

MAR 19770011: NORTHEASTERN ALBERTA

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FINAL REPORT
1977 EXPLORATION PROGRAM
QUARTZ MINERAL EXPLORATION PERMIT 209
NORTHEASTERN ALBERTA

INTRODUCTION

Exploration for uranium in northeastern Alberta was sparked by the announcement by Gulf Minerals of their discovery of a uranium deposit at Rabbit Lake Saskatchewan in 1968. A massive land acquisition covering most of the Athabasca Sandstone Basin attracted several companies to acquire permits in Alberta. The work done on these permits included airborne spectrometer surveys with little followup. Discouraging results from these surveys coupled with the lack of outcrop led to early abandonment of these permits. In 1974 Eldorado Nuclear acquired several permits in northeastern Alberta initiating a more detailed phase of exploration and prospecting. Norcen Energy Resources Limited under the name of its wholly owned subsidiary Great Plains Development Company acquired six Quartz Mineral Exploration Permits in January of 1976. Several companies acquired permits shortly after and by June of 1976 most of the area available for acquisition over the Athabasca Formation in northeastern Alberta was covered by exploration permits.

PREVIOUS EXPLORATION BY NORCEN

The Archer permits originally consisted of six permits covering the western margin of the Athabasca Formation as it is indicated on Research Council of Alberta, Map of Bedrock Geology of Alberta, 1970. During the summer of 1976 the author conducted a combined prospecting, surficial geology and lake bottom geochemical study over this area. The authors concluded from this study that the margin of the Athabasca Formation was located much further to the west than indicated on the geological map published by the Research Council of Alberta or indicated by the reconnaissance seismic study by Hobson and McAulay (1969). (For details on last year's exploration see Norcen Energy Resources Limited, 1976 yearend Report Quartz Mineral Exploration Permits NE Alberta and Athabasca River Areas by G. McWilliams and D.A. Sawyer). The recommendation by the permit area should be dropped and that additional permits south of Richardson Lake be acquired as soon as possible.

During the month of September, 1977 Norcen conducted a drilling program on Permits 208, 210 and 211 totalling 664 metres (2,178 feet). The discouraging results from this drilling program indicate that the combined depth of overburden and sandstone was greater than anticipated. Details of this drilling program are outlined in the Final Report Quartz Mineral Exploration Permits 208, 210, 211.

WORK PROGRAM

The work proposal for Quartz Mineral Permit 209 included a remote sensing study using Landsat imagery and an evaluation of published aeromagnetic and seismic data. This program was to take place following the drilling program on Permits 208, 210 and 211 in order to incorporate that information in our evaluation.

In early November Norcen was approached by a company that had used remote sensing and a seismic study as a guide to their drilling program on the adjacent permit. Comments from this discussion indicated that anomalous reflectivity encountered in their Landsat study were not related to ore forming processes in the underlying bedrock. This information coupled with the discouraging results from our drilling program indicated that the Proterozoic-Archaean unconformity underlying permits adjacent to Permit 209 is located too deep below the surface to be explored with the state of the art exploration methods.

Exploration in the Athabasca Basin in Saskatchewan indicates that the topographic surface underlying the Athabasca Formation is not regular as once assumed. Large changes in the thickness of the Athabasca Formation have been encountered over relatively short distances, due to faulting within the Archaean basement rocks. A detailed examination of the government aeromagnetic maps was conducted to determine whether faults occurring in Permit 209 could be traced from dislocations in the magnetic intensities of the basement rocks. In addition to this study a large anomaly occurring at Archer Lake was examined in detail to determine the depth of this anomaly below the surface.

The method used to determine the depth of the magnetic anomaly is the derivative method described by V. Vacquier et al in the Geological Society of America Memoir 47. A brief description of this method and the computed map are included in Appendix 1 of this report.

L. Bayrock of Bayrock and Reimchen Surficial Geology Ltd. conducted laboratory analysis of samples collected during the summer of 1976. The purpose of the study was to determine the nature of the glacial moraine and outwash to

determine if further glacial studies would be of any use in delineating bedrock geology. A total of 19 samples were subjected to seive analysis. A copy of the letter outlining the findings of this study and the analysis of the samples is included in Appendix 2 of this report.

One afternoon was spent flying out to inspect the previous year's camp at Archer Lake and fill in a hole where a bear had dug up the latrine.

AEROMAGNETIC INTERPRETATION

A detailed magnetic profile was conducted over Permit 209 and surrounding area using the published government aeromagnetic maps (G.S.C. map number 2844G). The primary objectives of the aeromagnetic study were to:

- A. define the lithology of the basement rocks underlying the Athabasca Formation,
- B. define fault zones concealed by the pervasive glacial cover,
- C. define those areas where the combined thickness of glacial cover and Athabasca Formation is not excessive for further exploration.

The magnetic characteristics of the basement rocks underlying Quartz Mineral Permit 209 indicate that these rocks are predominantly granitic gneisses. The magnetic intensity and local variations in relief closely resemble that of the foliated porphyroblastic feldspar-quartz-biotite gneisses mapped by G.C. Riley (1959) of the Geological Survey of Canada north of Lake Athabasca. At Archer Lake a large anomaly approximately 3 x 9 miles (4.8 x 14.5 km) gives a magnetic response 180 gammas above background. The shape and intensity of this anomaly indicate that it is due to a granitic stock intruding the granitic gneisses.

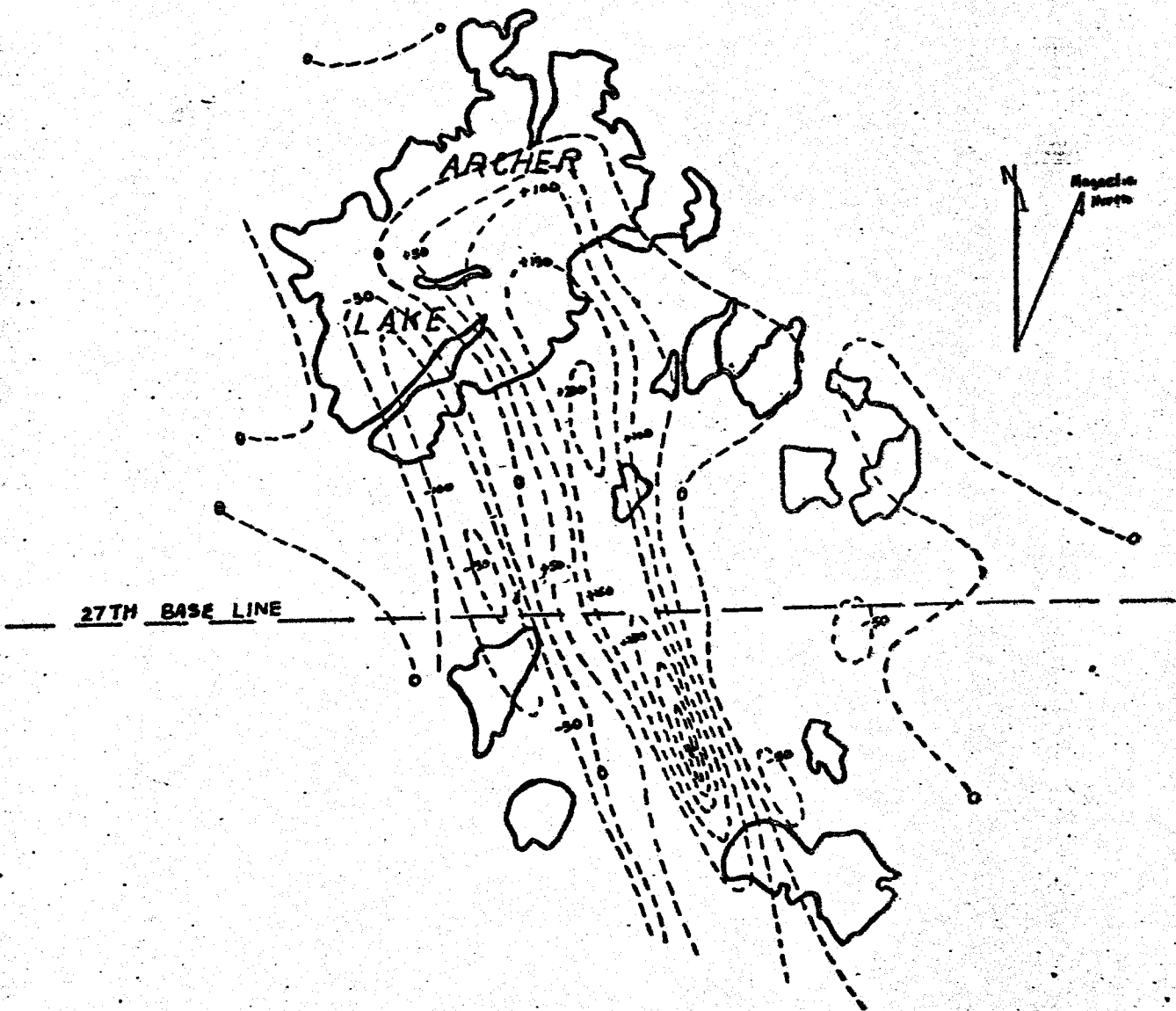
The metasedimentary gneisses which would appear to be the primary host rock for the mineralization in the Uranium City, Rabbit Lake, Key Lake and Maurice Bay uranium deposits in Saskatchewan have a much higher magnetic response than the granitic gneisses underlying Permit 209. At this time there is considerable debate over the mechanism of the deposition of the uranium in these deposits, however most explorationists believe that the association between these sedimentary gneisses and the ore deposition is of great importance.

In Permit 209 two northeast trending faults have been identified by minor deflections in the magnetic trend (see map 1 accompanying this report. These faults would appear to be local faults with little horizontal displacement.

The vertical displacement is very important to determine the feasibility of conducting further exploration in this area. The magnetic gradient across these faults is insufficient to use the gradient method to determine the depth to basement.

The gradient method of determining the depth of a magnetic feature below the surface was conducted over the oval magnetic high at Archer Lake. A curvature map was prepared over this anomaly and the distance between the maxima and minima was compared to curvature maps derived for idealized anomalies. The estimated depth of this anomaly below the flight level of the aircraft conducting the magnetic survey was 2,600 feet. Since the flight altitude of the aircraft was 1,000 feet above the ground surface the top of this stock is 1,600 feet below the surface. If the top surface of the anomaly is the unconformity underlying the Athabasca Formation then the thickness of the Athabasca Formation is not conducive for further exploration.

The other possibility is that the granitic stock causing the anomaly did not penetrate the total thickness of the gneisses and the Athabasca Formation is less than 1,600 feet thick. The excessive thickness of the Athabasca Formation in the adjacent permits as determined by drilling suggests that the sandstone may be very thick in this area.



Contour Interval 50 gammas per mile per mile

Curvature $\frac{\partial \Delta T}{\partial z^2} / 4I$

Scale 1:63,360 1 inch to 1 mile

Map #1
19770011

SUMMARY AND RECOMMENDATIONS

The magnetic study conducted over Permit 209 verified our findings on adjacent Permits 208, 210, 211, that is the thickness of Athabasca Formation overlying the basement unconformity is in excess of 500 feet which we feel is the maximum depth at which uranium mineralization could be detected. The study of the surficial sediments indicates that the overburden is far travelled and cannot be used as a prospecting tool in this area.

Exploration for unconformity type uranium mineralization should be concentrated in the area to the west of Permit 209. Permit 209 should be surrendered to the crown.

SUMMARY OF EXPENDITURES 1977
QUARTZ MINERAL PERMIT 209

Surficial Geology Study	\$1,285.00
Examination of the Landsat Study of Adjacent Permit - 1.5 days	\$ 107.00
Magnetic Interpretation - 14 days	\$1,001.00
Report Writing and Drafting - 7 days	\$ 500.00
Helicopter - 2 hours Camp Inspection Archer Lake	<u>\$ 610.00</u>
	\$3,503.00

APPENDIX 1

DERIVATIVE METHOD OF CALCULATING DEPTH
TO MAGNETIC BASEMENT

1. Select distinct anomalies which show maximum contrast in magnetic intensities.
2. Superimpose a square grid with grid lines oriented parallel and perpendicular to magnetic north.
3. The magnetic intensity is interpolated and recorded at each grid intersection.
4. The second vertical derivative, an approximation to the curvature is computed for each grid intersection.
5. The curvature values are contoured, and features of both the original total intensity survey map and computed curvature map are compared with computed model anomalies.
6. The depth of burial can be estimated from the distance between the curvature maxima and minima and the zero curvature contour.

