Azatic[illegible] Brook Structure [illegible] 0-73-11016)
~~Old~~ Hwy #17

April 30/73 — Request from T.C Kingsland to investigate the reasons for the failure of the existing culvert

May 25/73 — Request from T.C. Kingsland to investigate for a new single span structure at the above mentioned ~~Structure~~ Site

June 8th/73 — Foundation Recommendations were submitted for the forebayed structure with all the necessary ~~foundation~~ stability and settlement considerations.

June 8th/73 — E. Plan received from Regional Structural Planning office and also request additional field work for detour including Bailey Bridge Requirements.

June 15th/73 — Additional field investigation commenced
June 21/73 — " completed
June 28/73 — Recommendations for Bailey Bridge and detour were submitted in a memo to Mr. T.B Kingsland

July 18/73 — Final Drawings of Bailey including report containing the recommendations given on June 8th 1973 memo and also Bailey Bridge Memo of June 28th 1973 including a detailed report for documentation and contract purposes.

73-11016

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

W.P. 916-73-01

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

Cont 73-143

ATTENTION: Mr. M. Devata

DATE: 27 April 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: Culvert on Highway 17 East of Alfred
District 9 - Ottawa

I refer to my recent telephone discussion with Mr. Devata concerning the above-mentioned culvert which was subject to a partial failure recently and our field investigation shows that the probable cause of failure was erosion of the bed under the spread footings causing one footing to drop about 14 inches. A deposit of clay about 50 ft. downstream of the culvert would appear to confirm this reasoning. Further settlement could occur in the event of heavy rains causing further high flows through the culvert.

The culvert will obviously have to be replaced as soon as possible and we should therefore be glad if you will make arrangements for a foundation investigation to be carried out at this site as early as possible.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl

c.c. P. D. Billings
J. E. Callaghan - Att. E. Zavitski
E. R. Saint
R. Forrest
C. S. Grebski - Att. K. Bassi

ESTIMATED COST - $1200 —

Cont. 73-143

Mr. J. E. Callaghan,
District Engineer,
Ottawa, Ontario.

Structural Planning Office,
Kingston, Ontario.

Mr. E. Zavitski

27 April 1973.

Culvert on Highway 17 east of Alfred
District 9 - Ottawa

Further to my discussion with Mr. Zavitski concerning the above-mentioned culvert, this was recently inspected by our office.

This culvert, which is a 20' x 8' open footing structure, has been subjected to high flows during the recent runoff and one or both of the footings have been severely undermined. One of the footings has dropped approximately 14 inches causing the deck slab to fracture. Further settlement could occur given a repetition of high runoff conditions. The culvert will have to be replaced and it is recommended that this should take place as early as possible.

Foundations Section has been requested to carry out a foundation investigation. This office will carry out a hydrology study to determine the size required for the replacement structure.

It would appear that traffic diversion during the replacement of the culvert could possibly be carried out using the adjacent old Highway 17 alignment. The culvert under the old Highway 17 alignment is in very poor condition and it may be necessary to span this structure with bailey bridging. We will investigate this aspect further and let you have our comments as soon as possible.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
c.c. P. D. Billings
E. R. Saint
A. G. Stermac - Att. M. Devata
R. Forrest
C. S. Grabski - Att. K. Bassi

RECEIVED
FOUNDATIONS OFFICE
APR 30 1973
Ministry of Transportation & Communications

Structural Planning Office,
Kingston, Ontario.

27 April 1973.

Mr. J. E. Callaghan,
District Engineer,
Ottawa, Ontario.

Mr. S. Zavitski

Culvert on Highway 17 east of Alfred
District 9 - Ottawa

Further to my discussion with Mr. Zavitski concerning the above-mentioned culvert, this was recently inspected by our office.

This culvert, which is a 20' x 8' open footing structure, has been subjected to high flows during the recent runoff and one or both of the footings have been severely undermined. One of the footings has dropped approximately 14 inches causing the deck slab to fracture. Further settlement could occur given a repetition of high runoff conditions. The culvert will have to be replaced and it is recommended that this should take place as early as possible.

Foundation Section has been requested to carry out a foundation investigation. This office will carry out a hydrology study to determine the size required for the replacement structure.

It would appear that traffic diversion during the replacement of the culvert could possibly be carried out using the adjacent old Highway 17 alignment. The culvert under the old Highway 17 alignment is in very poor condition and it may be necessary to span this structure with Bailey bridging. We will investigate this aspect further and let you have our comments as soon as possible.

T. C. Kingsland
Regional Structural Planning Engineer

TCK:lh

c.c. P. G. Billings
A. R. Saint
A. G. Stermac - Att. M. Devata
R. Forrest
C. S. Grebski - Att. K. Hassi

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

May 4, 1973.

Telephone: 240-3282.

Master Soil Investigation,
104 Nonhar Drive,
Woodbridge, Ontario.

Dear Sirs:

This letter confirms our request of May 1, 1973, for the supply of C.M.E. 45 Auger machine together with all necessary equipment, as specified under the terms of our Contract Agreement, at Alfred, Ontario, on May 7, 1973.

Mobilisation will be from Ottawa.

Our Project Number is W.O. 73-11016 & 73-11024.

Yours truly,

M. Devata.
Supervising Foundations Eng.,
for: A. G. Starmac,
Principal Foundations Eng.

MD/so

c.c. W. W. Fry
(Attn: Mrs. J. McLaren)

Foundations Files
Documents

15-11016

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 18 May 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: Azatica Creek Culvert - Site 27-170
Highway 17, District 9 - Ottawa

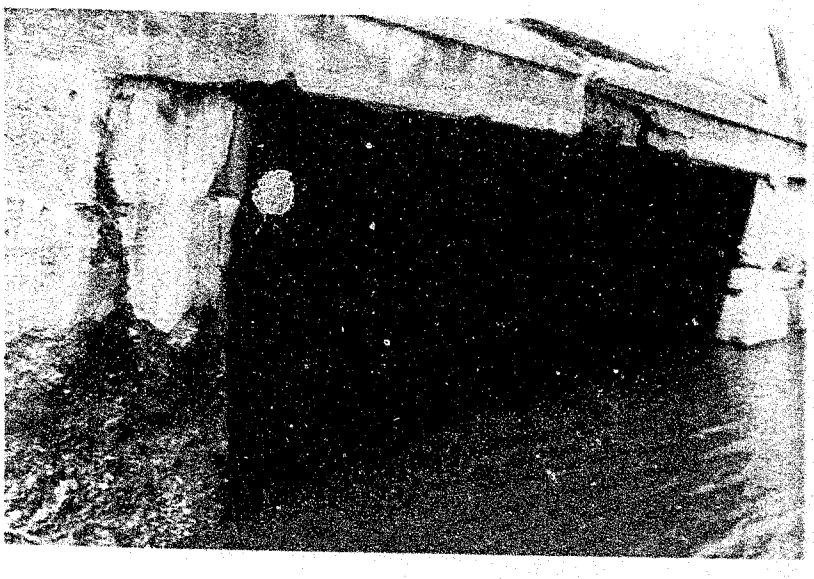
As requested, I am enclosing photographs taken in April 1973 of the above-mentioned culvert.

A. Van Dalen

A. Van Dalen

AV/hl
encls.

AZATIKA BROOK CULVERT



OLD SECTION OF EXISTING CULVERT

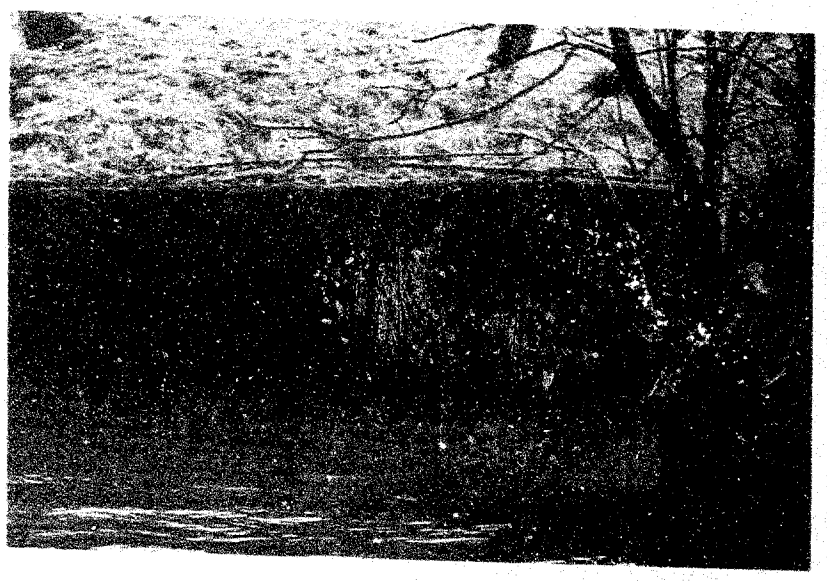
AZATIKA BROOK CULVERT

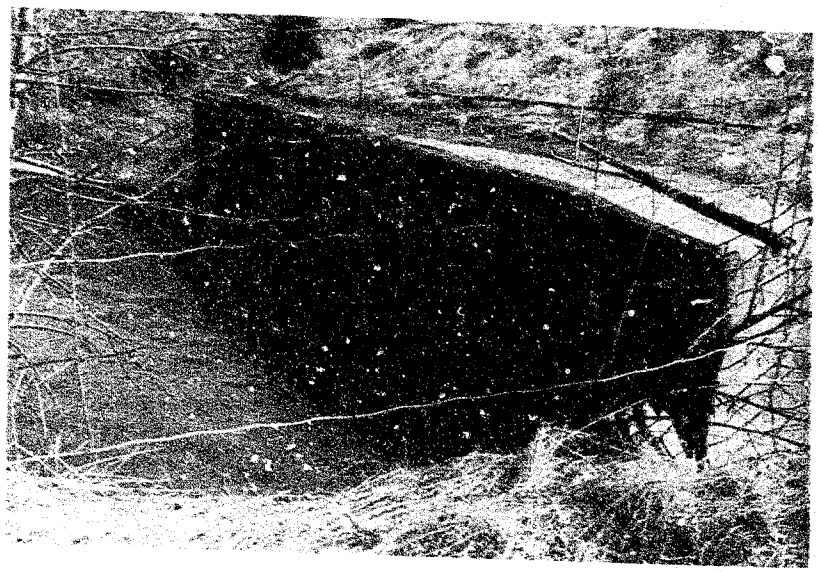
CLAY DEPOSIT– DOWNSTREAM

OUTLET PORTION OF EXISTING CULVERT

73-11016

AZATIKA BROOK CULVERT





OUTLET PORTION OF EXISTING CULVERT
NOTE CRACK AT THE RIGHTHAND SIDE

15-11016

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. P. D. Billings,
Regional Director,
Kingston, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION:

DATE: 23 May 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: Culvert at Azatika Brook, Site 27-170,
East of Alfred,
Highway 17, District 9-Ottawa, BW-1806

With reference to the recent partial failure of the above-noted structure, we recently recommended to the District that it should be replaced as soon as possible. Since then a foundation investigation has been carried out and a report will be issued at an early date. Meanwhile verbal information from Foundations Section suggests that the soft nature of the streambed will preclude the use of a closed invert type structure and that the most suitable replacement will probably be a single span AASHO beam bridge with abutments supported on piles founded on bedrock about 45 ft. below streambed.

A meeting between representatives of the Regional Sections involved in the replacement scheme will be held at 8:45 a.m. on May 24, in Mr. J. Percy's office to discuss the scheme and to set up relevant dates with a view to advertising a contract as soon as possible.

A two-lane bailey bridge detour would appear to be practicable supported on the old Highway 17 roadbed and spanning the old section of the culvert.

Preliminary estimated structural costs involved in the replacement scheme are:

Replacement structure ..... $ 60,000
2-lane bailey bridge ..... $ 15,000

Inspection of the culvert on May 22 shows that no significant further movement has occurred to date.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
c.c. A. J. Percy
R. Forrest
W. D. Birch
J. D. Harris
E. Saint - Att. M. Batten
A.G. Stermac - Att. M. Devata
C. S. Grebski - Att. K. Bassi
H. Chyc
J. M. Childs

73-11016

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

From: Structural Planning Office,
Kingston, Ontario.

Attention: Mr. M. Devata

Date: 24 May 1973.

Our File Ref.

In Reply To

Subject: Culvert at Azatika Brook, Site 27-170,
East of Alfred,
Highway 17, District 9 - Ottawa

Further to my telephone discussion today with Mr. Devata, I enclose a copy of an E.T.R. sheet showing a plan and profile at the above culvert site.

In view of the poor foundation conditions at the site mentioned by you previously we are thinking in terms of a single span AASHO beam type structure supported on piles driven to bedrock. Provided that 2:1 forward fill slopes are possible, a structure of some 80 ft. clear span would be required and, even if a culvert type structure had been feasible at this site, an AASHO beam type structure of this span would appear to be economical in comparison. We understand that your preliminary assessment is that a 2:1 slope would in fact be suitable for fill heights up to approximately 25 ft. but that this assessment has to be confirmed after analysis is completed.

I have sketched the outline of the proposed single span structure on the E.T.R. sheet and I shall be glad if you will let me have your comments on this proposal at your earliest convenience together with your firm recommendations.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encl.
c.c. P. D. Billings A. J. Percy R. Forrest
W. D. Birch J. D. Harris H. Chyc
E. Saint - Att. M. Batten A. G. Boucher
C. S. Grebski - Att. K. Bassi J. M. Childs

T. C. Kingsland

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

73-11016

TO: FILE

FROM: Systems Design Office, Kingston.

ATTENTION:

DATE: May 29th, 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W. P. 916-73-01, Azatika Brook Culvert, Highway 17 East of Alfred; District #9-Ottawa.

A meeting to review the present status of the above noted project was held in the Systems Design Office on Thursday, May 24th, 1973. Messers E. Saint, M. Batten, T. C. Kingsland, R. J. Forrest, A. G. Boucher, A. J. Percy and H. Eimers were in attendance.

