

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40J7-11

DIST. 1 REGION SOUTHWESTERN

W.P. No. 257-66-09

CONT. No. 75-082

W. O. No. 72-1148 72-11171

STR. SITE No. 6-287

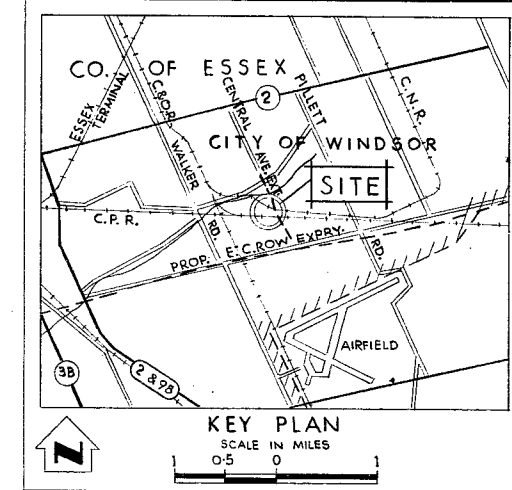
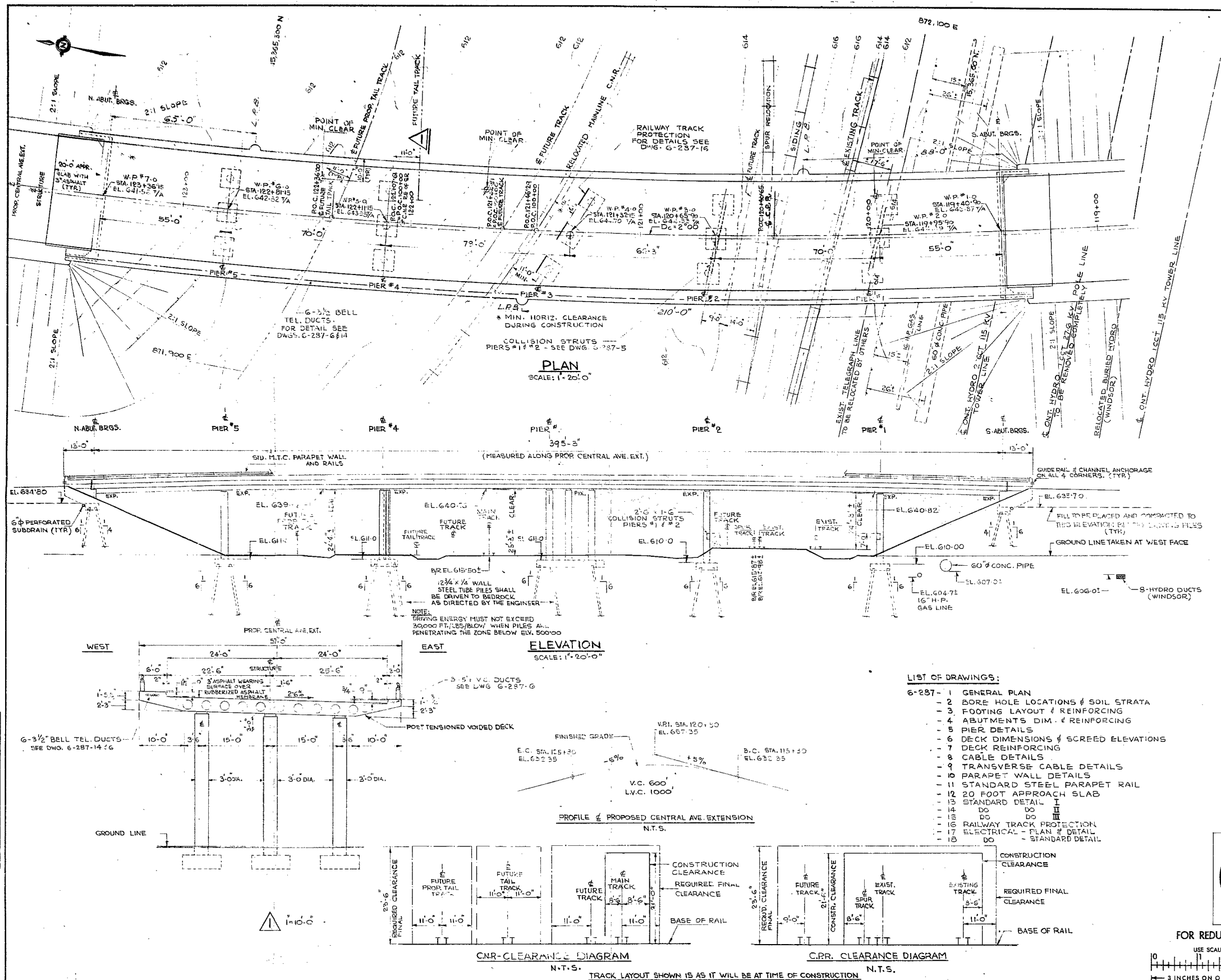
HWY. No. ERE

LOCATION CPR + CNR

CROSSING

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: 2 documents to be unfolded
before microfilmed



GENERAL NOTES:
CLASS OF CONCRETE:
DECK, CURBS ON DECK & PIERS - 5000 P.S.I.
PARAPET WALLS - 4000 P.S.I., REMAINDER - 3000 P.S.I.

CLEAR COVER TO REINFORCING STEEL:
DECK: TOP 1 1/2" BTM. 1"
CURBS: 2"
PARAPET WALLS 1 1/2" REMAINDER 3"

CONSTRUCTION NOTES:
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8". NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE DECK HAS BEEN PLACED, STRESSED AND GROUTED.

4077-11
GEORES No.

D.H.O. B.M. 530-66 617-972
TWO AND ONE HALF STOREY FRAME HOUSE (MASONIC TEMPLE) ON THE SOUTH SIDE OF E.C. ROW AVENUE EAST, BEING 1 MILE EAST OF THE INTERSECTION OF WALKER ROAD AND E.C. ROW AVENUE EAST AND 318 FEET SOUTH OF CENTRELINE OF PAVEMENT. TABLET IS SET HORIZONTALLY IN WEST FACE OF CONCRETE FOUNDATION BEING 5.6 FEET SOUTH OF THE NORTH WEST CORNER AND 0.4 FEET BELOW TOP OF FOUNDATION. ROUTE 13 WINDSOR.

CONCRETE QUANTITIES

| ITEM | DESCRIPTION | QUANTITY |
|------|---|------------|
| 1 | CONCRETE IN PIERS, ABUTS AND APPROACH SLABS | 125.0 C.Y. |
| 2 | CONCRETE IN PARAPET WALLS | 193.5 C.Y. |
| 3 | CONCRETE IN DECK | 55.0 C.Y. |
| 4 | CONCRETE IN APPROACH SLABS | 42.1 C.Y. |

REVISIONS

| NO. | DATE | BY | DESCRIPTION |
|-----|-----------|------|-----------------------------|
| 1 | DEC 27/75 | J.S. | NOTE FOR PILE DRIVING ADDED |
| 2 | JAN 16/76 | D.G. | UTILITIES ADDED |

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

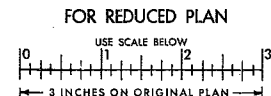
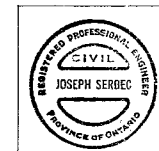
C.N.R. & C.P.R. O'HEAD
CENTRAL AVE. EXTENSION

KING'S HIGHWAY No. E.C. ROW EXPSWY. DIST. No. 1
CO. OF ESSEX LOT 102 CON. 2
CITY OF WINDSOR

GENERAL PLAN

| DESIGN | CHECK | DATE | W.P. No. | CONTRACT No. |
|--------|-------|------------|-----------|--------------|
| J.C. | CHECK | SEPT. 1975 | 257-66-09 | |
| D.G. | CHECK | | | |

DATE: SEPT. 1975 LOADING: 115 20-44 SITE No. 6-287 SHEET 1



MEMORANDUM

| |
|-------------|
| 40-5-51 |
| GEOCRES No. |

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

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

ATTENTION: Mr. S. Jants,
Structural Planning Technician.

DATE: April 30, 1973.

OUR FILE REF. IN REPLY TO

JUN - 6 1973

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
The Proposed Bridge Site 6-287
C.N.R. & C.P.R. Overhead at
Central Avenue Extension
E.C. Row Expressway
District #1, Chatham, Ont.

| |
|-------------|
| 4037-11 |
| GEOCRES No. |

W.O. 72-11171 -- W.P. 257-66-09

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above-mentioned 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/ao
Attch.
c.c.

E. J. Orr
B. R. Davis
A. Rutka
A. Wittenberg
F. C. Brown
B. J. Giroux
J. R. Roy
G. A. Wrong
B. A. Singh

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

Foundations Files

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FOUNDATION INVESTIGATION REPORT
For
The Proposed Bridge Site 6-287
C.N.R. & C.P.R. Overhead at
Central Avenue Extension
E.C. Row Expressway
District #1, Chatham
W.O. 72-11171 -- W.O. 257-66-09

1. INTRODUCTION:

A foundation investigation was undertaken for the proposed C.N.R. and C.P.R. Overhead at Central Avenue Extension. A multitude of possibilities exist in this case because the railway requirements are not finalized. On receiving a request from Mr. S. Jants, Structural Planning Technician for the Southwestern Region, dated February 21, 1973, a field and laboratory investigation was undertaken by this Office so as to determine the existing subsoil and groundwater conditions at the proposed crossing. Presented in this report are the results of the investigations together with recommendations concerning the structure foundations.

2. DESCRIPTION OF SITE:

At the proposed crossing the land is relatively flat. The area around the site is generally used as farmland. To the south-east the City of Windsor is constructing a garbage transfer station.