Calculation of the second vertical derivative of the magnetic intensity at a point T_0 . Eight intensity values about a value T_0 are used in the curvature computation. These values are labelled A through H and are illustrated as follows:

A	B	C
D	T_0	E
F	G	H

Curvature at the point T_0 is found by the expression:

$$0.5(3 T_{op} - 4T_1 + T_2)$$

where $T_{op} = 4T_0$

$T_1 = R + S$

$T_2 = M + N$

$M = A + C$

$R = D + E$

$N = F + H$

$S = B + G$

APPENDIX 2
SURFICIAL GEOLOGY

BAYROCK AND REIMCHEN SURFICIAL GEOLOGY LTD.

SUITE 201 - 1429 DOMINION STREET
NORTH VANCOUVER, B.C.
CANADA
V7J 1B3

TELEPHONE: (604) 980-0213

April 27, 1977

Mr. D. A. Sawyer,
Norcen Energy Resources Ltd.,
715 - 5th Avenue S.W.
CALGARY, Alberta
T2P 2X7



Dear Don:

Re: Surficial Geology -
Archer Lake Region

This letter is the follow-up to our telephone conversation of March 4th, 1977. We agreed that to write a comprehensive report on surficial geology of your lease holdings of the Archer Lake Region would not add new information, but would only add unnecessary costs.

This letter is a short summary of our work performed for you. Surficial geology, landform and deposits of the lease areas have been outlined and submitted to you previously. Field work conducted last summer substantiated our findings that nearly all of the area is covered by glacial moraine or outwash plains.

The glacial moraines are very thick in the area, being in places in excess of 300 feet. Till and other materials making up the moraine are of distant derivation, that is in excess of 5 miles in the glacial upstream direction. In our

Mr. D. A. Sawyer

-2-

April 27, 1977

opinion, the glacial moraines in your area are composed of material derived in excess of 10 miles or maybe even 50 miles. The morainic material in your area has no relationship to the underlying bedrock.

The outwash deposits occurring in the northern portion of the lease area are similarly of distant derivation and do not contain any components of the local bedrock.

The moraines and the outwash plains cover the bedrock to such an extent that no outcrops occur in the lease areas.

For the above reasons detail exploration of surficial geology will not yield any data concerning the local bedrock and consequently is not helpful in your endeavour of locating uranium ore bodies in the lease area.

Please find enclosed with this letter aerial photographs which came from you, field maps, sample analyses results and field notes. The invoice enclosed covers only the additional expenses and work performed since the last invoice of August 18, 1976.

It is unusually rare that such a large region as the Archer Lake Lease area would be covered by glacial moraine and outwash. In areas of ground moraine surficial geology has been and is successfully employed to locate ore deposits which are not readily found by other means.

We would be pleased to offer our services to you in the future in applying surficial geology techniques to ore prospecting and exploration.


L.A. Bayrock, Ph.D.

TRYLOWSKY ENGINEERING LTD.

ATTERBERG LIMITS AND GRADATION SUMMARY

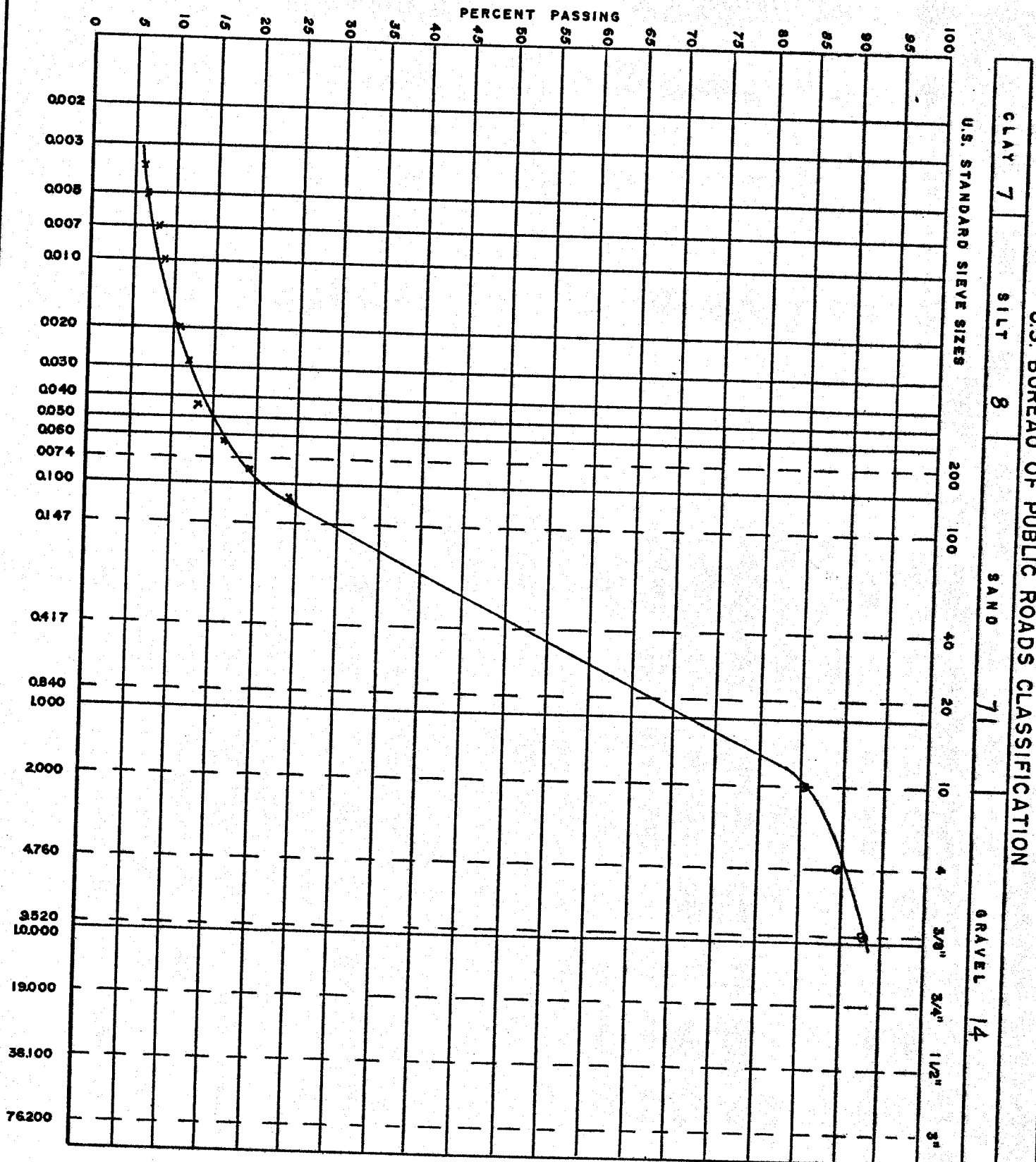
SAMPLE NO.	DESCRIPTION	W _n	LIMITS			DISTRIBUTION - %			REMARKS
			W _l	W _p	I _p	SAND	SILT	CLAY	
NG-76-21-1	Gravelly sand	--	--	--	--	49	2	4	Gravel 45% TILL
24-1	Silty sand, gravel	--	--	--	--	43	5	4	Gravel 48% TILL
26-1	Gravelly sand	--	--	--	--	53	2	0	Gravel 45% Outwash
27-1	Dirty, coarse sand	--	--	--	--	61	11	11	Gravel 17% TILL
28-1	Dirty, gravelly sand	--	--	--	--	80	4	6	Gravel 10% TILL
29-1	Sand	--	--	--	--	98	2	0	Outwash
30-1	Clean, coarse sand	--	--	--	--	81	0	0	Gravel 19% Outwash
31-1	Sandy gravel	--	--	--	--	45	6	4	Gravel 45% TILL
32-1	Gravelly sand	--	--	--	--	47	6	4	Gravel 43% TILL
33-1	Yellow sand, pebbles	--	--	--	--	91	2	0	Gravel 7% TILL
Gr. moraine ³³⁻¹	Silty sand	--	--	--	--	65	10	7	Gravel 18% TILL
33-2	Silty sand	--	--	--	--	66	17	8	Gravel 9% TILL
34-1	Gravelly sand	--	--	--	--	50	4	4	Gravel 42% TILL
NL-76- 3-1	Dirty, pink sand	--	--	--	--	71	8	7	Gravel 14% TILL
5-1	Silty, grav. sand	--	--	--	--	48	6	6	Gravel 40% TILL
6-1	Clean sand	--	--	--	--	100	0	0	Odd large rock ^{Outwash}
12-1	Clean sand	--	--	--	--	100	0	0	Outwash
13-1	Yellow sand, pebbles	--	--	--	--	91	0	0	Gravel 9% Outwash
15-1	Sandy gravel	--	--	--	--	26	2	2	Gravel 70% TILL

TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #1
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8, 17/11 1976
 BY SUF

MATERIAL DIRTY PINK SAND
 LOCATION _____
SAMPLE NL-76-3-1



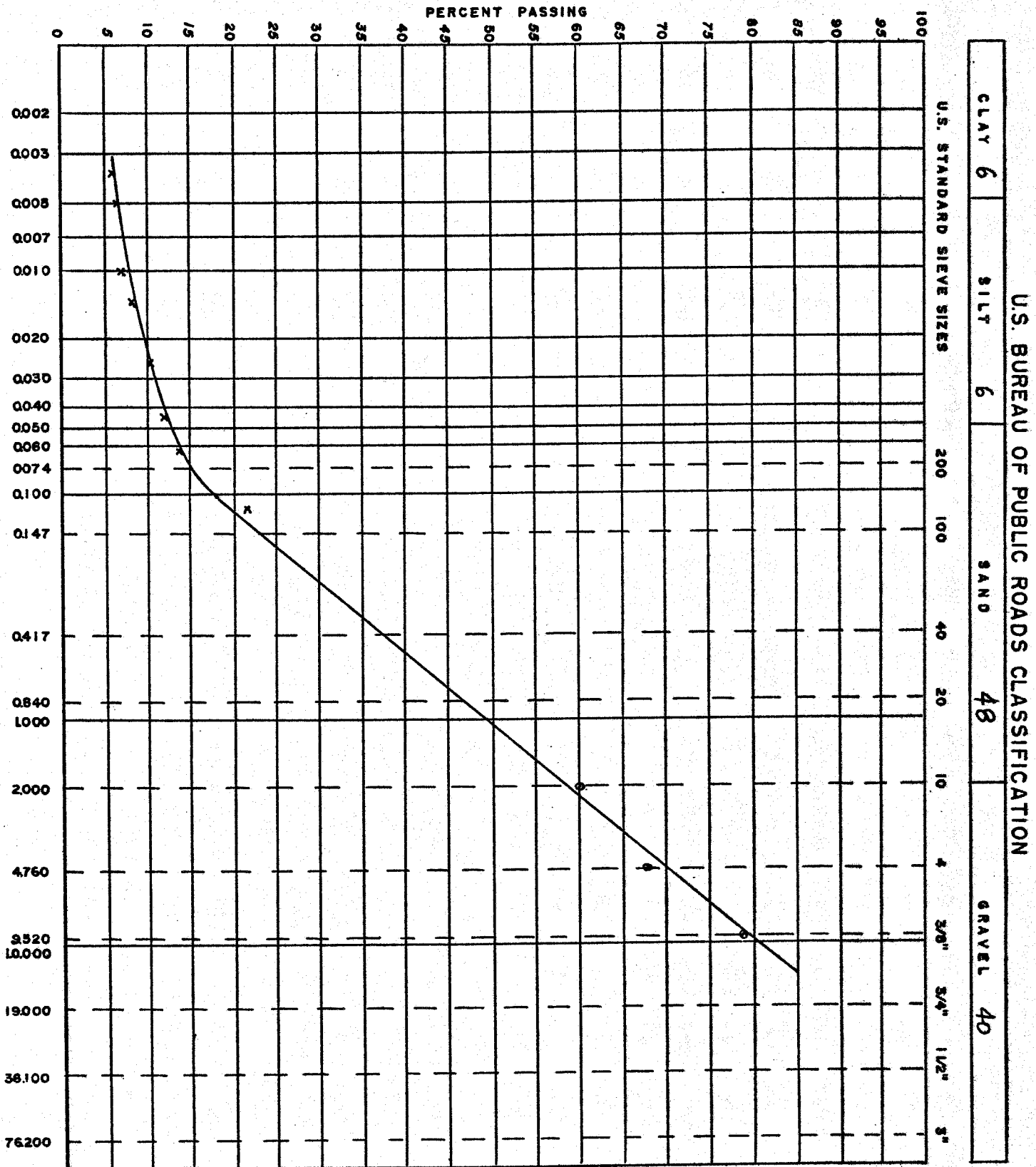
U.S. BUREAU OF PUBLIC ROADS CLASSIFICATION
 CLAY 7
 SILT 8
 SAND 71
 GRAVEL 14

TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph # 2
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 18, 21 / 11 1976
 BY SUF

MATERIAL SILTY, GRAVELLY SAND
 LOCATION SAMPLE NL-76-5-1

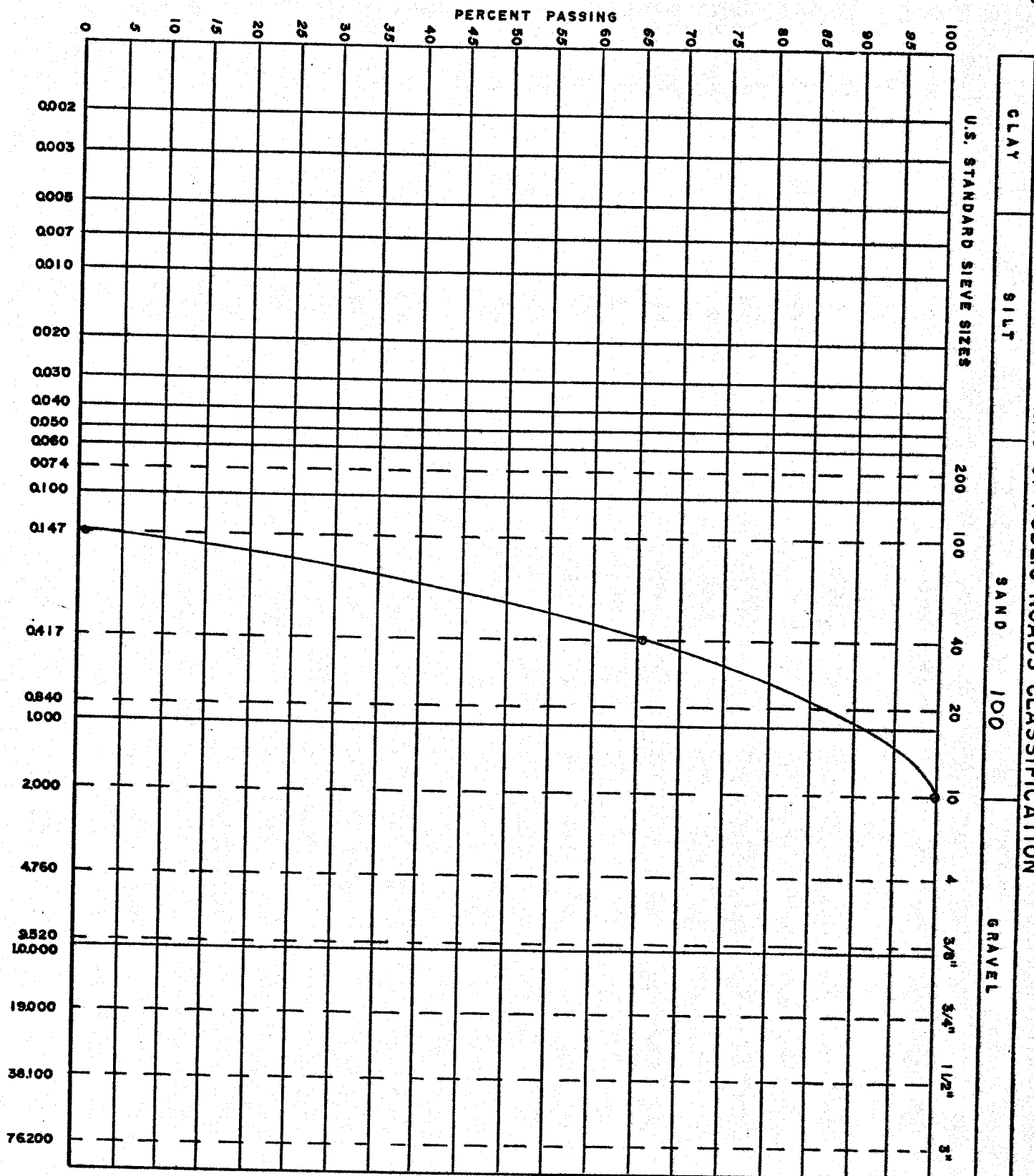


GRAIN SIZE ANALYSIS CURVE

19790011

CLIENT BAYROCK & REIMCHEN
DATE SAMPLED _____ 19____
BY _____
DATE TESTED 4/11 1976
BY S.U.F.

MATERIAL CLEAN YELLOW SAND
(ODD LARGE ROCK - EXCL.)
LOCATION _____
SAMPLE NL-76-6-1

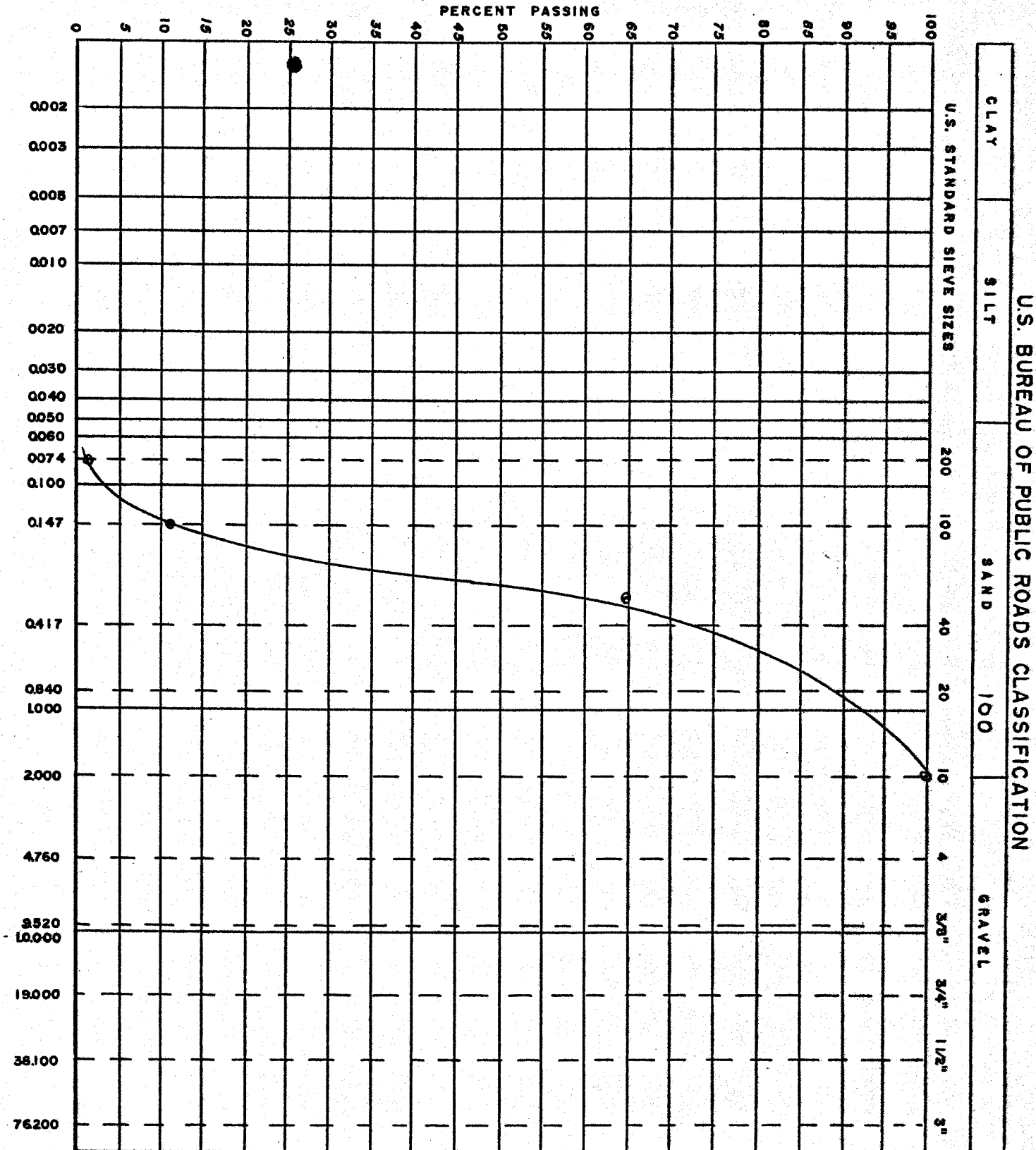


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #4
1977011

CLIENT BAYROCK & REIMCHEN
DATE SAMPLED _____ 19____
BY _____
DATE TESTED 8/11 1976
BY SVF

MATERIAL CLEAN, YELLOW
SAND
LOCATION _____
SAMPLE NL-76-12-1

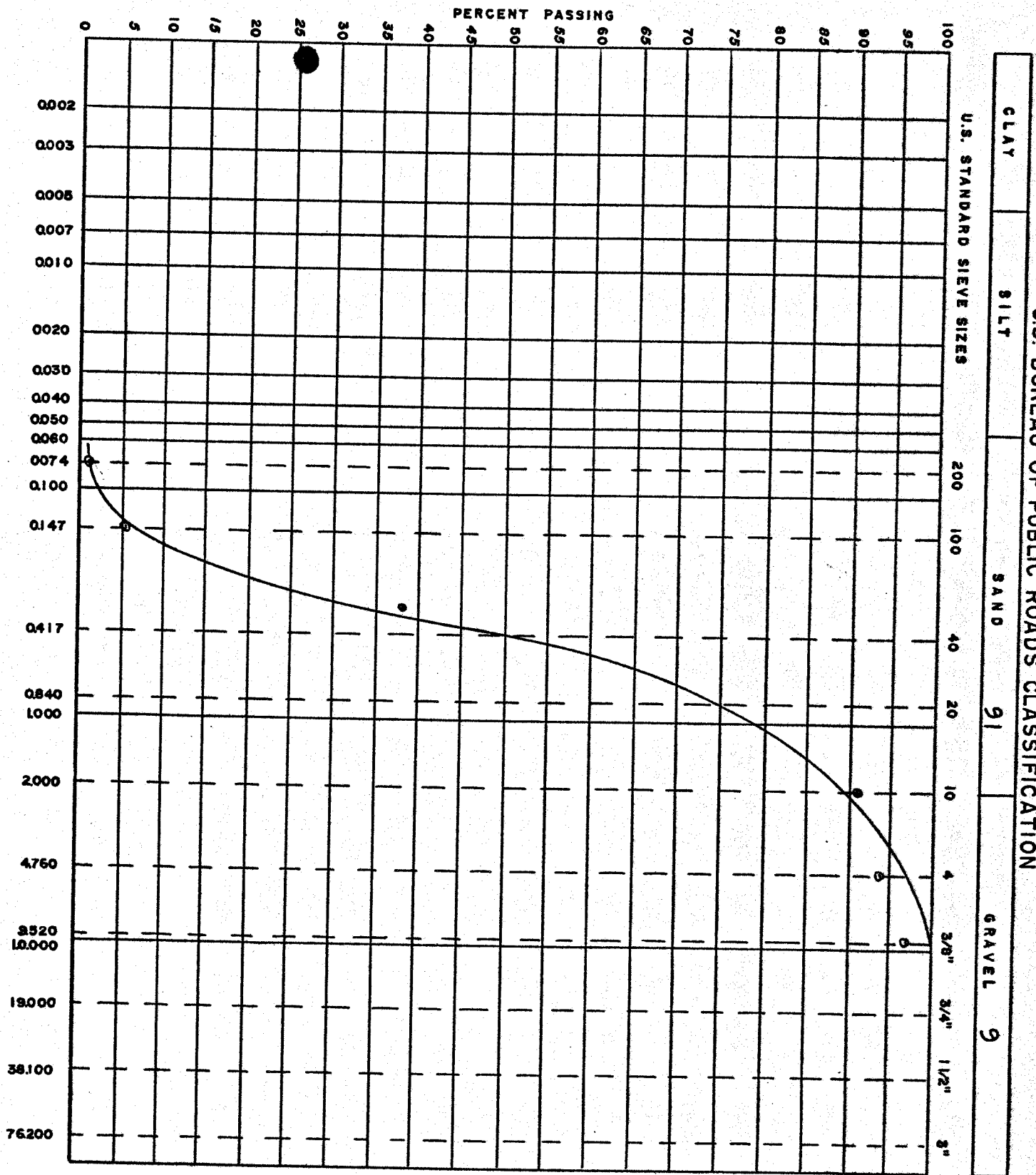


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph # 4
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8 / 11 1976
 BY SUF

