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GEOCRES No. 31F-51

DIST. 9 REGION Eastern

W.P. No. 3-67-02

CONT. No. 76-18

W. O. No. _____

STR. SITE No. 29-196

HWY. No. 17

LOCATION Petawawa River
Bridge

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: documents to be unfolded
before microfilming



Memorandum

To: Mr. S.J. Radbone,
Regional Manager,
Reg. Planning and Design Office,
Eastern Region, Kingston.

Attention:

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

Date: March 23, 1976.

Our File Ref.

In Reply to

Subject:

W.P. 3-67-02, Site 29-196
Petaawawa River Bridge
Highway 17, District 9

As this project has been stockpiled for some time, we wish to submit an updated D4 and Special Provisions for the Structure which will supersede all the contract documents previously sent to you.

Enclosed are two copies of the D4 and Special Provisions for your use.

One copy of the D4 and Special Provisions is also being forwarded to the following:

District Office
Systems Design Project Review Section
Structural Material Section
Structural Design Office
Estimating Office
Assistant Construction Engineer (Structures)
Regional Structural Planning Engineer.
Structural Maintenance Engineer
Soils Mechanics Section

NZ/ac
Encl.

M. Stoyanoff
M. Stoyanoff,
Structural Contract Engineer.

c.c. K. Bassi
J. Wear
J.M. Childs
K.C. Howe
B. Giroux
A.E. McKim
T.C. Kingsland
W. Birch
✓ C. Mirza
R. Forrest
J. Anderson



Mr. A. J. Percy,
Regional Manager, Systems Design,
Kingston, Ontario.

Structural Planning Office,
Kingston, Ontario.

Mr. C. E. Fritchard

October 2, 1972.

W.P. 3-67-02, Site 29-196,
Petawawa River Bridge (E.B.L.),
Highway 17N, District 8 - Ottawa

72-11-010

We have investigated the proposal to have the above structure span Portage Road (relocated) in addition to the Petawawa River. If the grade for Portage Road at the eastbound lane structure is dropped to about elevation 463.0, we would be in a "cut" condition. Due to the nature of the soil at this site, side slopes steeper than 3:1 appear to be undesirable.

Our estimates indicate that the cost of lengthening the structure would be approximately \$101,600. This would only be for the increase in length of the structure. The cost of excavation, etc., was not estimated.

If 2:1 side slopes could be used somehow this cost could be reduced to about \$62,000 for the eastbound lane structure.

No adequate survey information is available in this office for the proposed westbound lane structure.

Based on the E.B.L. structure and the location of the relocated Portage Road in relation to the Petawawa River, we have estimated the cost for lengthening this structure to be:

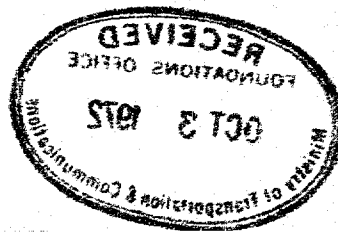
3:1 side slopes	\$ 146,800
-and- 2:1 side slopes	\$ 107,300

We have been advised by the Structural Design Office that the cost of redesigning the E.B.L. structure may be from \$15,000 to \$20,000 depending on whether the project will be issued to a consultant or done in the Structural Office. A minimum time of three months should be allowed to have this structure redesigned.

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

AV/TCK/hl

c.c. P. D. Billings
A. G. Stermac - Att. M. Devata
C. S. Grebski - Att. K. Bassi



FOUNDATION INVESTIGATION REPORT
For
The Proposed Structure at the Crossing of
Hwy. # 17 "New" and Petawawa River
Township of Petawawa County of Renfrew
District No. 9 (Ottawa)
W.O.72-11010 W.P.3-67-02

1. INTRODUCTION:

The Foundation Office was requested to carry out a subsurface investigation for the aforementioned structure, which will be located in the Township of Petawawa, County of Renfrew. The request was contained in a memo from Mr. T. C. Kingsland, Regional Bridge Planning Engineer, Eastern Region, dated January 5, 1972. An investigation was subsequently carried out by this office to determine the subsoil, bedrock and groundwater conditions at the proposed structure site.

This report contains the factual results obtained from the investigation, together with recommendations pertaining to the foundations of the proposed structure, as well as the stability and settlement considerations associated with the approach fills.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The area under investigation is located along the Petawawa River at a point approximately 1 1/2 miles south

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of existing Hwy. # 17, in the Township of Petawawa, County of Renfrew. The property west of the river is presently owned by the Canadian Armed Forces (Camp Petawawa). A two lane gravel surfaced roadway (Portage Road) is located on the east bank of the river. Except for a few cottages the land is not being used for either residential or commercial purposes. Two hundred yards south of the site, however, a sand and gravel pit is being worked. The north flowing Petawawa River is located in a 70 to 80 feet wide channel, the depth of water is typically 2 to 4 feet, with the river water level at about elevation 451. Rapids are present in the river immediately south of the site. The treed and brush covered west bank of the river is flat to gently undulating in relief between elevations 453 and 457. The treed east bank of the river, however, rises from elevation 452, at the river's edge, to approximately elevation 487, on the adjacent table land, this natural slope is standing between 2:1 and 3:1.

Physiographically the area under investigation is located in the region known as the "Petawawa Sand Plain." The granular overburden deposits encountered here were primarily laid down in a delta built in the Champlain Sea by the Petawawa, Parron, Indian and Ottawa Rivers during the Fossmill stage of Lake Algonquin. In the vicinity of the site

the sand and gravel deposits range from about 5 to 30 feet in thickness. The overburden is underlain by gneiss bedrock of Precambrian age.

3. FIELD AND LABORATORY WORK:

Eight sampled boreholes were put down during the course of the field investigation. The borings were advanced by means of two conventional diamond drill rigs adapted for soil sampling purposes.

Samples of the overburden were obtained in a 2 inch O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. Bedrock was proven in all of the borings by obtaining B.X. size rock core samples.

Following the sampling and drilling operations a detailed log was made for each of the borings, this log includes a record of the testing performed as well as the soil and bedrock types encountered. The locations and elevations of all the boreholes were surveyed by personnel from the Eastern Region Engineering Surveys Section, and are shown on Drawing No. 72-11010A, together with an estimated stratigraphical profile across the site. The elevations in this report are referenced to a Geodetic datum.

