

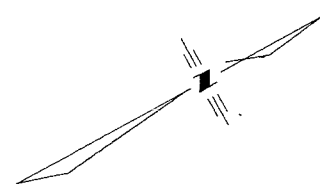
#66-F-232-C

W.P. #143-66

Hwy. #23

MAITLAND RIVER

(BURNETT DRAIN)

[illegible]

E. M. PETO ASSOCIATES LTD.

SOIL INVESTIGATION REPORT
PROPOSED BRIDGE-HIGHWAY 23 & BURNETT DRAIN

W.P. 143-66

66 F 232 C FOR

DEPARTMENT OF HIGHWAYS, ONTARIO

Dist. 3

DISTRIBUTION;

12 c.c. Department of Highways, Ontario
1 c.c. File

JOB NO. 66223

SEPTEMBER 1966

e. m. peto associates ltd.

YOUR REFERENCE:-

OUR REFERENCE:-

66223

1287 caledonia road,

TORONTO 19, ONTARIO

Telephone: 789-1128

September 7th, 1966

Department of Highways, Ontario,
Materials and Testing Division,
Downsview, Ontario.

Attention: Mr. A. Rutka, P.Eng.

Dear Sirs:

Re: Soil Investigation Report
Proposed Bridge - Highway 23 & Burnett Drain
W.P. 143-66

We have pleasure in submitting herewith our report on the soil and ground water conditions found to exist at the above site and our recommendations for the foundation design of the proposed bridge.

While we consider the report to be comprehensive, we will be pleased to be of further assistance, should you require any additional information in connection with this report.

Yours very truly,

E. M. PETO ASSOCIATES LTD.,



E. M. Peto, P.Eng.

KSS/hf

TABLE OF CONTENTS

	<u>PAGE</u>	<u>NO.</u>
1. INTRODUCTION		1
1.1 Authority		
1.2 Proposal		
1.3 Object of the Investigation		
2. SITE, GEOLOGY AND GENERAL INFORMATION		1
3. FIELDWORK AND DATA		2
4. LABORATORY WORK		3
4.1 Moisture Content Determination		
4.2 Mechanical Analyses		
4.3 Liquid Limits and Plastic Limits		
4.4 Shear Strength and Density Tests		
4.5 Chemical Analyses		
5. SOIL CONDITIONS		4
6. GROUND WATER CONDITIONS		5
7. CONCLUSIONS AND RECOMMENDATIONS		6
7.1 Allowable Bearing Capacity		
7.2 Settlements		
7.3 Excavations		
7.4 Chemical Attack		
7.5 Stability of Approach Fill		
7.6 Scour Protection		

TABLE OF CONTENTS - continued

-2-

TABLE "I"

Liquid Limit and Plastic Limit Test Results

GRADING CURVES

BOREHOLE LOGS

SITE PLAN AND PROFILE

1. INTRODUCTION

- 1.1 Authority: The authorization for this investigation was given by the Department of Highways, Ontario, Materials and Testing Division in a letter dated 2nd August 1966.
- 1.2 Proposal: It is proposed to construct a single 40 ft. clear span skewed bridge at station 484+73 on Highway 23 where Burnett Drain crosses the Highway. This bridge would replace an existing bridge. The existing grade of the road would be raised by about 3 ft. to an approximate elevation of 1234.0 above geodetic datum. The foundation pressures from the proposed bridge abutments are not known at this stage. The proposed footing locations are shown on the appended drawing.
- 1.3 Object of the Investigation: The object of this investigation was to determine the soil and ground water conditions existing at this site and to evaluate their properties for the foundation design of the bridge.

2. SITE, GEOLOGY AND GENERAL INFORMATION

- 2.1 The area around this site is fairly flat except for the steep banks of the stream and of the road embankment. The stream flows in a south westerly direction on the east side of the existing bridge. At the bridge, it takes a sharp turn and flows in a westerly direction. The south bank of the stream on the eastern side of the bridge is made up of fill consisting of sand, silt and large boulders 2 to 3 ft. in diameter, presumably to retard erosion. Some of these boulders are visible on the surface. The stream appears to have drifted southwards at this location, to its present position.
- 2.2 The banks of the stream are only about 4 to 6 ft. above the water elevation which was 1219.3 on 18th August 1966. The depth of water in the stream varies due to the variations in the elevations of the stream bed but generally there was about 2 to 4 ft. of water under the bridge.

2. SITE, GEOLOGY AND GENERAL INFORMATION - continued

-2-

- 2.3 The concrete apron at stream level on the southern abutment of the existing bridge has been broken in many places and some erosion of the stream bed appears to have taken place.
- 2.4 Geologically, this site overlies alluvial deposits and limestone Till of the Listowel Series.

3. FIELDWORK AND DATA

- 3.1 The fieldwork for this investigation was carried out during the middle part of August, 1966, by the field staff of E.M. Peto Associates Ltd., under the direct supervision of a soils engineer.
- 3.2 Three boreholes were sunk, at the locations shown on the appended site plan, using a self-propelled, track mounted flight auger. They were surveyed and their elevations were taken by the Surveyors of the Department of Highways, Ontario, South-western Region. These holes were taken down to depths at which "Refusal to Auger" occurred. As this occurred at about the same elevation in all the three holes, an additional hole was augered near borehole No. 1. The refusal depth in this hole was same as that of borehole No. 1. Hence the possibility of bedrock at this depth was anticipated and borehole No. 1 was taken down a further 5 ft., from the bottom of the auger hole, using a diamond drill rig. This showed that there was no bedrock at that depth, but only sandy Till with a high percentage of cobbles and boulders.
- 3.3 Standard penetration tests were carried out in the three boreholes and the results are shown on the appended borehole logs.

3. FIELDWORK AND DATA - continued

-3-

- 3.4 Soil samples were obtained at depths shown on the borehole logs. These samples were used for laboratory testing.
- 3.5 Observations of ground water conditions were made during the period of this fieldwork. The ground water conditions are described later in this report. A sample of the ground water and a sample of the water from the stream were taken for chemical analyses.
- 3.6 Attempts were made to obtain undisturbed samples of the fill material in the existing road embankment, by using brass liner tubes inside the split spoon sampler. These attempts were only partially successful, as the soils were fairly loose and some of the samples became disturbed. Wherever possible, these were tested for shear strength and density.

4. LABORATORY WORK

- 4.1 Moisture Content Determination: The moisture contents of the soils were determined, according to the standard method, on the samples obtained in the standard penetration tests. The results are given in the appended borehole logs.
- 4.2 Mechanical Analyses: Sieve analyses and hydrometer analyses, wherever necessary, were carried out on selected representative samples of the soil strata encountered. The results of these analyses are given as Grain Size Distribution Curves. These were used in the classification of the soils as described under the section "Soil Conditions" in this report.
- 4.3 Liquid Limits and Plastic Limits: These tests were carried out on selected samples of the soils mainly for classification purposes and for qualitative assessment of the compressibility characteristics of the soils. The results are given in the appended Table I.

4. LABORATORY WORK - continued

-4-

4.4 Shear Strength and Density Tests: It was possible to carry out unconfined compression tests only on one sample of the fill obtained at 7 ft. 6 inches in borehole 3. The shear strength obtained in this test was 890 lbs/sq.ft. The wet and dry densities were 131.0 lbs/cu.ft. and 106.7 lbs/cu.ft. respectively. The moisture content was 22.8% and the void ratio was .638.

4.5 Chemical Analyses: Tests were made on a sample of the ground water and a sample of the water from the stream, to determine the concentration of soluble sulphates. This was found to be about 30 parts per 100,000 for the ground water and 25 parts per 100,000 for the stream water, both indicating low risk. The pH value of each of the water samples was also determined and was found to be 6.4 for the ground water and 6.6 for the stream water, indicating very slight acidity.

5. SOIL CONDITIONS

5.1 The detailed descriptions of the soil strata encountered are given in the appended borehole logs and the soil profiles are shown on the appended drawing. The descriptions and the thickness of the soil strata shown were based on the field observations and on the results of the field and laboratory tests. The profiles represent only a generalized classification.

5.2 The top stratum is either approximately 3 ft. 3 inches of topsoil as in the area of borehole 1, or 5 to 10 ft. of fill. The 10 ft. of fill encountered in borehole 3 was placed to form the embankment for the road. It consists of loose to compact gravelly, silty sand with a clay binder. The organic silt encountered at 8 ft. 0 inches could be an old stream bed deposit. The 5 ft. of fill encountered in borehole 2 consists of clayey, sandy silt with boulders 2 to 3 ft. in diameter, placed, presumably, to retard erosion.

5. SOIL CONDITIONS - continued

-5-

- 5.3 Underlying the topsoil or fill are alluvial deposits consisting of clayey, sandy SILT; silty SAND, or silty, sandy GRAVEL. The thickness of these deposits varies from 0 ft. 9 inches to 6 ft. This deposit is at a lower elevation in the area of borehole 3 than in the other areas. This indicates that the stream might have been flowing previously in this area, might have eroded the underlying till and deposited the sandy gravel stratum as it moved southward to its present location. The lowest elevation of the lower surface of this stratum is 1214.5 ft.
- 5.4 Below the alluvial deposits is a stratum which could be classified, generally, as very stiff to hard sandy clayey SILT TILL. The composition of this stratum varies somewhat from place to place and in some places it has a high clay content. This stratum extends down to the elevation of approximately 1190 ft.
- 5.5 Underlying the SILT TILL is very dense silty SAND TILL with large cobbles and boulders.