The culvert failed several weeks ago, however, traffic is still able to use the highway. Some asphalt padding has been necessary over the failure.

The Regional Structural Planning Office has recommended that a single span structure, founded on piles, be built to replace the culvert. Preliminary cost estimates indicate that a single span structure would be more economical than the replacement of the culvert. The Structural Planning Office will require two months to complete the design and D-4 for the structure. T. C. Kingsland will issue a site plan request for the new bridge immediately. Engineering Surveys will have the site plan completed in three weeks.

A detour will be required to maintain traffic during the construction of the new bridge and a Bailey bridge will likely be necessary on the detour over Azatika Brook. Systems Design will forward the appropriate request for survey information for the detour. The detour may be able to follow the old roadbed along the south side of the existing highway.

---------- 2

It was noted that there could be a slope stability problem near the structure that may require the use of berms. This point will be investigated further during the design of the structure.

Soils investigations and recommendations for both the highway and detour will be supplied by the Materials and Testing Section.

It does not appear as if any changes in line or grade for Highway 17 are necessary. Systems Design will prepare a detour scheme as soon as possible. The detour should fit within the existing property limits, however, the exact limits cannot be determined until receipt of the survey information.

The following preliminary schedule was agreed upon.

Receipt of Site Plan	June 20, 1973
Prel. Bridge Plan	July 4, 1973
Detour Alignment	July 11, 1973
Soils Report	July 18, 1973
Structure D4 to SDO	Sept. 5, 1973
Scrutiny	Sept. 19, 1973.

H. Eimers
Design Group Engineer.

HE/ss
c. c. to: P. D. Billings
J. Childs
T. C. Kingsland
A. G. Boucher
E. Saint
A. E. Lodge
R. J. Forrest.

Copies made for

M. Devata
K. Bassi
31/5 73 T.C.K.

73-11016

This copy for: Mr. A. G. Stermac - Att. Mr. M. Devata

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J. D. Harris,
Principal Hydrology Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION:

DATE: 5 June 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 916-73-01, Site 27-170
Structure Replacement for Culvert at Azatika Brook
Highway 17, District 9 - Ottawa, BW-1806

With reference to our discussion today concerning the above-mentioned structure replacement, I wish to confirm the following:

Our hydrology study was put in hand as soon as the failure was notified to this office and our report will be forwarded to you as soon as possible. Preliminary cost estimates carried out at the time the structure failed showed that a single span bridge structure supported on piles driven to bedrock would be the most advantageous solution for the replacement of the failed structure on the grounds of economy, time, foundation soils condition and hydrology.

Estimates showed that culverts of the box type as well as a pipe arch or circular pipe were all more expensive than the single span solution, even without considering the cost of the stream diversion probably required for culvert solutions, the extra cost of fill and other construction difficulties, as well as the need for property easements for the temporary stream detour.

Our conclusions in respect of the structure type required meant that in our opinion hydrology was no longer the overriding factor in design and would merely determine streambed width, bed and bank protection, etc.

Our preliminary hydrology findings are as follows:

Failure was due to deep scouring in the bed under the new section of the culvert, coupled with the fact that considerable vertical load was exerted on the relatively new section of the culvert by 17 ft. of clay fill. The operating conditions for the old section of culvert built in 1924 were very different from those existing for the old and new sections combined since the height of fill now existing is approximately twice the original height. This may help to explain the longevity of the old section. The present height of fill over this old section is still fairly low. (See attached print showing stream profile and road cross section at culvert. Enclosed also is a copy of the E.T.R. sheet for this section of Highway 17.)

.....2

Our runoff calculations indicate that the existing culvert is hydraulically inadequate and that if it were to be replaced by a box culvert, probably a 20' x 16' opening would be more appropriate. As stated above, the cost of such a culvert, or its C.S.P. or pipe arch equivalent, would be more expensive than a structure solution.

Preliminary information from Foundations Section also indicates that a structure piled to bedrock would be preferable to a culvert supported on the soft clay subsoil.

We find that the calculated runoff is quite large for the relatively small catchment area of approximately 17 square miles. This, we feel, is due to the predominantly clay nature of the subsoil in the watershed. The runoff will be modified to some extent by the Alfred Bog which is some 2.5 square miles in area.

We are currently reviewing our hydrology findings which will be sent to you as soon as they are completed. However, our runoff calculations for the peak 25-year flood in their unreviewed state are as follows:

Watershed Rating Method (Class 1 assumed)

$Q = 2670$ cusecs

Rational Method

$Q = 2800$ cusecs

Frequency Analysis Method

$Q = 2500$ cusecs

The above flows include a retention factor in respect of the Alfred Bog.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.
c.c. P. D. Billings
J. Percy
A. G. Boucher
E. R. Saint
B. R. Davis
C. R. Wilmot
A. G. Stermac - Att. M. Devata (encl.)
C. S. Grebski - Att. K. Bassi

Mr. C. S. Grebski,
Structural Design Engineer,
Downsview, Ontario.

Structural Planning Office,
Kingston, Ontario.

Mr. K. Bassi

8 June 1973.

W.P. 916-73-01, Site 27-170,
Azatika Brook (3 Miles East of Alfred),
Highway 17, District 9 - Ottawa

Please find enclosed copy of Site Plan E-5254-1 for the above-mentioned project. The applicable geometric data has been superimposed on the plan and profile by Systems Design and confirm the information already given to you verbally.

I confirm that the design speed for this section of Highway 17 is 70 m.p.h.

The Hydrology Report has been submitted to Mr. J. D. Harris and a copy for your use is enclosed.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. A. G. Stermac - Att. M. Devata
J. D. Harris
P. D. Billings
A. J. Percy
R. Forrest

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

Telephone: 248-3282.

June 12, 1973.

F. E. Johnston Drilling Co. Ltd.,
P.O. Box 4134,
Postal Station 'E',
Ottawa, Ontario.
K1S 5B2

Dear Sirs:

This letter confirms our request of June 5, 1973, for the supply of a diamond drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Alfred, Ontario, on June 7, 1973.

Mobilization will be from Ottawa.

Our Project Number is W.C. 73-11016.

Yours truly,

M. Devata

MD/ac

M. Devata,
Supervising Foundations Eng.,
For: A. G. Stermac,
Principal Foundations Eng.

c.c. W. W. Pry
(Attn: Mrs. J. McLaren)

Foundations Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

AQS

MEMORANDUM

73-11016

TO: Mr. J. D. Harris,
Principal Hydrology Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION:

DATE: 12 June 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 916-73-01, Site 27-170,
Azatika Brook (3 miles east of Alfred),
Highway 17, District 9-Ottawa, BW-1806

Further to my letter of June 8th enclosing the Bridge Hydrology Report for the above-mentioned stream crossing, please find enclosed for your information a copy of the Preliminary Foundation Report for the above site received today from Foundations Office.

The preliminary findings in the Foundation Report confirm the recommendations contained in my Hydrology Report for a structure founded on piles to bedrock.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encl.

c.c. C. R. Wilmot
B. R. Davis
A. G. Stermac - Att. M. Devata
J. M. Childs
P. D. Billings
A. J. Percy
E. R. Saint
C. S. Grebski - Att. K. Bassi

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 14 June 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 916-73-01, Site 27-170,
Azatika Brook (3 miles east of Alfred),
Highway 17, District 9 - Ottawa

Further to our telephone discussion today, please find enclosed two copies of the Site Plan for the above-mentioned crossing.

The approved grades have been added to these preliminary plans in pencil by Systems Design. Copies of the final plan will be sent to you as soon as they are available.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. A. J. Percy
G. Boucher
C. S. Grebski - Att. K. Bassi

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. M. Devata,
Sup. Foundation Engineer.

FROM: K. W. Ingham

ATTENTION:

DATE: June 15, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT: Foundation Investigation 73-11016;
Highway 17 at Alfred

A brief description is given below for 2 boreholes drilled to bedrock at this site, together with the appropriate bedrock elevation.

Hole No. 3

Bedrock at 81.1

66.5 - 71.5 Limestone; dark grey, fine grained, medium to thick bedded, occasional thin irregular shale seams.

Hole No. 6

Bedrock at 85.8

59.8 - 64.8 Limestone; dark grey, fine grained, medium to thick bedded, occasional thin irregular shale seams, vertical fracture 61.0 - 61.2 ft.

KWI:mv

K. W. Ingham,
Geologist.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

73-11016

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 20 June 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 916-73-01, Site 27-170,
Azatika Brook Bridge,
Highway 17, District 9 - Ottawa

Attached hereto please find two copies of E.T.R. Sheet 60-17/29-0 on which is shown the proposed alignment and profile grade for the Bailey Bridge detour at this site.

On the basis of your foundation investigation, preliminary report W.O. 73-11016, may we have your recommendations with regard to the Bailey Bridge detour structure at this location.

Enclosed also are two copies of Site Plan E-5254-1 showing the proposed grade.

A. Van Dalen
For: T. C. Kingsland
Regional Structural Planning Engineer

AV/TCK/hl
encls.
c.c. A. J. Percy - Att. H. Eimers
W. D. Birch
E. R. Saint
C. S. Grebski - Att. K. Bassi

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM 73-11016

TO:	Mr. W. D. Birch, Structural Maintenance Engineer, Downsview, Ontario.	FROM:	Structural Planning Office, Kingston, Ontario.
ATTENTION:		DATE:	21 June 1973.
OUR FILE REF.		IN REPLY TO	

SUBJECT: W.P. 916-73-01 & 02, Site 27-170,
Azatika Brook Bridge (3 miles east of Alfred),
Highway 17, District 9 - Ottawa

I refer to Mr. W. Melinyshyn's letter to Mr. J. B. Wilkes dated June 4, 1973, in which the pre-engineering schedule dates for the replacement of the above-mentioned structure, including the bailey bridge detour, were set out. I now enclose copy of Bridge Site Plan E-5254-1 and copy of E.T.R. Sheet 60-17/29-0 with suggested location and profile of the bailey bridge detour marked on them.

The date for completion of bailey bridge drawings and quantities is July 13, 1973.

The enclosed information should be sufficient to enable you to proceed with bailey bridge details. However, if further details are required, please let me know as soon as possible.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. P. D. Billings
A. J. Percy
R. Forrest
H. Chyc
A. C. Stermac - Att. M. Devata
J. M. Childs
C. S. Grebski - Att. K. Bassi

FF-78

FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS:

W.P. 916-73-01

W.O. 73-11016

Foundation Report By: PP

Review of Design Drawings By: PP

Design Drawing No.'s: 27-170

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

RECOMMENDATIONS FOR THE DETOUR WILL FOLLOW.

Drawings Received JUNE 22 19 73.

Reviewed JUNE 22 19 73.

Signed P. Pang

No Comments
M.D.
June 26/73

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. T. C. Kingsland,
Reg. Structural Plng. Eng.
Kingston Regional Office.

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

ATTENTION:

DATE: June 28, 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT:

Proposed Bailey Bridge
Azatika Brook & Hwy. #17 Crossing
W.P. 916-73-01; Site #27-170
W.O. 73-11016
District #9 , Ottawa

A detour is proposed at the above described crossing in connection with the structure reconstruction. The temporary crossing will consist of twin bailey bridges located some 70 feet south of the existing Hwy. #17.

The field investigation carried out for the proposed new structure on Hwy. #17 indicate that piled foundations are the most suitable types.

Our recommendations for the bailey bridge supports are as follows:

The temporary bailey structure may be supported on No. 14 timber friction piles driven to depth necessary to achieve the required pile capacity. In determining the safe capacity of a No. 14 timber pile, the following equation may be used,

$$Q = 0.35L \text{ (tons)}$$

where Q = safe capacity on one pile
L = embedded length in original ground (ft)

These friction piles may settle within the clay subsoil due to the imposed loads. It is difficult to assess the magnitude of the settlement since the total loads and the construction details are not available at this time. After receiving the necessary information the settlement can be calculated. However, if settlements are intolerable, the bailey bridge may be supported on end-bearing steel 'H' piles driven to bedrock.

The allowable capacity for the pile will be dependent on the pile section chosen. It is assumed that the piles will meet refusal at approximate elevation 81± to elevation 86 ±.

No stability problems are anticipated for the proposed approach cuts and fills, constructed with 2:1 standard slopes.

...../2

Mr. T. C. Kingsland,
Regional Structural Planning Eng.,
Eastern Region,
Kingston, Ontario.

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

July 18, 1973.

Azatika Brook Culvert
Hwy. #17
W.P. 316-73-01, W.O. 73-11016
District #9 (Ottawa)

I am returning the enclosed negatives of photographs taken at the above site.

Thank you for your assistance and cooperation.

P. Payer

PP/ao
Attch.

P. Payer,
SENIOR FOUNDATIONS ENGINEER.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. T. C. Kingsland, (2)
Regional Structural Planning Eng.,
Eastern Region,
Kingston, Ontario.

ATTENTION:

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

DATE: July 13, 1973.

OUR FILE REF.

IN REPLY TO JUL 18 1973

SUBJECT

31G-163

FOUNDATION INVESTIGATION REPORT
For
The Proposed New Structure
At Hwy. #17 and Azatika Brook
Lot 17, Con. 5
Twp. of Alfred, County of Prescott
District #9 (Ottawa), Site 27-170
W.O. 73-11016 -- W.P. 916-73-01

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.

A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

AGS/ao
Attach.

c.c. E. J. Orr
B. R. Davis
A. Rutka
A. J. Percy
J. M. Childs
B. J. Giroux
E. R. Saint
G. A. Wrong
B. A. Singh

Foundations Files
Documents

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W.O. 73-11016 - W.P. 916-73-01

1. *INTRODUCTION:*

A request to carry out a foundation investigation at the crossing of Hwy. #17 and Azatika Brook was contained in a memorandum from Mr. T. C. Kingsland, Regional Structural Planning Engineer, dated April 27, 1973.

Following this request, a field investigation was carried out by the Foundations Office in two stages. The purpose of the first investigation was to determine the cause(s) of the partial failure of the existing culvert. Upon completion of the first stage, it became evident that an entire new structure will be needed at this location. The second investigation (B.H.'s #8 - 11) was primarily concerned with the determination of the bedrock profile at the proposed structure abutments locations.