All the samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this inspection, laboratory tests

were carried out on certain samples to determine the physical properties of the various soil types; namely,

Natural Moisture Content.

Grain-size Distribution.

The results of the laboratory tests are plotted on the Record of Borelog sheets and summarized on Figure # 1, all contained in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The overburden across the site are deltaic deposits composed of compact to very dense sands and gravels with random boulders throughout. The thickness of these deposits range from 3 to 5.5 feet in the vicinity of the Petawawa River, to 27.5 feet along the relatively high east bank of the river. The granular subsoil is directly underlain by metamorphosed bedrock of Precambrian age.

The soil and bedrock sequence, encountered at the boring locations, are shown on the borelog sheets, the stratigraphical profile plotted on Drawing No. 72-11010A has been inferred from this data. A brief resumé of the stratigraphical sequence from ground surface downward is presented in the sub-section to follow.

4.2) Sand and Gravel Deposits:

Granular deposits are present immediately below a thin (1 foot) topsoil cover. The deposit on the east bank

of the river is composed of a sandy gravel to gravelly sand, while on the west bank the deposit is primarily composed of a silty sand to sand with a trace to some gravel. The thickness of the granular materials range from 3 feet, along the east shore line of the river, to as much as 27.5 feet, on the high ground east of the river. Boulders up to 9 inches in size are present randomly throughout the granular deposits. Grain-size distribution testing was carried out for samples obtained in the granular subsoil, using 2-inch O.D. sampling equipment. The results are plotted on Figure # 1 in Appendix I of this report.

Standard Penetration Resistance testing was carried out within the granular deposits; the results are plotted on the Borelog sheets. The testing gave 'N' values which range from 9 blows/ft. to 100 blows for 4 inches. Based on these results it is estimated that the relative density of the granular materials vary from compact to very dense.

4.3) Gneiss Bedrock:

The granular overburden is directly underlain by metamorphic bedrock of Precambrian Age. The bedrock was proven in all of the boreholes by obtaining between 6 and 14 feet of BX size rock core samples.

The bedrock core samples were examined by Mr.

K. W. Ingham, Geologist, Department of Transportation and Communications. Mr. Ingham presented the results of his bedrock description, as well as an interpretation of the geologic conditions existing at this site, in a letter to this office, dated February 28, 1972. A copy of this letter is appended to this report. The bedrock description presented in the paragraphs to follow, is an excerpt from this letter.

The dominant type of bedrock encountered in the drilling is a banded medium grained quartz mica gneiss displaying a pronounced lineation dipping steeply at approximately 50 degrees. Bands of hornblende-biotite gneiss and granite pegmatite are subordinate types forming layers parallel to the quartz mica gneiss. These layers are often up to 5 feet thick.

The surface of the bedrock, within the river channel and along the west bank, was found to vary between elevations 439 and 446. Along the high east bank, however, the bedrock would appear to increase elevation in a north-easterly direction (highest level recorded elevation 464.5 at B.H. #2). In general the bedrock was found to be in a sound condition as evidenced by the high percentage of core recovery. At a few of the borings the upper 1 foot was in a fractured condition, while at others the upper 2 to 7 feet showed signs of slight weathering.

5. GROUNDWATER CONDITIONS:

Groundwater level observations were carried out during the period of the investigation in the open boreholes. The observations are presented on the individual borelog sheets as well as on Drawing No. 72-11010A. The results indicate that the groundwater level varies between elevation 451, in the vicinity of the river, to elevation 459, along the high eastern bank, corresponding to levels ranging from ground surface to 24 feet below ground surface, respectively. These observations would indicate that there is a natural hydraulic gradient towards the river, which confirms the fact that the Petawawa river controls the drainage in the general area.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a structure at the crossing of Hwy. # 17 "New" and the Petawawa River, in the Township of Petawawa, County of Renfrew. This crossing will be located approximately $1\frac{1}{2}$ miles south of existing Hwy. #17. It is understood that the structure will be 34 feet wide and have three spans (100' - 140' - 100'). The proposed profile grade of Hwy. # 17 "New" in the vicinity of the crossing, is to range from elevation 485 to 487. At this grade fill, up to 28 feet in height, will have to be placed to form the

west approach to the structure, only nominal fills and cuts however, will be required along the east approach.

The predominant deposits across the site are composed of compact to very dense sands and gravels with numerous boulders throughout. The thickness of these granular deposits ranges from 3 to 5 feet, along the channel of the Petawawa River, to as much as 27.5 feet on the high table land east of the river. The sands and gravels are underlain by metamorphic bedrock.

Comments and discussions of the factors relating to foundation design of the structure, as well as the stability and settlement considerations associated with the west approach fill are presented in the sub-sections to follow.

6.2) Structure Foundations:

6.2.1) Piers: - - -

The east and west piers are to be located on the edges of, or partially within, the channel of the Petawawa River. The overburden at the respective pier locations is composed of a limited thickness of sands and gravels underlain by gneiss bedrock. Since the granular soils are scour susceptible it is recommended that the piers be carried down through the overburden to bear on spread footings located directly on or within the bedrock.

The estimated founding levels are given below.

<u>Pier</u>	<u>Station</u>	<u>Estimated Footing Founding Elevation</u>	<u>Refer to</u>
East	412 + 00	445.5 North End - Stepping Up to 450.5 South End	B.H.s. #3 & 4
West	410 + 60	439 South End - Stepping up to 441 North End	B.H.s. #5 & 6

A spread footing, founded directly on the metamorphic bedrock, could be designed using an allowable bearing value of up to 20.0 t.s.f.

The pier footing excavations will extend below the river water level. Since the overburden in this area is granular and bouldery in nature seepage can be expected in the excavations. A positive dewatering scheme will, therefore, be required. One possibility would be to carry out the excavation from within an earth dyke composed of relatively impervious cohesive material, which is readily available locally. Any minor seepage into the enclosure could be handled using conventional techniques such as pumping from sumps. Alternatively the excavations could be carried out from within enclosures formed of interlocking steel sheet piling. The granular material, overlying bedrock, is often bouldery. It may be difficult to advance the sheeting through

such bouldery zones using conventional methods; this is particularly true in some areas at the location of the west pier, where the overburden is more extensive (refer to B.H. #6). In these areas it may be necessary to drive the sheeting as far as practically possible then remove the boulders or other obstacles under water from beneath the sheeting and continue driving to the next obstruction, where the process would be repeated. Using this method it may be possible to reach the surface of the bedrock.