6. GROUND WATER CONDITIONS

- 6.1 There was no fast flowing ground water at this site. However, some ground water entered the boreholes by very slow seepage from the occasional sand seams encountered in the holes. The seepage water levels observed are given below:

Borehole 1A

Depth at which water was encountered	30' 6"
Depth of water after 21 hours	27' 6"
Depth of water after 46 hours	24' 0"

6. GROUND WATER CONDITIONS - continued

-6-

Borehole 2

Depth at which water was encountered	26' 0"
Depth of water after 1½ hours	23' 9"
Depth of water after 48 hours	15' 6"

Borehole 3

Depth at which water was encountered	11' 0"
Depth of water after 5 minutes	10' 7"
Depth of water after 26 hours	10' 0"

- 6.2 The ground water conditions are those appertaining to the time of the investigation and may be subject to alterations due to seasonal effects or changes in drainage conditions.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Allowable Bearing Capacity: Assuming that a minimum depth of foundation of 6 ft. below the stream bed level is required, the foundation would bear in the sandy clayey SILT TILL even in the area of borehole No. 3. The allowable bearing capacity of shallow spread foundations, up to about 5 ft. wide and bearing in this SILT TILL stratum below the elevation of 1214.5 ft. is 8.0 kips/sq.ft. including a factor of safety of more than 3 against general shear failure. The allowable bearing capacity of wider or deeper foundations would be greater than 8.0 kips/sq.ft., and the exact value would depend on the actual width and depth of the foundation.

7.2 Settlements: The total and differential settlements of the foundations recommended in paragraph 7.1 above, should be small and within the allowable limits for the proposed structure.

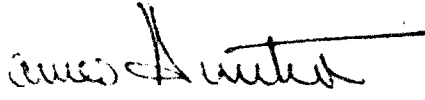
7. CONCLUSIONS AND RECOMMENDATIONS - continued

-7-

- 7.3 Excavations: The ground water is not likely to cause any serious problems during construction. However, precautions must be taken to deal with the surface water especially if the excavation and construction are carried out under wet weather conditions.
- 7.4 Chemical Attack: No precautions are necessary to protect the concrete embedded in the ground from chemical attack.
- 7.5 Stability of Approach Fill: It is considered that the existing approach fill is generally stable and should be capable of sustaining the proposed additional fill, which would be placed on top of it. Any compaction that may occur in the existing fill due to the weight of the new fill should be small and should occur rapidly.
- 7.6 Scour Protection: As there is indication of some scouring taking place, further information on scouring at this site should be obtained and taken into consideration in determining the depth of foundation required for scour protection.

Yours very truly,

E. M. PETO ASSOCIATES LTD.,

for. 
C.F. Freeman, P.Eng.,
Chief Engineer.

KSS/hf

Prepared by:

K.S. Senathirajah
K. S. Senathirajah,
Senior Soils Engineer.

JOB NO. 66223

SEPTEMBER, 1966

TABLE "I"

LIQUID LIMIT AND PLASTIC LIMIT TEST RESULTS

B.H.#	Sample #	Depth	Liquid Limit	Plastic Limit	Plasticity Index
1	3	7'0"-8'6"	18	12	6
1	6	15'0"-15'9"	24	16	8
2	1	5'0"-6'6"	18	11	7
2	5	20'0"-21'6"	19	12	7
3	12	20'0"	18	12	6

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>	
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4	
SOFT	2 - 4	250 - 500	LOOSE	4 - 10	
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30	
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50	
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50	
HARD	> 30	> 4000			
W.T.P.L.	WETTER THAN PLASTIC LIMIT		D.T.P.L.	DRIER THAN PLASTIC LIMIT	
	A.P.L. ABOUT PLASTIC LIMIT				

TYPE OF SAMPLE

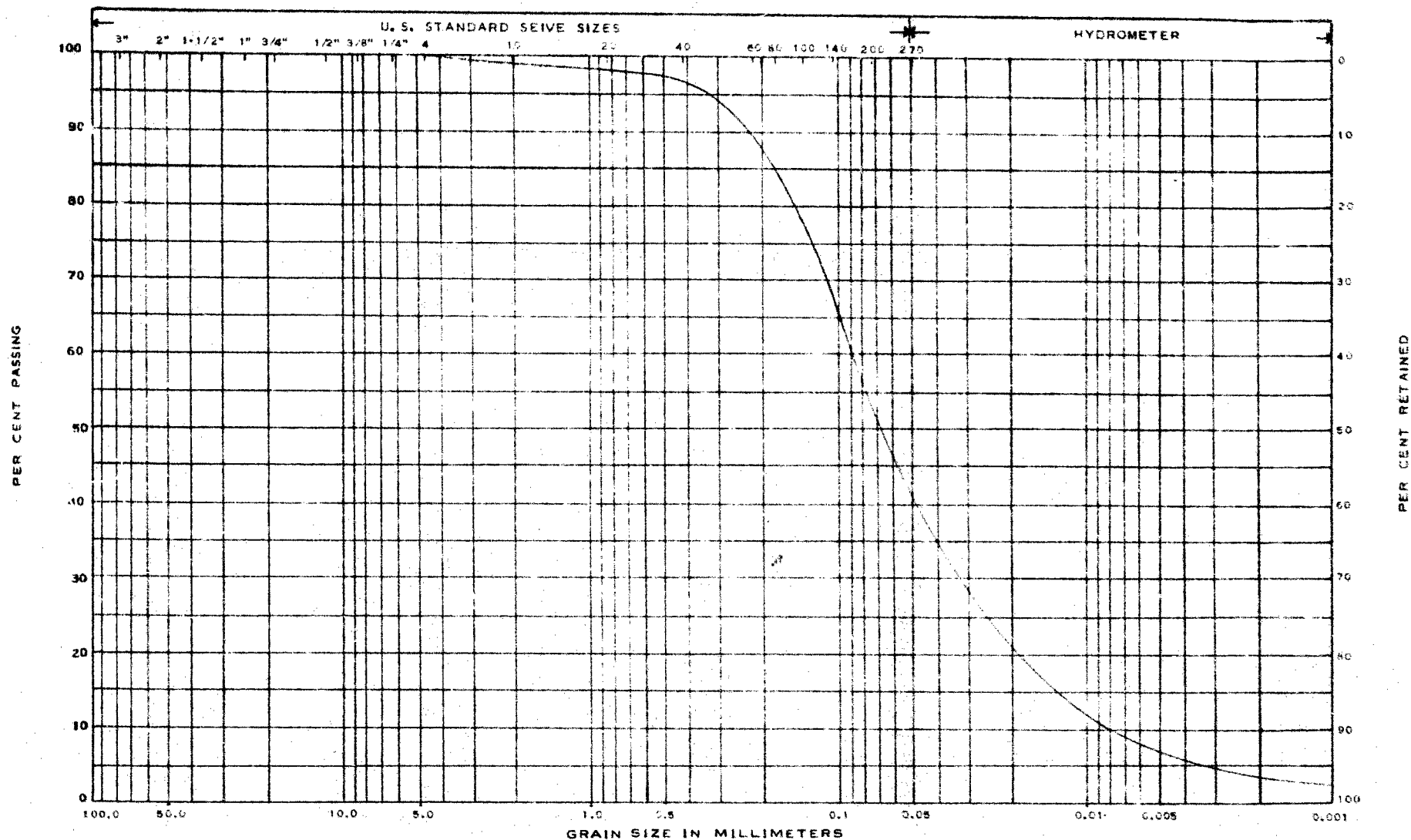
S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL		

e. m. peto associates ltd.

Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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MASS. INST. OF TECH. CLASSIFICATION

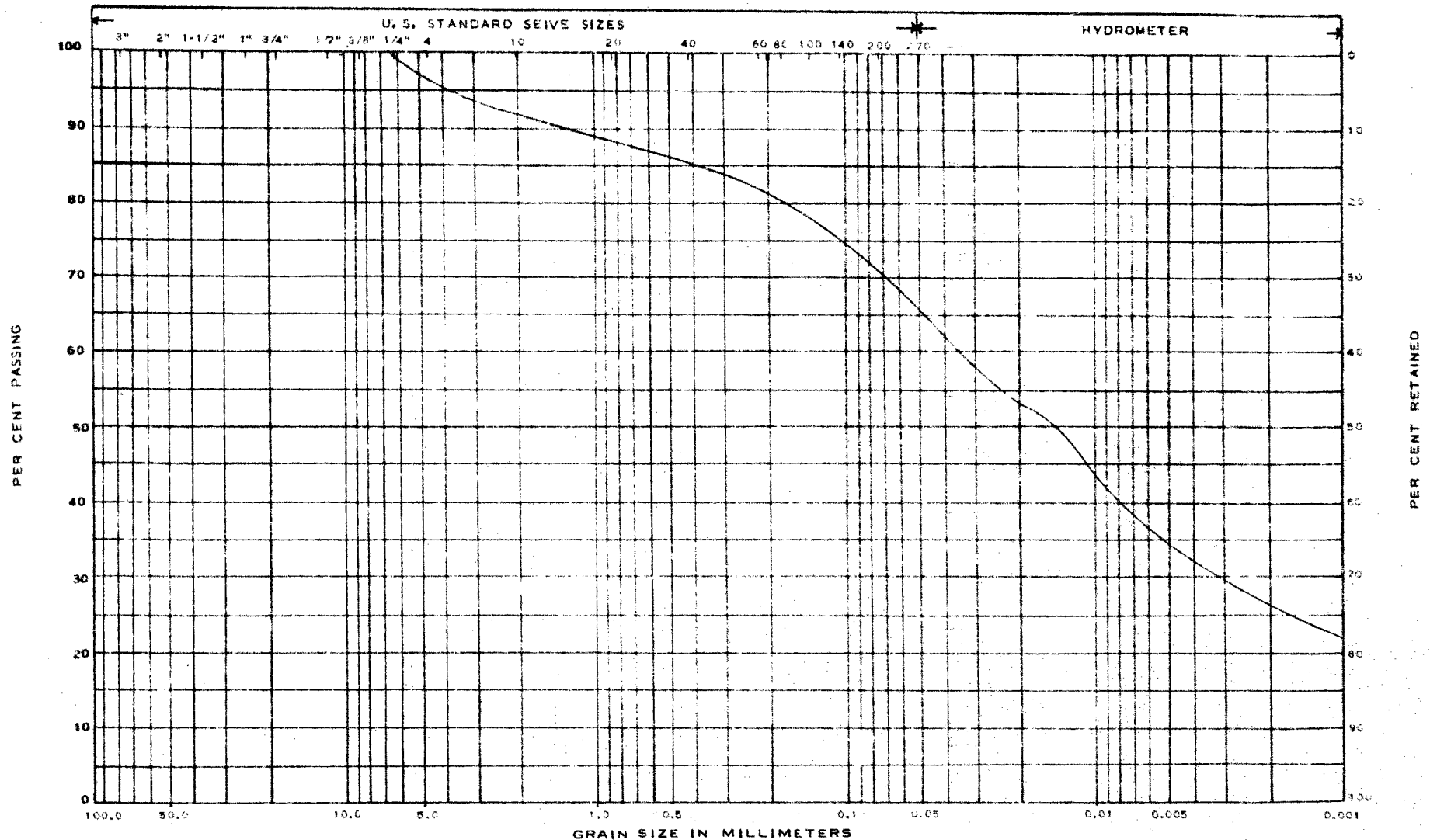
JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 1 SAMPLE NO. 1

DEPTH 2'-3'6" ELEVATION _____ REMARKS _____

GRAIN SIZE DISTRIBUTION

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STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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MASS. INST. OF TECH. CLASSIFICATION

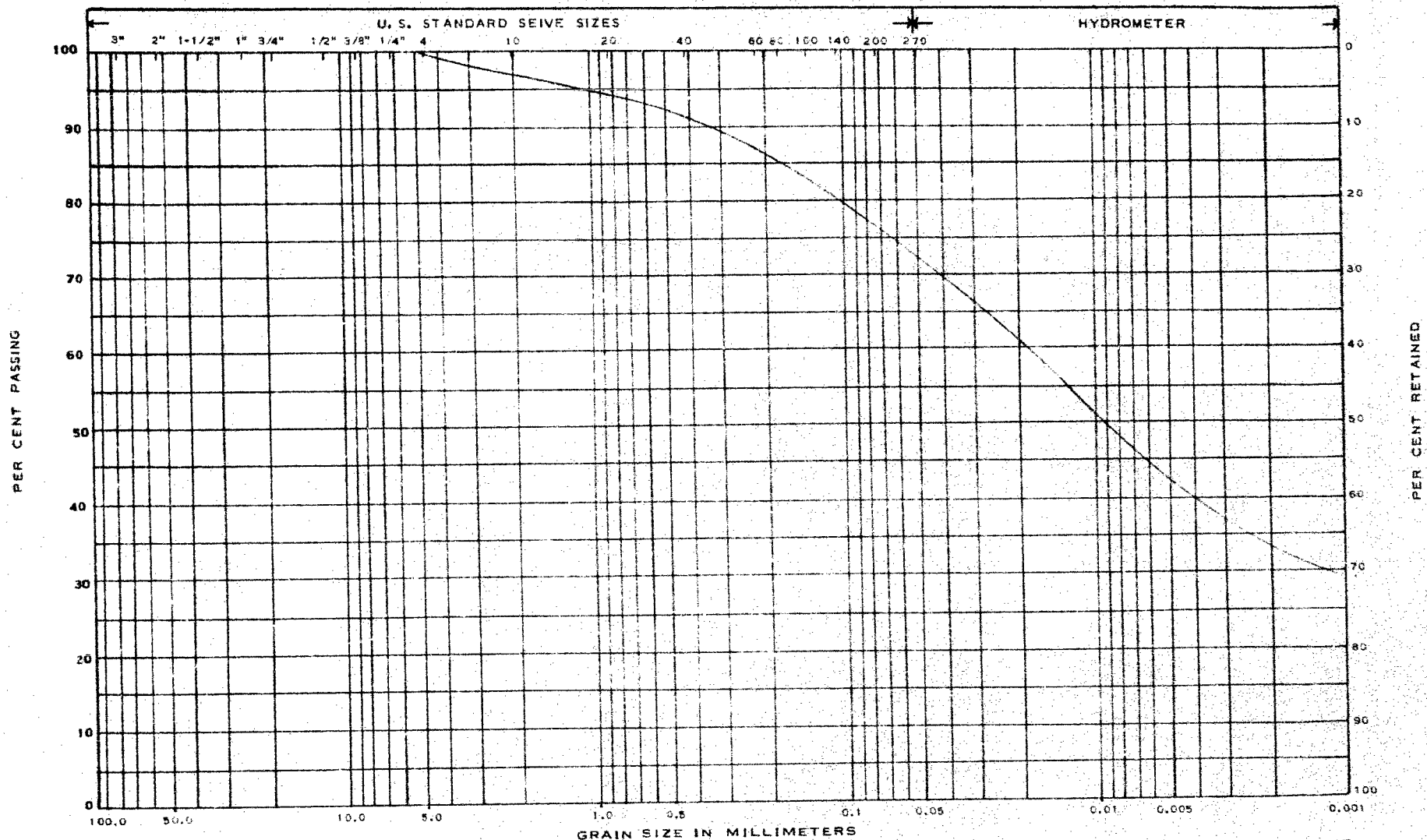
JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 1 SAMPLE NO. 2

DEPTH 5'-6'6" ELEVATION _____ REMARKS _____

GRAIN SIZE DISTRIBUTION

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STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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MASS. INST. OF TECH. CLASSIFICATION

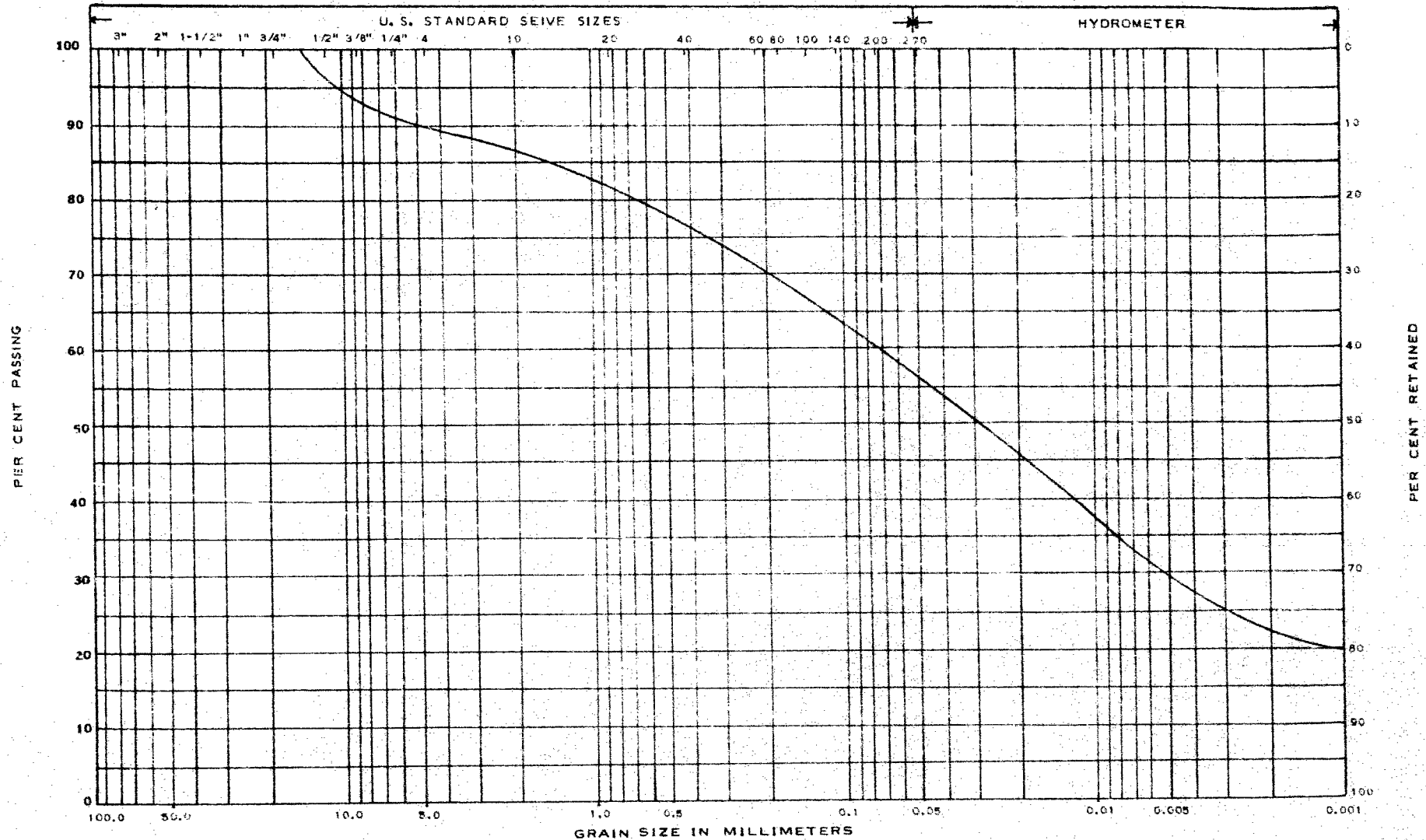
JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 1 SAMPLE NO. 4

