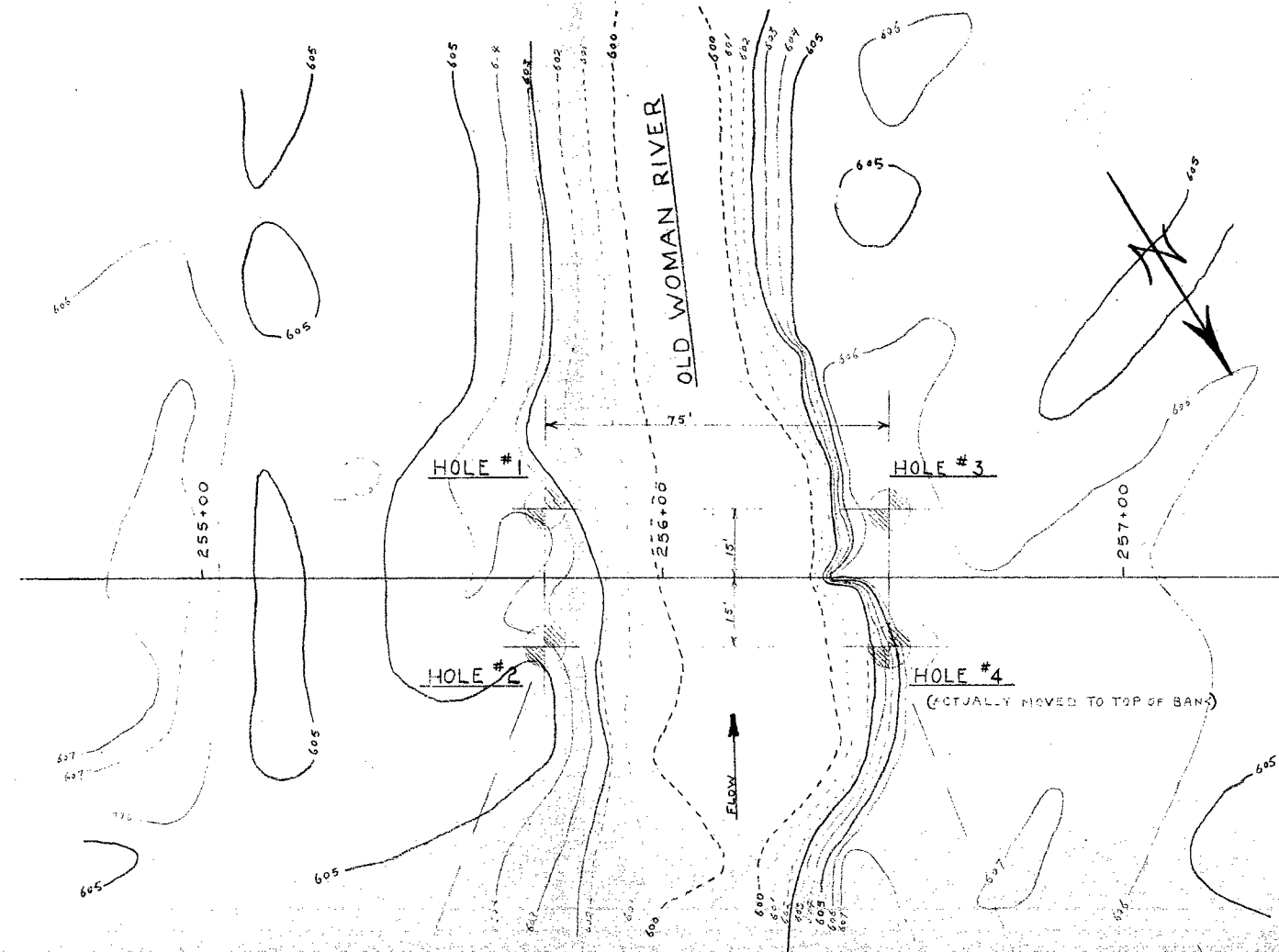


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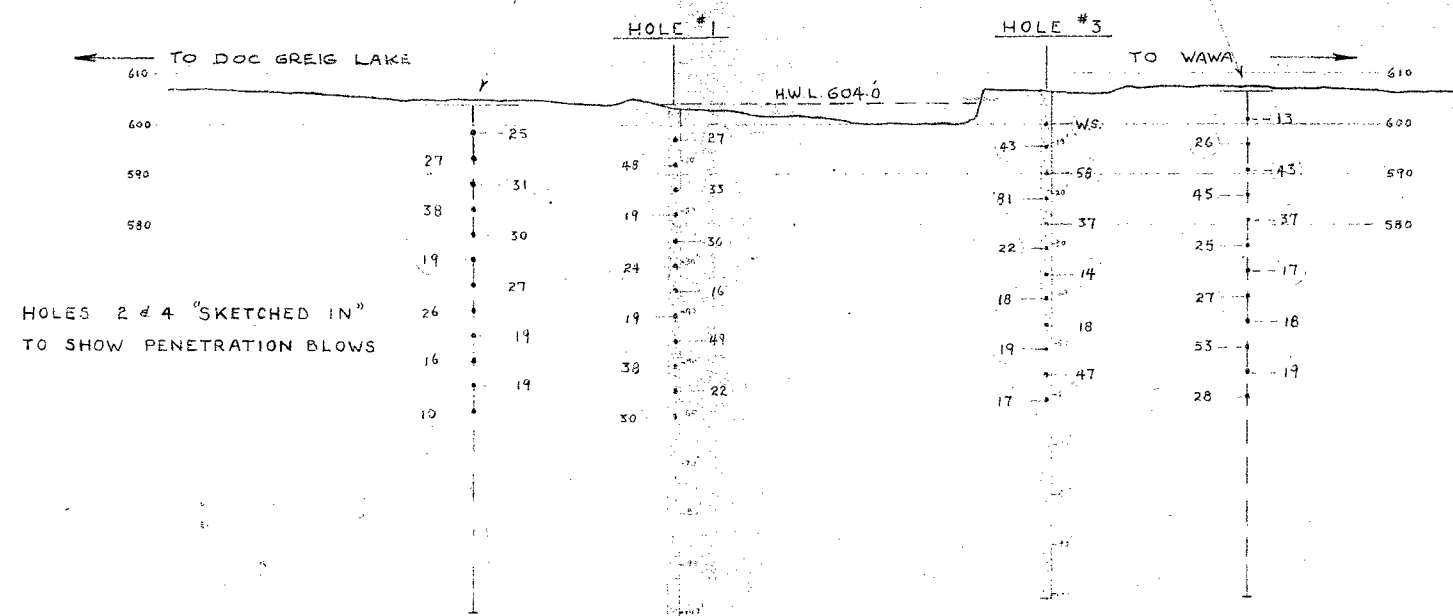
Hwy. #17

OLD WOMAN RIVER



LEGEND

- 2" O.D. SPLIT BARREL SAMPLE
- 16 STD. PENETRATION TEST BLOWS
- 4200 IN. LBS. BLOWS PER FOOT



SCALES: HOR. 1" = 20'
VER. 1" = 20'



e.m. peto & associates ltd.	
SOIL SITE INVESTIGATION AT OLD WOMAN RIVER--HWY.17 BRIDGE	
FOR DEPARTMENT OF HIGHWAYS OF ONTARIO	
OUR JOB No. 5790	DATE AUG. 26/57
CLIENTS PLAN No. E-3187	PER. <i>lu</i>

BA 541

e. m. peto associates ltd., 850 roselawn avenue, Toronto 10, Ontario

Job No. 5790

Client's Ref. No.

Date August 29th, 1957

Report on

SOIL SITE INVESTIGATION

at

OLD WOMAN RIVER

HIGHWAY 17 BRIDGE SITE

for

DEPARTMENT OF HIGHWAYS OF ONTARIO

Aug 29 1957 Old Woman R.

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57-1-232C

TERMS OF REFERENCE:

We were retained, by a letter dated July 10th, 1957, from Mr. J. C. McAllister to perform the soil investigation for the proposed new bridge on Highway 17 crossing the Old Woman River in the district of Algoma. The investigation was to be carried out in accordance with your marked site plan No. E-3187-1 dated September 1956.