6.2.2) Abutments:

- i) East Abutment (Station 413 + 00 - refer to B.H.s. #1 and 2)

This abutment can be founded on a spread footing located in the dense to very dense portion of the sand and gravel deposit. At least 5 feet of earth cover should be provided above the base of the footing in order to satisfy the front protection requirements in the area. A spread footing, founded at or below elevation 476, could be designed using an allowable bearing value of 3.5 t.s.f.

The granular subsoil, beneath the footing, will settle due to the induced bearing pressure. The foundation subsoil is in a dense state. Therefore, for the size of footing contemplated, imposing the aforementioned bearing

pressure, the settlement will be negligible in magnitude.

- ii) West Abutment (Station 409 + 60 - refer to R.H.'s #7 and 8)

The west abutment will be 'perched' within the approach fill. The abutment may be supported on a spread footing placed within the fill. The fill material below the top of the footing should consist of well compacted granular 'A' material, and should extend to a horizontal distance of at least 10 feet from the footing edge in the plane of the footing top. This portion of the fill should be constructed with side slopes no steeper than 2:1. The remainder of the fill should be completed to about profile grade for a distance of 50 feet behind the abutment before re-excavation for the footing. An allowable bearing pressure of 2.5 t.s.f. may be used in design.

If the abutment is supported on a spread footing, there will be differential settlement between this element and the adjacent pier. Providing the fill, in the immediate vicinity of the abutment footing, is well compacted, this should not exceed 1 inch. Since the major portion of the settlement will occur within the fill itself it would be advantageous if scheduling permits, to build the fill prior to the construction of this abutment; this would reduce the differential settlement to a value less than that quoted above.

As an alternative, the abutment may be supported on end-bearing piles driven to bedrock. The natural overburden is bouldery in nature. In order to ensure that the piles penetrate through such bouldery zones to bear on or within the bedrock it is recommended that they be equipped with reinforced tips. Piles to bedrock could be designed for the ultimate capacity of the pile section chosen - e.g. 12BP74 steel H-piles could be designed for 95 tons/pile.

No rock or bouldery fill should be placed in areas where piles are to be driven.

6.3) Other Considerations:

As discussed previously the west approach to the structure will be formed by constructing a fill whose maximum height is of the order of 28 feet. The fill will be placed directly on a competent granular overburden deposit. No stability problems are, therefore, anticipated for an embankment constructed of properly compacted fill, provided standard 2:1 slopes are employed.

Settlement will be induced in the foundation subsoil by the fill loading. The granular subsoil is competent in nature and limited in thickness. The settlement, therefore, should not exceed 1 inch; further it will be

elastic in nature - i.e. take place during or immediately following the construction period.

No major complications are envisaged along the east approach since the 35 to 38 feet high east bank of the river is not to be altered in any way by either a cutting or filling process.

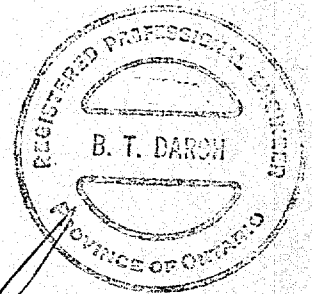
In a memo to this office, dated January 13, 1972, Mr. B. Sen. Mathur, P. Eng., Airphoto Interpretation Engineer, D.T.C., stated that some erosion was noticed along the east bank of the Petawawa River, specifically at about Station 412 + 15. If erosion in this area continued in the future it could detrimentally affect the stability of the natural east bank. The erosion pattern should be studied in the field prior to construction. If deemed necessary the toe of this slope should be protected against the erosional force of the river. This could be accomplished by placing a rip-rap cover to a level about 1 foot above the expected high water level.

7. MISCELLANEOUS:

The field work performed during the period of January 18 to February 1, 1972, was carried out under the supervision of Mr. W. V. Urie, Technician (Field).

The equipment used was owned and operated by the
F. E. Johnston Drilling Co. Ltd., Ottawa.

This report was written by Mr. B. T. Darch,
Senior Foundation Engineer and reviewed by Mr. M. Devata,
Supervising Foundation Engineer.



B. T. Darch

B. T. Darch, P. Eng.

M. Devata

M. Devata, P. Eng.

MD/mj
February 24, 1972.

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

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

FROM: K. W. Ingham

ATTENTION:

DATE: February 28, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT:

Foundation Investigation 72-11010;
Petawawa River Bridge; New Hwy. 17

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

Hole No. 1 Bedrock at 454.2

26.0 - 28.7 Granite boulders.
28.7 - 33.9 Coarse grained granite pegmatite containing 15% magnetite.
33.9 - 37.6 Banded medium grained quartz mica gneiss, lineation dips 50°.
37.6 - 39.3 Granite pegmatite.
39.3 - 40.2 Banded quartz mica gneiss.

Hole No. 2 Bedrock at 464.7

16.0 - 30.0 Banded quartz mica gneiss with minor thin granite bands.

Hole No. 3 Bedrock at 450.8

2.1 - 2.9 Gneissic boulders.
2.9 - 13.8 Banded quartz mica gneiss with minor granite bands, lineation dips 40°.

Hole No. 4 Bedrock at 445.5

4.9 - 5.5 Gneissic boulders plus loose rock.
5.5 - 11.5 Banded hornblende biotite gneiss, slightly weathered and moderately fractured throughout.
11.5 - 15.0 Banded quartz mica gneiss.

Hole No. 5

Bedrock at 439.2

12.4 - 15.5

Granite pegmatite plus granite.

15.5 - 19.4

Banded quartz mica gneiss with minor granite bands.

Hole No. 6

Bedrock at 441.4

10.1 - 16.0

Banded hornblende mica gneiss, slightly weathered and fractured in the top 2.5 ft.

Hole No. 7

Bedrock at 443.0

13.5 - 15.5

Banded quartz mica gneiss.

15.5 - 17.0

Granite.

17.0 - 23.7

Banded quartz mica gneiss.

Hole No. 8

Bedrock at 441.0

16.2 - 16.5

Boulders.

16.5 - 18.0

Banded quartz mica gneiss.

18.0 - 19.0

Granite pegmatite, slightly weathered.