DEPTH 10'-11'6" ELEVATION _____ REMARKS _____

GRAIN SIZE DISTRIBUTION

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STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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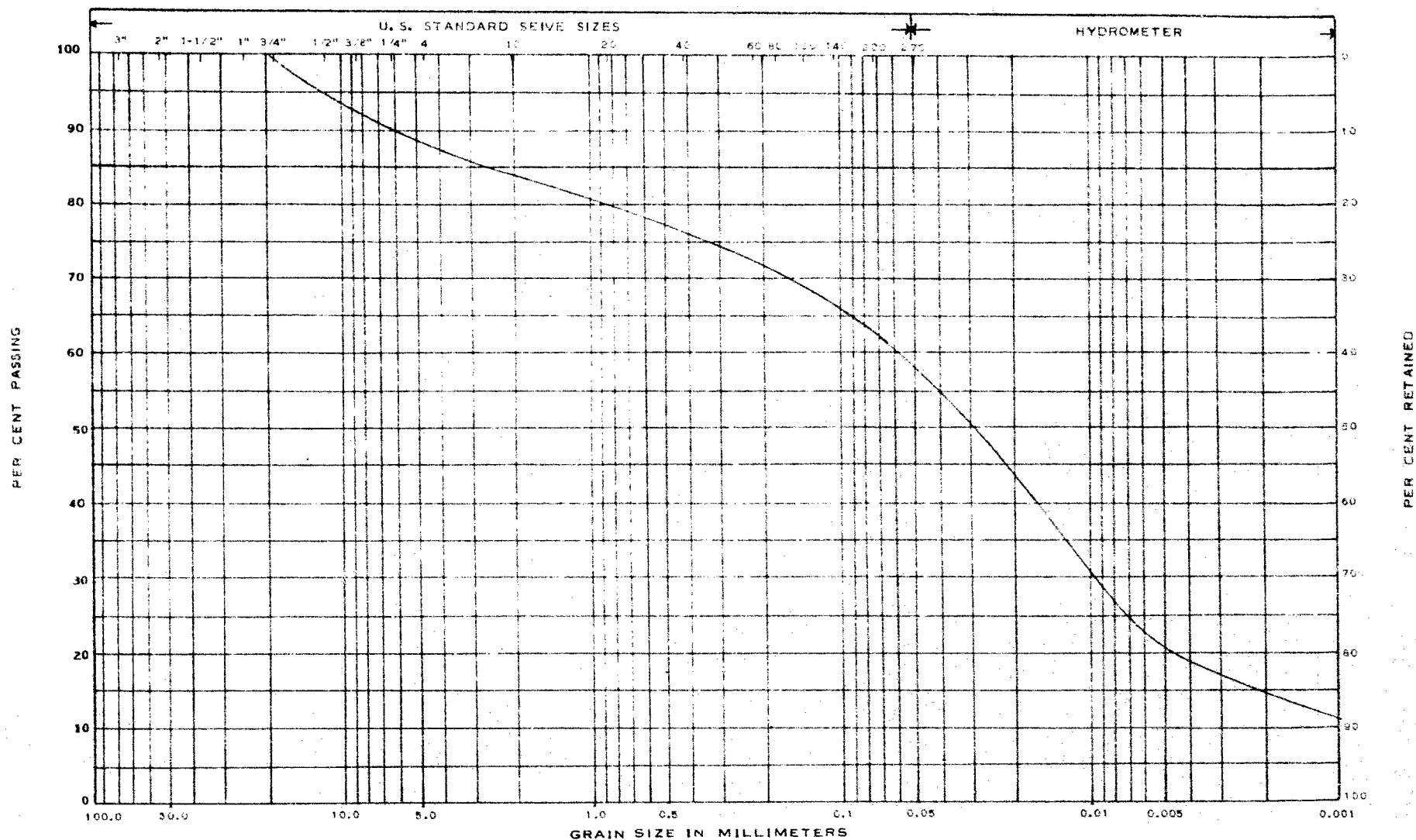
MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 1 SAMPLE NO. 6

DEPTH 15' ELEVATION _____ REMARKS _____

GRAIN SIZE DISTRIBUTION

Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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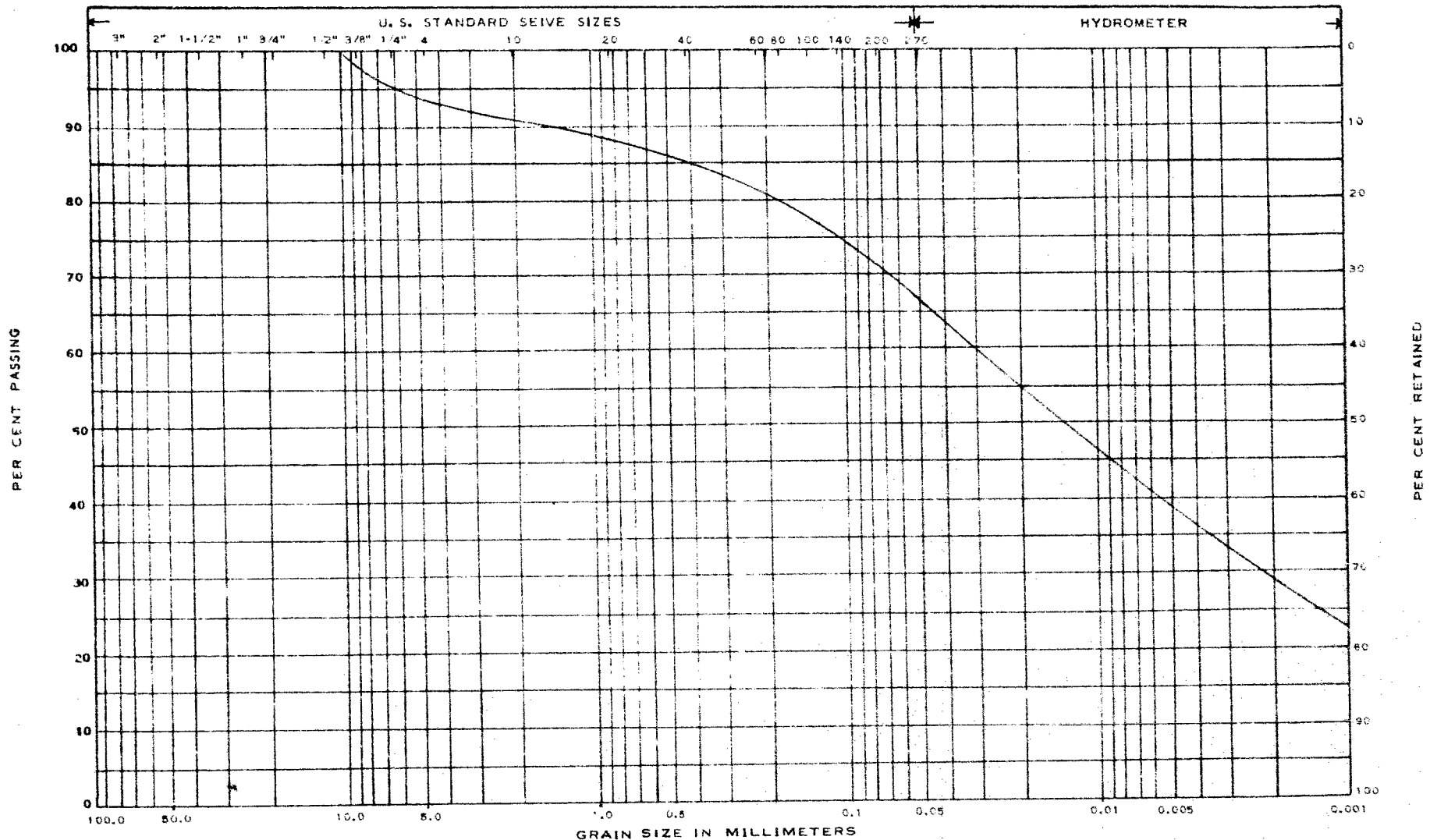
MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 2 SAMPLE NO. 1