This report contains the results of both investigations and our recommendations pertaining to the design of the proposed new structure foundations and approach embankments.

2. *DESCRIPTION OF THE SITE:*

The site is situated approximately 3 miles east of Alfred, on Hwy. #17. The surrounding terrain is gently rolling;

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the major features being the Valley of Azatika Brook and the existing Hwy. #17 embankment over the existing culvert(s). Azatika Brook flows in a northerly direction. The depth and width of the brook varies, being in general, wider and shallower outside the culvert. A small island, consisting of recently deposited clay is visible approximately 50 ft. downstream of the culvert. Most of the adjacent land is utilized as pasture.

Physiographically the site is located in the region referred to as the Ottawa Valley Clay Plains. The area is characterized by extensive clay deposits, interrupted by ridges of rock and sand. The sensitive marine clay, which was deposited in the geologic past in the Champlain Sea, varies markedly in thickness over the region. The clay is generally underlain by glacial till and/or interglacial sand and gravel deposits, followed in turn by bedrock of Precambrian Age.

3. *FIELD AND LABORATORY INVESTIGATION PROCEDURES:*

A total of eleven sampled boreholes and one dynamic cone penetration test was carried out during the course of the field work. Boring was achieved by means of Bombardier mounted hollow-stem continuous auger machine and conventional diamond drilling equipment adapted for soil sampling purposes. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler; the energy used in driving it conformed to the requirements of the Standard Penetration Test (SPT). 'Undisturbed' samples were recovered using 2 inch I.D. Shelby tubes which were pushed into the soil hydraulically. Where possible, in situ field vane tests were carried out to determine the undrained shear strength of the subsoil.

The bedrock was proven at six borehole locations using BX rock coring equipment.

Dynamic cone penetration test was carried out adjacent to one borehole. Driving energy to advance the cone was 350 ft.-lbs. per blow.

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All boreholes were surveyed in the field by personnel from Ottawa District. The locations and elevations of the borings are shown on Drawing No. 73-11016A which accompanies this report.

The groundwater level conditions across the site were determined by recording the water levels in the open boreholes during the course of the field investigation. The artesian condition encountered in B.H. #3 was completely sealed at the source.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection laboratory tests were carried out on selected samples to determine the following physical (engineering) properties:

Natural Moisture Content
Atterberg Limits
Grain-Size Distribution
Undrained Shear Strength
Bulk Density

The test results are plotted on the Record of Borehole sheets and summarized on Figure 1, and contained in the Appendix I of this report.

4. *SOIL TYPES AND SOIL CONDITIONS:*

4.1) *General:*

Generally uniform subsoil conditions were found to prevail over the site area. The natural subsoil consists of a relatively deep deposit of cohesive clay soil, followed by limestone bedrock. The clay deposit is overlain by fill material. The boundaries between different deposits are shown on the Record of Borehole sheets attached to the Appendix. The estimated stratigraphical profile of Drawing 73-11016A is based upon this information.

From ground level downward, the various strata are described in detail with regard to soil types and soil properties, as follows:

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4.2) *Fill Material - Silty Clay, Trace of Sand:*

The fill material was intersected in all borings and extends to the natural ground surface or to the top of culvert. The thickness of the deposit ranges from 5 ft. in B.H. #1 to 24 ft. in B.H. #2.

The fill material consists of silty clay, trace of sand, with the following average proportions: gravel - 0% sand - 2%, silt - 52%, and clay - 46%. However, in B.H.'s #8, #9, #10 and #11, an approximately 2 ft. thick granular base course was encountered immediately below the roadway surface.

Standard Penetration Test 'N' values varied between 3 and 29 blows/ft.,indicating that part of the roadway fill material is poorly compacted. Elsewhere the compaction appears to be adequate.

The consistency of the overall deposit is estimated to range from soft to very stiff.

Laboratory tests yielded the following results:

In-Situ Moisture Content (%)	33 - 41
Liquid Limit (%)	42 - 53
Plastic Limit (%)	25 - 34
Bulk Density (p.c.f.)	112 - 121

The thickness of the concrete of the culvert deck slab is approximately 2 ft. as determined in B.H.'s #1 and #4.

4.3) *Clay, Trace of Sand:*

Directly beneath the fill material or below the brook bed a relatively deep deposit of cohesive stratum was encountered. The thickness of the deposit ranges from 37 ft. in B.H. #1 to 60 ft. in B.H. #11. The lower boundary was found to be at the bedrock surface level (elevation 80± - elevation 89±).

The clay is a sensitive marine deposit, known locally as 'leda clay'. Throughout the stratum random pockets and up to 1/4" thick seams of silt were observed. A plot of plasticity index versus liquid limit (Fig. 2) indicates that this cohesive deposit is an inorganic clay of high plasticity (CH).

The undrained shear strength of the overall stratum, in general, increases with depth. A number of unconfined and unconsolidated undrained triaxial tests were carried out on samples and gave values of undrained shear strength ranging from about 400 to 1800 p.s.f. These values were, in general, lower than the field vane tests carried out at the corresponding sample elevations. The fairly wide divergence (see below) between field and laboratory testing can be attributed to the effects of disturbance caused by sampling in the field and by handling thereafter. The consistency of the stratum ranges from soft to very stiff.

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

	Range	*Average*
Natural Moisture Content (W) (%)	48 - 74	59
Liquid Limit (W_L) (%)	63 - 86	70
Plastic Limit (W_p) (%)	22 - 33	28
Bulk Density (γ) (p.c.f.)	98 - 110	103
Undrained Shear Strength (C_u) (p.s.f.)		
Field Vane Tests	560 - 2120	1489
Laboratory Tests	390 - 1840	1140
Sensitivity	2.0 - 12	

Typical grain-size distribution curves are included in the Appendix of this report (Fig. 3). For design purposes the following undrained shear strength values are suggested:

O.G. Level to Elevation 120	-	1,000 p.s.f.
Elevation 120 to Elevation 100	-	1,250 p.s.f.
Elevation 100 to Bedrock Surface	-	1,600 p.s.f.

4.4) Limestone Bedrock:

The clay deposit is directly underlain by bedrock which was proven in seven boreholes. Over the site the bedrock surface was found to vary between elevation 80± and elevation 89±.

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The bedrock, as described by Mr. K. W. Ingham, Geologist, composed of a dark grey, fine grained, medium to thick bedded limestone, with occasional thin irregular shale seams.

In general, the bedrock appears to be sound as evidenced by the core recovery and observations.

5. *GROUNDWATER CONDITIONS:*

Groundwater level observations were carried out during the period of the field work. The observed water levels are presented on the individual Record of Borehole sheets as well as on Drawing No. 73-11016A. The results indicate that the groundwater level varies between elevation 135.6 which is the water level in the brook and elevation 148.4. No groundwater level observation was carried out in B.H. #11.

Artesian condition was encountered in B.H. #3 once the boring penetrated through the cohesive clay stratum into the upper portion of the bedrock. The condition stabilized itself at elevation 149.6, which is approximately 2 ft. above the existing ground surface.

It is pointed out that some of the observed high groundwater level may not represent the true conditions due to the relatively impermeable nature of the subsoil and insufficient time for stabilized groundwater level observation.

6. *EXISTING STRUCTURE:*

The existing structure which carries Hwy. #17 over Azatika Brook consists of a two segmented culvert.

The south or intake part is a 20' x 8' x 60' "open type" concrete culvert built in 1924. In the year of 1952, Hwy. #17 was realigned to the north, and the grade line was increased by approximately 17 ft. at the same time a 20' x 8' x 135' rigid frame "open type" culvert was constructed to accommodate these changes. The centreline of the older culvert is about 24° due west to the centreline of the newer addition.

Rapid subsidence of the embankment was observed in

in early 1973, and required constant maintenance.

Both culvert segments appear to be in poor condition. The east side of the outlet portion settled about 14" relative to the west side, causing the deck slab to fracture. Soundings, taken at the outlet indicate that the brook bed has scoured some 6 - 7 ft. below the original level within the culvert. Erosion at the culvert base appears to be the main cause of the failure. Heavy rainfalls could increase the flow through the culvert which, in turn, may cause further scouring and possible collapse of the structure.

A careful review of the foundation requirements based on subsoil conditions, hydrology and other considerations was made by the Regional Structural Planning Office, and it was concluded that the most suitable scheme for this crossing will be a single-span structure.

At this stage, the proposal calls for the removal of the existing culvert and in part the existing roadway embankment and the construction of a single-span structure. Photographs of the existing culvert are included in the Appendix of this report.

7. *DISCUSSION AND RECOMMENDATIONS:*

7.1) General:

It is proposed to construct a new structure at the crossing of Azatika Brook and Hwy. #17, due to the partial failure of the existing culvert.

The proposed profile grade of the crossing will be at elevation 159± (Sta. 428+80, Centreline). The proposed channel bed will be about 16 ft. wide constructed at elevation 132± as shown on the preliminary plan (No. 27-170-1).

In addition, a detour of the roadway will be necessary to maintain the traffic for the duration of the construction. The temporary detour crossing is proposed to consist of twin bailey bridges located about 700 ft. south of the existing centre-line of Hwy. #17. Recommendations for the detour structure support were given by this Office in a memorandum dated

June 28, 1973.

Our recommendations pertaining to the new structure support, stability of the appraoches and other aspects are as follows:

7.2) *Abutment Foundations:*

The subsoil conditions encountered at the proposed abutment locations are not favourable for spread footing type foundations. Therefore, the abutments recommended to be perched within the approaches and be supported on end-bearing steel 'H' piles driven to bedrock. The allowable capacity of a pile will be dependent on the pile section chosen. For example, 12 BP 74 steel 'H' piles may be designed for a safe design load of 95 tons. For estimating purposes, it can be assumed that the piles will meet the bedrock surface at the following elevations:

West Abutment:	Elevation 87± - Elevation 89±
East Abutment:	Elevation 80± - Elevation 84±

Since the pile caps of the perched abutments will be formed within the approaches in impermeable stratum no major dewatering problems are anticipated.

No boulder or rock fill material should be placed in that portion of the approaches through which piles are to be driven.

7.3) *Approach Embankments:*

The proposed approaches will have a maximum height of about 17 ft. over the reconstructed channel bed. Stability analyses in terms of total stresses have been carried out to check the stability of the proposed approaches in longitudinal and transverse directions. The results indicate that the approaches will be stable with respect to a deep-seated rotational failure, provided standard 2:1 forward and side slopes are constructed.

Any new fill which may be needed should consist of well compacted acceptable material and keyed into the existing fill.

The existing embankment have consolidated the underlying compressible clay stratum for about 20 years previously; therefore, it is concluded that the major portion of the settlement have already completed. No major settlement problems are anticipated.

7.4) Other Considerations:

As indicated on the preliminary bridge drawing, the brook will be excavated within the limits of the existing culvert to elevation 132. Rip-rap (2 ft. thick) should be placed on the slopes up to elevation 143.

8. MISCELLANEOUS:

The field investigation was carried out during the period of May 7 to 15, and June 8 to 13, 1973, under the supervision of Mr. J. Bangs, Project Foundations Engineer.

Equipment was owned and operated by Master Soil Investigation Ltd. and by Johnston Drilling Co. Ltd. (Ottawa).

This report was written by Mr. P. Payer, Senior Foundations Engineer.

The entire project was under the general supervision of Mr. M. Devata, Supervising Foundations Engineer, who also reviewed this report.

P. Payer

P. Payer, P. Eng.

REGISTERED PROFESSIONAL ENGINEER
P. PAYER
PROVINCE OF ONTARIO

M. Devata

M. Devata. P. Eng.

PP/ao
July 11, 1973.

APPENDIX I

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 1

JOB 73-11016 — LOCATION Sta. 429 + 47 55' Rt. — ORIGINATED BY JB

W.P. 916-73-01 & 02 — BORING DATE May 1, 1973 — COMPILED BY PP

DATUM Geodetic — BOREHOLE TYPE Cont. Flight Auger — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) 1,000 – 1200 – 2000	LIQUID LIMIT w_L, PLASTIC LIMIT w_p, WATER CONTENT w (w_p – w – w_L); WATER CONTENT % 20 – 40 – 60	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
147.6	Ground Level									
0.0	Silty Clay Fill Material									
142.6	Top of Culvert									
140.6	Concrete									
7.0										
135.6	Water Level									
12.0										
123.6	Brook Bottom									
24.0	Clay (sensitive) trace of sand occ.layers & pockets of silt. Firm to Stiff		1	SS	PH	140				
			2	SS	PH					
			3	SS	PH	130				
			4	SS	PH					
			5	SS	PH	120	7.1		100 98	
			6	SS	PH		+9.0			
						110	+6.0 ● +6.7		102.5 100	0 0 27 73
							+7.3			
							+7.3			
						100	●		103.5	
							+7.0			
86.6			7	SS	PH	90	●		106	0 1 34 65
61.0	End of Borehole Refusal (Probable Bedrock)									

OFFICE REPORT ON SOIL EXPLORATION

20 / 15 ◇ 5 / 10 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE Nº 2

FOUNDATIONS OFFICE

JOB 73-11016 LOCATION Sta. 429 + 79 29' Lt. ORIGINATED BY JB

W.P. 916-73-01 & 02 BORING DATE May 7 & 8, 1973 COMPILED BY FP

DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

OFFICE REPORT SOIL EXPLORATION

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) 400 1200 2000	LIQUID LIMIT w_L, PLASTIC LIMIT w_P, WATER CONTENT w (w_P w w_L) WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
155.8	Ground Level									
0.0	Silty Clay									
	Trace of sand		1	SS	6					0 2 56 42
			2	SS	7					
	Fill Material		3	SS	9					0 2 49 49
			4	SS	29					0 2 55 43
	Firm to Very Stiff		5	SS	15					▼140.8
			6	SS	12	140				
131.8			7	TW	PH		+2.0		114	
24.0	Clay (sensitive)		8	TW	PH		+2.0		121	
	trace of sand		9	TW	PH	130	+4.0		94	
	occ. layers & pockets		10	TW	PH		+6.0		99 99.5	0 1 19 80
	of silt.		11	TW	PH		+4.0		104	0 0 32 68
			12	TW	PH	120	+6.9			
	Firm to Very Stiff		13	TW	PH		+6.7		103 104.5	0 0 34 66
			14	TW	PH		+4.7			
			15	TW	PH	110				
			16	TW	PH		+7.3		104 103	
						100	End of core +3.3			
86.8			17	TW	PH	90			103.5 102	0 1 43 56
69.0	End of Borehole Refusal (Probable Bedrock)									
						80				