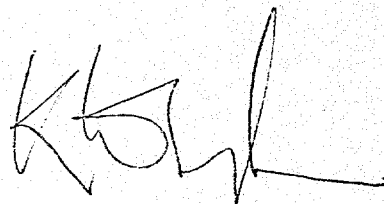
19.0 - 20.0

Banded gneiss, slightly weathered, core broken due to vertical fracture.

20.0 - 29.8

Banded quartz mica gneiss.

KWI:mv



K. W. Ingham,
Geologist.

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 72-11010

LOCATION Hwy.#17 'New' Sta. 413+20 o' 17' Rt.

ORIGINATED BY WU

W.P. 3-67-02

BORING DATE Jan. 18, 19 & 20, 1972

COMPILED BY RB

DATUM Geodetic

BOREHOLE TYPE Washboring-NX, BX Casing, BX Rock Core

CHECKED BY S.R.

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 % 10 20 30						
482.9	Ground Level																
481.9	Sandy Topsoil																
1.0	Sandy gravel to sand and gravel occ. boulders up to 5" in size below el. 472. Brown to Grey Loose to Very Dense Bouldery Zone (boulders up to 7" in size) Fractured Quartz Mica Gneiss Bedrock (Banded) (Interbeds of granite pegmatite up to 5" thick) Sound		1	SS	14	480											
			2	SS	9												
			3	SS	21												
						4	SS	57	475								
						5	SS	102									
						6	SS	100/4"	470								
						7	SS	130									
									465								
						8	SS	88									
						9	SS	80/5"	455								
						10	BX	40%									
						11	BX	86%	450								
						12	BX	90%									
454.2			13	BX	100%	445											
40.3	End of Borehole					440											

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 72-11010 LOCATION Hwy. 17 'New' Sta. 412 + 80 o/s 17' Lt. ORIGINATED BY WU
W.P. 3-67-02 BORING DATE Jan. 18 & 19, 1972 COMPILED BY RB
DATUM Geodetic BOREHOLE TYPE Washboring-NX, BX Casing-BX Rock Core CHECKED BY S.R.

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 WATER CONTENT % 10 20 30				
480.7	Ground Level														
0.0	Sandy Topsoil		1	SS	17	480									
1.0	Sand and gravel to sandy gravel		2	SS	74										
	(occ. boulders up to 5" in size below el. 472)		3	SS	59	475									58 lb (2)
	Brown to Grey		4	SS	58 1/4"	470									
	Compact to Very Dense		5	SS	55 1/2"										
464.7			6	SS	100 7/8"	465									
16.0	Quartz Mica Gneiss Bedrock (Banded)		7	BX	100%										
	minor thin granite interbeds.		8	BX	100%										
			9	BX	99%	460									
			10	BX	100%	455									
450.7	Sound		11	BX	100%										
30.0	End of Borehole					450									

458.7
in open BH
Jan. 19/72

FOUNDATION SECTION

ORIGINATED BY **WU**

COMPILED BY BTD

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 + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % w_p ——— w ——— w_L			
453.7	Ground Level											
0.0	Silly sand & gravel (occ. boulders up to 5" in size)		1	SS	26.7							Jan. 31/72
450.8	Very Dense		2	SS	50.4							
2.9	Quartz Mica Gneiss Bedrock (Banded)		3	BX	74.1	450						
			4	BX	100%	445						
	minor thin granite interbeds.		5	BX	99%	440						
439.9	Sound											
13.8	End of Borehole											
						435						

FOUNDATION SECTION

ORIGINATED BY WU

COMPILED BY RIA

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		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % w_p — w — w_L			
451.0	Ground Level											
0.0	Silty sand & gravel (boulders up to 7" in size throughout)	0.0	1	BX	69%	450						P.C.F. 13.5 A.S.I. CL Feb. 1/72
	Compact to Very Dense	0.0	2	SS	29							
445.5	fractured	0.0	3	BX	59%	445						
5.5	Hornblende Biotite Gneiss Bedrock (Banded)		4	BX	77%							
	slightly weathered					440						
	Quartz Mica Gneiss Bedrock		5	BX	84%							
436.0	Sound											
15.0	End of Borehole					435						

FOUNDATION SECTION

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	BLOWS / FOOT	WATER CONTENT ——— w	WATER CONTENT %		
							SHEAR STRENGTH P.S.F.		w_p ——— w ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					
151.6	Ground Level											
0.0	Sandy Topsoil		1	SS	23	450						
1.0	Silty sand & gravel to sand and gravel		2	SS	33							
	Brown to Grey		3	SS	10	445						
	Compact to Dense		4	SS	28							
439.2	Boundary Zone boulders to 9" in size					440						
12.4	Granite Pegmatite Bedrock		5	BX	89%							
	Sound		6	BX	100%							
	Quartz Mica Gneiss Bedrock		7	BX	100%	435						
432.2	Banded Sound											
19.4	End of Borehole					430						

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 72-11010

LOCATION Hwy. 17 'N' Sta. 410 + 25 o/s 10' Lt.

ORIGINATED BY ME

W.P. 3-67-02

BORING DATE Jan. 27, 1972

COMPILED BY BTD

DATUM Geodetic

BOREHOLE TYPE Washoring-BX Casing - BX Rock Core

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				w_p ——— w ——— w_L WATER CONTENT %					
							<input type="radio"/> UNCONFINED	<input type="radio"/> + FIELD VANE								
							<input type="radio"/> QUICK TRIAXIAL	<input type="radio"/> x LAB. VANE								
451.5	Ground Level															
0.0	Sandy Topsoil	2														
1.0	Silty sand & gravel to sand & gravel (boulders up to 9" in size throughout)	1	SS	60/3"	450											
		2	BX	70%												
		3	SS	100%												
		4	BX	70%	445											
		5	SS	36/1"												
		6	BX	33%												
441.4	Very Dense	7	SS	37/2"												
10.1	Slightly weathered Hornblende Mica Gneiss Bedrock	8	BX	100%	440											
435.5	Banded Sound	9	BX	100%												
16.0	End of Borehole				435											


















Jan. 27/72


DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB A.O. 72-11010LOCATION Hwy. #17 "New" - Sta. 409+80, c/s 17' RT.ORIGINATED BY A.V.B.W.P. 3-67-02BORING DATE January 26, 1972.COMPILED BY R.W.B.DATUM GeodeticBOREHOLE TYPE Washboring - NX & BX Casing
EX Rock CoreCHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					w_p ——— w ——— w_L WATER CONTENT %				
456.5	Ground Elev.															
0.0	Sandy topsoil															
	Sand, with some gravel Dense		1	SS	48	455										
	Gravelly Sand to Sandy Gravel (Occasional boulders up to 4" in size throughout)		2	SS	100/2"											
																
																
			3	SS	60	450										
																
			4	SS	64											
																
						445										
443.0	Very Dense		5	SS	105											
13.5			6	BX	100%											
	Granite					440										
	Quartz Mica Gneiss Bedrock (Banded)		7	BX	100%											
																
			8	BX	100%	435										
432.8	Sound		9	BX	100%											

 Elev.
451.8
W.L.
In
Open
B.H.,
Jan. 27/72

∇ Elev.
 451.8
 W.L.
 In
 Open
 B.H.,
 Jan. 27/72

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB W.O. 72-11010

LOCATION Hwy. #17 'New' - Sta. 409+40, o/s 17' LT.