DEPTH 5'-6'6" ELEVATION _____ REMARKS _____

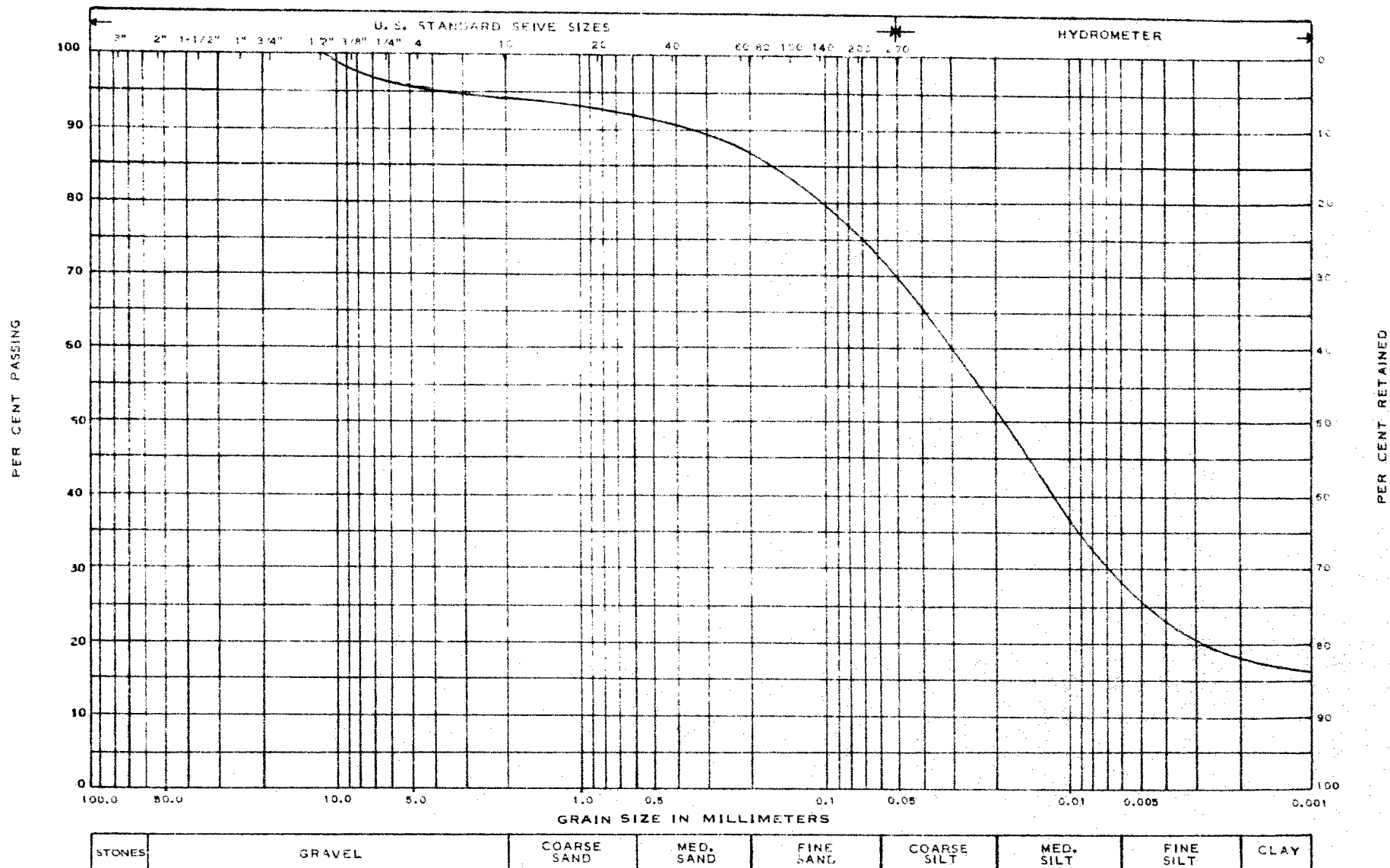
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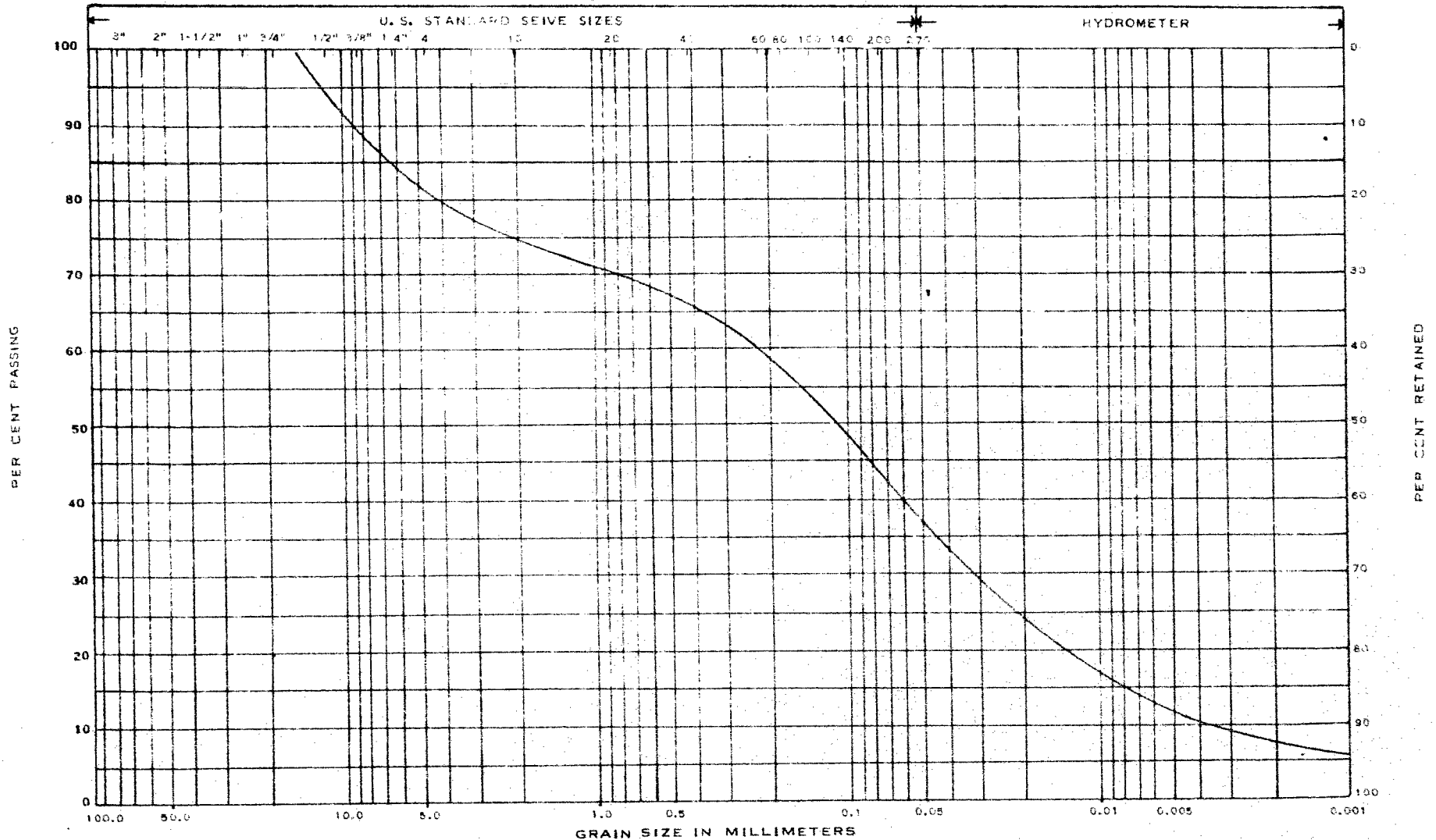
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STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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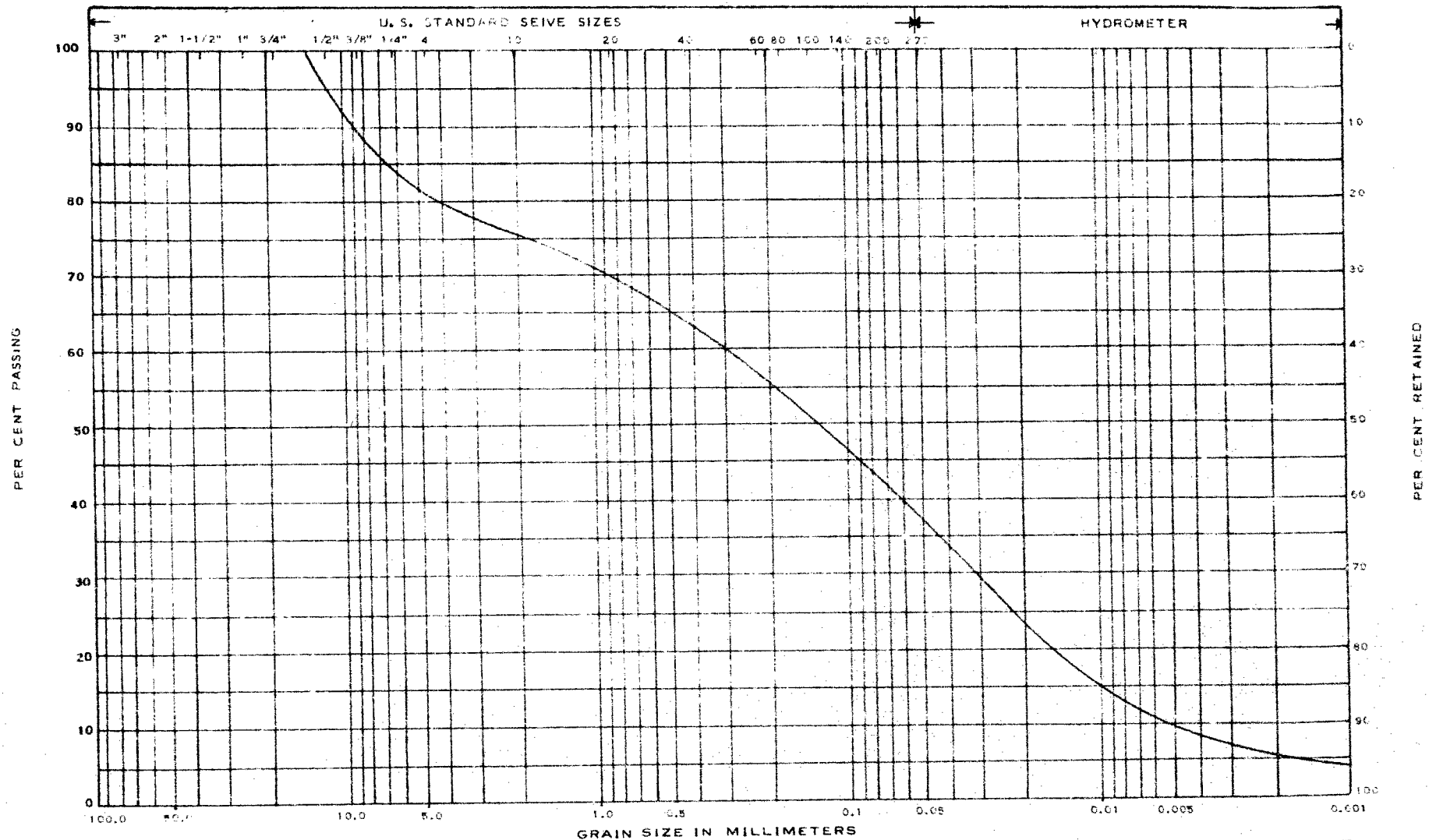
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JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 3 SAMPLE NO. 1