15 20 10 5 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE Nº 3

FOUNDATIONS OFFICE

JOB 73-11016 LOCATION Sta. 430 + 20 52' Lt. ORIGINATED BY JB

W.P. 916-73-01 & 02 BORING DATE May 9 & 10, 1973 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger & BX Rock Coring CHECKED BY JR

OFFICE REPORT - SOIL EXPLORATION

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT
147.6	Ground Level				
0.0	Clayey silt, trace of sand		1	SS	5
			2	SS	7
	Fill Material				
			3	TW	PH
128.1	Firm				
19.5	Clay (Sensitive)		4	TW	PH
			5	TW	PH
	trace of sand		6	TW	PH
			7	TW	PH
	Soft to Very Stiff		8	TW	PH
			9	TW	PH
	occasional layers & pockets of silt.		10	TW	PH
			11	TW	PH
81.1					
66.5	Limestone Bedrock		12	RC BX	100%
76.1	Sound				
71.5	End of Borehole				

ELEV. SCALE: 140, 130, 120, 110, 100, 90, 80, 70

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
400 1200 2000

+9.3 +5.0 +11.6 +6.8 +5.8 +11.0 +9.9 +5.6

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P W W_L
WATER CONTENT %
20 40 60

BULK DENSITY γ P.C.F.: 112, 100, 99, 99, 100, 101, 110, 101

REMARKS Head ▽

0 1 48 51

0 0 37 63

0 1 32 67

Art. ▽ Water Encountered

15 20 5 10 % STRAIN AT FAILURE

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 4

JOB 73-11016 — LOCATION Sta. 430 + 08 42' Lt. — ORIGINATED BY JB

W.P. 916-73-01 & 02 — BORING DATE May — COMPILED BY PP

DATUM Geodetic — BOREHOLE TYPE Cont Flight Auger — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — WATER CONTENT % (20 40 60)	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
148.7	Ground Level									
0.0	Fill Material									
	Silty Clay									
140.7	Top of Culvert									
8.0										
138.7	Concrete					140				
10.3	Water Level									
12.1										
						130				
122.6	Brook Bottom									
26.1										
122.3	Clay		1	SS	3					
26.4	End of Borehole					120				

20 / 15 ◇ 5 / 10 % STRAIN AT FAILURE

OFFICE REPORT — SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 5

JOB 73-11016 — LOCATION Sta. 429 + 96 29' Lt. — ORIGINATED BY JR

W.P. 916-73-01 & 02 — BORING DATE May 11, 1973 — COMPILED BY FD

DATUM Geodetic — BOREHOLE TYPE Cont. Flight Auger — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL
155.0	Ground Level						400 1200 2000	20 40 60		
0.0	Sand - Fill									
2.0	Silty Clay		1	SS	11	150				
			2	TW	FH				113	
			3	SS	11					
	Fill Material		1	TW	FH				116	
139.9						140				
15.1	End of Borehole (Top of Culvert)									
						130				

OFFICE REPORT — SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No 6

FOUNDATIONS OFFICE

JOB 73-11016 LOCATION Sta. 428 + 99 60' Rt. ORIGINATED BY JB

W.P. 916-73-01 & 02 BORING DATE May 11 & 14, 1973 COMPILED BY PB

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger-BX Rock Coring CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE
145.6	Ground Level					
0.0	Silty Clay					
	Soft					
136.6	Fill Material		1	SS	3	140
9.0	Clay		2	TW	PH	
	(sensitive)					
	trace of sand		3	TW	PH	130
	occ.layers & pockets		4	TW	PH	
	of silt.		5	TW	PH	
			6	TW	PH	120
	Soft to Stiff		7	TW	PH	
			8	TW	PH	110
			9	TW	PH	100
			10	TW	PH	90
85.8						
59.8	Limestone Bedrock					
80.8	Sound					
64.8	End of Borehole					80

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
400 1200 2000

+6.0 +9.0 +10.0 +6.8 +6.8 +10.0 +10.5 +9.4

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P W W_L
WATER CONTENT %
20 40 60

BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
	▼ 140.0
104	
104	0 0 20 80
102	
104	
106	0 1 29 70

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 7

JOB 73-11016 — LOCATION Sta. 429 + 96 29' Rt. — ORIGINATED BY JB
W.P. 916-73-01 & 02 — BORING DATE May 15, 1973 — COMPILED BY PP
DATUM Geodetic — BOREHOLE TYPE Cont. Flight Auger — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
155.9	Ground Level				
0.0	Silty Clay		1	SS	7
			2	SS	12
	Fill Material				
138.4			3	SS	20
17.5					
	Clay		4	TW	PH
	(sensitive)		5	TW	PH
	trace of sand		6	TW	PH
	occ. layers and		7	TW	PH
	pockets of silt.		8	TW	PH
			9	TW	PH
	Firm to Stiff				
			10	TW	PH
			11	TW	PH
			12	TW	PH
86.4					
69.5	End of Borehole Refusal Probable Bedrock				

ELEV. SCALE: 150, 140, 130, 120, 110, 100, 90, 80

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
400 1200 2000

+2.8, +6.4, +5.1, +6.0, +4.9, +7.7, +5.6

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
w_P — w — w_L
WATER CONTENT %
20 40 60

BULK DENSITY γ F.C.F.	REMARKS GR.SA.SI.CL.
	▼143.8
100	0 1 39 60
104	
103	0 0 32 68
106	
107.5	0 0 25 75

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 8

JOB 73-11016 — LOCATION Sta. 429 + 30 15' Rt. — ORIGINATED BY JB

W.P. 916-73-01 & 02 — BORING DATE June 8, 1973 — COMPILED BY SO

DATUM Geodetic — BOREHOLE TYPE Cont. Flight Auger & BX Rock Coring — CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L — PLASTIC LIMIT w_p — WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL
159.3	Ground Level									
0.0	Probable Silty Clay Fill Material									
141.3						150				▼ 142.8
18.0	Probable Clay					140				
						130				
						120				
						110				
						100				
89.4						90				
69.9	Limestone Bedrock		1	RC BX	99%					
83.8	Sound									
75.5	End of Borehole					80				

20 / 15 ✧ 5 / 10 % STRAIN AT FAILURE

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 9

JOB 73-11016 — LOCATION Sta. 429 + 48 15' Lt. — ORIGINATED BY JB

W.P. 915-73-01 & 02 — BORING DATE June 11, 1973 — COMPILED BY SO

DATUM Geodetic — BOREHOLE TYPE Cont. Flight Auger & BX Rock Coring — CHECKED BY

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV SCALE
158.8	Ground Level					
0.0	Probable Silty clay Fill Material					150
140.8						140
18.0	Probable Clay					130
						120
						110
						100
						90
86.9						
71.9	Limestone Bedrock		1	BC BX	99%	
81.6	Sound					
77.2	End of Borehole					80

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P — W — W_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

GR SA SI C

▼ 148.1

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT — SOIL EXPLORATION

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 10

JOB 73-11015 — LOCATION Sta. 430 + 20 15' Rt. — ORIGINATED BY JB

W.P. 916-73-01 & 02 — BORING DATE June 11, 1973 — COMPILED BY SO

DATUM Geodetic — BOREHOLE TYPE Cont. Flight Auger & BX Rock Coring — CHECKED BY

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p w w_L WATER CONTENT %	BULK DENSITY γ P C F	REMARKS GR SA SI CL
158.4	Ground Level									
0.0	Probable Silty Clay Fill Material					150				▼148.4
141.4						140				
17.0	Probable Clay					130				
						120				
						110				
						100				
						90				
81.4										
78.0	Limestone Bedrock		1	RC BX	90%	80				
79.9	Sound									
78.5	End of Borehole									

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT — SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No 11

FOUNDATIONS OFFICE

JOB 73-11016 LOCATION Sta. 430 + 35 15' Lt. ORIGINATED BY RC

W.P. 916-73-01 & 02 BORING DATE June 12, 1973 COMPILED BY SO

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger & BX Rock Coring CHECKED BY

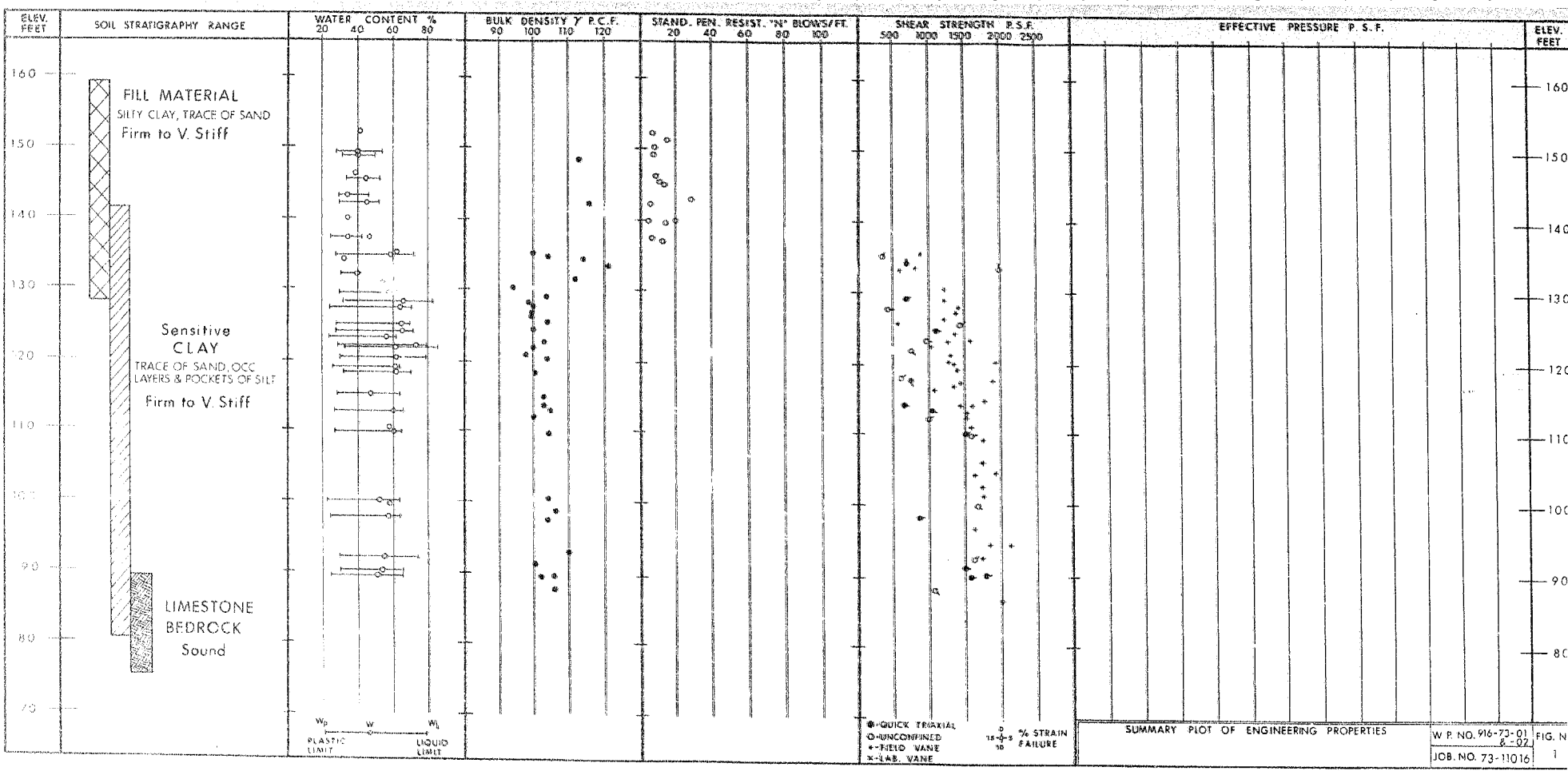
SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	WATER CONTENT %		GR. SA. SI. CL.
157.9	Ground Level									
0.0	Probable Silty Clay Fill Material					150				
139.9						140				
18.0	Probable Clay					130				
						120				
						110				
						100				
						90				
80.4						80				
77.5	Limestone Bedrock		1	BX	100%					
75.4	Sound									
82.5	End of Borehole					70				

15 ◇ 5 % STRAIN AT FAILURE (20 / 10)