This work was to be carried out in the standard manner in continuity with other work being carried out for your department in the Algoma district.

METHOD OF OPERATIONS:

This investigation was carried out by our number 3 unit, a skid-mounted Sullivan "12" diamond drill rig, which was dismantled and ferried to the site by boat during the period of July 17th to July 19th. Work commenced at the location of test hole number 3 on July 20th and the final test hole was completed by the night of July 28th. Due to the remoteness and general inaccessibility of this site except by way of Lake Superior, a supervisor with an outboard motor boat was maintained at this site in order to assist the crew, to expedite the work and to bring in supplies of fuel and rations. This boat was also required for standby emergencies in case of injury or accident to the crew.

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

METHOD OF OPERATIONS: (Cont'd)

Each test hole was performed in the standard manner by driving and cleaning BX drill casing, sampling ahead of the casing with a 2" O.D. split barrel sampler. The standard penetration test results were recorded when sampling, these being the number of blows of a 140 lbs. hammer falling 30" required to drive the split barrel sampler a distance of one foot. No cohesive stratum was encountered on this site, therefore Shelby tube samples were not taken.

Because of the reasonable uniformity of the material being obtained, the casing was driven only to the 60 ft. depth in test hole 1, thereafter wash samples were recovered to termination at 101 feet. Due to loss of wash water at the 65 to 70 ft. depth at test holes 2, 3 and 4, the casing had to be driven to 75 ft. so that samples could be obtained below this depth.

OBSERVATIONS:General Site Conditions:

This bridge site is located in the district of Algoma, Township 31, range XXI. The crossing itself is approximately 500 feet inland from the edge of Lake Superior at Old Woman's Bay. The geology of this site is, of course, similar to that of the other sites in this area for which reports have recently been submitted.

The river crossing at the proposed bridge site is only some 65 ft. wide at high water level; although the river flows through the centre of a relatively flat, wide and shallow valley. The approaches to each bank are therefore fairly level with little rise for some distance back from the river banks. We could not find any indication at the bridge site that the river had overflowed its banks in the recent past. In view of the comparatively low banks, it appears extremely doubtful that the depth of water at the crossing ever exceeds a maximum of 7 ft. We found the velocity and volume of flow during July to be small. The mouth of the river is almost completely sealed off by sand bars, which barely permit the passage of a shallow rowboat into the river from Lake Superior.

OBSERVATIONS:Soil Conditions:

The test hole locations are clearly shown on the site plan attached to the rear of this report. With Mr. Frank Fancy's permission, the test hole locations were changed slightly in order to enable the machine to be set up on dry ground. The distance between the test holes on opposite banks was increased to some 75 ft. to clear the actual water gap. The soil conditions encountered at each test hole are shown on the borehole logs attached at the rear of this report. We have also shown a profile of the road centre line with test holes 1 and 3 super-imposed on it. The results obtained at the other two test holes have also been shown in outline at the correct elevations on the longitudinal section view.

Beneath the top soil, but with a minor exception at test hole 3, the soil stratification is extremely uniform throughout. From ground surface to the 4 or 5 ft. depth generally, the stratum is a fine sand. From the 5 ft. depth to between 9 and 13 ft., there exists a stratum of medium to very coarse sand and fine gravel. The gravel is generally multi-coloured and the sand reddish-brown. This gravel deposit ranges from barely compact at test hole 4, to dense and very dense at test holes 1 and 3.

Below the sand and gravel deposit, all samples recovered at each hole were exclusively sand to the terminal depth at 101 feet below ground surface. There were of course, numerous minor variations in the colour and grading of the sands, and there was some evidence of a silt content at various depths, particularly in test hole 3. In every test hole, there was considerable fibrous organic content below the 45 or 50 ft. depth. Although there was considerable variation in density with depth there was some remarkable similarity between test holes at similar elevations. In general the densities remained from compact to dense up to very dense to approximately the 30 ft. depth. Below this the densities decreased somewhat, although there appeared to be a somewhat more dense stratum around the 50 ft. depth except at test hole 2. Test hole 2 gave somewhat lower values than those generally obtained below the 40 ft. depth in the other test holes.