DEPTH 1'0"-2'6" ELEVATION _____ REMARKS _____

GRAIN SIZE DISTRIBUTION

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GRAVEL								
STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

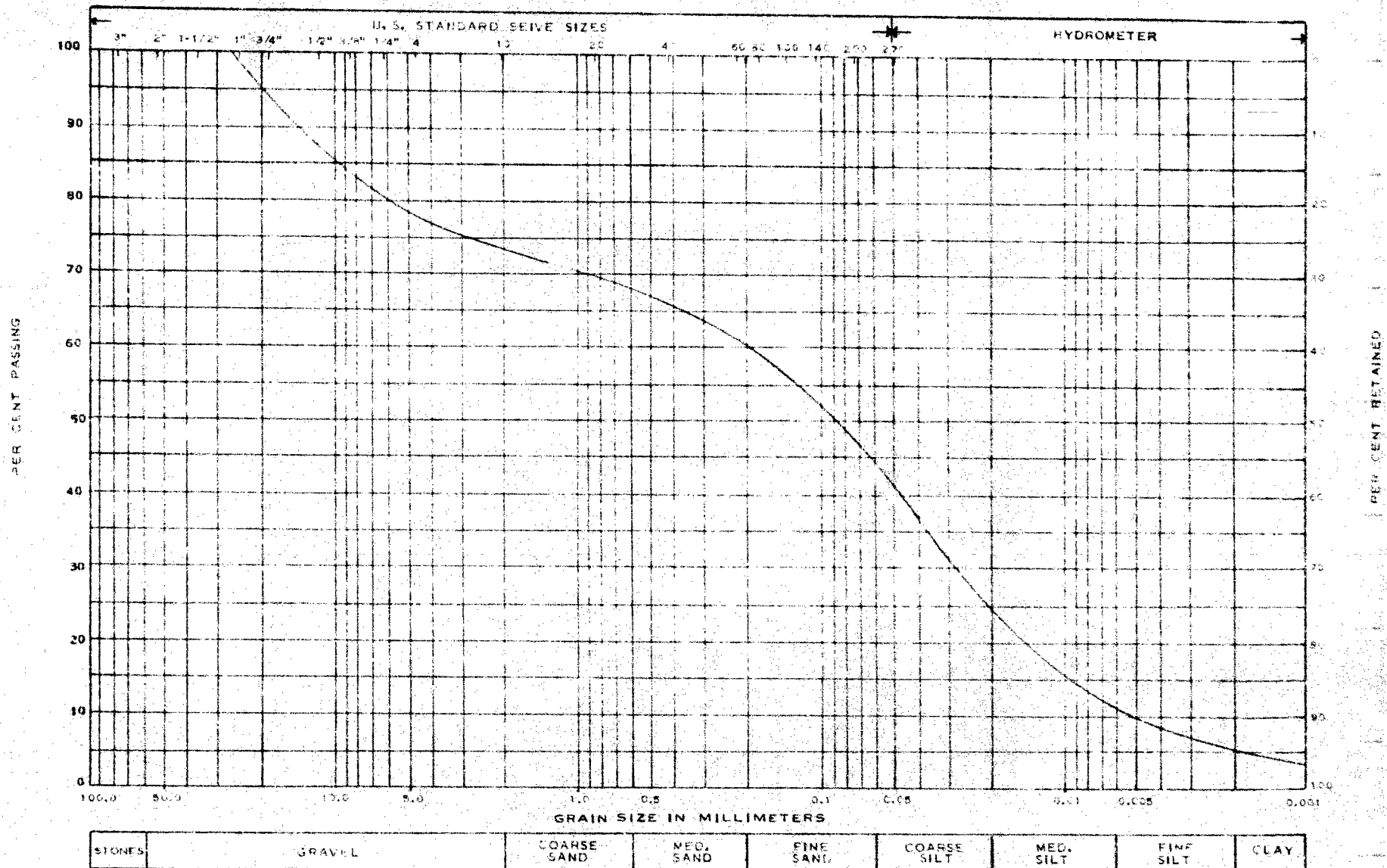
JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 3 SAMPLE NO. 2 & 3

DEPTH 5'0"-6'6" ELEVATION _____ REMARKS _____

GRAIN SIZE DISTRIBUTION

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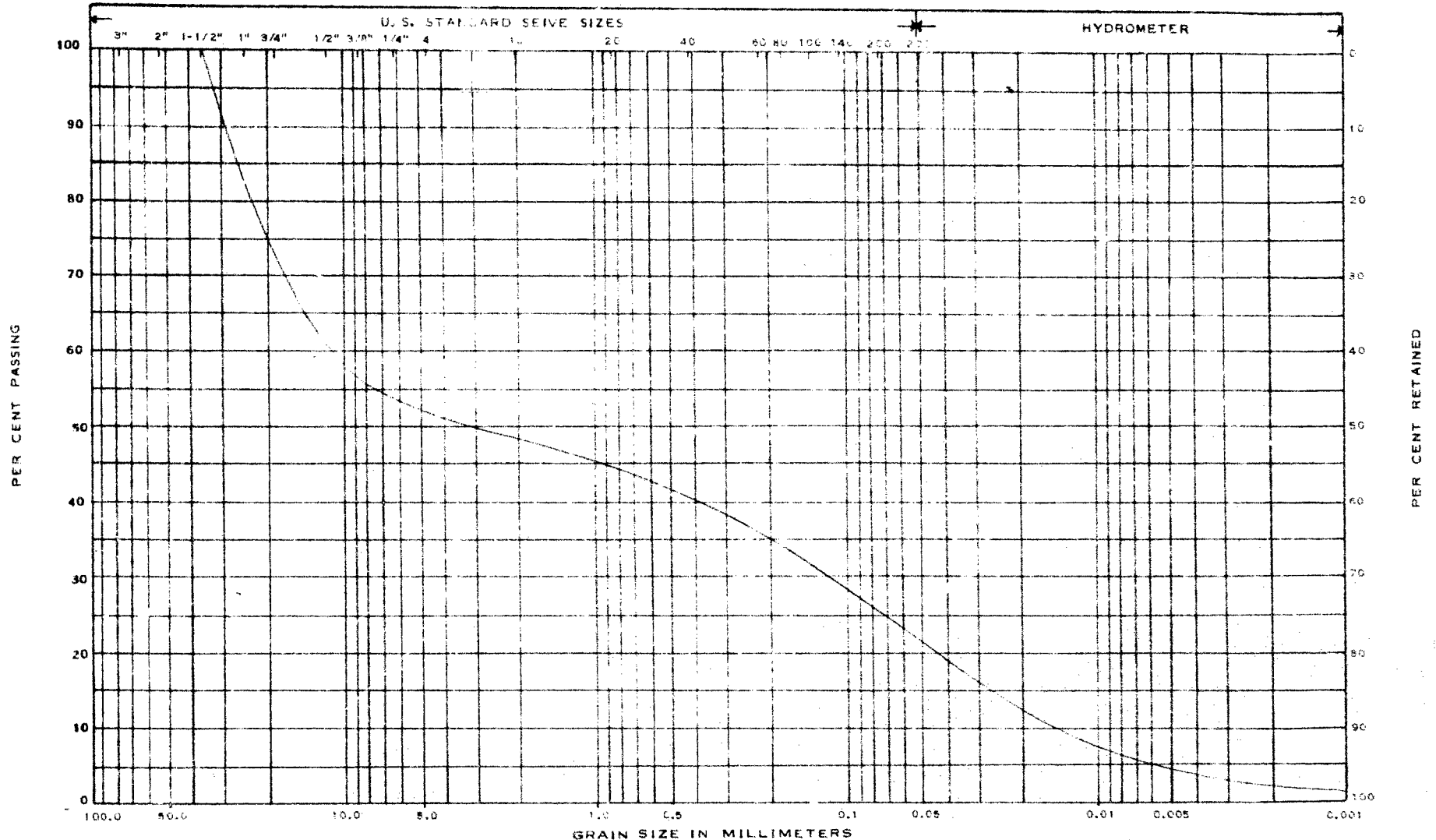
JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 3 SAMPLE NO. 4