MATERIAL YELLOW SAND, PEBBLES
 LOCATION _____
SAMPLE NL-76-13-1

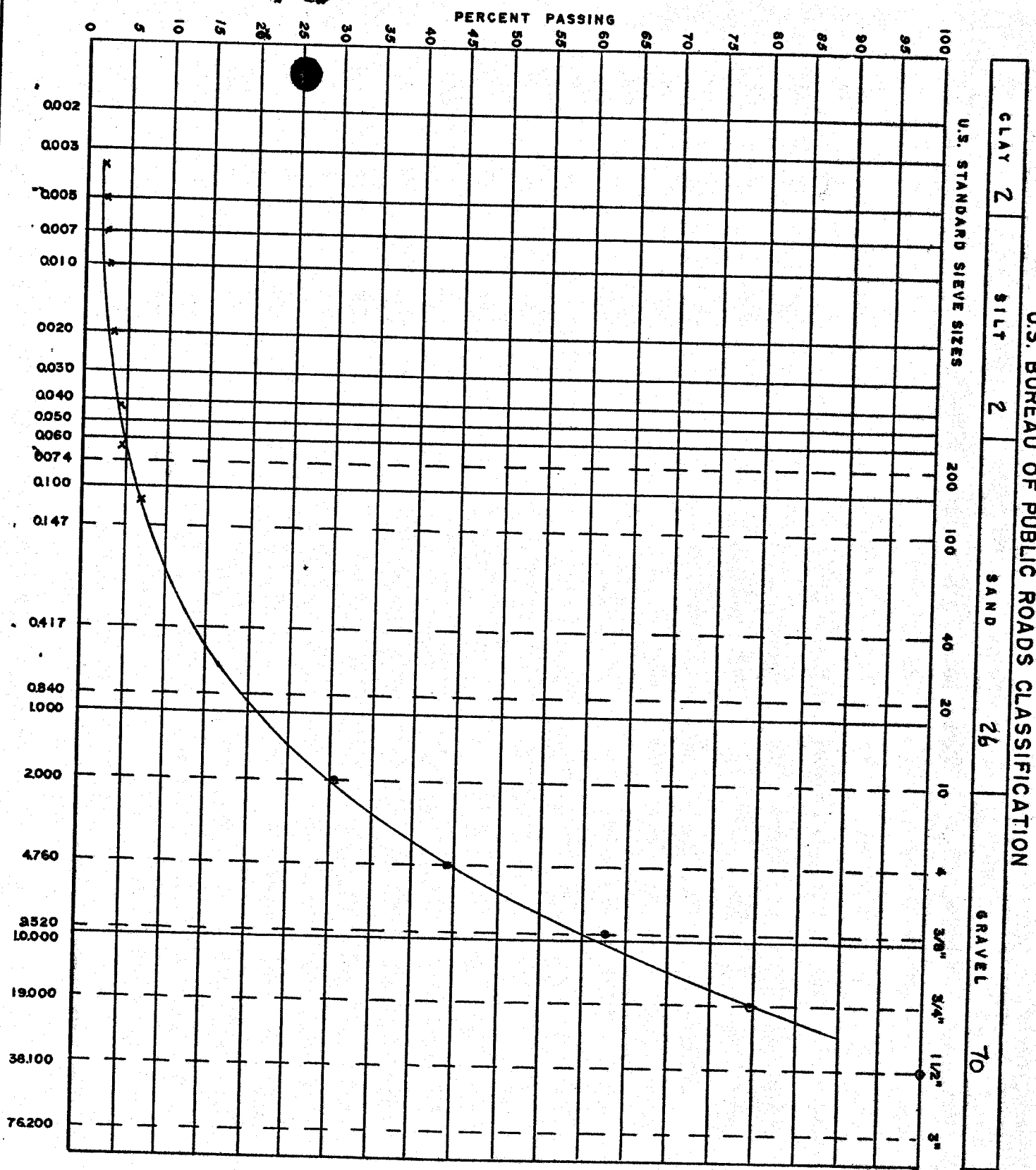


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #5
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8,18/11 1976
 BY SUF

MATERIAL SANDY GRAVEL
 LOCATION SAMPLE NL-76-15-1

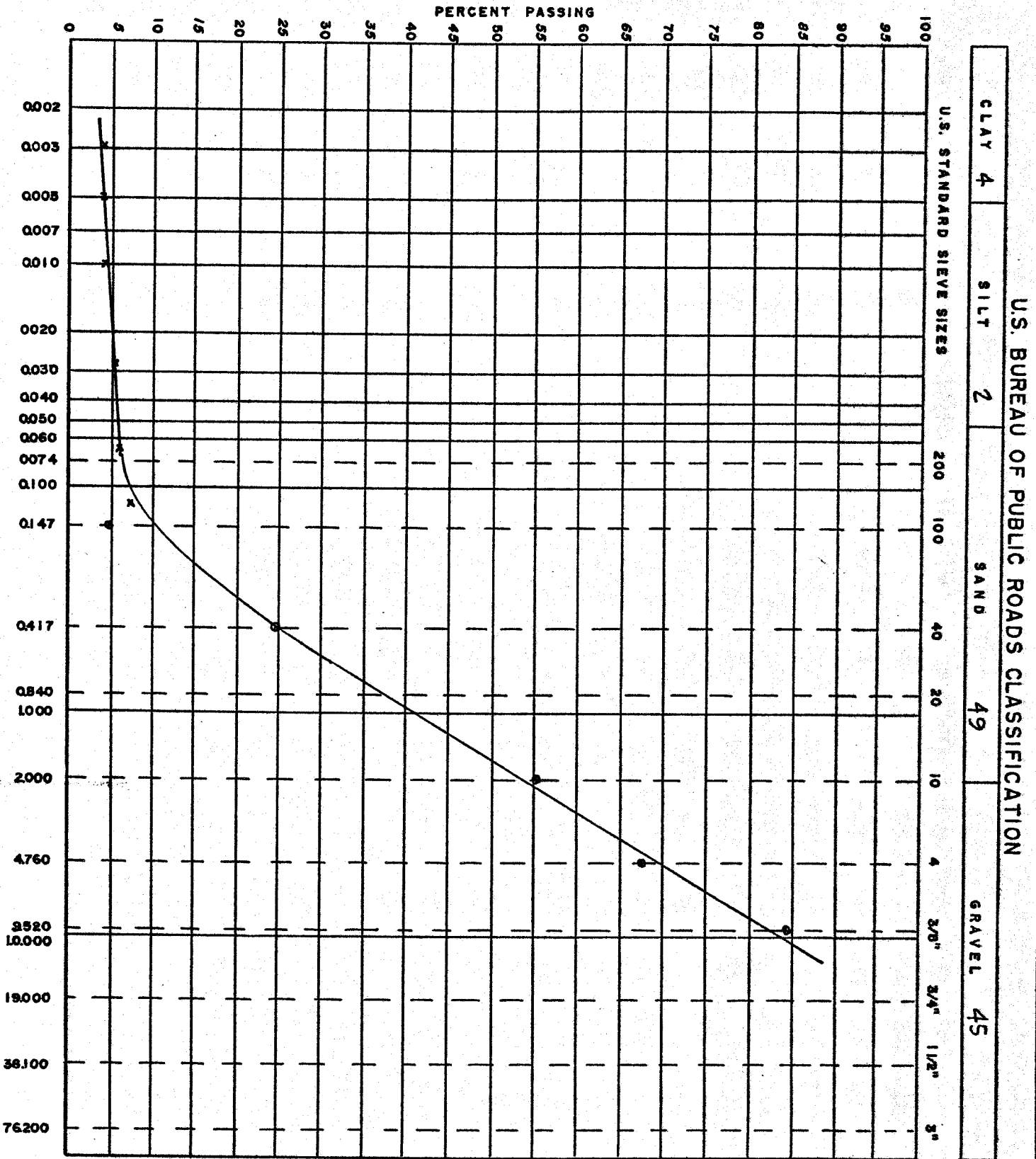


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #16
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 2,17/11 1976
 BY SUF