Geologically, this site is part of the physiographic region known as the St. Clair Clay Plain. The region is one of little relief with a deep deposit of clay, being approximately 118 ft. at this site.

3. FIELD WORK AND LABORATORY INVESTIGATION:

The field work consisted of ten sampled boreholes and five dynamic cone tests, four of the cones being adjacent to four of the boreholes. Eight of the boreholes were advanced by a Bombardier mounted C.M.E. equipped with hollow stem augers and the other two boreholes by a Bombardier mounted continuous-flight auger. The bedrock in B.H.'s 7 and 12 was cored using a BX core barrel. Split-spoon samples were taken at regular intervals and standard penetration "N" values were obtained in driving the split spoon. The resulting penetration "N" values are recorded in the Appendix. Thin walled 2 inch I.D. Shelby tube soil samples were taken by advancing the Shelby tubes hydraulically. The in situ undrained shear strength was measured using an M.T.C. vane. All field and laboratory test results are recorded on the accompanying borelog sheets.

Soil samples were identified in the field and again upon arrival in the laboratory. Laboratory tests to determine moisture content, grain size and Atterberg Limits were carried out on representative samples. The soil samples obtained from Shelby tubes were subjected to unconfined compression tests, triaxial compression tests, and consolidation tests.

The groundwater levels across the site were determined by recording the water levels in the open boreholes over the period of the investigation.

The locations and elevations of the boreholes as well as the inferred stratigraphical profile are plotted on Drawing 72-11171A attached to this report. The surveying of the site was carried out by personnel from the Southwestern Region Engineering Surveys Section.

4. SUBSOIL CONDITIONS:

4.1) General:

Generally uniform subsoil conditions were found to prevail over the site area. The subsoil consisted of a deep

deposit of cohesive soil, followed by a compact to very dense silty sand (B.H. #177 & 182) followed by limestone bedrock. The boundaries between different deposits are shown on Record of Borehole sheets attached to the Appendix. The estimated stratigraphical profile of Drawing 72-11171A is based on this information. Following is a description of the subsoil.

4.2) Clayey Silt With Sand and Traces of Gravel:

This deposit was encountered in all the borings and extended from the ground surface to the bedrock about 118 ft. down. In B.H. #177 and 182 an approximate 8 ft. layer of compact to very dense silty sand was found to overlie the limestone bedrock. A plot of Plastic Index versus Liquid Limit (Fig. 2) shows that the great majority of the points fall within the CL zone. In some boreholes relatively thin layers of granular soil were found.

The upper portion of the deposit contain an 8 to 16 ft. thick, very stiff to hard desiccated zone brown in colour. Below this zone the colour of the clayey silt changes to grey and the consistency ranges between very stiff and hard.

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

| | |
|--------------------------------------|------------|
| Natural Moisture Content (%) | 10 - 39 |
| Liquid Limit (%) | 20 - 44 |
| Plastic Limit (%) | 12 - 23 |
| Bulk Density (p.c.f.) | 128 - 137 |
| "N" Values (Blows/ft.) | 11 - >100 |
| <u>Undrained Shear Strength</u> | |
| Field Vane (p.s.f.) | 800 - 2000 |
| Unconfined Compression Test (p.s.f.) | 740 - 1740 |
| Triaxial Compression Test (p.s.f.) | 685 - 1655 |

A typical grain size distribution curve envelope is included in the Appendix as Fig. 3.

4.3) Limestone Bedrock:

Bedrock at this site was found to consist of generally sound limestone.

5. GROUNDWATER CONDITIONS:

The following groundwater levels were observed during the field investigations:

| | |
|-----------|-------|
| B.H. #171 | Dry |
| B.H. #172 | Dry |
| B.H. #174 | 611.6 |
| B.H. #175 | 612.0 |
| B.H. #176 | 612.0 |
| B.H. #177 | 611.3 |
| B.H. #178 | 611.8 |
| B.H. #179 | 611.8 |
| B.H. #180 | 611.9 |
| B.H. #182 | 611.1 |

6. RECOMMENDATIONS:

6.1) General:

At the present time three proposals for the new overhead bridge are being considered. These are:

- a) Four-span (65.5 - 109 - 109 - 65.5) structure
- b) Four-span (68.5 - 96 - 96 - 45) structure
- c) Five-span (58 - 96 - 45 - 78 - 45) structure.

The proposed grade is such that 30 - 32 ft. high approach embankments will be required.

6.2) Foundations:

The following alternative methods of supporting the structure should be considered:

1) Spread Footings in Original Ground:

The entire structure may be supported on spread footings placed within the very stiff to hard desiccated zone of the subsoil between elevation 605 and elevation 598. A safe

net pressure of 3.5 t.s.f. may be assumed for design purposes.

The desiccated zone is susceptible to softening on contact with water, therefore, it is recommended that the base of the footing excavations be protected by a concrete working slab, immediately on exposure.

All foundations should be protected against frost action by at least 4 feet of earth cover. No dewatering problems are anticipated.

The estimated maximum settlement will be in the order of 1.0 to 1.5 inches under the pier footings.

2) Spread Footings on Compacted Fill:

As an alternative, the abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 t.s.f. may be assumed. The granular material should consist of G.B.C. Class 'A' and should be fully compacted according to the current Standards. A detailed construction scheme is outlined on Figure 1.

3) Perched Abutments on Short Piles:

As a second alternative, the abutments may be constructed within the approach fills and supported on short piles driven through the fill and some 10.0 ft. into original ground. In the case of 12-3/4" O.D. and 1/4" thick wall steel tube piles, a safe design load of 25 tons per pile may be used.

It should be pointed out, that this latter proposal is based on experience with similar structures and similar subsoil conditions in the general area.

Regardless of which method is adopted, the structure should be built to accommodate the 3 to 3.5 inches differential settlement between the abutments and piers.

4) End-Bearing Piles:

As another alternative, the abutments and piers may be supported on steel H-piles driven to bedrock. The maximum allowable load for the particular steel sections may be

assumed for design purposes.

6.3) Approach Embankments:

The shear strength of the subsoil is such that it will be able to safely support the 30-32 ft. high approach embankments constructed with 2:1 side slopes. The fill should consist of well compacted acceptable material. Care should be taken to ensure that no bouldery fill is placed within the approaches through which piles have to be driven, and it is recommended that this portion of the fill contain no larger grain sizes than 3 inches.

Based on performance of structures and embankments built in the same general area and under somewhat similar subsoil conditions, it is estimated that a maximum settlement of 4 to 5 inches will take place over a long period of time under the fill at the abutment location.

To minimize the effect of differential settlements between the abutments and pier footings, it is recommended that the approach embankments be built in advance of the structure for as long a period as possible. The topsoil and the soft surficial material should be removed in accordance with the pertinent Standards within the construction area.

7. MISCELLANEOUS:

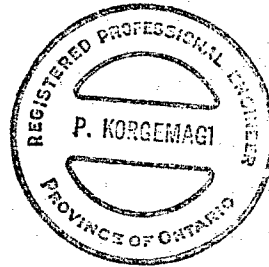
The field work was carried out from March 12 to March 26, 1973, and was supervised by Mr. P. Korgemagi, Project Foundations Engineer.

The equipment used was owned and operated by P.V.K. and Sons Ltd., Burford, Ontario.

This report was prepared by Mr. P. Korgemagi and reviewed by Mr. K. G. Selby, Supervising Foundations Engineer.

P. Korgemagi

P. Korgemagi, P. Eng.



K. G. Selby

PK/ao
April 26, 1973.

K. G. Selby, P. Eng.

APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 171

JOB 72-11171

LOCATION Co-ords. 15,364,968 N; 671,992 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 26, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY JH

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w | | | BULK DENSITY γ P.C.F. | REMARKS |
|---------------|--|------------|---------|------|------------|-------------|--|----|----|-----|-----|--|-----|-------|------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT. PLT | NUMBER | TYPE | BLOWS/FOOT | | 25 | 50 | 75 | 100 | 125 | w_p | w | w_L | | |
| 612.8 | Ground Level | | | | | | | | | | | | | | | |
| 0.0 | Clayey silt with sand Brown and Grey traces of gravel. Stiff to Hard | | 1 | SS | 11 | 610 | | | | | | | | | | W.L. not established 2 3/4 h2 22 2 29 h2 27 3 28 h1 28 |
| | | | 2 | SS | 11 | | | | | | | | | | | |
| | | | 3 | SS | 11 1/2 | | | | | | | | | | | |
| | | | 4 | SS | 98 | | | | | | | | | | | |
| 600.3 | | | 5 | SS | 46 | 600 | | | | | | | | | | |
| 12.5 | | | 6 | SS | 24 | | | | | | | | | | | |
| | | | 7 | SS | 20 | 590 | | | | | | | | | | |
| | | | 8 | SS | 16 | | | | | | | | | | | |
| 578.8 | End of Borehole | | 9 | SS | 18 | 580 | | | | | | | | | | |
| 34.0 | | | | | | | | | | | | | | | | |
| | | | | | | 570 | | | | | | | | | | |

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 172

JOB 72-11171

LOCATION Co-ords. 15,364,988 N; 872,042 E.