OFFICE REPORT ● SOIL EXPLORATION

P.O. 28

SUMMARY PLOT OF ENGINEERING PROPERTIES



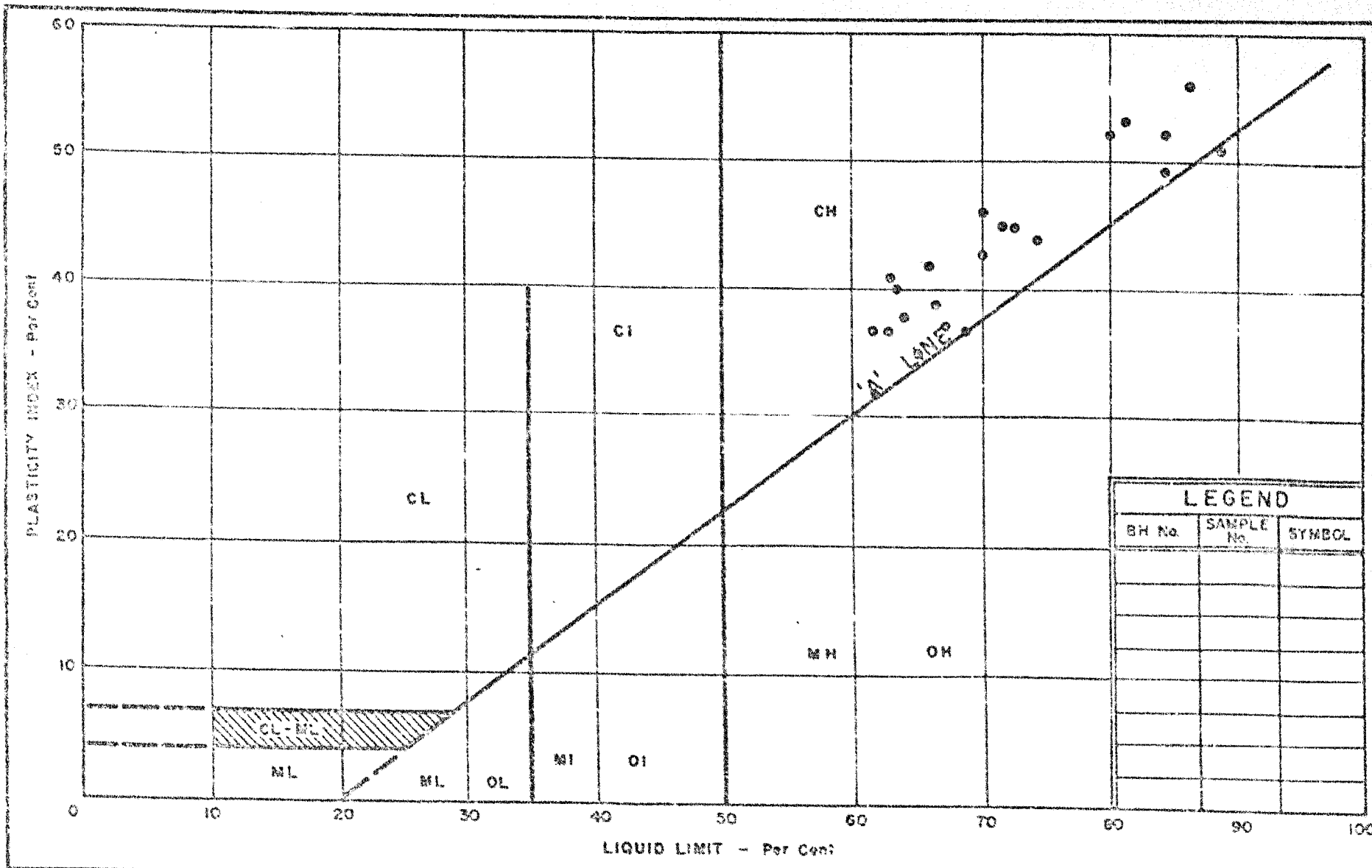
SUMMARY PLOT OF ENGINEERING PROPERTIES

W.P. NO. 916-73-01 & -02

JOB. NO. 73-11016

FIG. N 1

REVISED JUL[illegible] 1966



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART

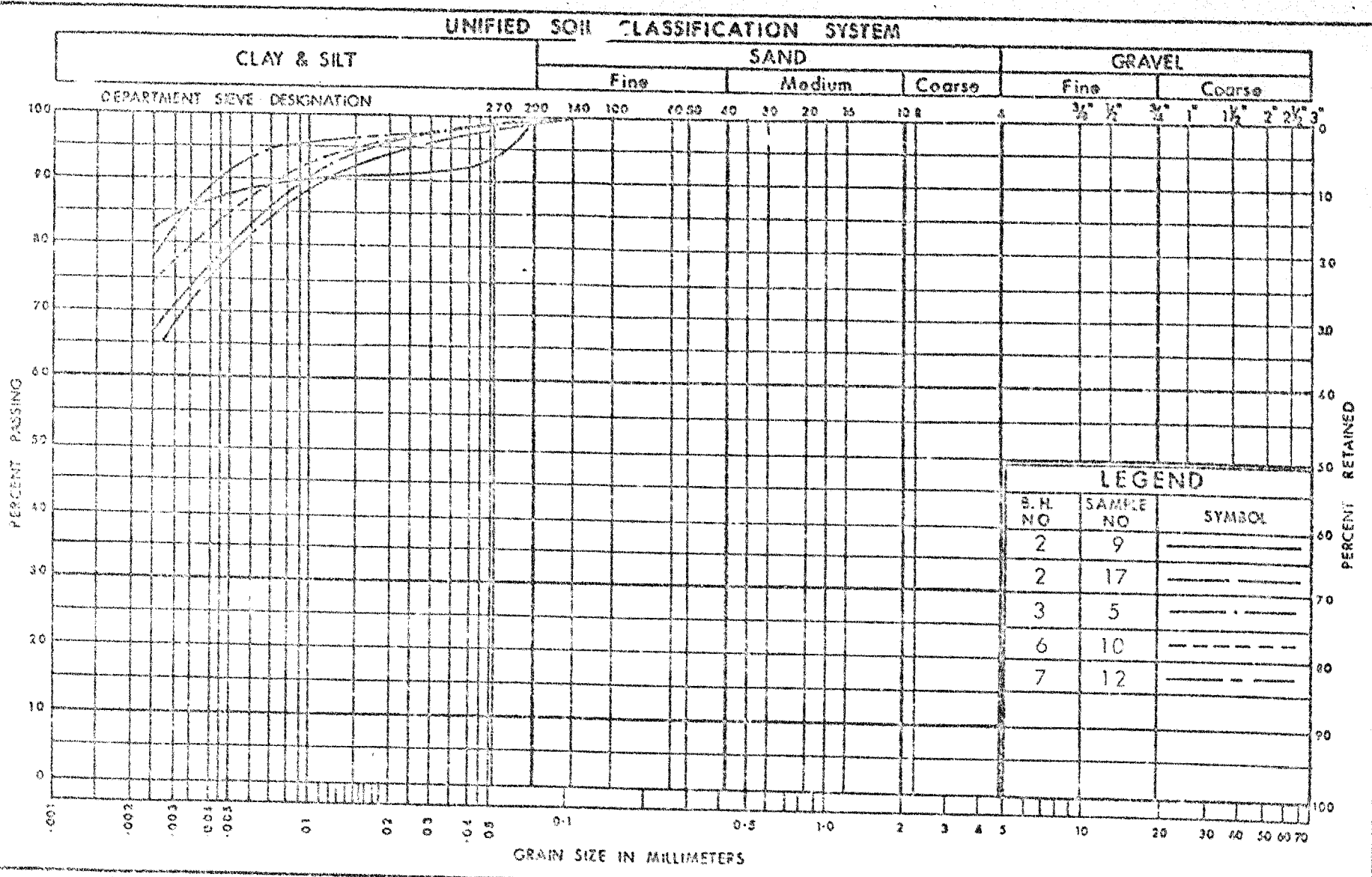
Sensitive CLAY

W.P. No. 916-73-01 & 02

JOB No. 73-11016

FIG. 2

FORM OD-MT-
REV. AUG. 1971



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

GRAIN SIZE DISTRIBUTION

Sensitive CLAY

W.P. No. 916-73-01 & 02

JOB No. 73-11016

FIG. 3

FD-9 (Rev. Jan. 73)

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION 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 :-

CONSISTENCY	c LB/SQ FT
VERY SOFT	0 - 250
SOFT	250 - 500
FIRM	500 - 1000
STIFF	1000 - 2000
VERY STIFF	2000 - 4000
HARD	> 4000

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

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	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAU	" " DRAINED "		

FD-9b (Rev. Jan. 73)

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 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

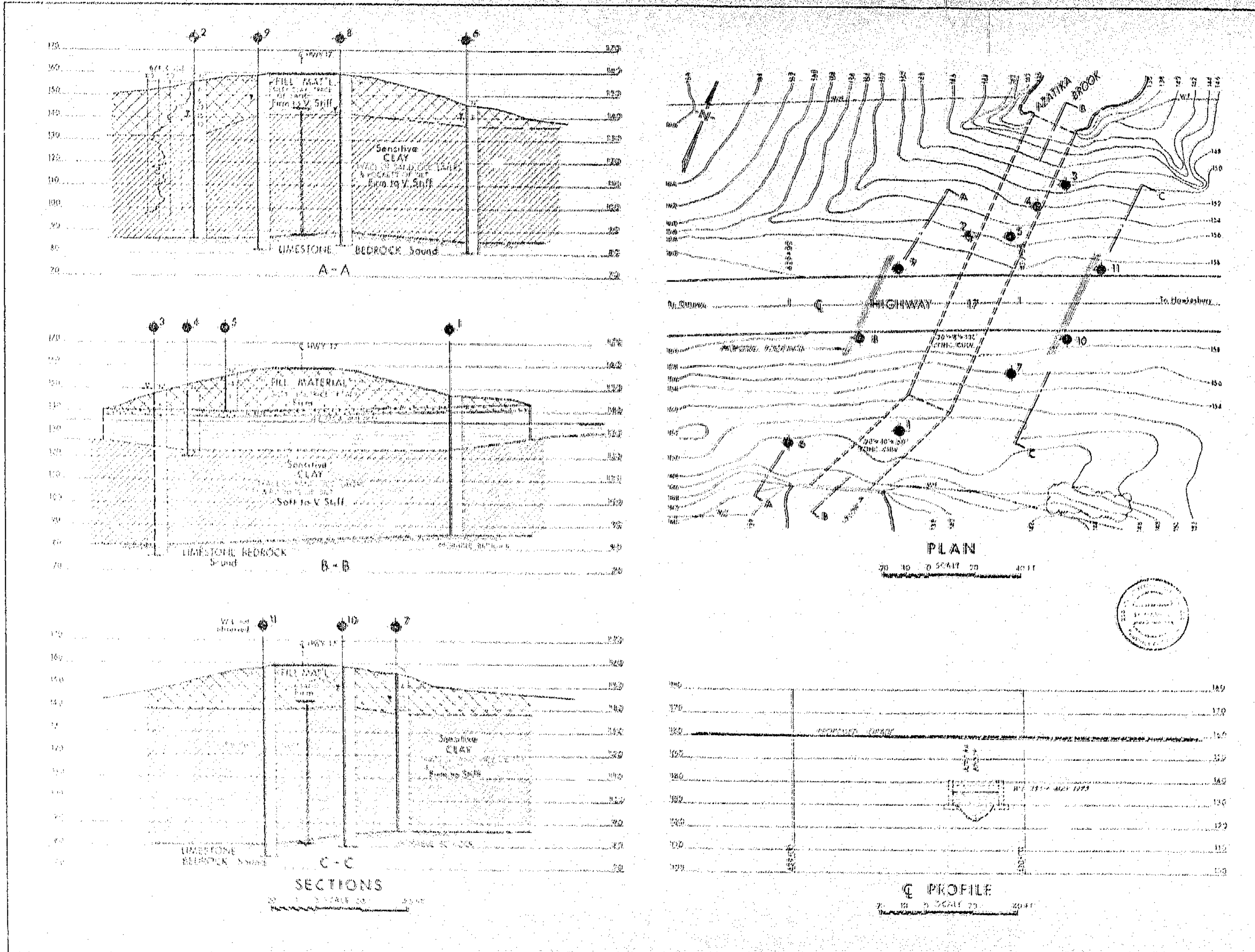
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

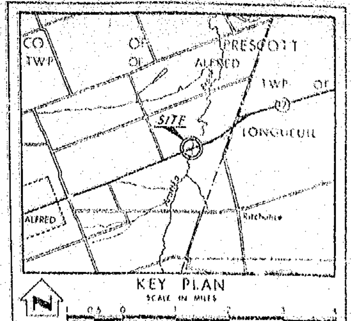
FOUNDATIONS

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





LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation MAY & JUNE 73
- Head / Encountered — ARTESIAN WATER

NO.	ELEVATION	STATION	OFFSET
1	147.6	429+47	55' Rt
2	155.8	429+79	29' Lt
3	147.6	430+20	52' Lt
4	148.7	430+08	42' Lt
5	155.0	429+96	29' Lt
6	145.6	428+99	60' Rt
7	155.9	429+96	29' Rt
8	159.3	429+30	15' Rt
9	158.8	429+45	15' Lt
10	159.4	430+20	15' Rt
11	157.9	430+35	15' 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.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS — ONTARIO

AZATIKA BROOK

HIGHWAY NO. 17 DIST NO. 9
CO. PRESCOTT
TWP. ALFRED LOT 17 CON. 5

BORE HOLE LOCATIONS & SOIL STRATA

DRAWING NO. 73-11016A

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: A. Stermac,
Principal Foundation Engineer,
Room 107, West Building.

FROM: Structural Office,
West Building,
Downsview.

ATTENTION:

DATE: July 10th, 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT:
Azatika Brook Bridge,
3 Miles East of Alfred,
W.P.916-73-01, Site 27-170,
Hwy. 17, District 9.

73-11-016

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C.S. Grebski,
Structural Design Engineer.

CSG:dp
Attach.

cc. Foundation Office.