MATERIAL GRAVELLY SAND
 LOCATION _____
SAMPLE NG-76-21-1

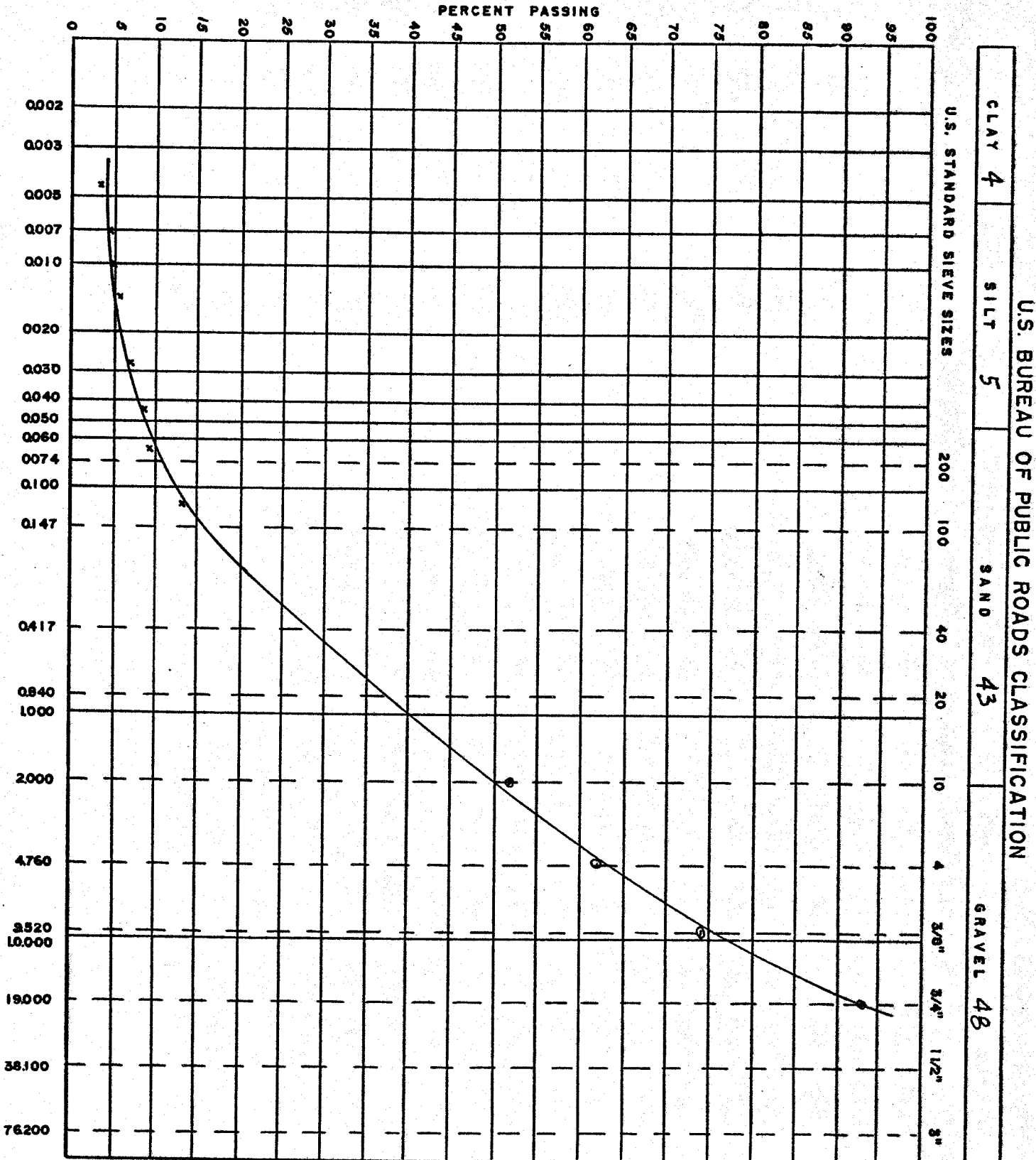


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #17
 19970811

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 18 21 / 11 19 76
 BY SUF

MATERIAL SILTY SAND & GRAVEL
 LOCATION _____
SAMPLE NG-76-24-1

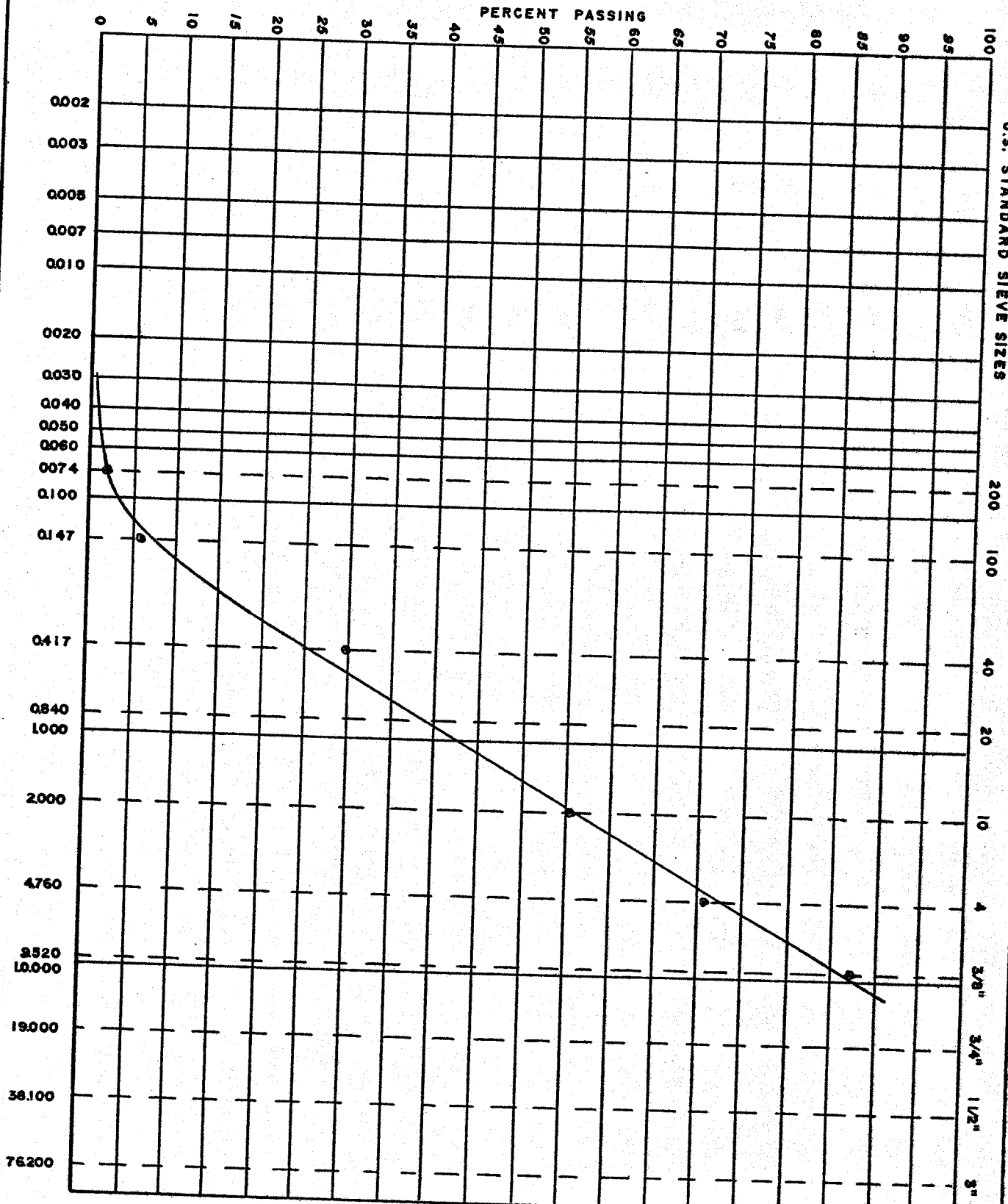


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #8
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 4/11 1976
 BY SUF

MATERIAL GRAVELLY SAND
 LOCATION _____
SAMPLE NG-76-26-1



CLAY	SILT	SAND	GRAVEL

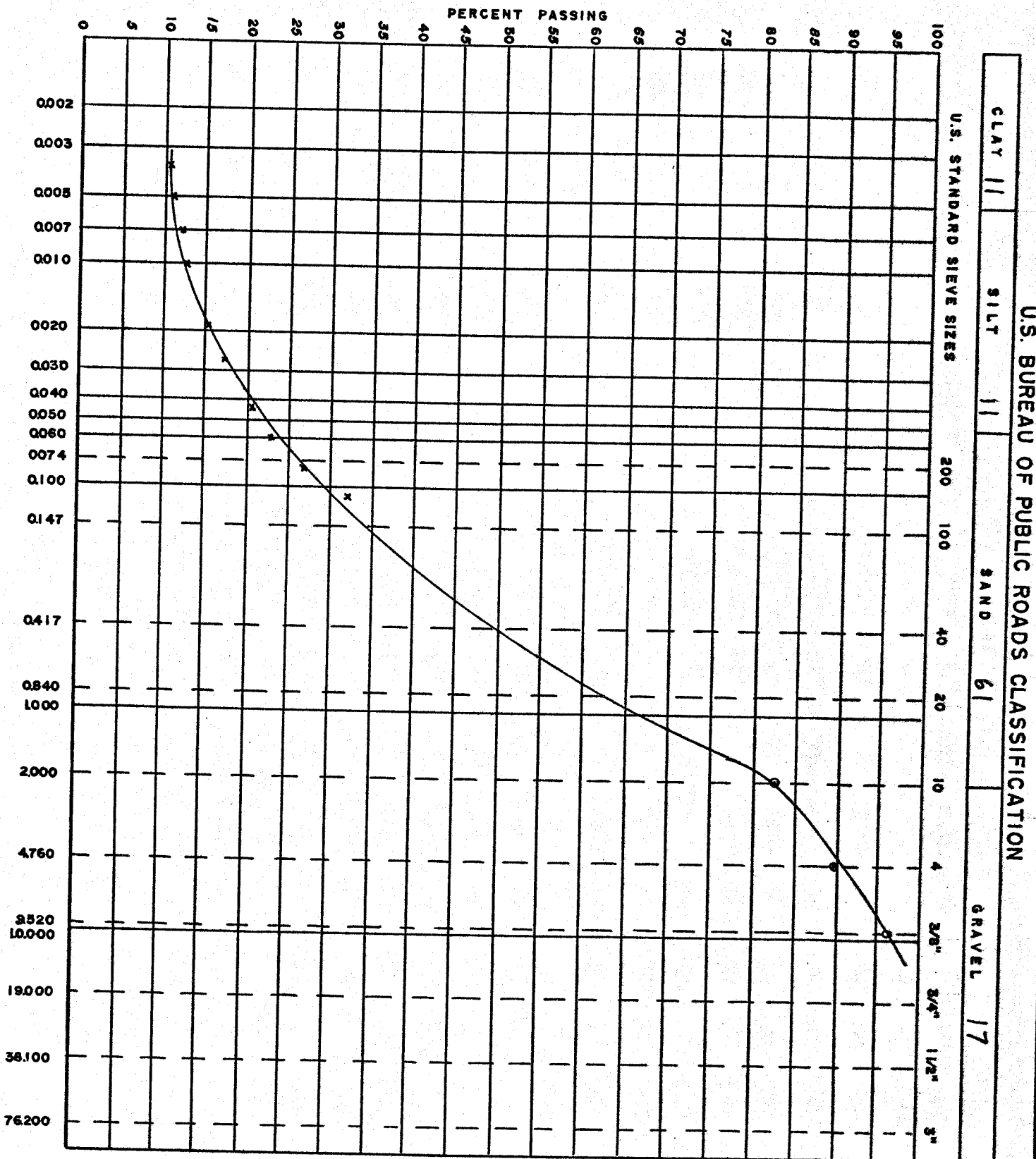
U.S. BUREAU OF PUBLIC ROADS CLASSIFICATION

TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph # 9
 19770011-

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8,18/11 1976
 BY SUF

MATERIAL DIRTY COARSE SAND
 LOCATION SAMPLE NG-26-27-1

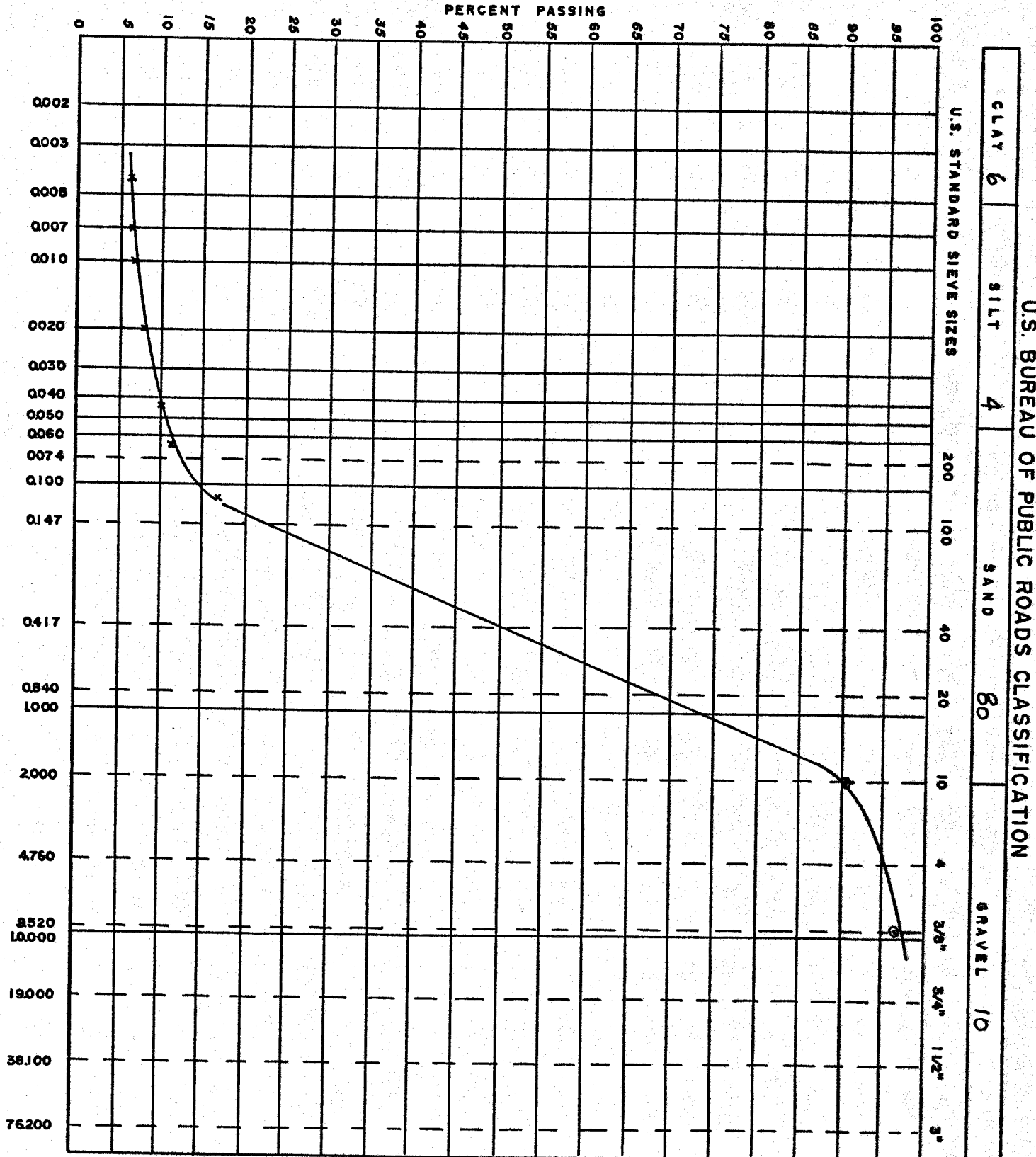


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph # 10
 19770011-

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 18, 21 / 11 1976
 BY SUF

MATERIAL DIRTY, GRAVELLY SAND
 LOCATION SAMPLE NG-76-28-1



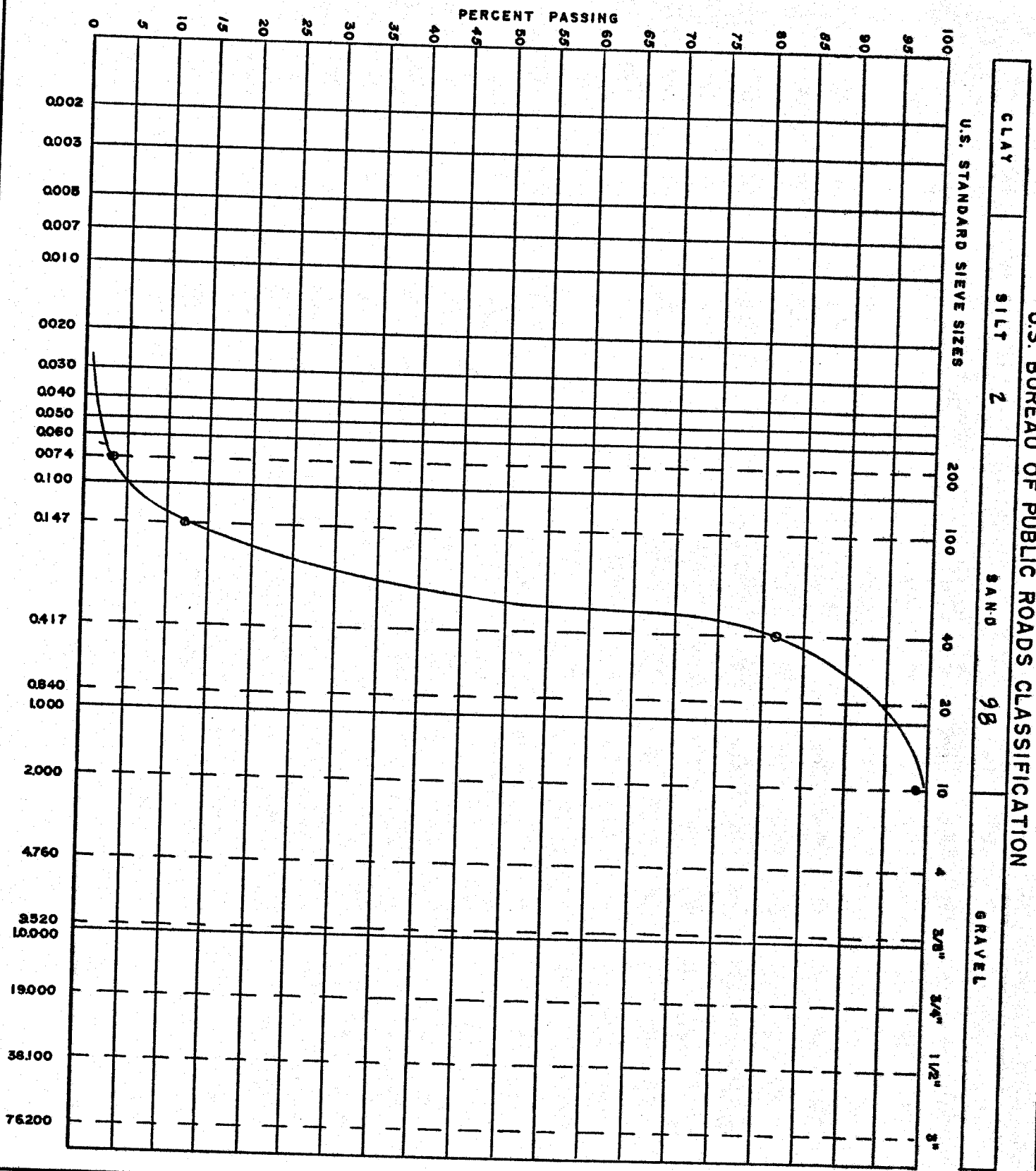
GRAIN SIZE ANALYSIS CURVE

Graph # 11

19770011.

CLIENT BAYROCK & REIMCHEN
DATE SAMPLED _____ 19__
BY _____
DATE TESTED 4/11 1976
BY SUF

MATERIAL SAND
LOCATION _____
SAMPLE NG-76-29-1

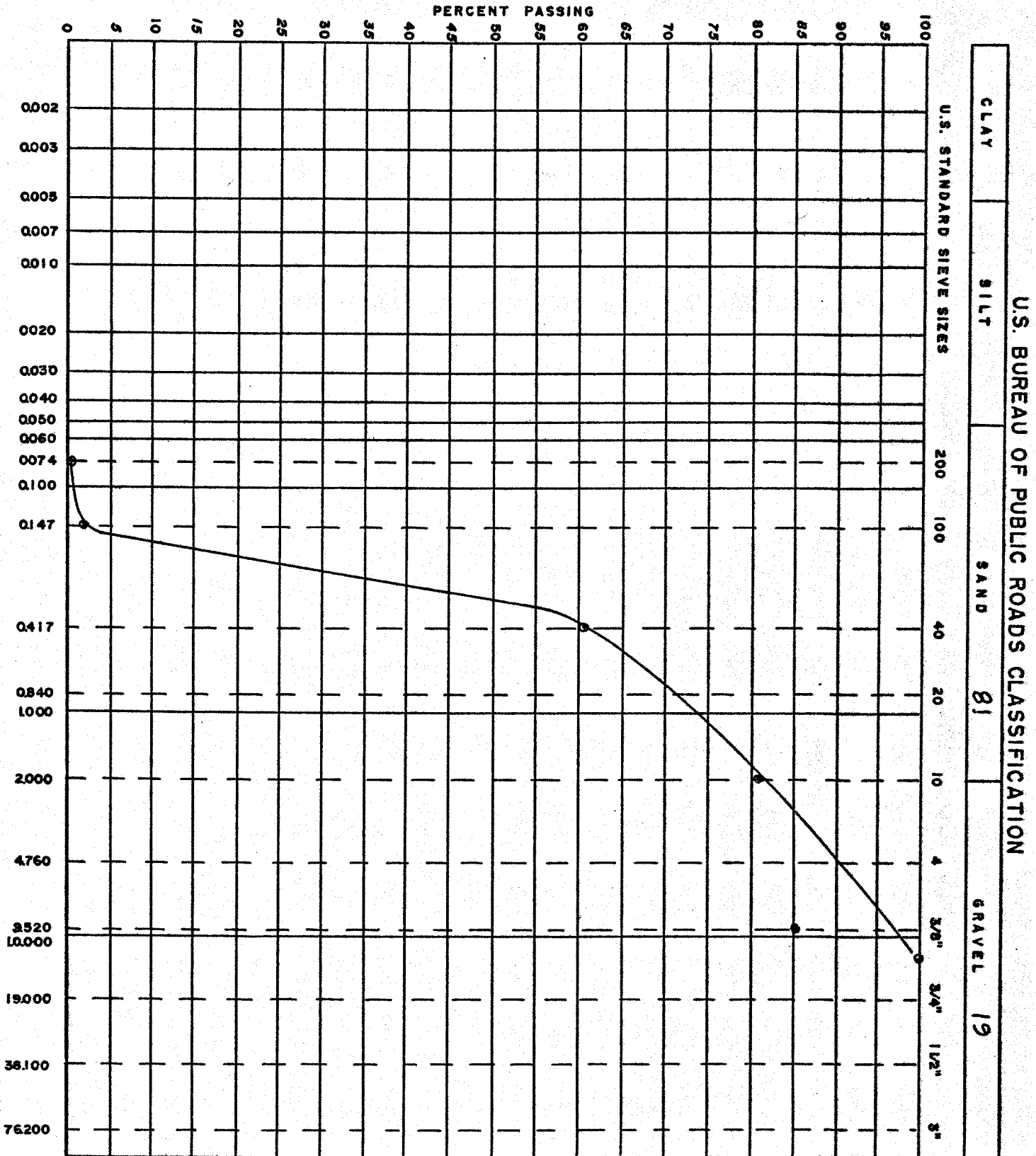


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #12
 19770811

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 2 / 11 1976
 BY SVF

MATERIAL CLEAN, COARSE SAND
 LOCATION _____
SAMPLE NG-76-30-1

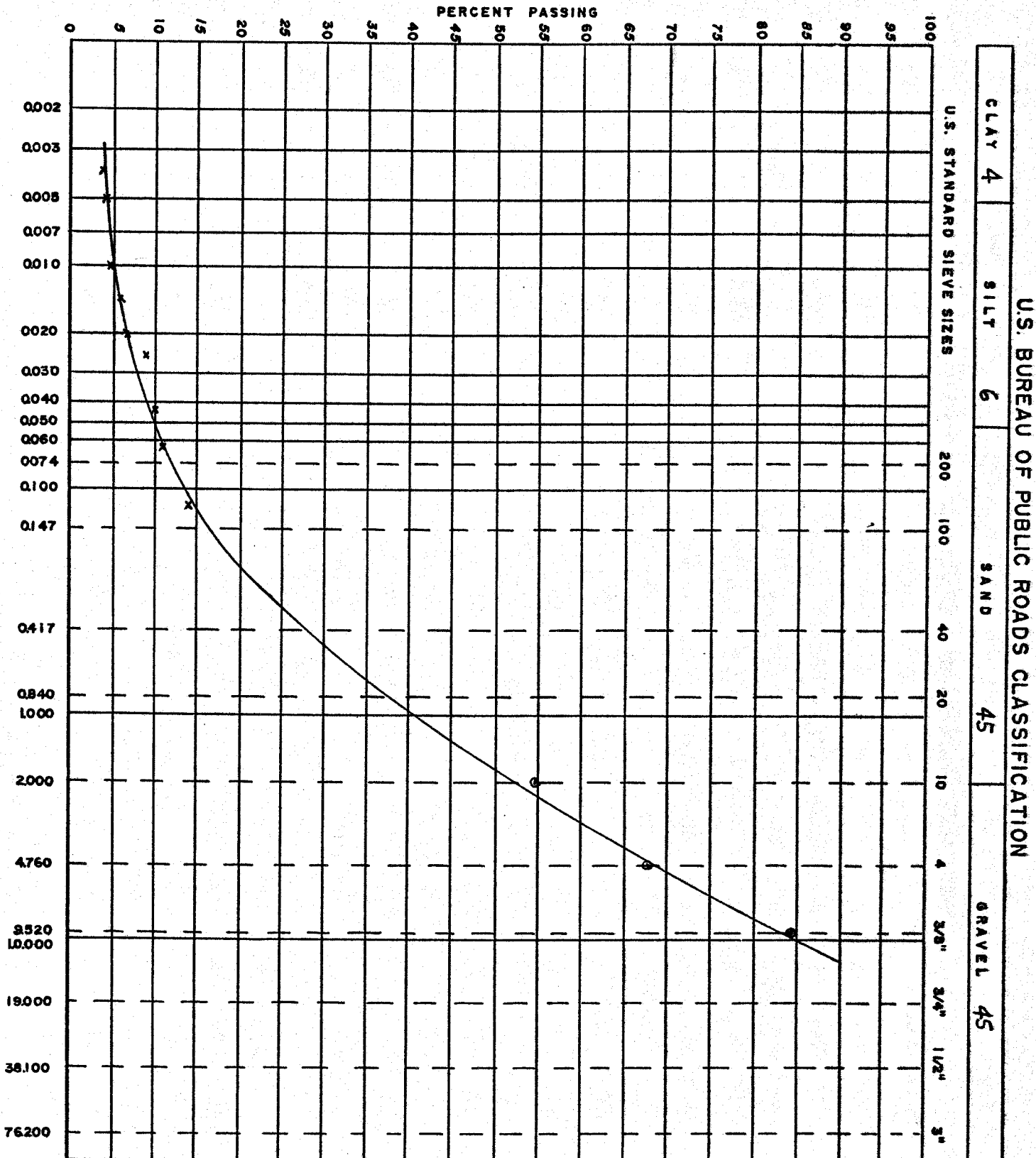


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #13
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8, 18 / 11 1976
 BY SUF