ORIGINATED BY B. Urle

W.P. 3-67-02

BORING DATE January 19, 1972.

COMPILED BY R.R.B.

DATUM Geodetic

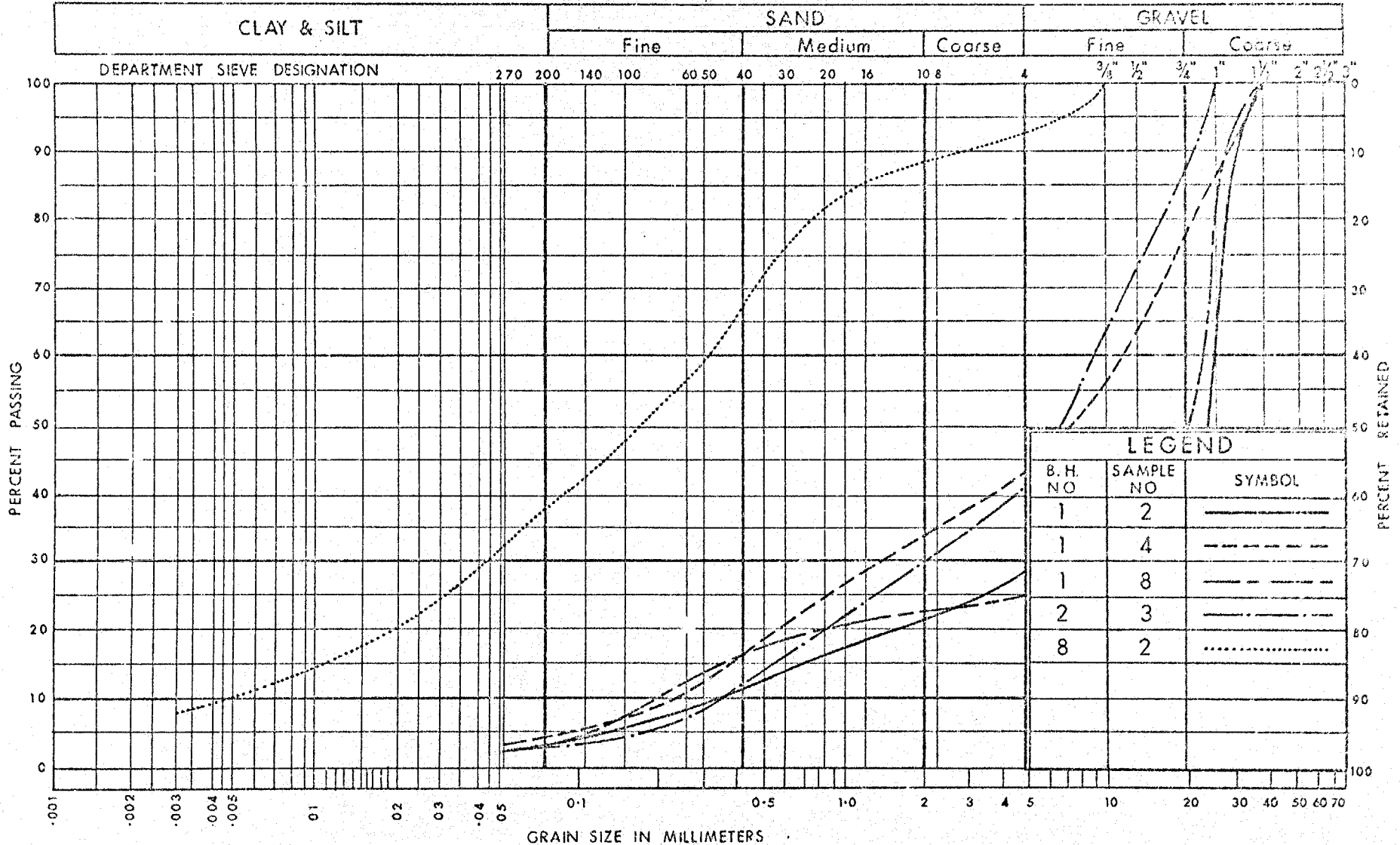
BOREHOLE TYPE Washboring BX & NX Casing

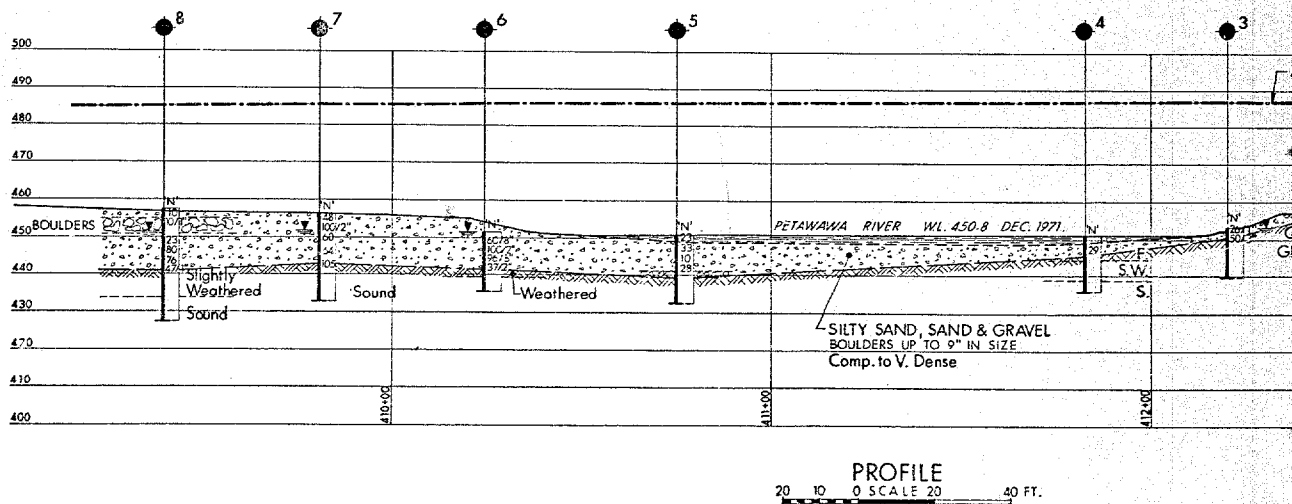