OBSERVATIONS:Soil Conditions: (Cont'd)

In three of the four test holes, the casing wash water was lost between 71 and 75 ft., and it was therefore necessary to drive the casing just below this depth so that the wash water could be recovered and samples obtained to the total depth. Because of the proximity of the river and the granular material encountered levels remained at roughly that of the existing stream during the course of the investigation.

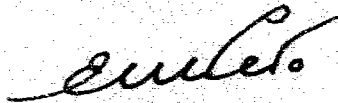
RECOMMENDATIONS AND CONCLUSIONS:

1. The soil conditions at this site can be regarded as well above the average for river crossings in this area. Load bearing values of the order of 3.0 tons per sq. ft. can be used for spread footings up to 10 ft. wide at elevation 595. This value can be increased to as much as 3.9 tons per sq. ft. for footings 4 ft. wide or less. For footings between 4 ft. and 10 ft. width, the load bearing value is approximately proportional.
2. If it is desired for reasons of economy to keep the footings at slightly higher elevations, say up to elevation 600, then the load bearing value should be limited to 3.0 tons per sq. ft. even for narrow footings. There might be slightly more than the normal tolerance of $3/4$ " settlement, particularly in the area of test hole 4, but most of this settlement would naturally occur during construction.
3. Due to the very limited fluctuation in water level at this site, the depth of potential scour under the bridge abutments can be considered to be not more than 8 or 9 feet. For example, at the North-West bank, scour protection need not be provided below about elevation 591, assuming the abutment is placed at the edge of the existing bank.
4. Driving of sheeting for scour protection and/or for semi dewatering during construction will be extremely difficult in the dense to very dense sand stratum at and immediately below the suggested footing elevation. It may well be necessary to resort to jetting to assist in driving the sheeting.

RECOMMENDATIONS AND CONCLUSIONS: (Cont'd)

5. Pile foundations are not considered necessary on this site, because of the adequate bearing values, and the virtual impossibility of driving displacement piles.

E. M. PETO ASSOCIATES LTD.,







E. M. Peto, P. Eng.

EMP:sb

e. m. peto associates ltd.
SOIL ENGINEERING SERVICE - TORONTO, ONTARIO
BORCHOLE LOG

Job Name Old Woman R. Hwy. 17 Job No. 5790 Borehole No. 2
Client Dept. of Highways of Ontario Casing EX Boring Date July 25th - 26th, 1957.
Datum D.H.O. Compiled By E.M.P. Checked By V.T.

SAMPLE CONDITION

 UNDISTURBED
 FAIR
 DISTURBED
 LOST

SAMPLE TYPE

S.S. 2" STANDARD SPLIT TUBE SAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE





ABBREVIATIONS


















V.T. IN SITU VANE SHEAR TEST
Q/6 UNCONFINED COMPRESSIVE STRENGTH
W.L. WATER LEVEL IN CASING
W.T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVEL, SOIL MOISTURE & REMARKS
			0-0 602.3 ±					WE JULY 26 8:00 AM. HOLE DEPTH 36'
FINE SAND			3'-0"					
			5'-0"					
COARSE SAND AND MULTI-COLOURED GRAVEL TO 1 1/2" DIA.	BROWN	COMPACT	9'-0" 10'-0"		1 X SS	SS	25	VERY MOIST TO WET
			12'-0"					
COARSE SAND	LT. BROWN	COMPACT	15'-0"		2 X SS	SS	27	VERY MOIST TO WET
			18'-0"					
MEDIUM SAND	GREY-BROWN	COMPACT TO DENSE	21'-0"		3 X SS	SS	31	VERY MOIST TO WET
" " "	"	DENSE	24'-0"		4 X SS	SS	38	VERY MOIST TO WET
			27'-0"					
FINE TO MEDIUM SAND	LT. BROWNISH-GREY	COMPACT TO DENSE	30'-0"		5 X SS	SS	30	VERY MOIST TO WET
			33'-0"					
FINE & MEDIUM SAND	BROWN-GREY	COMPACT	36'-0"		6 X SS	SS	19	WET
			39'-0"					
FINE TO MEDIUM SAND	DK. GREY	COMPACT	42'-0"		7 X SS	SS	27	VERY MOIST TO WET
			45'-0"					
COARSE SAND	LT. BROWN	COMPACT	48'-0"		8 X SS	SS	26	VERY MOIST TO WET
			51'-0"					
FINE SAND	GREY	COMPACT	54'-0"		9 X SS	SS	19	WET
			57'-0"					
MEDIUM TO COARSE SAND	GREY	COMPACT	60'-0"		10 X SS	SS	16	WET
			63'-0"					
FINE SAND, MINOR ORGANIC CONTENT	DK. GREY	COMPACT	66'-0"		11 X SS	SS	19	VERY MOIST TO WET
			69'-0"					
" " " " " "	" " "	LOOSE TO COMPACT	72'-0"		12 X SS	SS	10	WET
			75'-0"					
FINE SAND	GREY		78'-0"		13 X W.S.	W.S.	-	
			81'-0"					
FINE TO MEDIUM SAND WITH ORGANIC CONTENT	GREY		84'-0"		14 X W.S.	W.S.	-	
			87'-0"					
" " " " " "	"		90'-0"		15 X W.S.	W.S.	-	
			93'-0"					
" " " " " "	"		96'-0"					
			99'-0"					
" " " " " "	"		101'-0"		16 X W.S.	W.S.	-	
					HOLE TERMINATED			

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

Job Name Old Women River Hwy. 17 Job No. 5790 Borehole No. 3
Client Dept. of Highways of Ontario BX Boring Date July 20th - 22nd, 1957
Datum D.H.C. Compiled By M.B.P. Checked By L.H.

SAMPLE CONDITION		SAMPLE TYPE		ABBREVIATIONS	
	UNDISTURBED	S.S.	2" STANDARD SPLIT TUBE SAMPLE	V.T.	IN SITU VANE SHEAR TEST
	FAIR	S.L.	SPLIT BARREL WITH LINERS	Q/u	UNCONFINED COMPRESSIVE STRENGTH
	DISTURBED	S.T.	THIN-WALLED SHELLBY TUBE SAMPLE	W.L.	WATER LEVEL IN CASING
	LOST	W.S.	WASH SAMPLE	W.T.	GROUND WATER TABLE IN SOIL
		R.C.	ROCK CORE		

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample Type	No. of Bore Holes	WATER LEVELS SOIL MOISTURE & REMARKS
TOP SOIL & CLAY			0.5' 806.5'				
			5'-0"				ALL SAMPLES VERY MOIST TO WET
MEDIUM TO VERY COARSE SAND & FINE GRAVEL	REDDISH-BROWN				1 	W.S.	
			10'-0"				
AS ABOVE WITH SOME FINE SAND & STONES	AS ABOVE GREY	DENSE			2 	S.S.	43
			13'-0"				
			15'-0"				
MEDIUM SAND, FEW SMALL PEBBLES LAYER OF FINE TO VERY FINE SAND	REDDISH-GREY GREY	VERY DENSE			3 	S.S.	58
			20'-0"				
MEDIUM SAND	LT. REDDISH-BROWN	VERY DENSE			4 	S.S.	81
			25'-0"				
FINE TO MEDIUM SAND, SLIGHTLY SILTY	GREY	DENSE			5 	S.S.	37
			30'-0"				
" " "	"	COMPACT			6 	S.S.	22
			35'-0"				
AS ABOVE WITH ORGANIC CONTENT	GREY DK. GREY	COMPACT			7 	S.S.	14
			40'-0"				
MEDIUM TO COARSE SAND WITH POCKETS OF FINE GREY SILTY SAND	REDDISH-GREY - BROWN	COMPACT			8 	S.S.	18
			45'-0"				
FINE TO COARSE SAND	" "	COMPACT			9 	S.S.	18
			50'-0"				
FINE TO MEDIUM SAND WITH ORGANIC CONTENT	GREY	COMPACT			10 	S.S.	19
			55'-0"				
MEDIUM TO COARSE SAND MIXED WITH FINE SAND WITH ORGANIC CONTENT	REDDISH-GREY GREY	DENSE			11 	S.S.	47
			60'-0"				
FINE SAND, CONSIDERABLE ORGANIC CONTENT	DK. GRAY	COMPACT			12 	S.S.	17
			65'-0"				
			70'-0"				
FINE TO MEDIUM SAND, SOME ORGANIC CONTENT	BROWN - GREY				13 	W.S.	-
			75'-0"				
			80'-0"				
FINE SAND, ORGANIC CONTENT	GREY				14 	W.S.	-
			85'-0"				
			90'-0"				
FINE TO MEDIUM SAND STRONG ORGANIC OREUR	GREY				15 	W.S.	-
			95'-0"				
			100'-0"				
FINE SAND	GREY		101'-0"		16 	W.S.	-
			HOLE TERMINATED				