MATERIAL SANDY GRAVEL
 LOCATION _____
SAMPLE NG-76-31-1

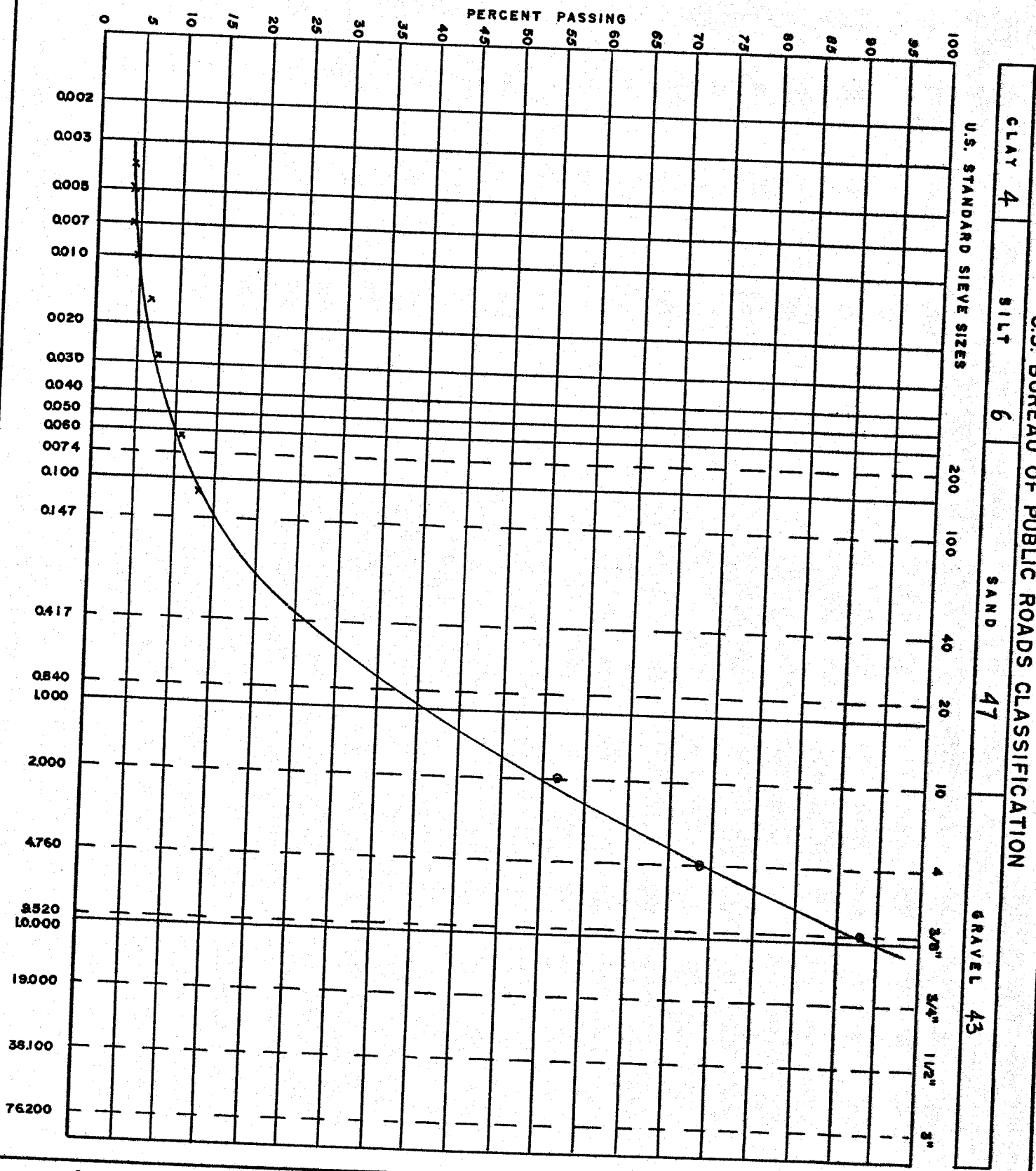


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #14
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8.18/11 1976
 BY SUF

MATERIAL GRAVELLY SAND
 LOCATION _____
SAMPLE NG-76-32-1

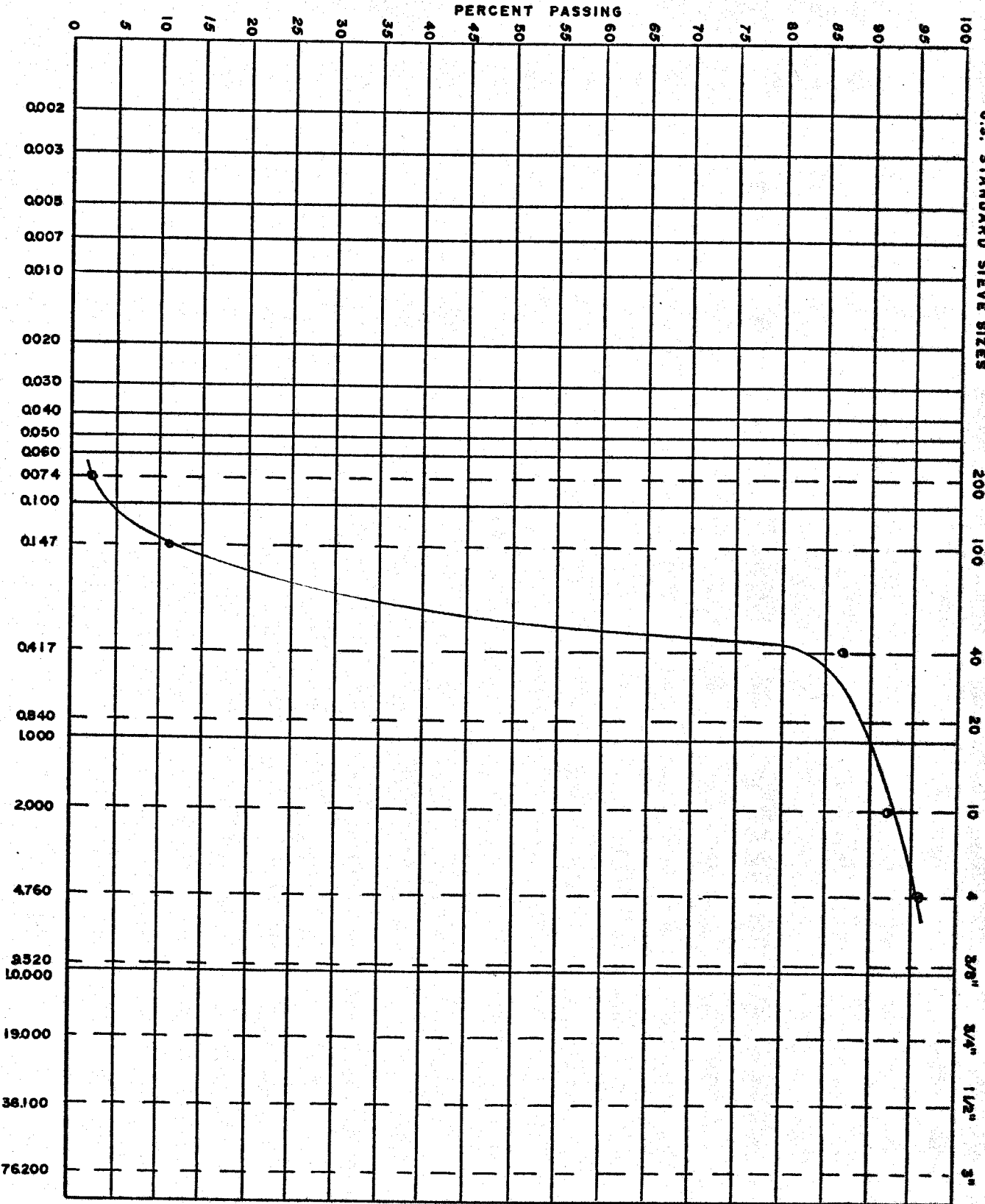


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #15
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 4/11 1976
 BY SUF

MATERIAL YELLOW SAND, PEBBLES
 LOCATION _____
SAMPLE NG-76-33-1



U.S. BUREAU OF PUBLIC ROADS CLASSIFICATION

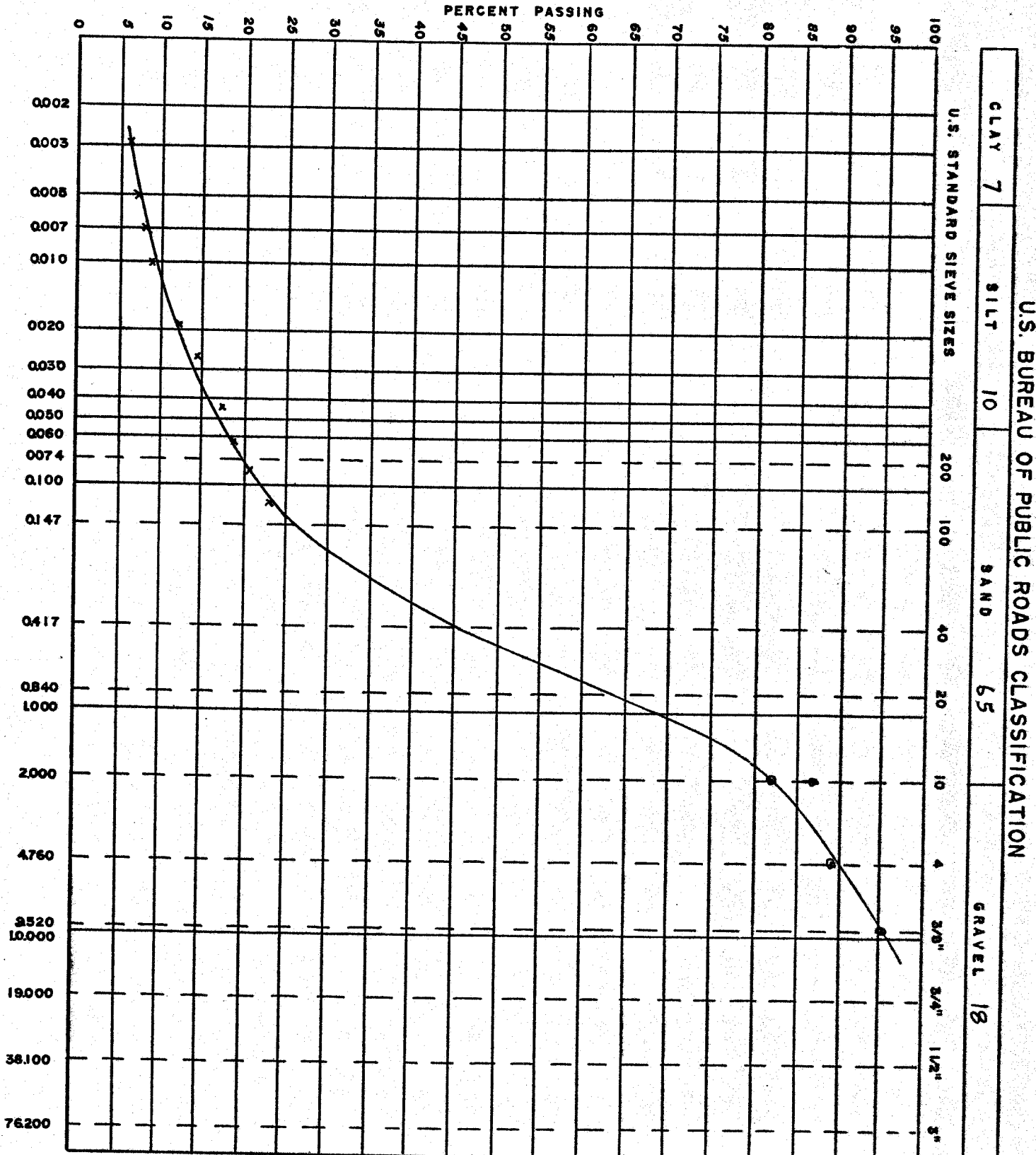
CLAY			
SILT	2		
SAND		91	
GRAVEL			7

TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph #16
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 8,17/11 1976
 BY SUF

MATERIAL SILTY SAND, PEBBLES
 LOCATION _____
SAMPLE NG-76-33-1
(GROUND MORaine)