ORIGINATED BY FK

W.P. 257-66-09

BORING DATE March 26, 1973

COMPILED BY FK

DATUM Geodetic

BOREHOLE TYPE Auger

 CHECKED BY *FK*

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L | | | BULK DENSITY γ P.C.F. | REMARKS | |
|--------------|---|-------------|---------|------|------------|-------------|---|--|--|---|--|--|------------------------------------|---------|---|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE | | | WATER CONTENT % 10 20 30 | | | | | |
| 612.9 | Ground Level | | | | | | | | | | | | | | GR SA SI CL |
| 0.0 | Clayey silt with sand Brown Grey traces of gravel Stiff to Hard | | 1 | SS | 14 | 610 | | | | | | | | | W.L. not established 2 32 37 29 5 28 40 27 |
| | | | 2 | SS | 55 | | | | | | | | | | |
| | | | 3 | SS | 100 | | | | | | | | | | |
| 600.4 | | | 4 | SS | 105 | | | | | | | | | | |
| 12.5 | | | 5 | SS | 53 | 600 | | | | | | | | | |
| | | | 6 | SS | 34 | | | | | | | | | | |
| | | | 7 | SS | 20 | 590 | | | | | | | | | |
| | | | 8 | SS | 20 | | | | | | | | | | |
| 578.9 | | | 9 | SS | 17 | 580 | | | | | | | | | |
| 34.0 | End of Borehole | | | | | | | | | | | | | | |
| | | | | | | 570 | | | | | | | | | |

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 174

JOB 72-11171

LOCATION Co-ords. 15,365,109 N; 872,018 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 23, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *ML*

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w | | BULK DENSITY γ P.C.F. | REMARKS |
|----------------|-----------------------|-------------|---------|------|------------|-------------|--|----------------------------|--|--|------------------------------------|---------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. | | w_p — w — w_L | | | |
| | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × LAB VANE | WATER CONTENT % 10 20 30 | | | |
| 611.8 | Ground Level | | | | | | 1000 | 2000 | | | | |
| 0.0 | Topsoil | | | | | | | | | | | |
| 1.0 | | | | | | | | | | | | |
| | Clayey silt with sand | | 1 | SS | 19 | 610 | | | | | | |
| | | | 2 | SS | 18 | | | | | | | |
| | | | 3 | SS | 96 | | | | | | | |
| | | | 4 | SS | 97 | | | | | | | |
| 597.3 | Brown | | 5 | SS | 38 | 600 | | | | | | |
| 14.5 | Grey | | 6 | SS | 28 | | | | | | | |
| | | | 7 | SS | 23 | | | | | | | |
| | traces of gravel | | 8 | SS | 17 | 590 | | | | | | |
| | | | 9 | TW | PH | | | | | | | |
| | Very Stiff to Hard | | 10 | SS | 16 | 580 | | | | | | |
| | | | 11 | TW | PH | | | | | | | |
| | | | 12 | SS | 15 | 570 | | | | | | |
| | | | 13 | TW | PH | 560 | | | | | | |
| | | | 14 | SS | 18 | 550 | | | | | | |
| 547.8 | | | | | | | | | | | | |
| 64.0 | End of Borehole | | | | | 540 | | | | | | |

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 175

JOB 72-11171 LOCATION Co-ords. 15,365,127 N; 871,963 E.
 W.P. 257-66-09 BORING DATE March 22, 1973
 DATUM Geodetic BOREHOLE TYPE Auger

ORIGINATED BY PK
 COMPILED BY PK
 CHECKED BY SK

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w | | | BULK DENSITY γ P.C.F. | REMARKS |
|--------------|-----------------------|-------------|---------|------|------------|-------------|--|----------------------------|--|--|----------|--|------------------------------------|-----------------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. | | | WATER CONTENT % | | | | |
| | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × LAB VANE | | w_p — w — w_L | 10 20 30 | | | |
| 612.5 | Ground Level | | | | | | 1000 | 2000 | | | | | | GR. SA. SI. CL. |
| 0.0 | Topsoil | | | | | | | | | | | | | |
| 1.0 | | | | | | | | | | | | | | |
| | Clayey silt with sand | | 1 | SS | 21 | 610 | | | | | | | | |
| | | | 2 | SS | 22 | | | | | | | | | 2 30 40 28 |
| | | | 3 | SS | 27 | | | | | | | | | |
| | | | 4 | SS | 73 | | | | | | | | | |
| 599.2 | Brown | | 5 | SS | 35 | 600 | | | | | | | | |
| 13.3 | Grey | | 6 | SS | 35 | | | | | | | | | 4 28 39 29 |
| | | | 7 | SS | 26 | | | | | | | | | |
| | traces of gravel | | 8 | SS | | 590 | | | | | | | | 3 28 42 27 |
| | | | 9 | TW | PH | | | | | | | | | |
| | Very stiff to hard. | | 10 | SS | 19 | 580 | | | | | | | | |
| | | | 11 | TW | PH | | | | | | | | | |
| | | | 12 | SS | 22 | 570 | | | | | | | | 1 37 41 21 |
| | | | 13 | TW | PH | | | | | | | | | |
| 559.5 | | | | | | 560 | | | | | | | | |
| 53.0 | Sand Very Dense | | 14 | SS | 65 | | | | | | | | | |
| 54.0 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 548.5 | | | 15 | SS | 32 | 550 | | | | | | | | |
| 64.0 | End of Borehole | | | | | 540 | | | | | | | | |

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 176

JOB 72-11171

LOCATION Co-ords. 15,365,110 N; 871,961 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 21 and 22, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *PK*

| SOIL PROFILE | | STRAT. PLOT | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w | | BULK DENSITY γ P.C.F. | REMARKS | |
|--------------|-----------------------|-------------|---------|------|------------|-------------|--|----|--|-----|------------------------------------|---------|-----|
| ELEV. DEPTH | DESCRIPTION | | NUMBER | TYPE | BLOWS/FOOT | | 25 | 50 | 75 | 100 | | | 125 |
| 612.4 | Ground Level | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | | | | | | | | |
| 1.0 | | | 1 | SS | 21 | 610 | | | | | | | |
| | Clayey silt with sand | | 2 | SS | 34 | | | | | | | | |
| | | | 3 | SS | 79 | | | | | | | | |
| | | | 4 | SS | 76 | | | | | | | | |
| 596.8 | Brown | | 5 | SS | 58 | 600 | | | | | | | |
| 15.6 | Grey | | 6 | SS | 26 | | | | | | | | |
| | traces of gravel | | 7 | SS | 24 | | | | | | | | |
| | | | 8 | SS | 28 | 590 | | | | | | | |
| | Very Stiff to Hard | | 9 | TW | PH | | | | | | | | |
| 578.4 | | | 10 | SS | 23 | 580 | | | | | | | |
| 34.0 | End of Borehole | | | | | | | | | | | | |

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE N^o 177

JOB 72-11-171

LOCATION Co-ords. 15,365,153 N; 872,011 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 20 and 21, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *SK*

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w | | BULK DENSITY γ P.C.F. | REMARKS | |
|----------------|------------------------|-------------|---------|------|------------|-------------|--|----------------------------|--|----|------------------------------------|------------|----------------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. | | WATER CONTENT % | | | | |
| | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE x LAB VANE | w_p — w — w_L | | | | |
| 611.8 | Ground Level | | | | | | 1000 | 2000 | 10 | 20 | 30 | | GR SA. SI. CL. |
| 0.0 | Topsoil | | | | | | | | | | | | |
| 1.0 | | | 1 | SS | 14 | 610 | | | | | | | |
| | | | 2 | SS | 29 | | | | | | | | |
| | | | 3 | SS | 76 | | | | | | | | |
| | | | 4 | SS | 82 | 600 | | | | | | | 1 29 42 28 |
| 596.3 | Brown | | 5 | SS | 148 | | | | | | | | |
| 15.5 | Grey | | 6 | SS | 32 | | | | | | | | |
| | | | 7 | SS | 28 | | | | | | | | |
| | | | 8 | SS | 21 | 590 | | | | | | | |
| | | | 9 | TW | PH | | | | | | | 134.5 | |
| | | | 10 | SS | 19 | 580 | | | | | | | |
| | Clayey silt with sand, | | 11 | TW | PH | | | | | | | 135 134 | |
| | traces of gravel. | | 12 | TW | PH | 570 | | | | | | | |
| | | | 13 | SS | 18 | | | | | | | | |
| | | | | | | 560 | | | | | | | |
| | Stiff to Hard | | 14 | TW | PH | | | | | | | 132 132 | |
| | | | | | | 550 | | | | | | | |
| | | | 15 | SS | 19 | | | | | | | | 3 22 45 30 |
| | | | | | | 540 | | | | | | | |
| | | | 16 | TW | PH | | | | | | | | |
| | | | | | | 530 | | | | | | | |
| | | | 17 | SS | 28 | | | | | | | | |
| | | | | | | 520 | | | | | | | |
| | | | 18 | SS | 125 | | | | | | | | |
| | | | | | | 510 | | | | | | | |

20
15 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 178

JOB 72-11171

LOCATION Co-ords. 15,365,222 N; 871,951 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE Mar. 29, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | | LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L | | | BULK DENSITY γ P.C.F. | REMARKS |
|----------------|-----------------------|-------------|---------|------|------------|-------------|--|--|--|--|---|--|---|------------------------------------|---------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 1000 2000 | | | | WATER CONTENT % 10 20 30 | | | | |
| 612.1 | Ground Level | | | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | 610 | | | | | | | | | |
| 1.0 | | | 1 | SS | 17 | | | | | | | | ○ | | |
| | Clayey silt with sand | | 2 | SS | 36 | | | | | | | | ○ | | |
| | | | 3 | SS | 69 | | | | | | | | ○ | 1 | |
| | | | 4 | SS | 86 | 600 | | | | | | | ○ | | |
| 597.1 | Brown | | 5 | SS | 40 | | | | | | | | ○ | | |
| 15.0 | Grey | | 6 | SS | 34 | | | | | | | | ○ | | |
| | | | 7 | SS | 30 | | | | | | | | | | |
| | traces of gravel. | | 8 | SS | 23 | 590 | | | | | | | ○ | 1 | |
| | | | 9 | SS | 22 | | | | | | | | ○ | | |
| | Very Stiff to Hard | | | | | 580 | | | | | | | | | |
| 578.1 | | | 10 | SS | 16 | | | | | | | | | | |
| 34.0 | End of Borehole | | | | | | | | | | | | | | |
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DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 179