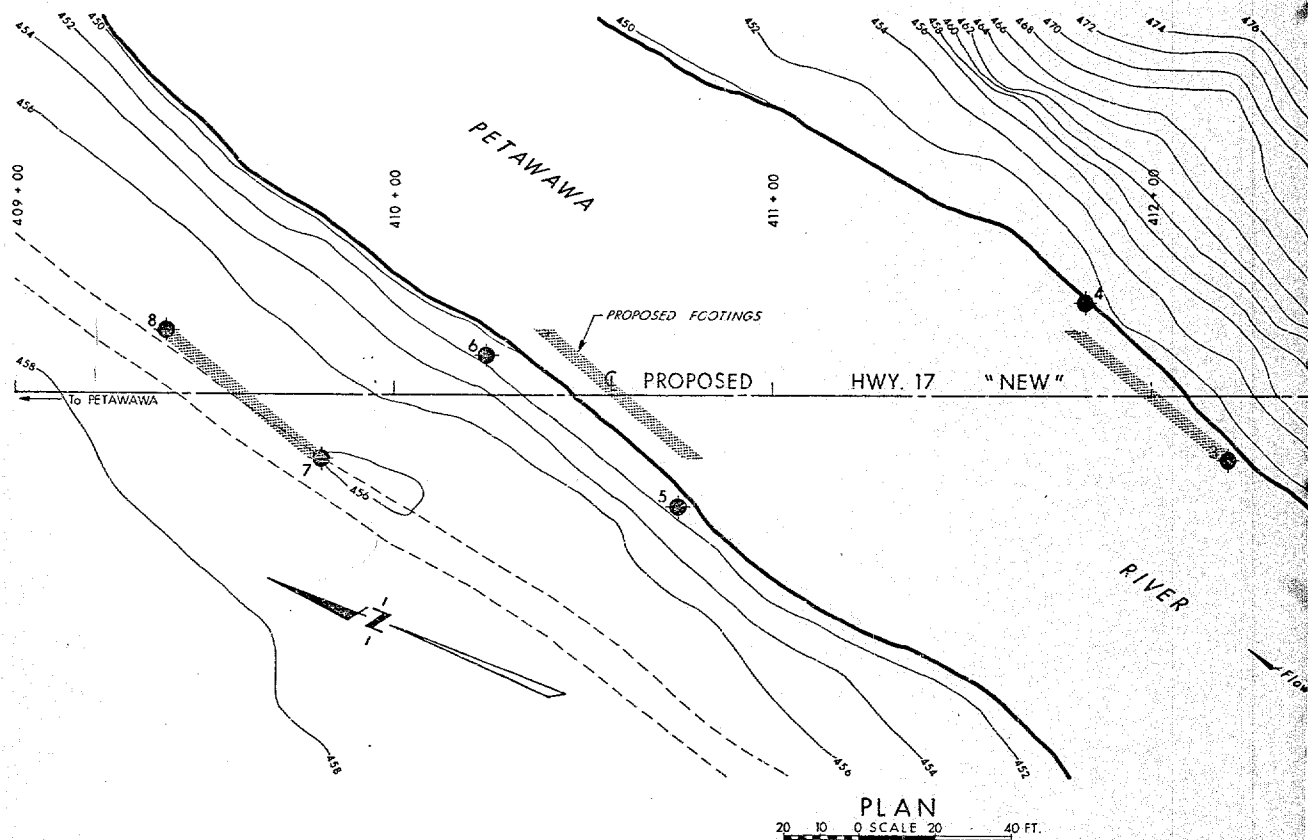
CHECKED BY S.R.

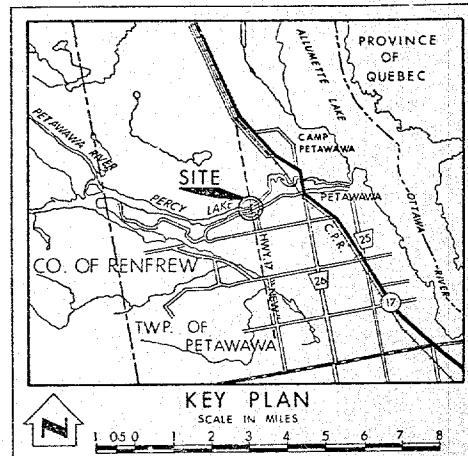
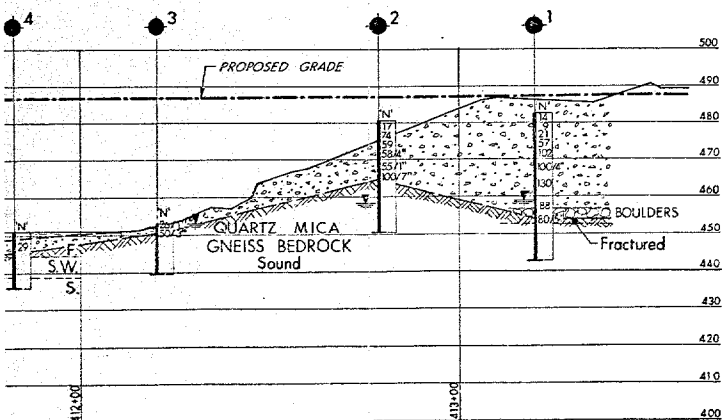
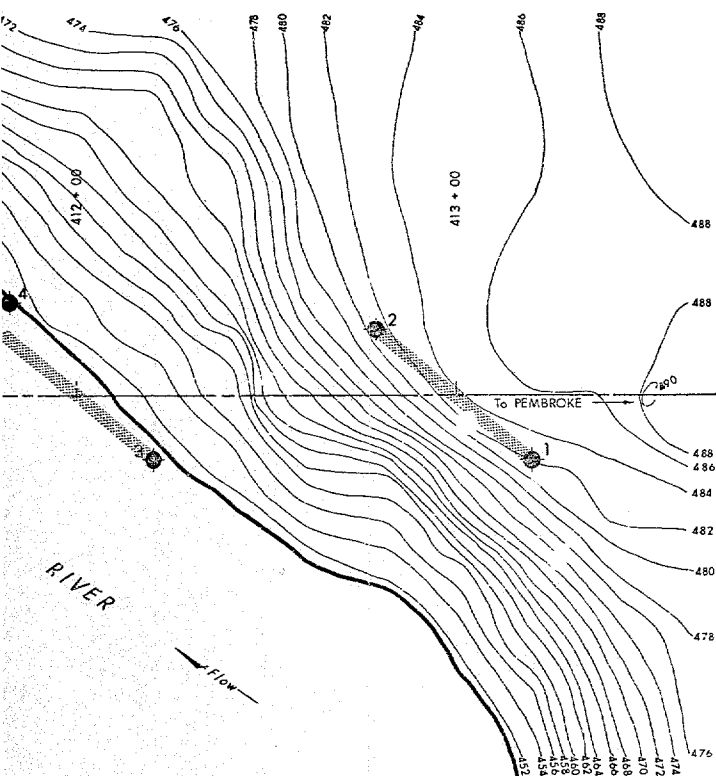
BX Rock Core