DEPT. 7'0"-8'6" ELEVATION REMARKS

GRAIN SIZE DISTRIBUTION

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STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
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MASS. INST. OF TECH. CLASSIFICATION

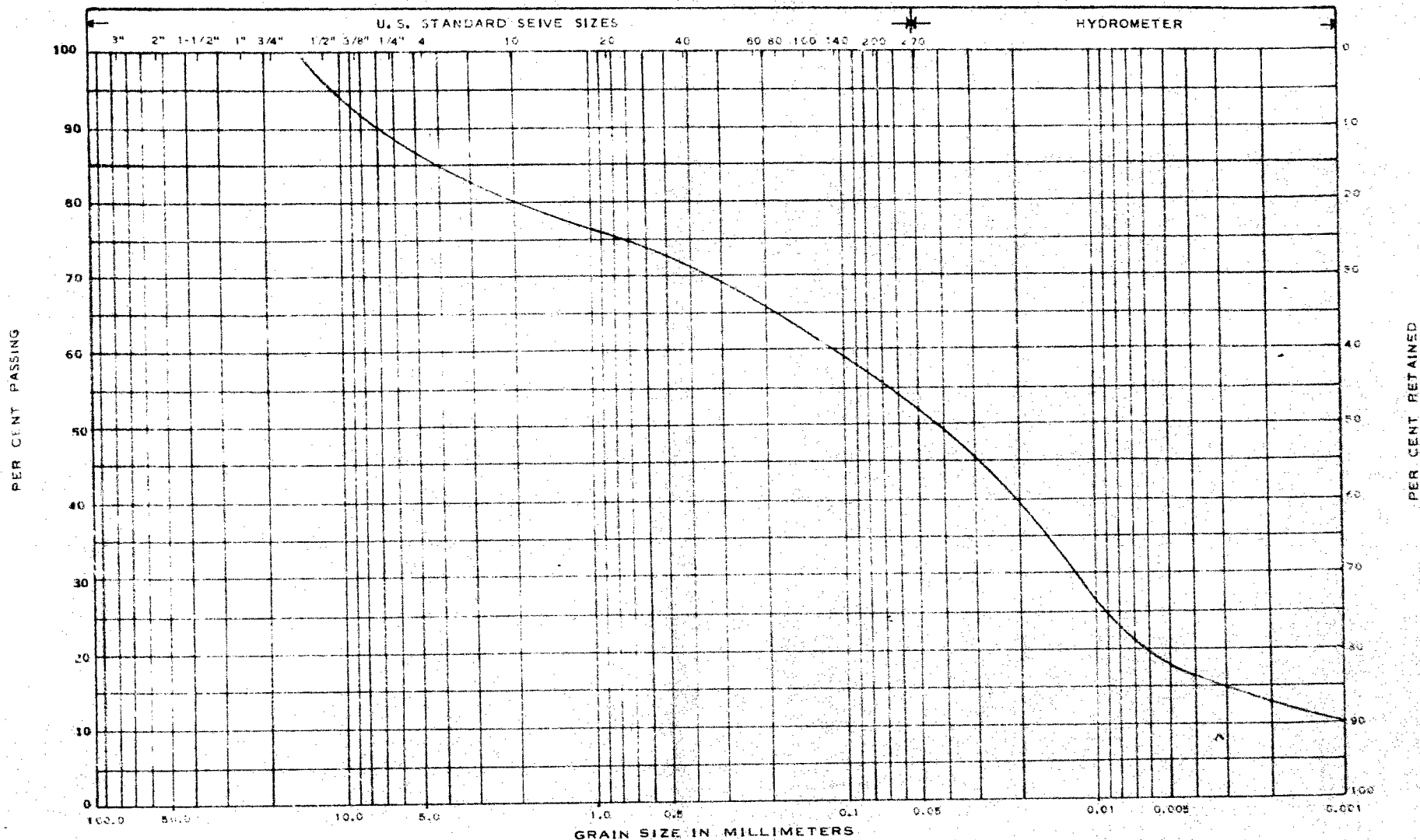
JOB NAME Hwy. #23 - WP 143-66 JOB NO. 66223 HOLE NO. 3 SAMPLE NO. 9 x 3

DEPTH 10.6" - 11.6" ELEVATION REMARKS

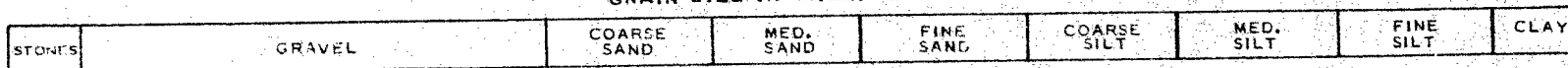
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DEPTH 20'-21'6" ELEVATION _____ REMARKS _____

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Consulting soil engineers

RECORD OF BOREHOLE NO. 1

JOB NO. 66223 JOB NAME Proposed Structure-Hwy. 23 & Burnett Drain-W.P.143-66TECHNICIAN A. J.

BORING DATE Aug. 16/66 CLIENT Department of Highways, Ontario. ENGINEER K.S.S.

GROUND ELEV. 1225.3 BOREHOLE TYPE 4" Auger to 36'0", then AXT TYPED BY D.C.

SOIL PROFILE		SAMPLES			DYNAMIC CONE PENETRATION BLOWS/FOOT - x - - - STANDARD PENETRATION TEST BLOWS/FOOT - . - - - 20 40 60 80 100 SHEAR STRENGTH C _u LB/SQ. FT.	LIQUID LIMIT _____ W _L PLASTIC LIMIT _____ W _p WATER CONTENT _____ W W _p W W _L WATER CONTENT % 10 20 30	REMARKS
DEPTH ELEV.	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/FOOT		
0'0"	Loose Sandy Silty Topsoil						
3'3"			1	SS	6		
4'0"	Loose Sand & Gravel						
	Stiff Dark Brown Silty Clay with pebbles, TILL, Sandy in places.		2	SS	26		
			3	SS	42		
	D.T.P.L.						
			4	SS	47		
			5	SS	42		
			6	SS	45		
			7				
	A seam of wet coarse Sand from 15'9" to 16'3"		8	SS	80		
	Silt content increasing with depth.		9	SS	87		
			10	SS	61		
			11				
35'2"	Dense Light Grey Clayey Silty SAND TILL with cobbles. Refusal to auger at 36'0". Hole diamond drilled from 36'0" to 41'0". Cobbles and gravel recovered. Hole terminated at 41'0"				175/8"		
						175/8"	

Groundwater conditions observed in Hole 1-A adjoining hole 1 are given in the report.

24'0" August 19/66

JOB NO. 66223

JOB NAME Proposed Structure-Hwy. 23 & Burnett Drain-W.P. 143-66

TECHNICIAN A.J.

BORING DATE Aug. 17/66

CLIENT Department of Highways, Ontario.

ENGINEER K.S.S.

GROUND ELEV. 1226.3

BOREHOLE TYPE 4" Auger

TYPED BY D.C.