e. m. peto associates ltd.
SOIL ENGINEERING SERVICE - TORONTO, ONTARIO
BOREHOLE LOG

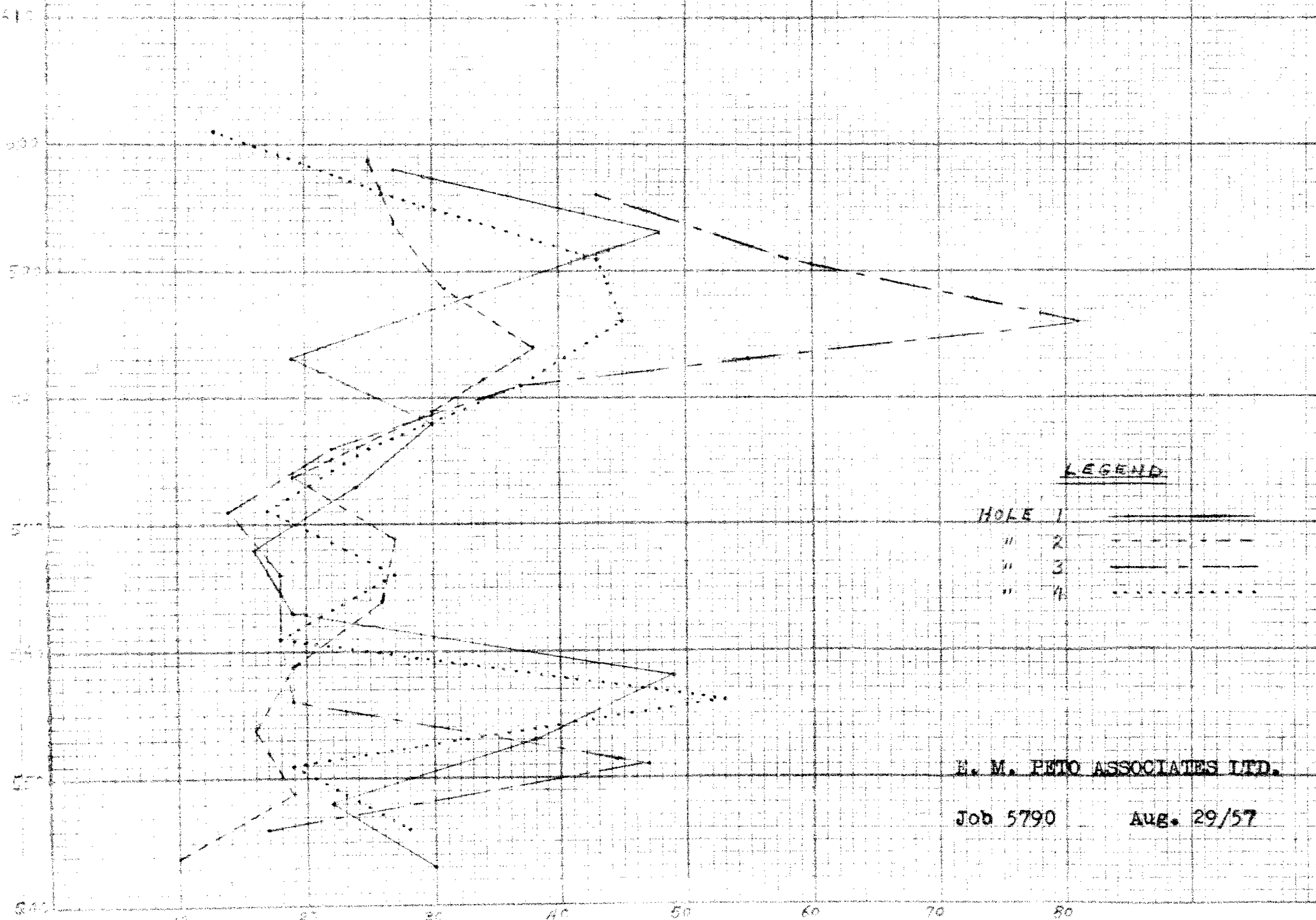
Job Name Old Wagon River Hwy. 17
Client Dept. of Highways of Ont.
Drawn D.H.O.