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — w_L				BULK DENSITY γ P.C.F.	REMARKS					
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT				PLASTIC LIMIT — w_p					WATER CONTENT — w				
							SHEAR STRENGTH P.S.F.				WATER CONTENT %									
							<div><div><div><div></div><div>○ UNCONFINED</div></div><div><div>● QUICK TRIAXIAL</div><div>+ FIELD VANE</div></div><div><div></div><div>x LAB. VANE</div></div></div></div>				<div><div><div><div></div><div>w_p</div></div><div><div>w</div><div>w_L</div></div></div></div>									
457.5	Ground Level																			
0.0			1	SS	10															
			2	SS	10	1"	455								8 55 32 5					
	Bouldery Zone (Boulders up to 6" in Size)		3	BX	40%															
			4	BX	50%		450													
	Silty Sand to Sand with a trace to some gravel throughout		5	SS	23															
			6	SS	80															
	Compact to Very Dense		7	SS	76		445													
441.0			8	SS	47	1"														
16.5							440													
	Granite Pegmatite																			
	Quartz Mica Gneiss Bedrock (Banded)		9	BX	100%															
	Slightly Weathered		10	BX	50%		435													
			11	BX	100%															
							430													
427.7	Sound																			
29.8	End of B.H.						425													

UNIFIED SOIL CLASSIFICATION SYSTEM







LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation, Jan. & Feb. 1972.		
NO.	ELEVATION	STATION	OFFSET
1	482.9	413+20	17' RT.
2	480.7	412+80	17' LT.
3	453.7	412+20	17' RT.
4	451.0	411+82	24' LT.
5	451.6	410+75	30' RT.
6	451.5	410+25	10' LT.
7	456.5	409+80	17' RT.
8	457.5	409+40	17' LT.

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS DESIGN SERVICES BRANCH — FOUNDATION OFFICE			
PETAWAWA RIVER			
HIGHWAY NO. 17 "NEW"		DIST. NO. 9	
CO. RENFREW			
TWP. PETAWAWA		LOT 15	CON. VII. & VIII.
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMD. B.U.	CHECKED <input checked="" type="checkbox"/>	W.P. NO. 3-67-02	DRAWING NO.
DRAWN S.R.	CHECKED <input checked="" type="checkbox"/>	JOB NO. 72-11010	72-11010 A
DATE FEB. 23, 1972	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>Altman</i>	CONT. NO.		