JOB 72-11171

LOCATION Co-ords. 15,365,247 N; 871,998 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 16, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w | | | BULK DENSITY γ | REMARKS |
|--------------|-----------------------|-------------|---------|------|------------|-------------|--|----|----|-----|-----|--|-----|-------|--------------------------|---------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | 25 | 50 | 75 | 100 | 125 | w_p | w | w_L | | |
| 612.1 | Ground Level | | | | | | | | | | | | | | | |
| 0.0 | | | | | | | | | | | | | | | | |
| 1.0 | | | | | | | | | | | | | | | | |
| | Clayey silt with sand | | 1 | SS | 11 | | | | | | | | | | | |
| | | | 2 | SS | 23 | | | | | | | | | | | |
| | | | 3 | SS | 95 | | | | | | | | | | | |
| | | | 4 | SS | 90 | | | | | | | | | | | |
| | Brown | | 5 | SS | 64 | | | | | | | | | | | |
| 595.1 | | | 6 | SS | 28 | | | | | | | | | | | |
| 17.0 | Grey | | 7 | SS | 21 | | | | | | | | | | | |
| | traces of gravel | | 8 | SS | 17 | | | | | | | | | | | |
| | | | 9 | TW | PH | | | | | | | | | | | |
| | Stiff to Hard | | 10 | SS | 24 | | | | | | | | | | | |
| | | | 11 | TW | PH | | | | | | | | | | | |
| 567.1 | | | 12 | SS | 20 | | | | | | | | | | | |
| 45.0 | End of Borehole | | | | | | | | | | | | | | | |

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 180

JOB 72-11171

LOCATION Co-ords. 15,365,289 N; 871,944 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 15, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | | LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w | | | BULK DENSITY γ P.C.F. | REMARKS |
|--------------|-----------------------|-------------|---------|------|------------|------------------|--|------------|--------------|-----------|--|--|----------|------------------------------------|-----------------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. | | | | WATER CONTENT % | | | | |
| | | | | | | | O UNCONFINED | | + FIELD VANE | | w_p w w_L | | | | |
| | | | | | | ● QUICK TRIAXIAL | | x LAB VANE | | 1000 2000 | | | 10 20 30 | | |
| 612.2 | Ground Level | | | | | | | | | | | | | | GR. SA. SI. CL. |
| 0.0 | Topsoil | | | | | | | | | | | | | | |
| 1.0 | | | 1 | SS | 16 | 610 | | | | | | | | | |
| | | | 2 | SS | 15 | | | | | | | | | | |
| | Cobbles | | 3 | SS | 80 | | | | | | | | | | |
| | Clayey silt with sand | | 4 | SS | 97 | | | | | | | | | | |
| 597.2 | Brown | | 5 | SS | 50 | 600 | | | | | | | | | |
| 15.0 | Grey | | 6 | SS | 35 | | | | | | | | | | |
| | | | 7 | SS | 23 | | | | | | | | | | |
| | traces of gravel | | 8 | SS | 15 | 590 | | | | | | | | | |
| | | | 9 | TW | PH | | | | | | | | | | |
| | Very Stiff to Hard | | 10 | SS | 17 | 580 | | | | | | | | | |
| | | | 11 | TW | PH | | | | | | | | | | |
| | | | 12 | SS | 15 | 570 | | | | | | | | | |
| | | | 13 | TW | PH | | | | | | | | | | |
| 558.2 | | | 14 | SS | 17 | 560 | | | | | | | | | |
| 54.0 | End of Borehole | | | | | | | | | | | | | | |

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 181

JOB 72-11171 LOCATION Co-ords. 15,365,306 N; 871,942 E.
 W.P. 257-66-09 BORING DATE Mar. 15, 1973
 DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY PK
 COMPILED BY PK
 CHECKED BY SK

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 75 100 125 | LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L | WATER CONTENT % γ | BULK DENSITY γ | REMARKS |
|--------------|------------------|------------|---------|------|------------|-------------|--|---|-----------------------------|--------------------------|------------------------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLT | NUMBER | TYPE | BLOWS/FOOT | | | | | | |
| 612.1 | Ground Level | | | | | | | | | | P.C.F. GR. SA. SI. CL. |
| 0.0 | | | | | | 610 | | | | | |
| 601.6 | | | | | | | | | | | |
| 10.5 | End of Cone Test | | | | | 600 | | | | | |

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 182

JOB 72-11171

LOCATION Co-ords. 15,365,312 N; 871,996 E.

ORIGINATED BY PK

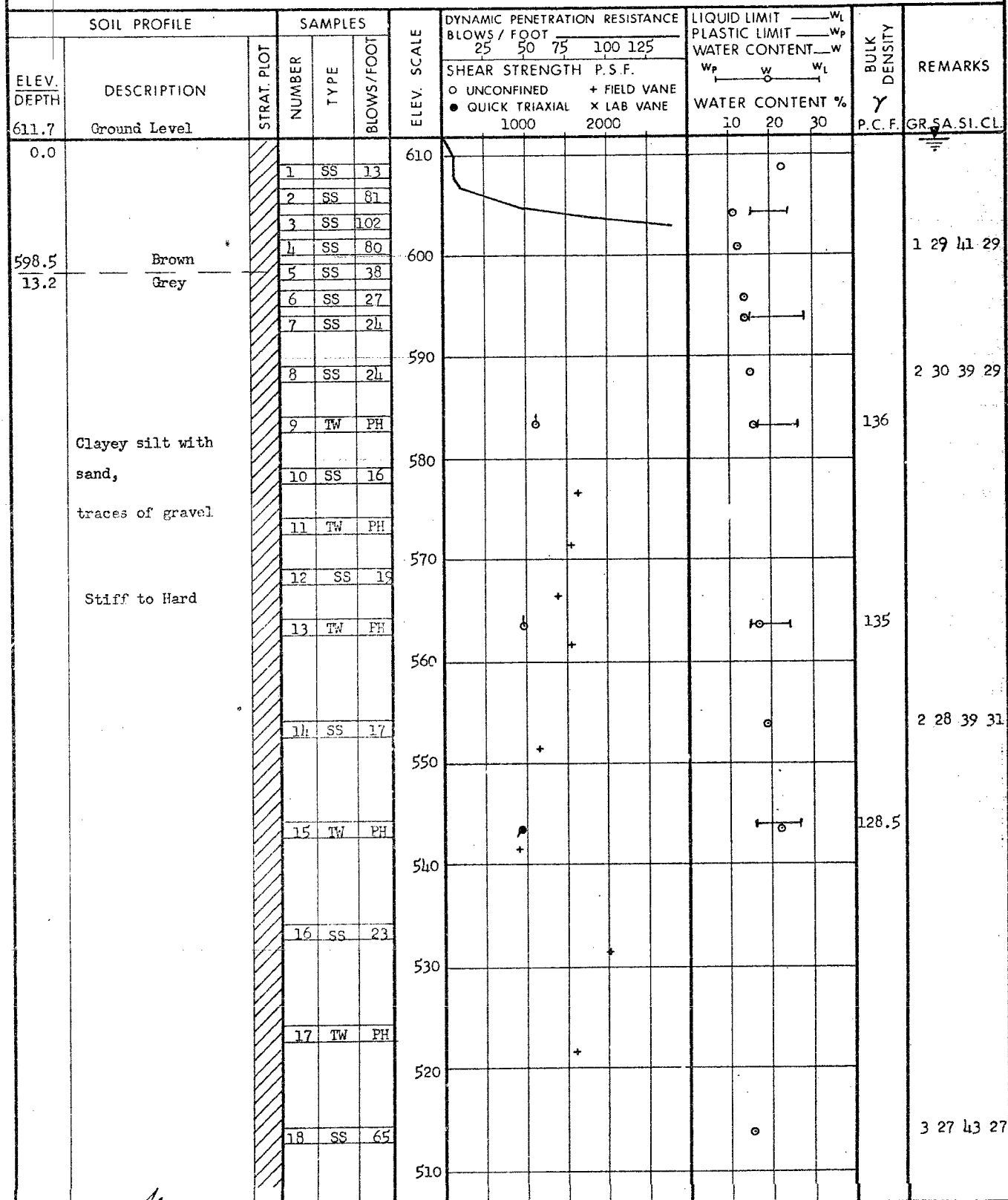
W.P. 257-66-09

BORING DATE March 12 to 14, 1973

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *SK*

20
15 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 182 cont.

JOB 72-11171

LOCATION Co-ords. 15,365,312 N; 871,996 E.