No Comments
D. Derrah
July 16/73

FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS: W.P. 916-73-01

W.O. 73-11916

Foundation Report By: P.P. PAYER

Review of Design Drawings By: PP

Design Drawing No.'s 27-170-1

1. Does footing design comply with our report or subsequent memos? YES

2. If answer to 1. is No, is present design acceptable?

3. Has sufficient field work been done? YES

4. Are estimated pile lengths shown on Drawings correct? If not, make a new list. O.K.

5. If excavation of unsuitable soil is recommended, is this shown on Drawings? N.A.

6. Are approaches designed in accordance with our report? Check slopes and berm lengths. YES

7. Do you anticipate any construction problems? i.e., dewatering, stability of temporary slopes or excavations. No

8. Summarize your comments; on separate sheet if necessary.

No Comments

Drawings Received JULY 13 19 73

Reviewed JULY 13 19 73

Signed P.P. Payer

P PAYER UNA

73-11016

Minutes of Pre-Contract Review

Boardroom 1 of Regional Office July 19, 1973
W.P. 916-73-01, Azatika Brook, 3 Mi. East of Alfred

Those in attendance:

H. B. McKay	Engineering Audit
H. Alguire	District 9 - Ottawa
A. E. Irving	Systems Design
H. Eimers	Systems Design
A. Bailey	Systems Design
K. Bassi	Structural ~~Planning~~ Design
T. C. Kingsland	Structural Planning
A. Van Dalen	Structural Planning
P. Payer	Foundations Office
M. Stoyanoff	Structural Contract Office
M. Batten	Materials & Testing

Comments
Sheet 5

1. Change Temporary fence to DD-901
2. Erase high water level from profile
3. Change Bailey Bridge drawing to No. 27-170-13
4. Put Sta. on typical section

Sheet 6

1 Show thickness of rip-rap on note
2. Granular backfill to structure to be distinguished from roadway granular
3. Backfill to structure to be granular A
4. Show type of curb & gutter on drawing
5. Limits of excavation on east side of structure to be shortened to 431+60 and the difference in elevation to be padded with H.L. 4

Bridge Drawings

1. Foundation Office recommended that timber piles should be used under Bailey Bridge abutments.
2. District questioned how the Bailey Bridge was to be erected. i.e. in the dry or with launching nose. If launching nose was to be used, would the grades on each side of Bailey Bridge interfere with this operation. A teletype is to be sent from Systems Design Office to Bridge Maintenance concerning this matter.

Cont.....2

D-4

1. Change granular 'C' backfill to structure to granular 'A' backfill to structure.
2. 10% of tender for engineering costs
3. A price of $700.00 was to be inserted on the sundry sheet for clearing cost.

General Comments

1. District pointed out that they did not want to use H. L. 1 on this contract.
2. District requested that an alternate detour route be considered in the event the Bailey Bridge failed.
3. District noted that the items for "sodding" and "application of water (for sod)" should be deleted and that they would seed the new slopes.
4. Soils data is shown on contract drawing removal sheet.
5. The use of explosives is prohibited on this contract.
6. District recommended an interim completion date of January 15/73 (base course paving only) final completion date of June 15/73.

District pointed out that waterproofing of deck should likely wait to next year. Therefore base course of asphalt on deck would have to be removed.

7. 25 contract books required.

PRIORITY 73 JUL 20 AM 9:40

MX KINR JULY 20 1973 9:15 PRIORITY

DOWN 1: W D BIRCH STRUCTURAL MAINTENANCE ENG

MAINTENANCE BRANCH DOWNSVIEW

00063

00064

COPIES TO:

KINR: P D BILLINGS

T C KINGSLAND

E SAINT

R FORREST

OTTA 1: J CHILDS DISTRICT ENGINEER

DOWN: M SINCLAIR OPERATIONS DOWNSVIEW

H CHYC PROGRAM SECTION DOWNSVIEW

J WEAR SYSTEMS DESIGN DOWNSVIEW

A G SIERMAC FOUNDATIONS OFFICE DOWNSVIEW

W P 916-73-01 HIGHWAY 17 AZAITKA BROOK

W.O 73-11-016

DISTRICT 9 OTTAWA

REFER TO MY LETTER OF JULY 18 1973

I CONFIRM OUR TELEPHONE CONVERSATION YESTERDAY THAT CONTRARY TO THE RECOMMENDATIONS OF THE FOUNDATION OFFICE, TIMBER PILES WILL NOT BE PROVIDED FOR THE BAILEY BRIDGE ON THE DETOUR.

A E IRVING

SYSTEMS DESIGN KINGSTON

SAC

TELETYPE TELETYPE TELETYPE TELETYPE TELETYPE

D OFFICE REVIEW REPORT

BOARDROOMS: E-1 and E-2,
DOWNSVIEW, ONTARIO.

DATE: July 27, 1973

W.P.: 16-73-01-02 CONTRACT: 73-143 HIGHWAY: 17

TYPE OF WORK: Grading, Drainage, Granular Base, Hot Mix Paving and Structure.

LOCATION: Azatika Brook Bridge 3.0 Miles East of Alfred

DISTRICT: 9

ADVERTISING DATE: August 8, 1973

ATTENDANCE:

J.B. Wilkes	H. Emers	A.E. Irving	R. Northwood	K. Bassi
E.J. Orr	R.A. Verscheure	W. Bennett	K. Livingston	M. McArthur
J.R. Wear	R. Beaudro	J. Jenkins	R. Quinn	
E.J. Willis	J.E. Callaghan	H. Chyc	M. Devata	

POINTS OF DISCUSSION:

1) Mr. McArthur of Structural Maintenance stated that as spread footings are being used piles are not a requirement.

2) Bailey erection to be only work prior to spring '74. Region are to insert a special "Interior Date for Completion of Bailey & Detour".

3) The use of H. L. 1 was approved by Mr. W. R. Bennett.

4) It is understood by the Foundations Section that a granular pad is required under bailey cribs but on checking with the Maintenance Branch it is understood that no provision has been made for such a pad.

E.J. Willis
PROJECT REVIEW SUPERVISOR

for:

J.R. Wear
PROJECT REVIEW ENGINEER

EJW/rk

c.c.:

P.D. Billings	W.D. Birch
A.J. Percy	J. Crannie
E.R. Saint	E.J. Willis
J.M. Childs	M. Stoyanoff
H.B. McKay	C. Grebski
W. Melinyshyn	W.R. Bennett
G. Wrong	A. ~~Ferrus~~ STERNAC
R. Beaudro	
B. Giroux	

J. Gerbic 3629

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO:	Mr. W.D. Birch, Structural Maintenance Engineer.	FROM:	Structural Maintenance Office, Room 312A, Central Bldg., Downsview.
ATTENTION:		DATE:	August 7, 1973.
OUR FILE REF.		IN REPLY TO	

SUBJECT: Azatika Creek, Site No. 27-170, Hwy. 17, District 9

Receiving the Head Office Review Report of July 27, 1973 I took notice that a granular pad was recommended under the bailey cribs.

Checking with Mr. P. Payer, Senior Foundation Engineer who investigated the soil for the bailey structure, it was confirmed again that the original soil could take up to 1000 pounds per square foot load.

Please note that the maximum load under this crib will be less than 900 pounds per square foot. This is to confirm Mr. McArthur's statement at the Review Meeting that the spread footing as per drawing 916-73-01 is adequate.

F. Gormek
Structural Maintenance
Design Engineer

FG:nh
c.c.
J. B. Wilkes
E. J. Orr
J. R. Wear
E. J. Willis
H. Emers
R. A. Verscheure
R. Beaudro
J. E. Callaghan
A. E. Irving
W. Bennett
J. Jenkins
H. Chyc
R. Northwood
K. Livingston
R. Quinn
M. Devata
K. Bassi
M. McArthur
G. M. Sinclair
P. Payer

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

To: Mr. W. D. Birch,
Structural Maintenance Engineer,
DOWNSVIEW, Ontario.

From: Materials and Testing Office,
KINGSTON, Ontario.

Attention:

Date: August 13th, 1973

Our File Ref.

In reply to

Subject: Cont. 73-143, Azatika Creek, Culvert Replacement, Hwy. # 17
3 Miles East of Alfred, District # 9, Ottawa

We are in receipt of the contract drawings for this project.

It is noted that the proposed timber crubs are to be established directly on the insitu subsoil materials without pile support.

In view of the very soft condition of the near surface soils, it was recommended that a granular pad be placed under these timber cribs at the regional pre-contract review meeting.

This is required to obtain a uniform load distribution to the subsoil directly under the proposed crib construction and to obtain material stable enough to prepare a proper grade for bedding the proposed crib sills.

It is recommended that provision be made for a minimum 18" Granular 'A' pad at these crib sites either by alteration of the contract drawing or by negotiation during construction.

A. M. Batten,
Senior Soils Supervisor

AMB/sgp

c. c. - G. A. Wrong
A. G. Stermac
A. R. Rutka
A. J. Percy
T. C. Kingsland
H. A. Meyer
J. M. Childs

Mr. J. M. Childs,
District Engineer,
District #9,
Ottawa, Ontario.

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

August 17, 1973.

Mr. J. A. Cruickshank,
Construction Engineer.

Bailey Bridge, Asatika Brook, 5 Miles East of Alfred, Hwy. #17, District #9, Ottawa.
W.P. 916-73-01 -- W.O. 73-1101

The Head Office Review Meeting was held for the above-mentioned project on July 27, 1973. At that time, it was understood that the Regional Materials Office would like to include a granular pad underneath the timber crib for the Bailey Bridge. However, in the Minutes of the Head Office Review Meeting, it was stated that the granular pad was recommended by the Foundations Office. We have discussed this discrepancy with the System Design Office and Mr. E. J. Willis, Project Review Supervisor, agreed that the necessary corrections to the Minutes will be made.

Discussions were carried out between the writer and the personnel from Ottawa District Office, Structural Maintenance Office, Regional Structural Planning Office and Regional Materials Office, in order to assess the necessity of a granular pad under the timber crib for the Bailey Bridge. From these discussions, the following conclusions can be made.

The maximum load under the timber crib will not exceed 900 p.s.f. as indicated by the Structural Maintenance Office, which is less than the safe bearing capacity of the foundation subsoil (1,000 p.s.f.). In view of this, the granular pad is not essential from the bearing capacity point of view. However, the foundation subsoil is a sensitive cohesive silty clay, which may easily be softened by groundwater seepage or uncontrolled surface runoff. In such a case, it may be advantageous to place a granular pad, prior to the construction of the timber crib. This aspect was discussed with Mr. J. Cruickshank and it was agreed that, if necessary, such a granular pad will be placed during the time of construction.

In view of the foregoing, it can be concluded that the structural design drawings for the Bailey Bridge need not show any granular pad underneath the timber crib.

.....2

We believe that the aforementioned information is sufficient for your present requirements. Should you require further information, please contact our Office.

MD/ao

M. Devata,
SUPERVISING FOUNDATIONS ENGINEER.

c.c. W. D. Birch (Attn: F. Gormek)
J. R. Wear
A. J. Percy
T. C. Kingsland
E. R. Saint

Foundations Files
Documents

SUMMARY OF PILE DRIVING RECORDS

W.O. 73-11016 W.P. 916-73-01 CONT. 73-43 DIST. 9

SITE AZAMKA BROOK BRIDGE

DATE DRIVEN MAY 23-30 1974 WEIGHT OF ANVIL 6001b

HAMMER TYPE DROP WEIGHT 2 TON ENERGY 24000 - 32000 Ft/lb

LOCATION OF PILES	PILE				ESTIMATED TIP EL. (ft.)	DIFFERENCE Longer(+) Shorter(-) Than Estimated (ft.)	REMARKS
	TYPE	NO.	LENGTH (ft.)	TIP EL. (ft.)			
EAST ABUTMENT	12 BP 74	41	62.4	80.1	80 - 84	—	
WEST ABUTMENT	— " —	17	54.2	89.8	87 - 89	- .8	

Form OB-MT-205

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS AND TESTING OFFICE
FOUNDATION SECTION

716-73-01,02
73-11016

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 73-143 STRUCTURE ARAUKA BROOK BRIDGE

CONTRACTOR BERTRAND, FREDE CONST. CO. LTD. DESIGN LOAD OF PILE

HAMMER DETAILS: TYPE DROP WEIGHT 2 TON HEIGHT OF FALL OR ENERGY 6'-8'

TYPE OF ANVIL OR CAP H-PILE, 12" WOOD BLOCK WEIGHT OF ANVIL OR CAP 600

PILE DETAILS 12 B.P. @ 74 lbs/FT - 0.607", 1:12 BATTER, STEEL PLATE [illegible] WITH WOOD BLOCK

PILE NO. 41 LOCATION EAST ABUTMENT DATE DRIVEN MAY 23/74

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE ~~64'~~ 62.5 FINAL CUT OFF ELEVATION 142.50

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

SIGNED [signature]
NAME (PRINT) M. SHAVEE
DATE MAY 23/74
ATTACH SKETCH OF PILE NUMBERING SYSTEM

142.5
62.5
79.0

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

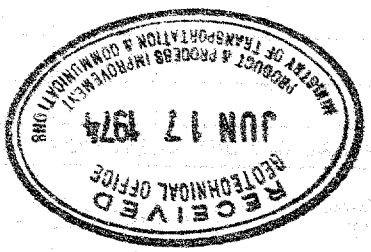
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

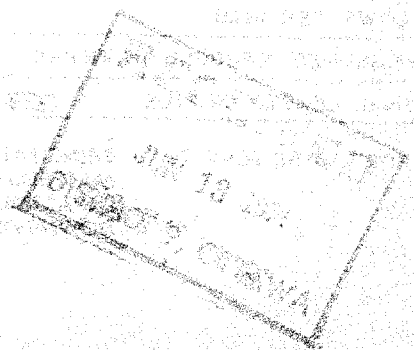
Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.