DOCUMENT NO. _____ DATE _____

GEOCRES No. 317-51

DIST. 9 REGION Eastern

W.P. No. 3-67-02

CONT. No. 76-18

W. O. No. _____

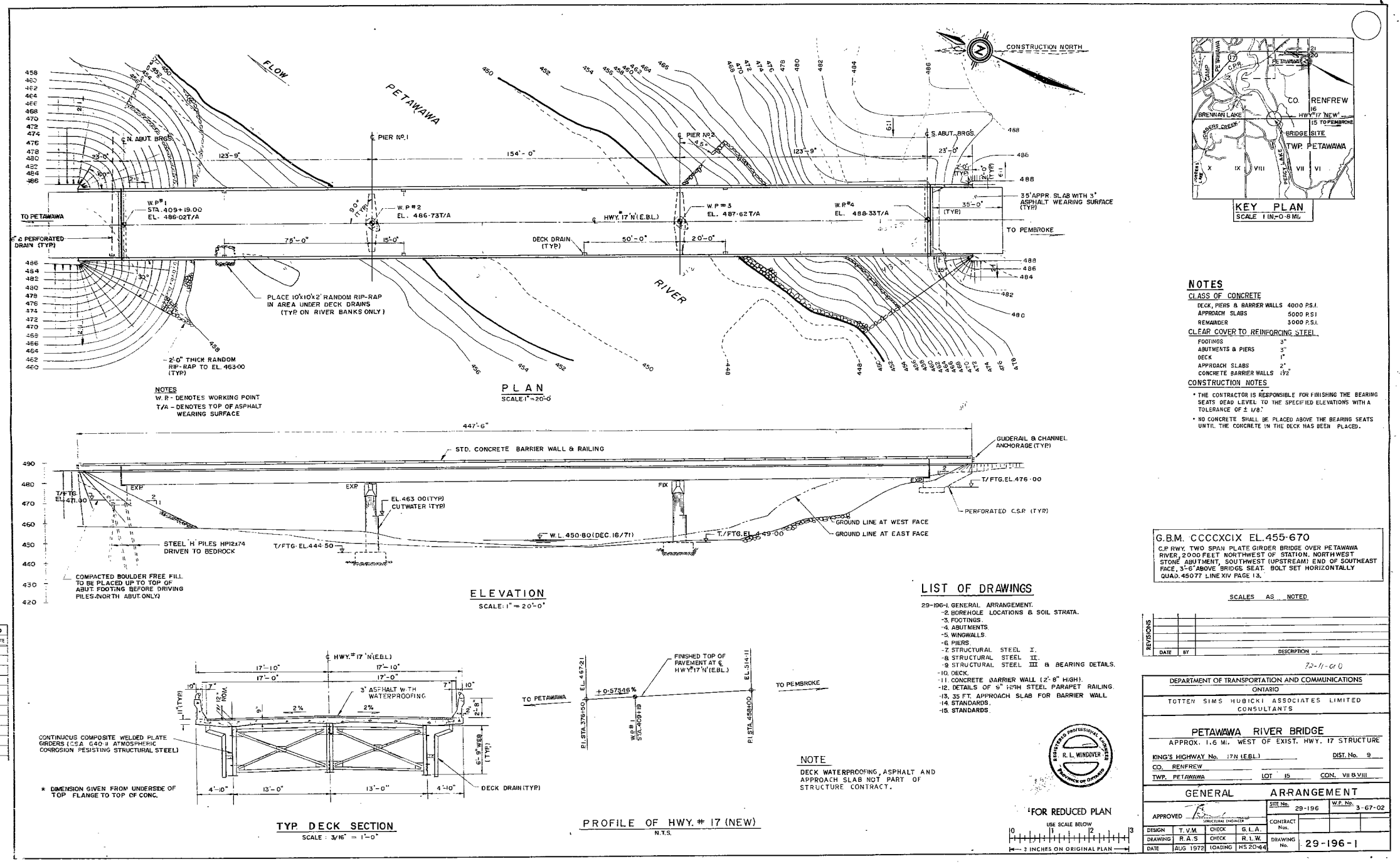
STR. SITE No. 29-196

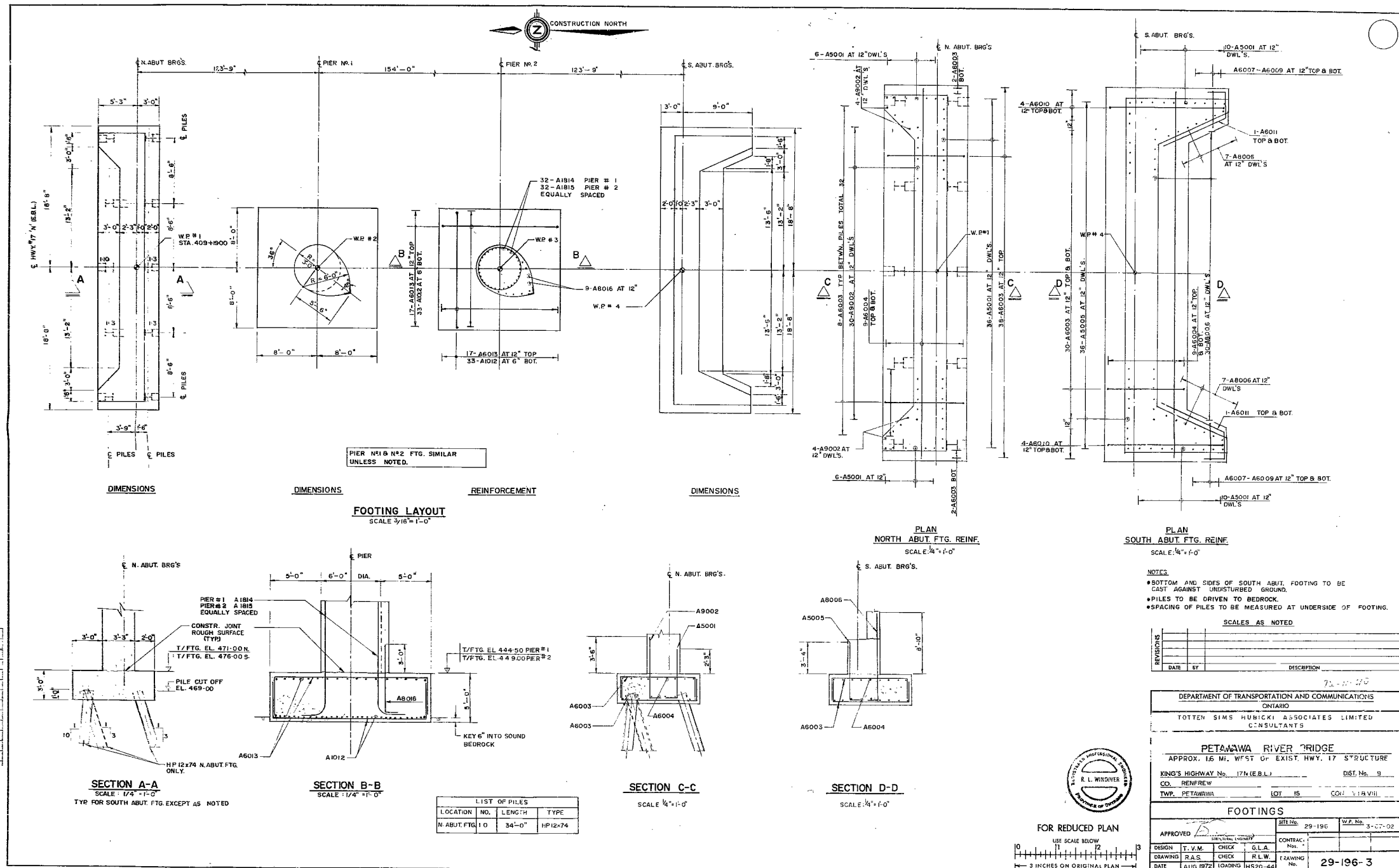
HWY. No. 17

LOCATION Petawawa River Bridge

OVERALL DIMENSIONS OF STRUCTURE (SEE PLAN) 2

REMARKS: _____





DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS ONTARIO	
TOTTEN SIMS HURWICK ASSOCIATES LIMITED CONSULTANTS	
PETAWAWA RIVER BRIDGE	
APPROX. 1.6 MI. WEST OF EXIST. HWY. 17 STRUCTURE	
KING'S HIGHWAY No. 17N (E.B.L.)	DIST. No. 9
CD. RENFREW	LOT 15
TWP. PETAWAWA	CON. 318 VIII
FOOTINGS	
APPROVED	DATE 29-196
DESIGN T.V.M. CHECK G.L.A.	CONTRACT No. 3-07-02
DRAWING R.A.S. CHECK R.L.W.	DRAWING No. 29-196-3
DATE AUG. 1972	LOADING HS20-44