ORIGINATED BY PK

W.P. 257-66-09

BORING DATE March 12 to 14, 1973

COMPILED BY PK

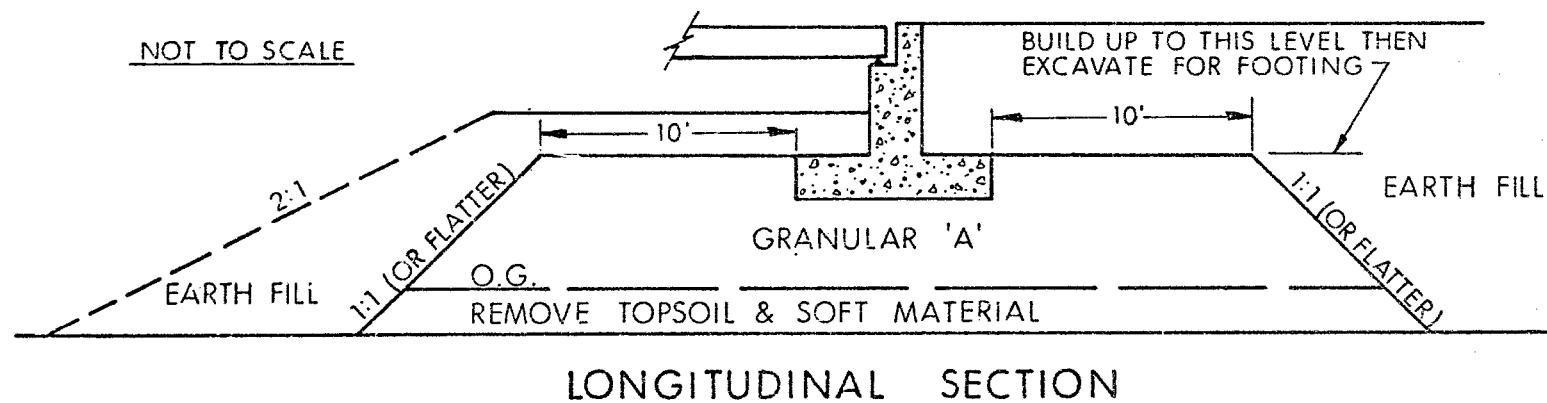
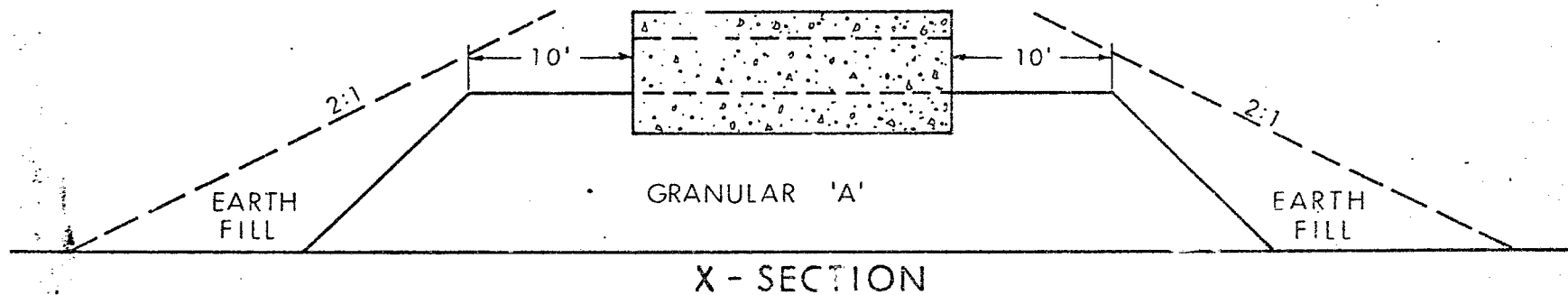
DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *PK*

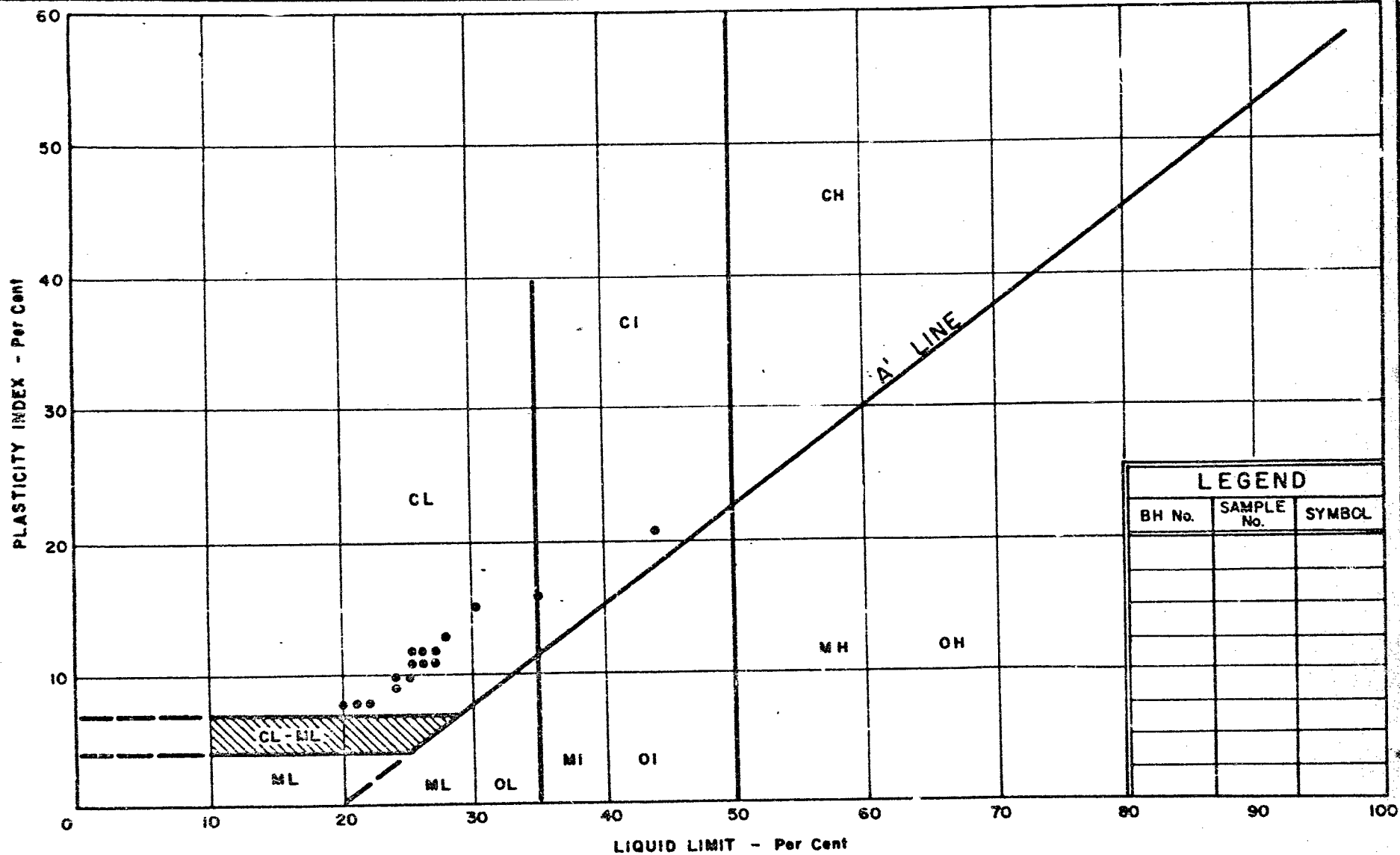
| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | | | | | LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w | | | BULK DENSITY γ P.C.F. | REMARKS |
|--------------|-----------------|-------------|---------|------|------------|-------------|--|----|----|-----|-----|--|-----|-------|------------------------------------|---------|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | 25 | 50 | 75 | 100 | 125 | w_p | w | w_L | | |
| 501.7 | | | 19 | SS | 99 | | | | | | | | | | | |
| 110.0 | Silty sand | | | | | 500 | | | | | | | | | | |
| 102.8 | Very Dense | | | | | | | | | | | | | | | |
| 118.9 | Bedrock | | 20 | BXL | - | 490 | | | | | | | | | | |
| 120.3 | End of Borehole | | | | | | | | | | | | | | | |

ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M. T. C. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART
CLAYEY SILT
WITH SAND, TRACES OF GRAVEL