FORM DB-RD-76
71-3409

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MISCELLANEOUS DETAIL SHEET

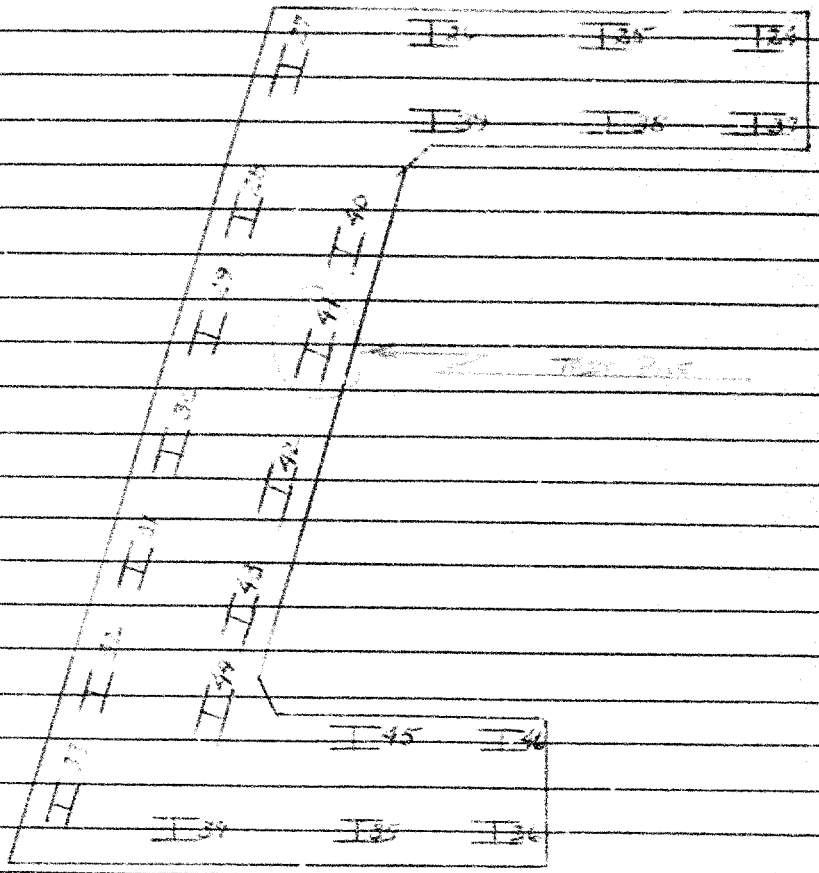
(DO NOT USE FOR GRADING QUANTITIES, ETC. OR FOR SCRATCH PAD USE)

SHEET NO. _____ OF _____ DATE May 22/72

WORK PROJECT NO. _____ CONTRACT NO. 71-152 ITEM NO. _____

LOCATION OF MATERIAL, ETC. EAST ABUTMENT FOOTING (STEEL H-PILES)

UNIT



Form OB-MT-285

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS AND TESTING OFFICE
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 73-143 STRUCTURE AZATIKA BROOK BRIDGE

CONTRACTOR BERTRAND & FRERE DESIGN LOAD OF PILE

HAMMER DETAILS: TYPE DELT WEIGHT 4000 lbs. HEIGHT OF FALL OR ENERGY 6 - 8

TYPE OF ANVIL OR CAP H PILE / WOOD CUSHION BLK WEIGHT OF ANVIL OR CAP 600 lbs.

PILE DETAILS 12 3.P. @ 79 lbs/FT - 0.607", 1:12 BATTER

PILE NO. 17 LOCATION WEST ABUTMENT DATE DRIVEN May 30/74

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
60	1			26	5		51	10		76	
	2	1	MAY 29 1100 hrs	27	5		52	11		77	
	3	1	MAY 30 8:45 AM	28	12		53	11		78	
	4	1		29	12		54	11		79	
	5	1		30	11		55	BED ROCK		80	
	6	3		31	10		56			81	
	7	3		32	9		57			82	
	8	3		33	9		58			83	
	9	3		34	7		59			84	
	10	3		35	8		60			85	
	11	3		36	8		61			86	
	12	3		37	8		62			87	
	13	3		38	9		63			88	
	14	3		39	8		64			89	
	15	3		40	9		65			90	
	16	3		41	9		66			91	
	17	3		42	9		67			92	
	18	3		43	9		68			93	
	19	2		44	9		69			94	
	20	4		45	9		70			95	
	21	4		46	10		71			96	
	22	4		47	12		72			97	
	23	5		48	10		73			98	
	24	5		49	10		74			99	
	25	5		50	12		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 54' 2" FINAL CUT OFF ELEVATION 144.00

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

144.00
54.2
89.80

SIGNED W. L. Shaver
NAME (PRINT) W. SHAVER
DATE May 30/74

ATTACH SKETCH OF PILE NUMBERING SYSTEM

FORM DB-RD-76
71-3409

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MISCELLANEOUS DETAIL SHEET

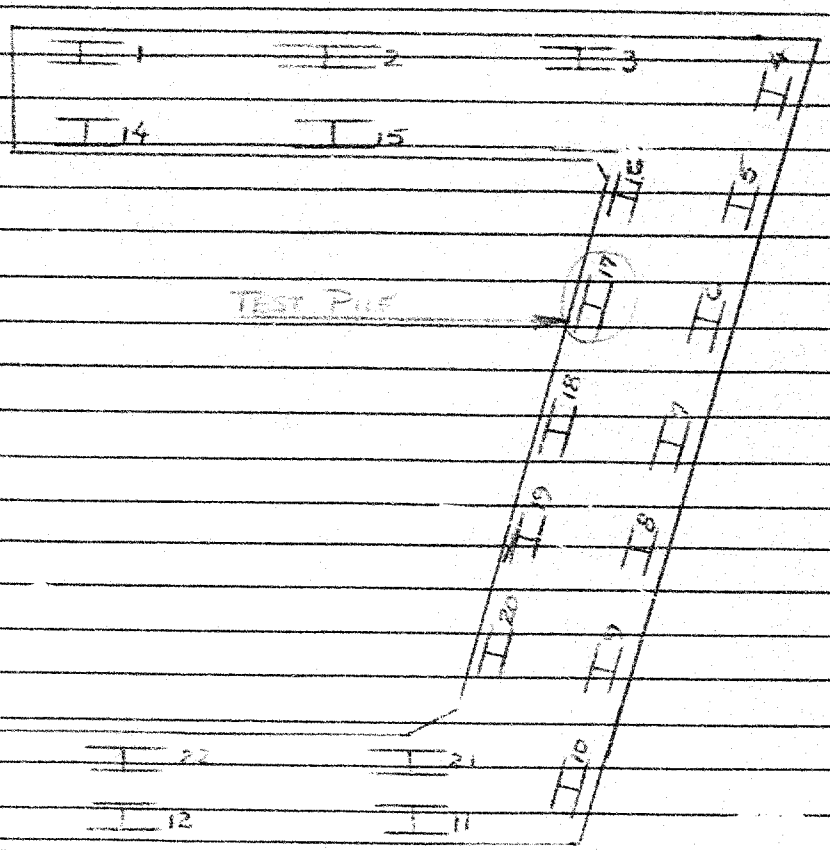
(DO NOT USE FOR GRADING QUANTITIES, ETC. OR FOR SCRATCH PAD USE)

SHEET NO. _____ OF _____ DATE May 30/74

WORK PROJECT NO. _____ CONTRACT NO. 71-143 ITEM NO. _____

LOCATION OF MATERIAL, ETC. West Abutment Footing (Steel H-Piles)

UNIT



DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 316-163

DIST. 9 REGION Eastern

W.P. No. 916-73-01

CONT. No. 73-143

W. O. No. 73-11016

STR. SITE No. 27-170

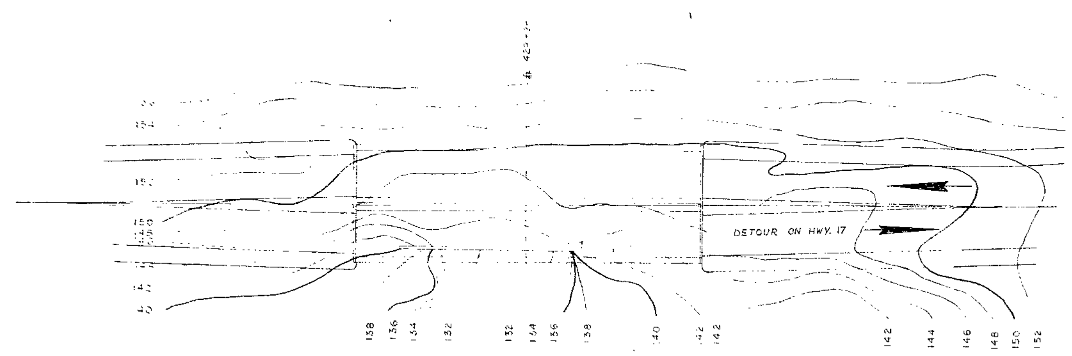
HWY. No. 17

LOCATION PROP. NEW STRUCTURE AT HWY. 17 & AZATIKA BROOK

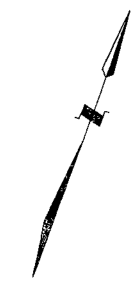
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

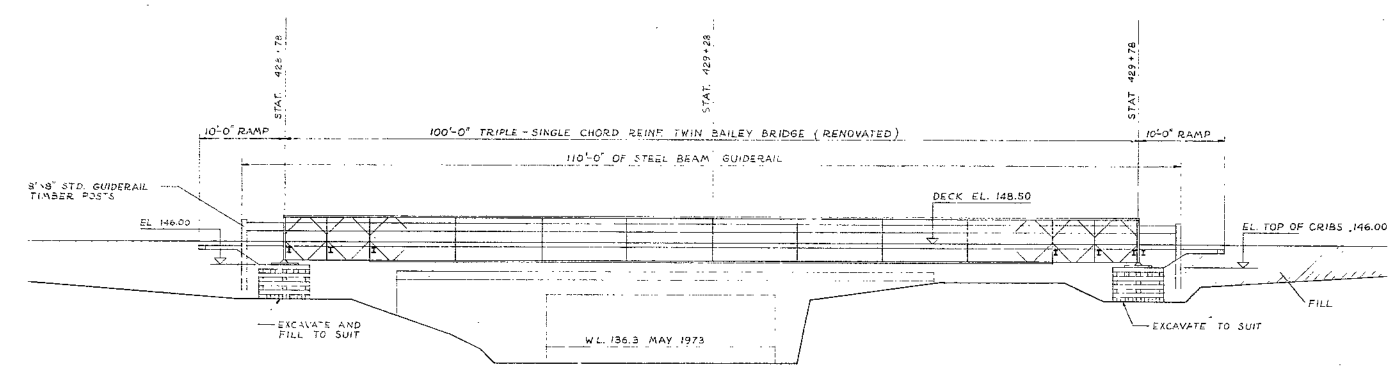
REMARKS: DOCUMENTS TO BE UNFOLDED BEFORE MICROFILMED

G.I-20 SEPT. 1976

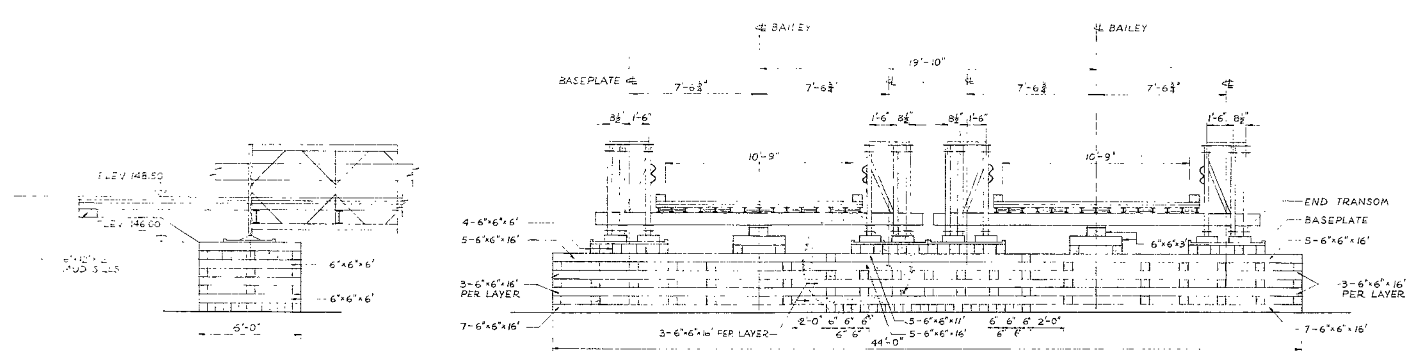


PLAN SCALE 1" = 20'-0"





ELEVATION SCALE 1/8" = 1'-0"



DETAIL OF TIMBER CRIBS (TYPICAL AT BOTH ENDS) SCALE 1/4" = 1'-0"

NOTES TO CONTRACTOR

1. Decking to be installed as shown on plan D.D. 1201.

2. Guide rail to be installed as shown on bridge drawings and SD-9-74.

3. Fill as determined on the site.

4. ERECTION AND LAUNCHING

(a) (i) The Contractor shall not assemble, launch or delaunch the bailey until the layout and elevations of the launching and construction rollers have been approved by the Engineer. Double rollers shall be used at all locations.

(ii) The tops of the rollers must all be at the same elevation, unless specified otherwise on the drawings.

(iii) The tops of the rollers must be levelled across in pairs at right angles to the centre line of the structure.

(b) (i) The launching nose shall consist of 60 feet of single-single skeleton construction and — feet of double-single skeleton construction.

(ii) The launching links must be inserted 20 feet from tip of nose.

(c) (i) All pins, bolts and threaded parts must be free of dirt and be lubricated at the time of installation.

(ii) Transom clamp tightening bars must be wired to the panel verticals. Sway braces must be fully tightened to gauge blocks and all lock nuts secured.

(iii) All panel pins on structure must be keyed.

(d) When the combined weight of the bridge and nose exceeds 60.0 tons on a single storey bridge and 80.0 tons on a double storey bridge, the balance beam assembly must be used.

(e) Wear deck must be installed after launching.

5. ADDITIONAL NOTES FOR CHORD REINFORCED BRIDGES

(a) Bracing frame bolts must be installed in the reinforcing chords prior to the chords being installed on the panels.

(b) Tapered chords must be used for launching and delaunching.

6. MAINTENANCE

The Contractor shall be responsible for the maintenance of the structure and approaches, including the following:

(a) Check that all bracing bolts, chord bolts, transom clamps are and remain fully tightened.

(b) Keep baseplates and bearings free of debris. Inspect baseplates and cribs periodically and correct any uneven settlement to the satisfaction of the Engineer. Packing under end transom and ramps must be kept tight.

(c) Notify the District Engineer immediately of any damages.