Job No. 5790
Casing EX
Compiled By E.M.P.

Borehole No. 4
Boring Date July 22 - 24th, 1957.
Checked By V.T.

SAMPLE CONDITION			SAMPLE TYPE			ABBREVIATIONS		
<input checked="" type="checkbox"/> UNDISTURBED			S.S. 2" STANDARD SPLIT TUBE SAMPLE			V.T. IN SITU VANE SHEAR TEST		
<input checked="" type="checkbox"/> FAIR			S.L. SPLIT BARREL WITH LINERS			Q/u UNCONFINED COMPRESSIVE STRENGTH		
<input checked="" type="checkbox"/> DISTURBED			S.T. THIN-WALLED SHELBY TUBE SAMPLE			W.L. WATER LEVEL IN CASING		
<input checked="" type="checkbox"/> LOST			W.S. WASH SAMPLE			W.T. GROUND WATER TABLE IN SOIL		
			R.C. ROCK CORE					
SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS
TOP SOIL OVER GENERALLY			0'-0" 606.5'					
FINE SAND			5'-0"					SAMPLES ALL VERY MOIST TO WET.
COARSE SAND, SOME FINE GRAVEL	REDDISH-BROWN	COMPACT	9'-0"		1	S.S.	13	
MEDIUM TO COARSE SAND	" "	COMPACT	10'-0"		2	S.S.	26	
MEDIUM SAND	REDDISH-GRAY	DENSE	15'-0"		3	S.S.	43	
FINE TO MEDIUM SAND	" "	DENSE	20'-0"		4	S.S.	45	
FINE SAND	GRAY	DENSE	25'-0"		5	S.S.	37	
FINE TO MEDIUM SAND	" "	COMPACT	30'-0"		6	S.S.	25	
" " "	" "	COMPACT	35'-0"		7	S.S.	17	
MEDIUM SAND	" "	COMPACT	40'-0"		8	S.S.	27	
FINE TO MEDIUM SAND WITH CONSIDERABLE ORGANIC CONTENT	" "	COMPACT	45'-0"		9	S.S.	18	
FINE TO MEDIUM SAND	" "	VERY DENSE	50'-0"		10	S.S.	53	
FINE SAND WITH ORGANIC CONTENT	" "	COMPACT	55'-0"		11	S.S.	19	
FINE SAND, SLIGHTLY ORGANIC	" "	COMPACT TO DENSE	60'-0"		12	S.S.	28	
COARSE TO VERY COARSE SAND	REDDISH-GRAY		70'-0"		13	W.S.	-	LOST WASH WATER AT 71" TO 75"
FINE TO VERY COARSE SAND	MULTI-COLOURED PARTICLES		80'-0"		14	W.S.	-	
MOSTLY FINE SAND WITH SOME COARSE SAND	GRAY		90'-0"		15	W.S.	-	
AS ABOVE	" "		100'-0"		16	W.S.	-	
			101'-0"					HOLE TERMINATED

GRAPH -- STD. PENETRATION TEST RESULTS vs. ELEVATION (Depth)



LEGEND

HOLE	1	---
"	2	- - - - -
"	3	— — — — —
"	4

E. M. PETO ASSOCIATES LTD.

Job 5790 Aug. 29/57

STD. PENETRATION TEST BLOW PER FOOT