W.P. No. 257-66-09

JOB No. 72-11171

FIG. 2

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT

SAND

GRAVEL

Fine

Medium

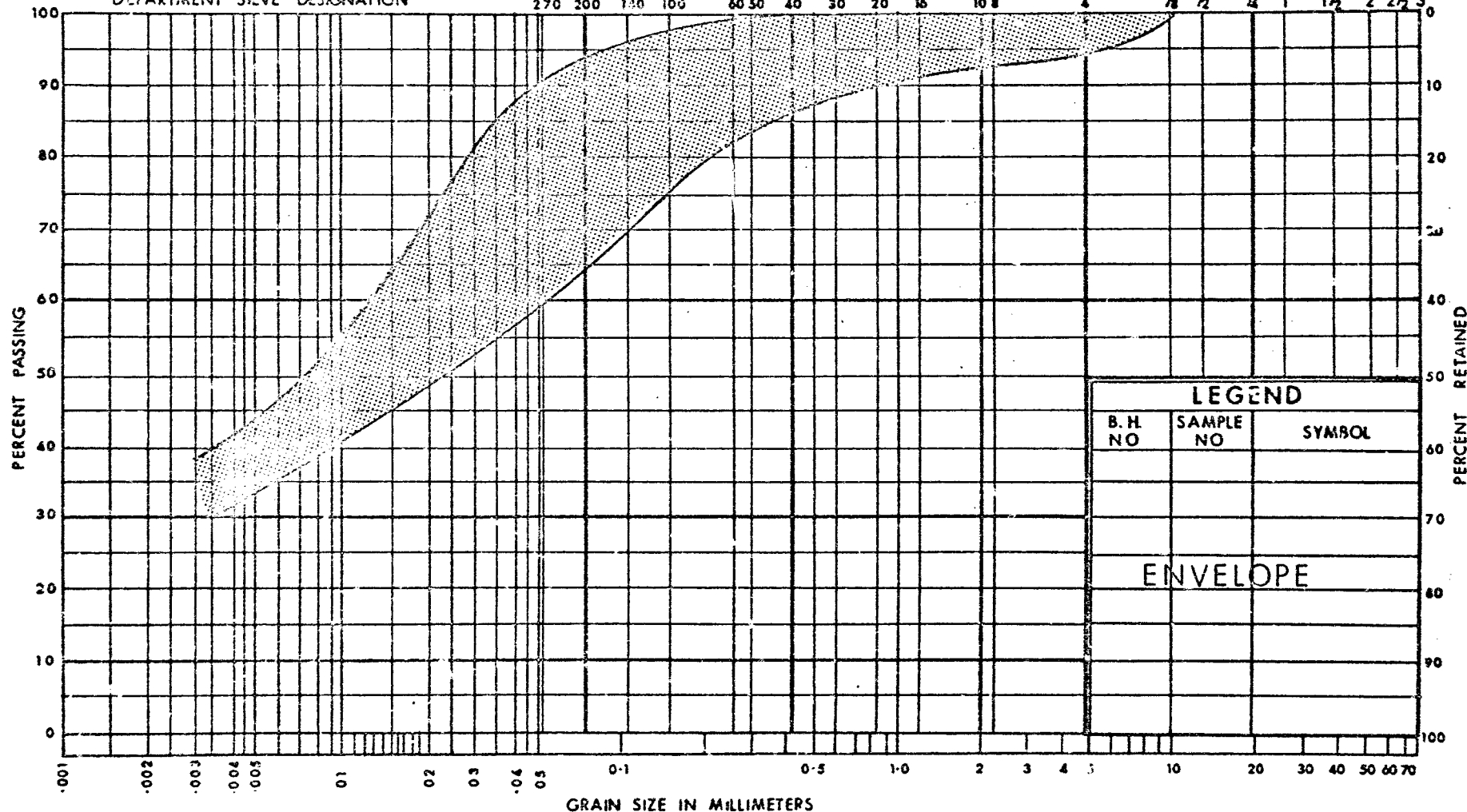
Coarse

Fine

Coarse

DEPARTMENT SIEVE DESIGNATION

270 200 150 100 60 50 40 30 20 16 10 8 4 3/4 1/2 3/8 1 1 1/2 2 2 1/2 30



LEGEND

| B. H. NO | SAMPLE NO | SYMBOL |
|----------|-----------|--------|
| | | |
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ENVELOPE

DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS



DESIGN SERVICES
BRANCH

GRAIN SIZE DISTRIBUTION
CLAYEY SILT
WITH SAND, TRACES OF GRAVEL

W.P. No. 257-66-09

JOB No. 72-11171

FIG. 3

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTPENETRATION RESISTANCE

'N'-STANDARD PENETRATION RESISTANCE : - 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>c LB/SQ. FT.</u> | <u>DENSENESS</u> | <u>'N' BLOWS / FT.</u> |
|--------------------|---------------------|------------------|------------------------|
| VERY SOFT | 0 - 250 | VERY LOOSE | 0 - 4 |
| SOFT | 250 - 500 | LOOSE | 4 - 10 |
| FIRM | 500 - 1000 | COMPACT | 10 - 30 |
| STIFF | 1000 - 2000 | DENSE | 30 - 50 |
| VERY STIFF | 2000 - 4000 | VERY DENSE | > 50 |
| HARD | > 4000 | | |

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

| | | | |
|------|---------------------|------|-------------------|
| S.S. | SPLIT SPOON | T.W. | THINWALL OPEN |
| W.S. | WASHED SAMPLE | T.P. | THINWALL PISTON |
| S.T. | SLOTTED TUBE SAMPLE | O.S. | OESTERBERG SAMPLE |
| A.S. | AUGER SAMPLE | F.S. | FOIL SAMPLE |
| C.S. | CHUNK SAMPLE | R.C. | ROCK CORE |

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

| | | | |
|-----|---|------|-----------------|
| U | UNCONFINED COMPRESSION | L.V. | LABORATORY VANE |
| UU | UNCONSOLIDATED UNDRAINED TRIAXIAL | F.V. | FIELD VANE |
| CIU | CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL | C | CONSOLIDATION |
| CID | " " DRAINFD " | S | SENSITIVITY |
| CAU | " ANISOTROPIC UNDRAINED " | | |
| CAD | " " DRAINED " | | |

ABBREVIATIONS & SYMBOLS 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 |
| w_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 |
| 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 |
| $\log_e \sigma$ 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 (YOUNG'S MODULUS) |
| G | MODULUS OF SHEAR DEFORMATION |
| K | MODULUS OF COMPRESSIBILITY |
| η | COEFFICIENT OF VISCOSITY |

EARTH PRESSURE

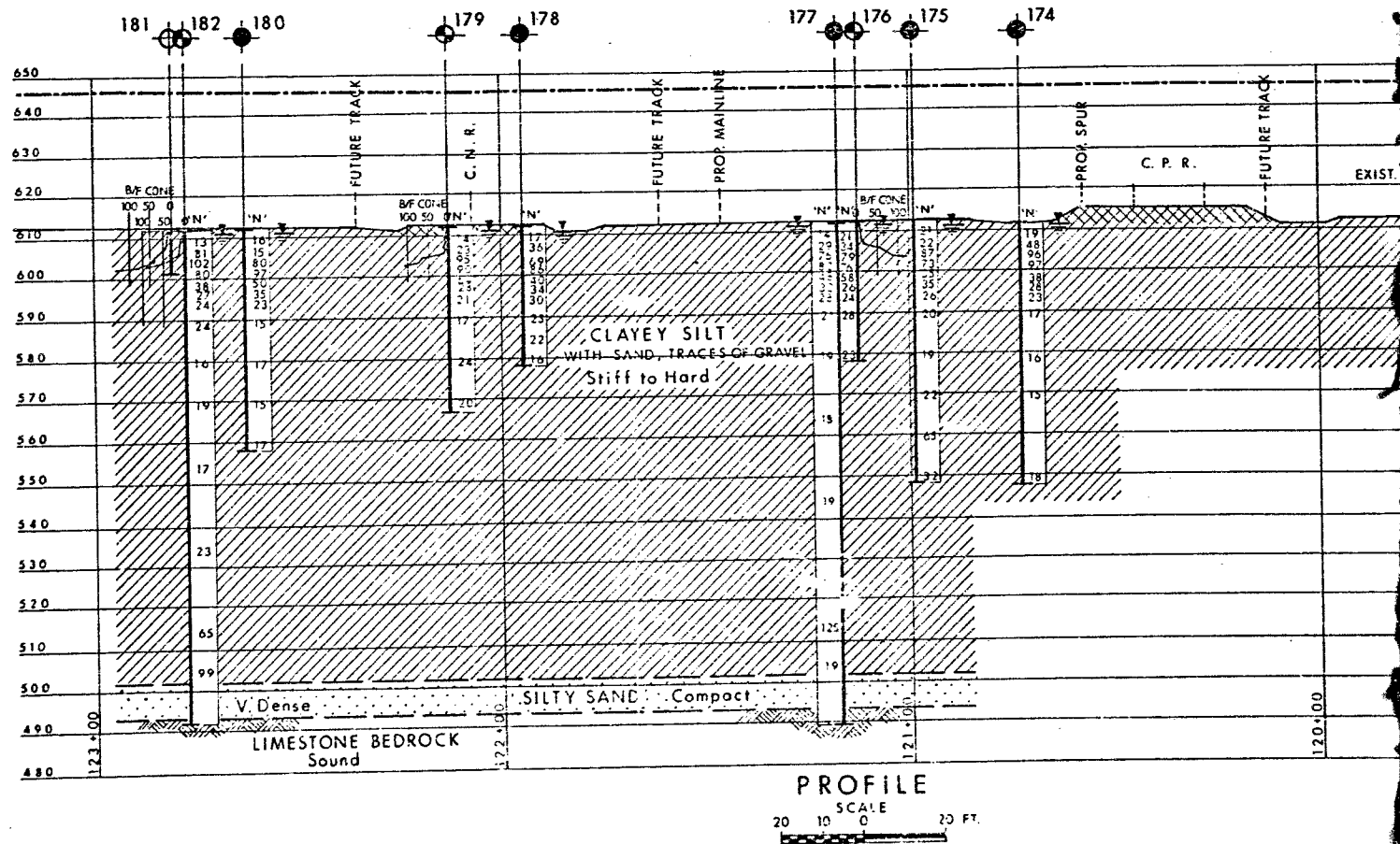
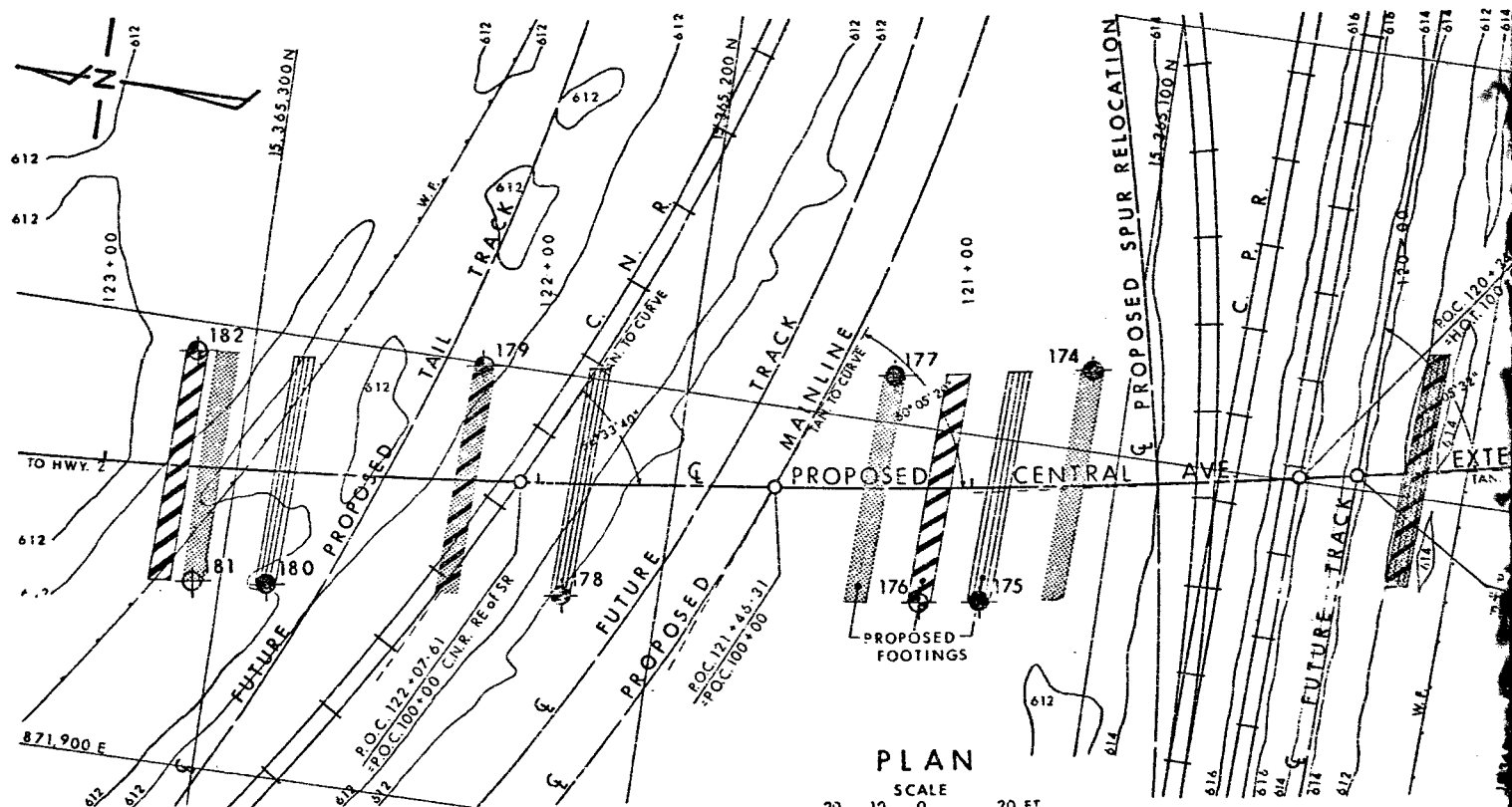
| | |
|----------|---|
| d | DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE |
| δ | ANGLE OF WALL FRICTION |
| K | DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS |
| K_0 | COEFFICIENT OF EARTH PRESSURE AT REST |

