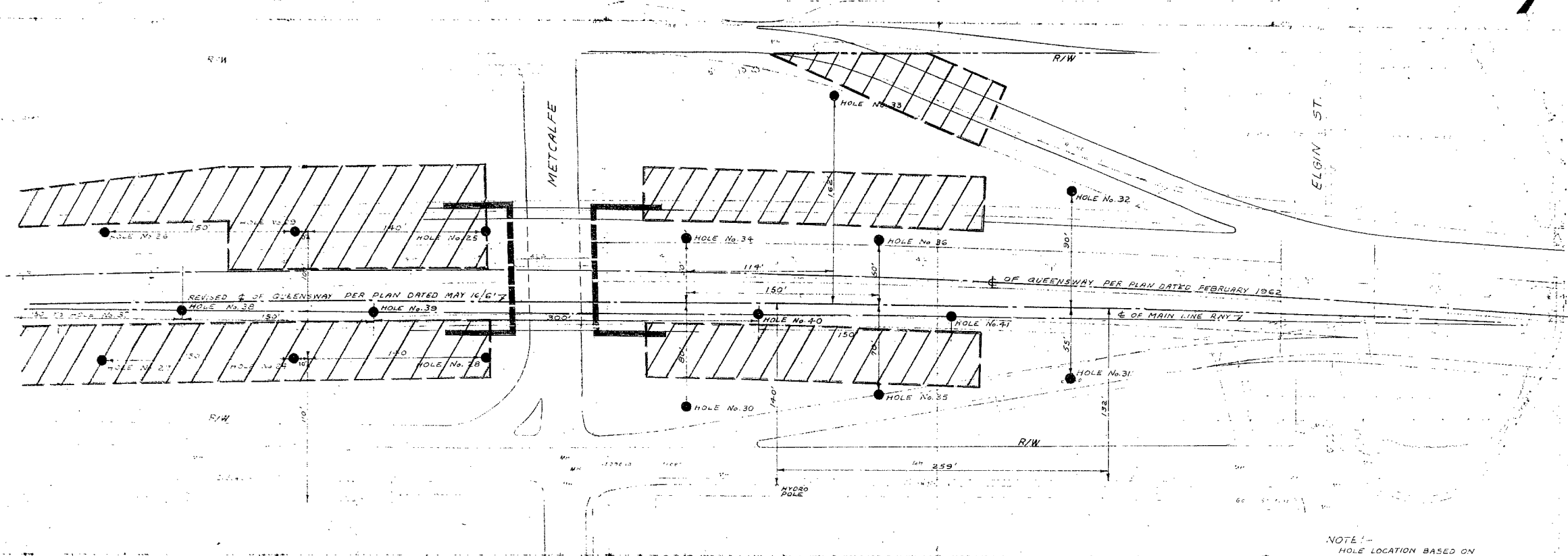
PLAN SCALE 1" = 40'

HOLE LOCATIONS BY -
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PROFILE SCALE VERTICAL 1" = 10' HORIZONTAL 1" = 40'

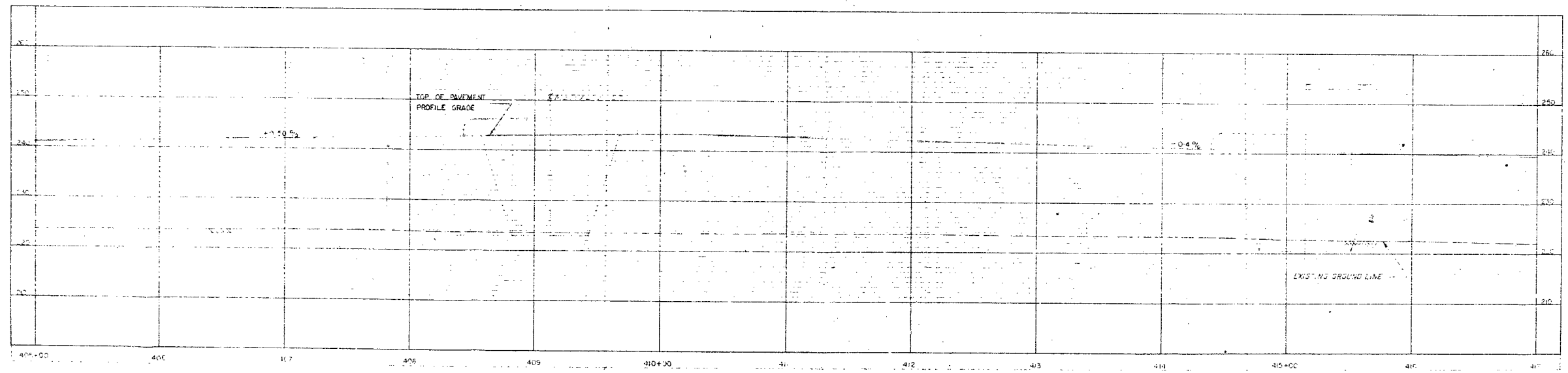
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E. LEWIS GATHEY & CO. OF CANADA LIMITED Consulting Engineers	DEPT. OF HIGHWAYS OF ONTARIO Director of Planning & Design
Drawn By: GSE Checked By: W.W.	Date: July 1959 Scale: as shown Sheet: 1 of 1 DWG. No: III-A-25



PLAN SCALE 1" = 40'

NOTE: -
HOLE LOCATION BASED ON
REVISED PLAN DATED MAY 16, 1961

HOLE LOCATIONS BY:-
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OTTAWA



PROFILE SCALE VERTICAL 1" = 10' HORIZONTAL 1" = 40'

No.	Revisions	By	Date
DEPARTMENT OF HIGHWAYS OF ONTARIO OTTAWA QUEENSWAY LIMITED-ACCESS HIGHWAY OTTAWA CANADA STA 405+00 TO STA 417+00 R/W & UTILITIES			
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Designed by	Date	DWG. No.	
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		III-A-26A	
PLATE I-E			