To M. DeVati

316-163

REVISIONS		
DATE	BY	DESCRIPTION

PRINT RECORD

No.	FOR	DATE

REGISTERED PROFESSIONAL ENGINEER CIVIL F. GORMEK PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

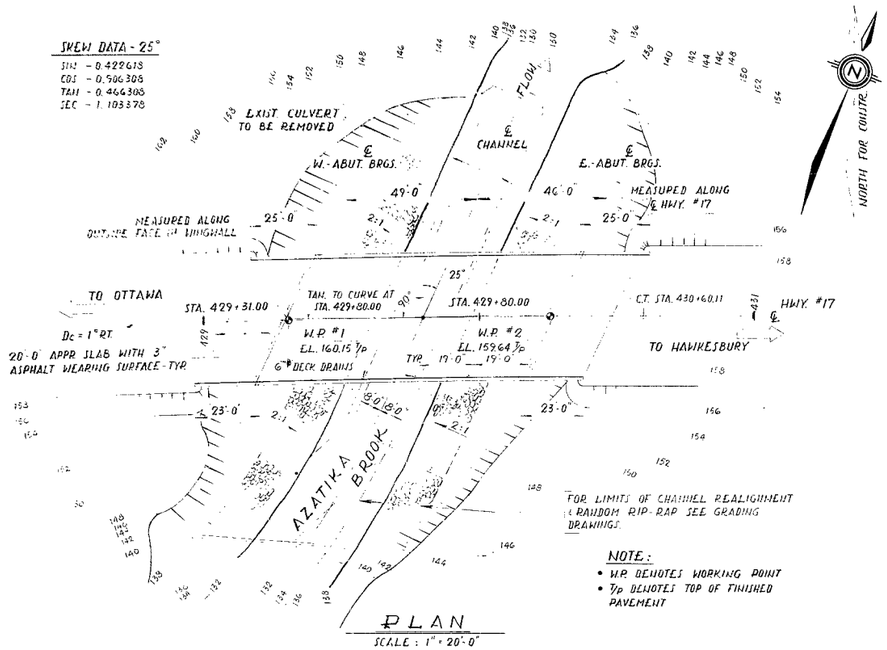
DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

AZATIKA BROOK BRIDGE
3 MILES EAST OF ALFRED

KING'S HIGHWAY No. 17 DIST. No. 9
CO. PRESCOTT
TWP. ALFRED LOT 17 CON. 5

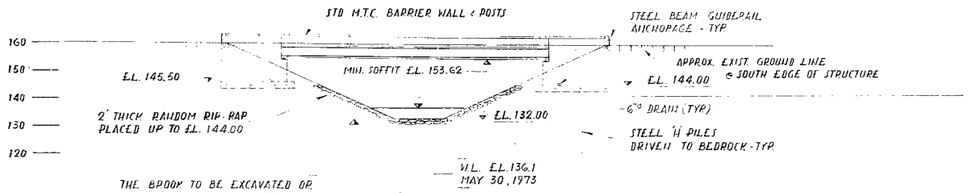
GENERAL PLAN

APPROVED (signature) STRUCTURAL ENGINEER				SITE No. 27-170	W.P. No. 916-73-01
DESIGN		CHECK		CONTRACT Nos.	
DRAWING	D.J	CHECK	(initials)	DRAWING No.	D-27-170-13
DATE	JULY, 73	LOADING			



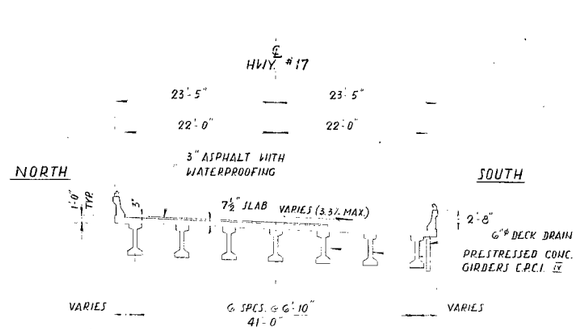
PLAN

SCALE : 1" = 20'-0"



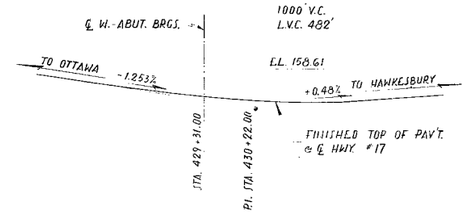
ELEVATION

SCALE : 1" = 20'-0"



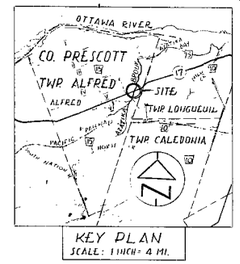
TYP. DECK SECTION

SCALE: ⅜" = 1'-0"



PROFILE OF HWY. #17

N.T.S.



REFERENCE BENCH MARK

B.M. 166.64
GEODETIC DATUM
N ∠ W IN W ROOT 2'S PINE
93' LT. 431+66

NOTE

CLASS OF CONCRETE :

PRESTRESSED GIRDERS — 5000 P.S.I.
DECK, CURBS & BARRIER WALL - 4000 P.S.I
REMAINDER — 3000 P.S.I.

CLEAR COVER ON REINF. STEEL

FOOTINGS & ABUTMENTS - 3"
CURBS & APPROACH SLABS - 2"
TOP OF DECK - 1½", BOTT - 1"
BARRIER WALLS - 1½"

CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE ±⅛".

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

LIST OF DRAWINGS

R. M. H. KAN — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

FOR REDUCED PLAN

USE SCALE BELOW

10 11 12 13

← 3 INCHES ON ORIGINAL PLAN →

PRINT RECORD

No.	FCN	DATE

316-163

REVISIONS

DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

73-11-016

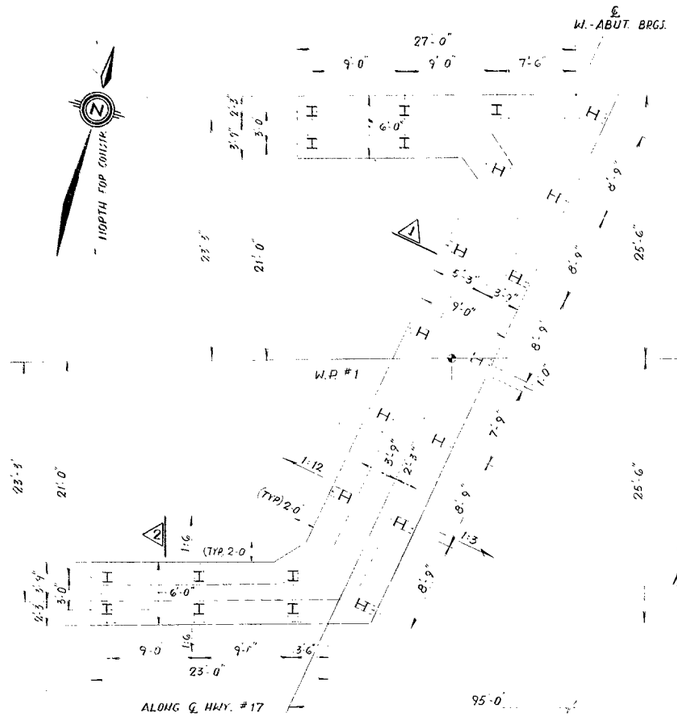
AZATIKA BROOK BRIDGE

3 MILES EAST OF ALFRED

KING'S HIGHWAY No. 17 — DIST. No. 9
CO. PRESCOTT
TWP. ALFRED — LOT 17 — CON. I

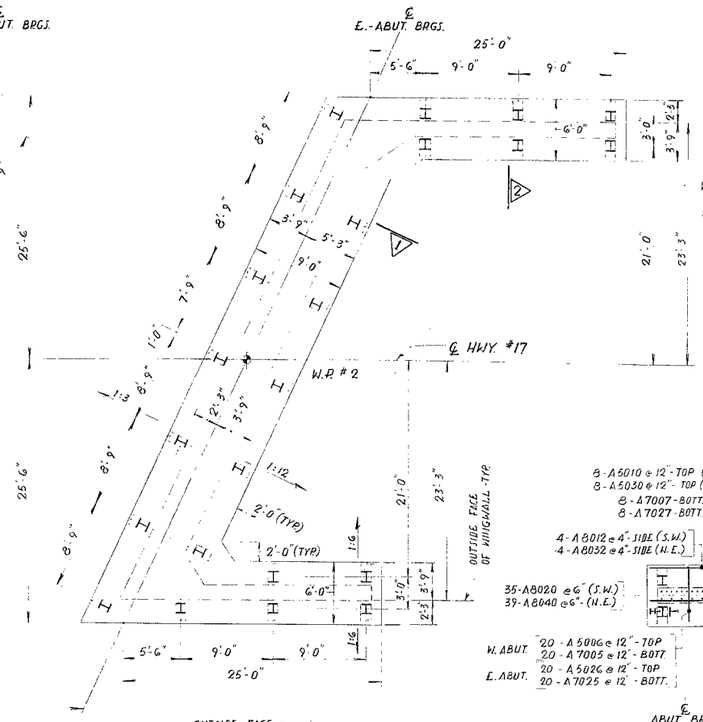
— GENERAL LAYOUT —

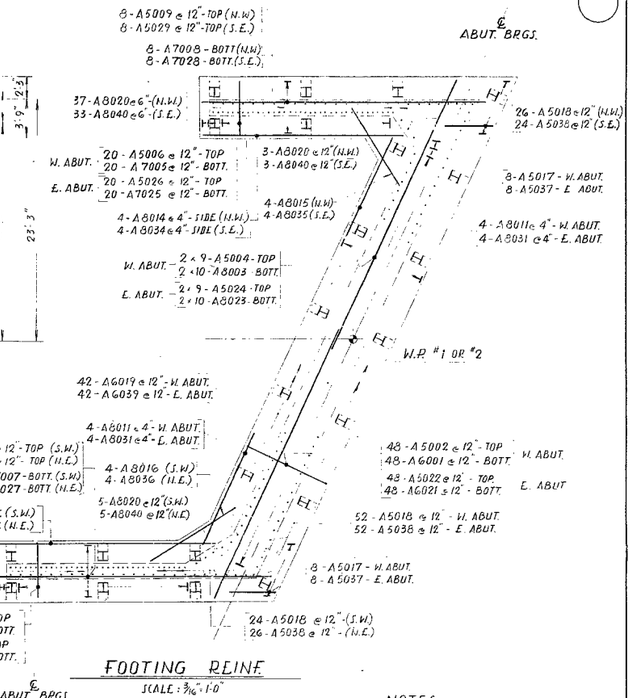
APPROVED ..... STRUCTURAL ENGINEER		CONTRACT No.	
DESIGN R.K.	CHECK R.A.J.	W.P. No.	916-73-01
DRAWING A.A.	CHECK K.K.	SITE No. 27-170	SHEET 1
DATE JUL/73	LOADING H 20-44		



FOUNDATION LAYOUT

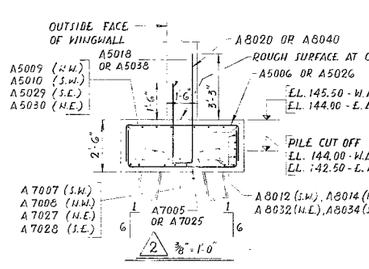
SCALE : 3/16" = 1'-0"

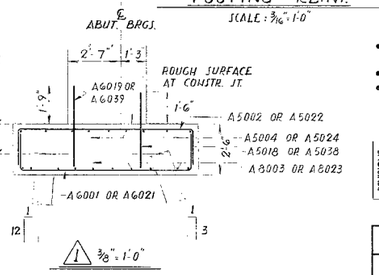




FOOTING REINF.

SCALE : 3/16" = 1'-0"



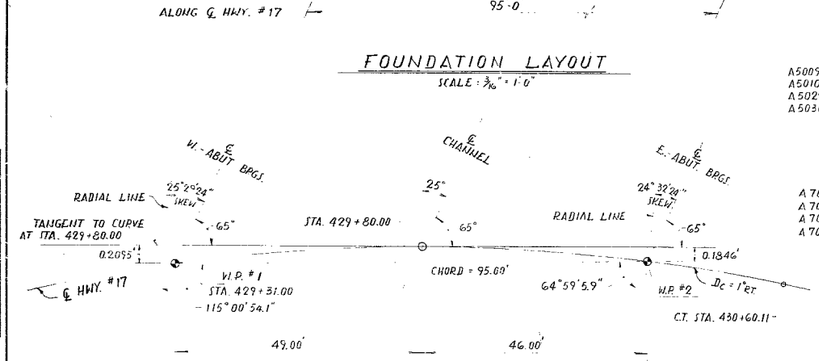


NOTES

- PILE SPACING TO BE MEASURED AT UNDERSIDE OF FOOTINGS
- PILES TO BE DRIVEN TO BEDROCK.
- FOR SPLICE DETAILS SEE STD. BD 52-1 ON SHEET 12

— PILES —

LOCATION	BATTER	QTY.	LENGTH	TYPE
W. - ABUT.	1 : 3	7	63'-0"	HP 12 × 74
	1 : 12	5	60'-0"	
	1 : 6	11	61'-0"	
E. - ABUT.	1 : 3	7	67'-0"	
	1 : 12	5	64'-0"	
	1 : 6	11	64'-0"	



LOCATION OF WORKING POINTS

N.T.S.

PRINT RECORD		
No.	ICA	DATE

FOR REDUCED PLAN

USE SCALE BELOW

0 1 2 3

3 INCHES ON ORIGINAL PLAN

REGISTERED PROFESSIONAL ENGINEER H. K. JACKSON PROVINCE OF ONTARIO

316-163

REVISIONS		
DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

23-17-016

AZATIKA BROOK BRIDGE

3 MILES EAST OF ALFRED

KING'S HIGHWAY No. 17 — DIST. No. 9

CO. PRESCOTT

TWP. ALFRED — LOT 17 — CON. V

FOUNDATION LAYOUT & REINF.

APPROVED ..... STRUCTURAL ENGINEER		CONTRACT No.	
DESIGN H.K.J.	CHECK P.K.	W.P. No.	916-73-01
DRAWING A.A.	CHECK H.K.J.		
DATE 1967/73	LOADING M-S 20-44	SITE No. 27-170	SHEET 3