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 |





— NOTE —

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

| | | | |
|---|------------------|---------------------------|------------------|
| MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO | | | |
| DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE | | | |
| PROP. CENTRAL AVE. EXTENSION AT C.N.R. & C.P.R. CROSSING | | | |
| HIGHWAY NO. <u>PROP. E.C. ROW EXPRESSWAY</u> DIST. NO. <u>1</u> | | | |
| CO. OF <u>ESSEX</u> | | CITY OF <u>WINDSOR</u> | |
| TWP. _____ | | LOT _____ CON. _____ | |
| BORE HOLE LOCATIONS & SOIL STRATA | | | |
| SUBMIT P. K. | CHECKED <u>✓</u> | W.P. NO. <u>257-66-09</u> | DRAWING NO. |
| DRAWN OL. J. | CHECKED <u>✓</u> | WO NO. <u>72-11171</u> | 72-11171A |
| DATE 10 MAY 1973 | | SITE NO. | |
| APPROVED <u>[Signature]</u> DESIGNER, FOUNDATIONS | | COUNT NO. | |
| | | BRIDGE DRAWING NO. | |



REF. E-5339-1

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

72-11171

TO: Mr. A. G. Stermac
Principal Foundation Engineer
Foundation Office
West Bldg., Downsview

FROM: Structural Planning
Southwestern Region

ATTENTION:

DATE: February 21, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 257-66-09, Bridge Site 6-287
C.N.R. & C.P.R. Overhead
at Central Avenue Extension
E. C. Row Expressway
District 1, Chatham

Would you kindly arrange to have a Foundation Investigation conducted at the above location. I have enclosed two prints of bridge site plan E-5339-1 with possible footing locations for three schemes. As discussed with Mr. K. Selby on February 19, 1973, several other schemes would have their footings fairly close to the footing locations indicated on the drawing. A multitude of possibilities exist in this case because the railway requirements are not finalized.

I would like to point out that the present location of the Central Avenue Extension bridge is about 600 feet to the east from an earlier proposal for which Foundation Investigation Report W.J. 71-11118 was issued.

This report is urgently required and should be available by April 11, 1973, or sooner if possible.

Also enclosed is a list of utilities personnel and the field reconnaissance report. Pictures of the site are also enclosed.

When the railways are contacted, they should be asked about the necessity of a flagman.

S. Jants

S. Jants
Structural Planning Technician

SJ:sz
Enc.

cc C. S. Grebski
A. Crowley

Design Services Branch,
1201 Wilson Avenue,
Downsview, Ontario.
M3M 1J8

March 16, 1973.

Telephone: 248-3262.

P.V.K. & Sons,
R.R. #4,
Brantford, Ontario.

Dear Sirs:

This letter confirms our request of March 9, 1973,
for the supply of a C.M.E. 55 drill together with all
necessary equipment, as specified under the terms of our
Contract Agreement, at Windsor, Ontario, on March 12, 1973.

mobilization will be from Brantford, Ontario.

Our Project Number is W.O. 72-11171. ✓

Yours truly,

KGS/ao

cc: W.W. Fry
(Attn: Mrs. M. Andrews)

Foundations Files
Documents

For: K. G. Selby,
Supervising Foundations Engineer,
A. G. Stermac,
Principal Foundations Engineer.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

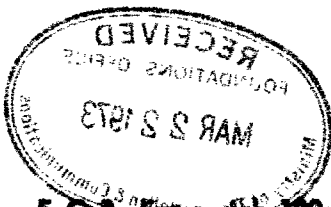
Copy for the information of Mr. K. Selby

Mr. F. E. Loscombe,
Reg. Super^r of Eng. Surveys,
Southwest Region.

Mr. W. R. Agnew,
Field Supervisor,
Engineering Surveys.

Mr. P. J. Rule

March 20, 1973.



RE: W.P. 257-66-09, Hwy. E.C.R. Exp. No. 130-72
Central Ave. Extension and CN - CP Railways
City of Windsor
Township of Sandwich East, County of Essex
Party Chief - R. LaRouche

Please be advised that the request dated March 7, 1973 received from P. Korgemagi, Soils Foundation Engineer, Head Office, has been completed on March 13, 1973 and field data is now in the Engineering Surveys drafting office.

This request was for locating, staking and ground elevations at various boreholes as shown on site plan. This was carried out and the ground elevations were reduced and checked and a copy given to engineer. No other field work was carried out at this time.

I am turning in one book of borehole elevations.

W. R. Agnew,
Field Supervisor.

c.c.

Mr. A. Wittenberg, Att. T. A. Hickey,
Mr. K. Selby, Att. P. Korgemagi,
Mr. J. Forster,
Mr. A. Crowley.

Mr. A. P. Watt,
Regional Structural Planning Eng.,
Southwestern Region,
London, Ontario.

Foundations Office,
Design Services Branch,
West Bldg., Downsview.

April 11, 1973.

Proposed Crossing at C.P.R., C.N.R. and
Central Ave. Extension, E.C. Row Expressway,
W.O. 72-11171 -- W.P. 257-66-09

We have recently completed a field investigation at the above site. Following are the summarized findings of this investigation together with our recommendations pertaining to the design of the structure foundations.

Subsoil Conditions:

The borings have revealed that the subsoil at the site consists of a deep deposit of clayey silt with sand and traces of gravel, underlain by limestone bedrock. The upper portion of the deposit contains an 8 to 16 ft. thick very stiff to hard desiccated zone. Below this depth the undrained shear strength of the material decreases. The desiccated surface crust appears to be suitable for spread footing type foundations.

Because of the compressible nature of the subsoil, it is inevitable that consolidation settlements will occur over a long-term period due to the imposed loads of structure and embankment. Past experience, however, indicates that these settlements will be of a minor nature.

Recommendations:

At the present time three proposals are being considered:

- a) Four-span (65.5 - 109 - 109 - 65.5) overpass structure
- b) Four-span (68.5 - 96 - 96 - 45) overpass structure
- c) Five-span (58 - 96 - 45 - 78 - 45) overpass structure

Foundations:

1) Spread Footings in Original Ground:

The entire structure may be supported on spread footings placed within the very stiff to hard desiccated zone of the subsoil between elevation 605 and elevation 598. A safe net pressure of 3.5 t.s.f. may be assumed for design purposes.

The desiccated zone is susceptible to softening on contact with water, therefore, it is recommended that the base of the footing excavations be protected by a concrete working slab, immediately on exposure.

All foundations should be protected against frost action by at least 4 feet of earth cover. No dewatering problems are anticipated.

The estimated maximum settlement will be in the order of 1.0 to 1.5 inches under the pier footings.

2) Spread Footings on Compacted Fill:

As an alternative, the abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 t.s.f. may be assumed. The granular material should consist of G.B.C. Class 'A' and should be fully compacted according to the current Standards. A detailed construction scheme is outlined on Figure 1.

3) Perched Abutments on Short Piles:

As a second alternative, the abutments may be constructed within the approach fills and supported on short piles driven through the fill and some 10.0 ft. into original ground. In the case of 12-3/4" O.D. and 1/4" thick wall steel tube piles, a safe design load of 25 tons per pile may be used.

It should be pointed out, that this latter proposal is based on experience with similar structures and similar subsoil conditions in the general area.

Regardless of which method is adopted, the structure should be built to accommodate the 3 to 3.5 inches differential settlement between the abutments and piers.