SOIL PROFILE		SAMPLES			DYNAMIC CONE PENETRATION BLOWS/FOOT STANDARD PENETRATION TEST BLOWS/FOOT --- 20 40 60 80 100 SHEAR STRENGTH C_u LB/SQ. FT					LIQUID LIMIT _____ W_L PLASTIC LIMIT _____ W_p WATER CONTENT _____ W W_p — W — W_L WATER CONTENT % 10 20 30			REMARKS
DEPTH ELEV.	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/FOOT								
0'0"	Sandy Silty Topsoil												
1'6"	Loose to compact clayey silty sand with boulders up to 2'0" diameter, FILL												
5'0"	Firm to stiff light brown Sandy Silty Clay with cobbles. TILL, W.T.P.L.		1	SS	62								
				SS	42								
9'0"	Stiff Dark Brown Sandy Silty CLAY TILL		2	SS	52								
			3	SS	76/3"								
			4	SS	44								
			5	SS	53								
			6	SS	154/9"								
			7	SS	42								
35'0"	Dense Light Grey Clayey Silty SAND TILL with cobbles.		8	SS	130/4"								
39'0"	Refusal to augers at 39'0"												

15'6"
August 19/66

Slow seepage of water into hole at 26'0" Water rose to 23'9" after 1-1/2 hrs. and to 15'6" after 48 hrs.

e. m. peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO. 3

JOB NO. 66223 JOB NAME Proposed Structure-Hwy. 23 & Burnett Drain-WP 143-66 TECHNICIAN A.J.
 BORING DATE August 18/66 CLIENT Department of Highways, Ontario. ENGINEER K.S.S.
 GROUND ELEV. 1230.5 BOREHOLE TYPE 4" Auger TYPED BY D.C.

SOIL PROFILE		SAMPLES			DYNAMIC CONE PENETRATION BLOWS/FOOT — x — STANDARD PENETRATION TEST BLOWS/FOOT — — — 20 40 60 80 100 SHEAR STRENGTH C_u LB/SQ. FT.					LIQUID LIMIT ——— W_L PLASTIC LIMIT ——— W_p WATER CONTENT ——— W W_p W W_L WATER CONTENT % 10 20 30			REMARKS
DEPTH ELEV.	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/FOOT								
0'0"	Loose Topsoil												
1'6"	Loose to Compact Sand and Silt with some Gravel, FILL		1	SS	14								
			2	SS	3								
			3										
8'0"	Loose Black Org. SILT		4	SS*	9								
8'6"	Compact Clayey Sand and Gravel, FILL		5&6	SS	41								
10'0"	Compact Light Grey Sand and Gravel. Saturated.		7,8 & 9	SS	38								
16'0"	Stiff Grey Brown Clayey Sandy SILT TILL.		11	SS	47								
			12	SS	122								
			13	SS	40/3"								
			14	SS	73								
			15	SS	62								
40'2"	Dense Light Grey Silty SAND TILL with cobbles.		16	SS	180/6"								
44'6"	Dry												
	Refusal to auger at 44'6"												

August 19/66
 ▼ W.L. 10'0"
 Water entered hole at 11'0"
 The water level after 5 mins. was 10'7" and after 20 mins. it was also 10'7".
 After 26 hrs. the water level was 10'0"

SS* These samples were obtained in Brass Liner Tubes inside the Split Spoon Sampler.

Foundation File

Peto

A. P. Watt
Regional Bridge Location Eng.
Bridge Division

K. Selby
Foundation Section
Materials & Testing Div.

December 19, 1966

W.P. 143-66, Bridge Site 25-37
Maitland River Tributary
(Burnett Drain) Bridge)
2.3 Miles South of Listowel
Highway 23
District #3, Stratford

We have reviewed the Preliminary Plan D-6063-P for the above-mentioned structure. We note that the designer has decided to use Steel 'H' Piles rather than spread footings as recommended by the Soils Consultant.

We estimate that design loads as high as 100 tons per pile can be achieved by a 5-10 feet penetration into the silty sand till layer containing cobbles and boulders. In view of the presence of the latter, we recommend that the tips of the piles be reinforced.

KGS:mt

K. G. Selby

MEMORANDUM

Peto

To: Mr. A. G. Stermac
Principal Foundation Engineer
Lab Building
D O W N S V I E W

FROM: A. P. Watt

DATE: November 30, 1966

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 143-66, Bridge Site 25-37,
Maitland River Tributary (Burnett Drain) Bridge,
2.3 miles south of Listowel,
Highway 23,
District 3, Stratford.

Attached please find one copy of the preliminary
plan D-6063-P for the above noted structure.

Would you kindly review the bridge foundations
proposed and inform me if they are satisfactory.

A reply would be appreciated within the next
two weeks.



A. P. WATT
REGIONAL BRIDGE LOCATION ENGINEER

APW:gf
ATT'D

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac
Principal Foundation Engineer
Lab Building
D O W N S V I E W

From: A. P. Watt

Date: November 30, 1966

Our File Ref.

In Reply To

Subject: W.P. 108-66, Bridge Site 25-72,
Maitland River (Boyle Drain) Bridge,
8.7 miles south of south Jct. Hwy. 86,
Highway 23,
District 3, Stratford.

Attached please find one copy of the preliminary plan D-6062-P for the above noted structure.

Would you kindly review the bridge foundations proposed and inform me if they are satisfactory.

A reply would be appreciated within the next two weeks.



A. P. WATT
REGIONAL BRIDGE LOCATION ENGINEER

APW:gf
ATT'D

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac
Principal Foundation Engineer
Lab Building
D O W N S V I E W

From: A. P. Watt

Date: December 6, 1966

Our File Ref.

IN REPLY TO

SUBJECT: W.P. 143-66, Bridge Site 25-37,
Maitland River Tributary (Burnett Drain) Bridge,
2.3 miles south of Listowel,
Highway 23,
District 3, Stratford.

Please be advised that the note on the preliminary plan D-6063-P reading "Bed El. 1207.0" appearing in the elevation view of the bridge which is just below the plan view, should read "Bed El. 1217.0".



A. P. WATT
REGIONAL BRIDGE LOCATION ENGINEER

APW:gf

Bay, 401 & Acre St.,
Gunnview, Ontario.

August 2, 1966

Materials and Testing Division

S. R. Felo Associates Ltd.,
1257 California Road,
Toronto 19, Ontario.

Attention: Mr. S. R. Felo

- Re: Letter of Authority - Foundation Investigations -
1. M.P. 153-66, Bridge Site 25-37, Kaitland (Burnett Drain) River Tributary Bridge, 2.8 Miles South of Hwy. 36, Highway 23 - District 3 (Stratford).
 2. M.P. 105-66, Bridge Site 25-72, Kaitland River Bridge (Boyle Drain), 5.7 Miles South of South Jet. Hwy. 36, Highway No. 23, District 3 (Stratford).
-

Dear Sir:

Please consider this your authorization to carry out the foundation investigation at the two above mentioned sites.

The plans with the proposed footing locations, were given to your representative on August 2, 1966. Enclosed were also the preliminary structure site reports for your use and guidance.

We understand that accommodations can be obtained at the Blue Barn Hotel in Listowel.

You are requested to submit eleven (11) copies of each report to the Department by not later than September 7, 1966.

In accordance with our terms of reference, you are to have a qualified soils engineer in charge of the field work at all times. Any deviation from this arrangement has to meet our prior approval. Previous requirements as to preliminary borehole information and laboratory testing program should be followed.

Should there be any queries regarding the above mentioned investigations, please feel free to call on this office, or on the Regional Bridge Location Engineer in London, Mr. A. F. Watt - Telephone No. 451-5400 (Area Code 519).

cont'd. /2 ...

August 2, 1966

Since the drawings accompanying the foundation reports, showing the location of borings, the inferred subsoil conditions, etc., are to become contract drawings, you are requested to prepare them in accordance with the D.M.O. Standards. To enable you to do this, we are supplying you with a sample drawing with all the necessary explanations, together with linen sheets for your drawings. You are also requested to provide us with Cronaflex copies of the drawings.

Charges for the work will be in accordance with your Schedule of Rates, dated December 1, 1963, and invoices to be addressed to the attention of the undersigned.

We are attaching Purchase Order J 34823 (W.F. 143-66), and Purchase Order J 34824 (W.F. 108-66), covering the purchase of any new material required for this work, in order that you may use these as a basis for exemption from the Federal Tax for such purchases. The Exemption Certificate is printed thereon.

AGG/Bief
Attach.

Yours very truly,

Alf Turnmire
W. A. Rutka,
MATERIALS & TESTING ENGINEER

cc: Messrs. S. McCombie
A. Cater
J. G. Tillicock
A. P. Watt
J. Roy
Mrs. I. Steinberg
B. Konings
A. Crowley
H. Szymanski (2)
Foundations Office
Gen. Files (2)

Mr. B. S. Davis,
Bridge Engineer,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

September 12, 1966

SEP 12 1966

FOUNDATION INVESTIGATION REPORT BY:
E. R. Peto Associates Limited --
Proposed Bridge - Highway 23 and
Barnett Drain - District 3 (Stratford)
S.P. 143-56

Attached, please find the report for the above mentioned site, prepared and submitted by the consultant, E. R. Peto Associates Ltd.

We have reviewed the report and believe that it contains all the information necessary for your further design work. Should, however, you desire to discuss any aspect of the report, please feel free to contact this Office.

AGS/Eder
Attach.

A. G. Lister
A. G. Lister,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. B. S. Davis (2)
B. A. Tregaskes
D. W. Farren
A. Gater
A. P. Watt
J. G. Tillcock
J. Moy
A. Watt

Foundations Office
Gen. Files