4) End-Bearing Piles:

As another alternative, the abutments and piers may be supported on steel H-piles driven to bedrock. The maximum allowable load for the particular steel sections may be assumed for design purposes.

Approach Embankments:

The shear strength of the subsoil is such that it will be able to safely support the 30-32 ft. high approach embankments constructed with 2:1 side slopes. The fill should consist of well compacted acceptable material. Care should be taken to ensure that no bouldery fill is placed within the approaches through which piles have to be driven, and it is recommended that this portion of the fill contain no larger grain sizes than 3 inches.

Based on performance of structures and embankments built in the same general area and under somewhat similar subsoil conditions, it is estimated that a maximum settlement of 4 to 5 inches will take place over a long period of time under the fill at the abutment location.

To minimize the effect of differential settlements between the abutments and pier footings, it is recommended that the approach embankments be built in advance of the structure for as long a period as possible. The topsoil and the soft surficial material should be removed in accordance with the pertinent Standards within the construction area.

We hope that the foregoing will be sufficient for your design purposes. If further information is required, please contact this Office. Our complete report will be submitted to you in the near future.

Aravash

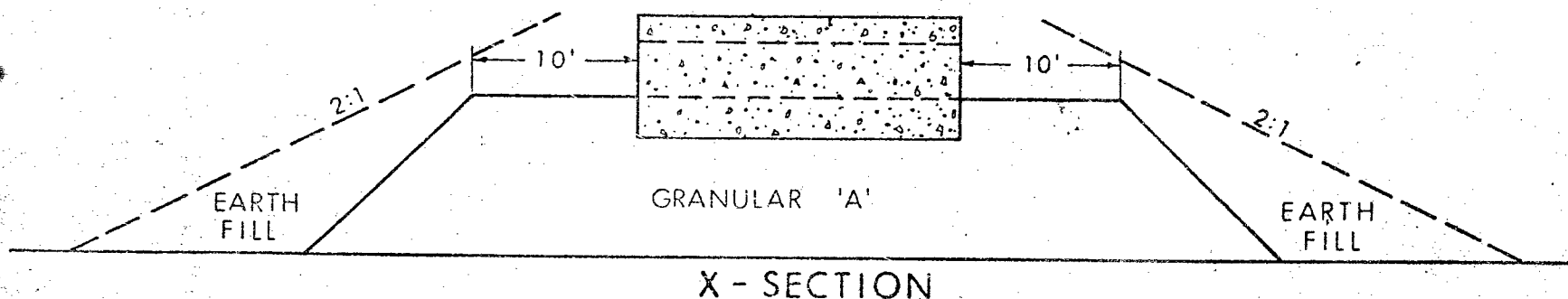
PP/ao

For K. G. Selby,
SUPERVISING FOUNDATIONS ENGINEER.

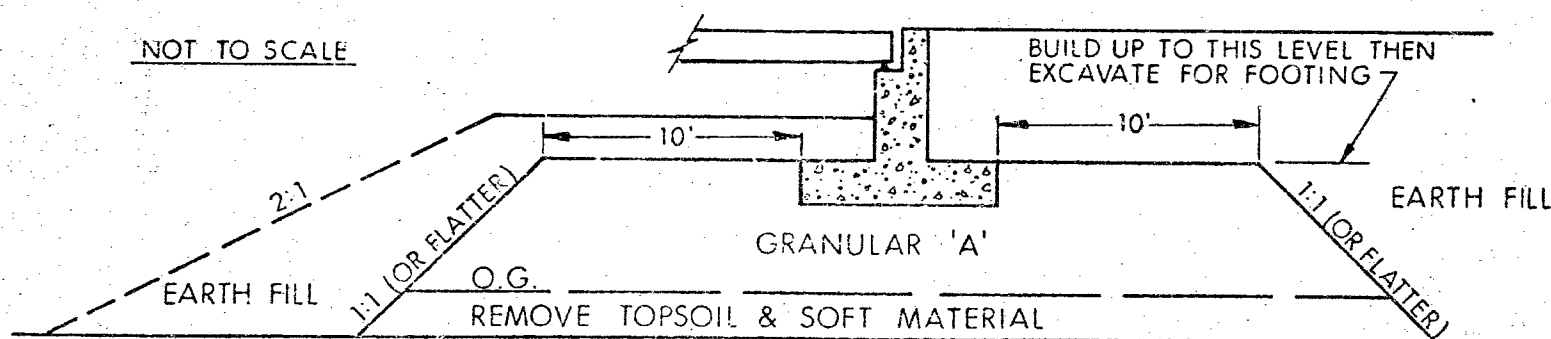
cc: A. Crowley
J. G. Forester
J. L. Keen
A. Wittenberg

Foundations Files ✓
Documents

ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



X - SECTION



LONGITUDINAL SECTION

NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. P. Watt,
Regional Structural Planning
Eng.,
London Region, London, Ont.

FROM: Structural Office,
West Building,
Downsview, Ontario.

ATTENTION:

DATE: August 28, 1973.

OUR FILE REF.

IN REPLY TO

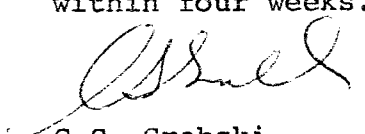
SUBJECT: C.N.R. & C.P.R. O'Head Central Avenue Extension,
W.P. 257-66-09, Site 6-287,
Hwy. E.C. Row Expswy., District No. 1

72-11-171

Attached herewith are prints of the revised Preliminary Bridge Plan Drawing D-6287-P2 of the above mentioned structure.

The estimated cost of the proposed structure has not been changed. Construction clearances for railway approval only have been added.

Any comments or revisions you may have should be submitted within four weeks.


C.S. Grebski,
Structural Design Engineer.

/cls

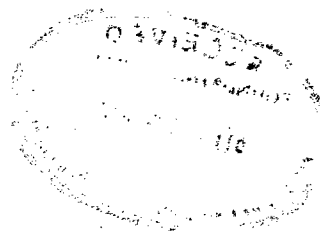
Attach.

No comments

AR

3/10/73

c.c. B. R. Davis
W. D. Birch
A. E. McKim
W. McFarlane
M. Stoyanoff
A. Stermac - 2 memos plus plan
J. Anderson - memo only
A. Crowley



Mr. A. P. Watt,
390 Saskatoon Street,
P. O. Box 6008,
LONDON, Ontario.

Structural Office,
West Building,
1201 Wilson Ave.,
Downsview, Ontario.

September 14, 1973.

C.N.R. & C.P.R. O'Head
Central Ave. Extension,
W.P. 257-66-09, Site 6-287,
E. C. Row Expswy., District 1.

72-11-171

Attached herewith are revised prints of the revised Preliminary Bridge Plan Drawing D 6-287-P3 for the above-mentioned structure.

The estimated cost of the proposed structure has not been changed. Construction clearances for railway approval only have been added.

Any comments or revisions you may have should be submitted within four weeks.

CSG/jh
Attach.

C. S. Grabski
Structural Design Engineer

c.c. W. McFarlane
M. Stoyanoff
A. Stermac ✓
J. Anderson
A. Crowley

No comments

AR

3/10/73

DRAWING REVISED & SENT
TO STRUCTURAL RECORDS
FEB 12, 1975

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac
Principal Foundation Engineer
Foundation Office
West Bldg., Downsview

FROM: Structural Planning
Southwestern Region

ATTENTION:

DATE: October 2, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 257-66-09, Bridge Site 6-287
C.N.R. & C.P.R. Overhead
Central Avenue Extension
E. C. Row Expressway
City of Windsor
District 1, Chatham

The designer has proposed the use of 20 foot approach slabs for the above structure as shown on drawing number 6-287-1 enclosed.

The Chatham District has requested whether 35 foot approach slabs have been considered for this site.

Our present policy on approach slabs is 35 foot approach slabs shall be used on all structures carrying Freeway and Expressway traffic and 20 foot approach slabs shall be used on structures on other paved roads or on roads to be paved in the near future.

Would you kindly advise if in your opinion the settlement of the approach fills to the structure is sufficient to warrant special consideration such as a 35 foot approach slab. Bear in mind the cost of a 35 foot approach slab is approximately \$12,800.00 and a 20 foot approach slab is approximately \$4,800.00.

Kindly return drawing number 6-287-1 with your reply.



A. P. Watt
Regional Structural Planning Engineer

APW:sz
Enc.

cc W. McFarlane
F. C. Brown
T. A. Hickey

Mr. C. Grebski,
Structural Design Engineer,
Structural Design Section,
West Bldg., Downsview

Soil Mechanics Section,
Geotechnical Office,
West Bldg., Downsview.

August 27th, 1974.

J. Keen

W.P.'s 257-66-03,04,05,06,07,09,21
E.C. Row Expy., Windsor,
District #1 (Chatham)

Following is a summary of the main points of our discussion on August 22, 1974 regarding piled foundations for the abovementioned projects.

1. For the C. & O. Rwy. structures a cost estimate of spread footings versus piled foundations indicates a much smaller saving in favour of spread footings than previously anticipated. This is partly due to the fact that as a result of the recent pile tests we are able to reduce the number of piles required by about 25%. In view of this and other (mainly settlement) considerations it was decided to adopt the piled foundation design.
2. A restriction on the use of pile driving hammers delivering more than 30,000 ft.lbs. per blow when the pile tips are within 3 ft. of bedrock, to be incorporated in the contract, requires that the bedrock surface be defined accurately at locations where piles are to be driven. To achieve this it will be necessary for the Soil Mechanics Section to carry out additional borings at all of the structure sites. In order to meet the present design schedule this drilling work should be completed and reported on by the end of October 1974.

K.G. Selby

K.G. Selby
Supervising Engineer

KGS/rgb

c.c. A. Watt
J. Anderson

Files
Documents