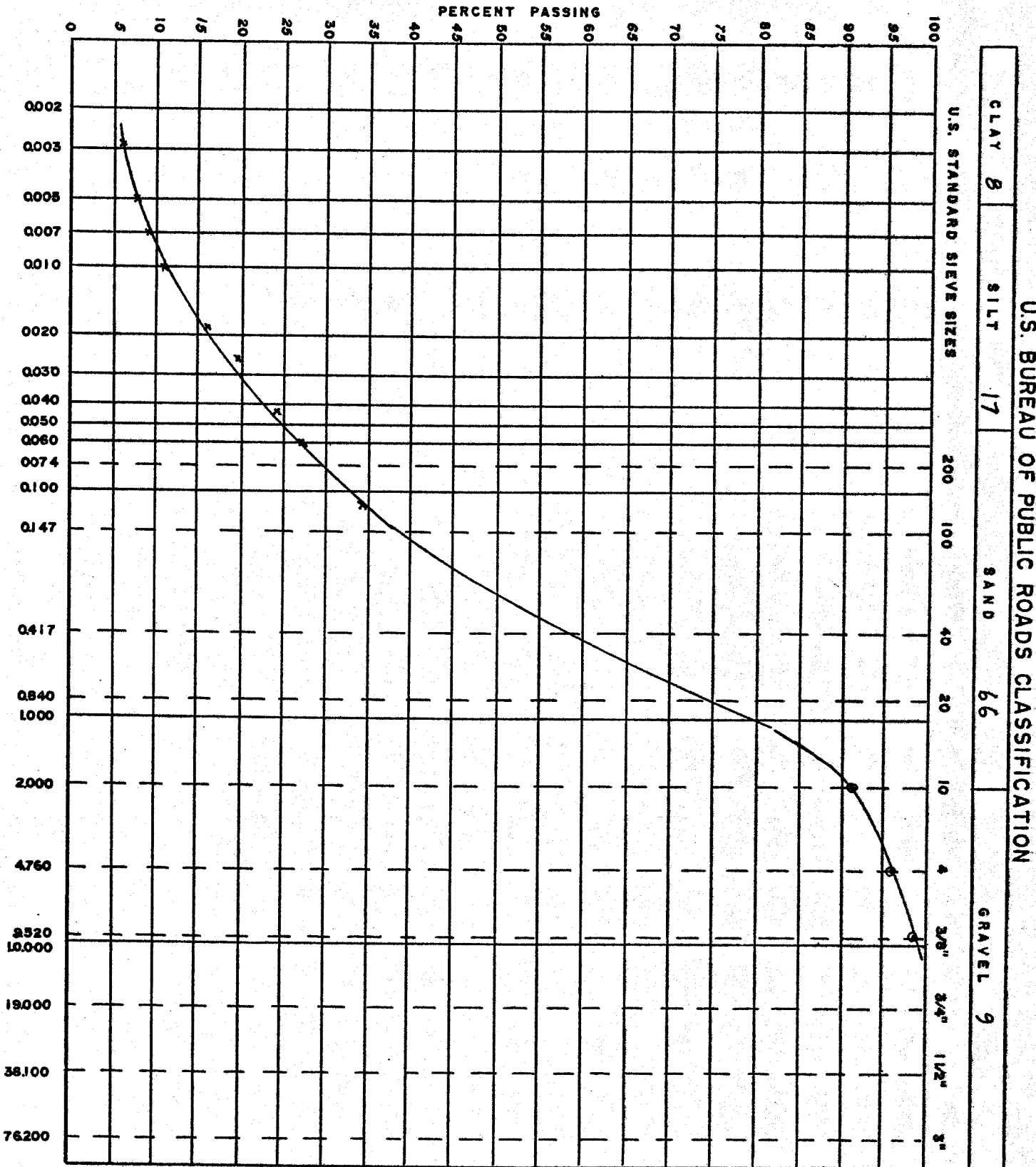


TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph # 17
 19770011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 4, 17 / 11, 1976
 BY SUF

MATERIAL SILTY SAND, ROCKS
 LOCATION SAMPLE NG-76-33-2

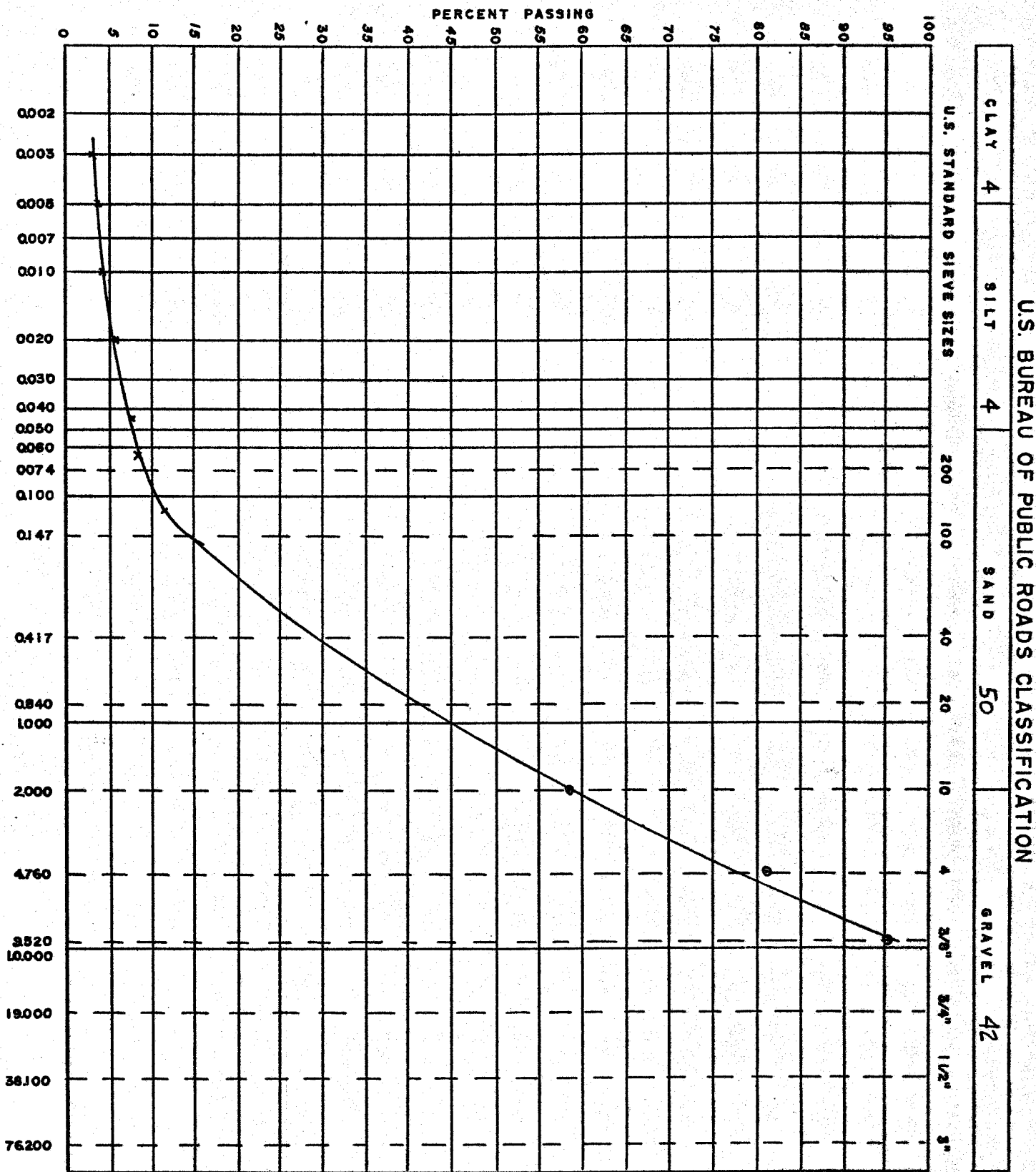


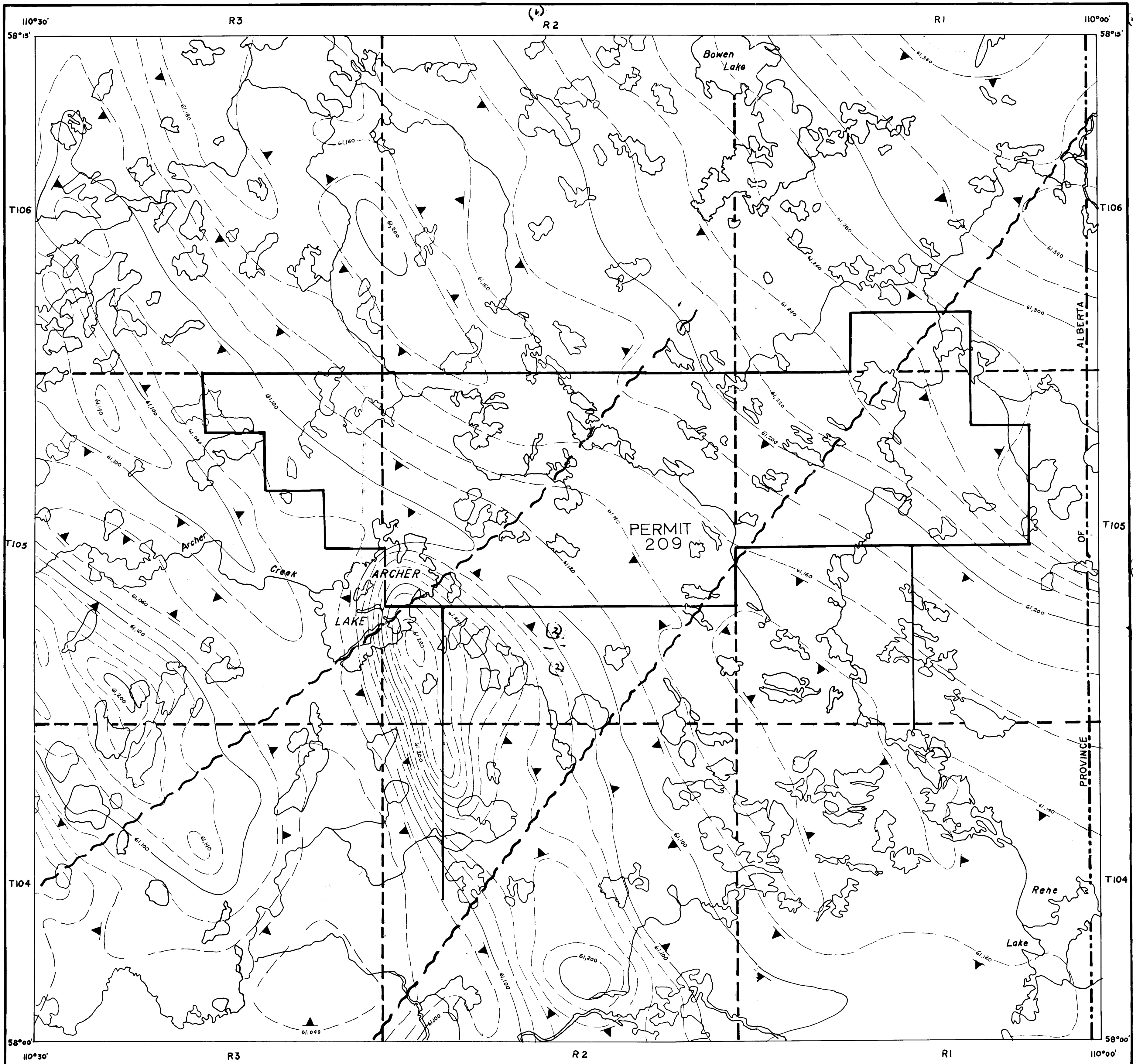
TRYLOWSKY ENGINEERING LTD.
GRAIN SIZE ANALYSIS CURVE

Graph # 18
 19970011

CLIENT BAYROCK & REIMCHEN
 DATE SAMPLED _____ 19____
 BY _____
 DATE TESTED 4, 17 / 11 19 76
 BY SUF

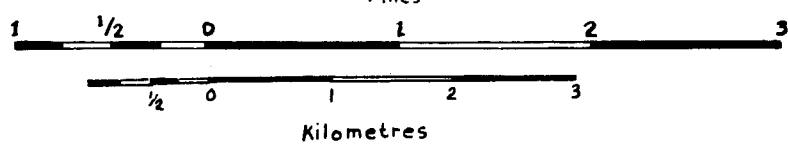
MATERIAL GRAVELLY SAND
 LOCATION _____
SAMPLE NG-76-34-1





ARCHER LAKE
ALBERTA

Scale: One Inch to One Mile



Map #2

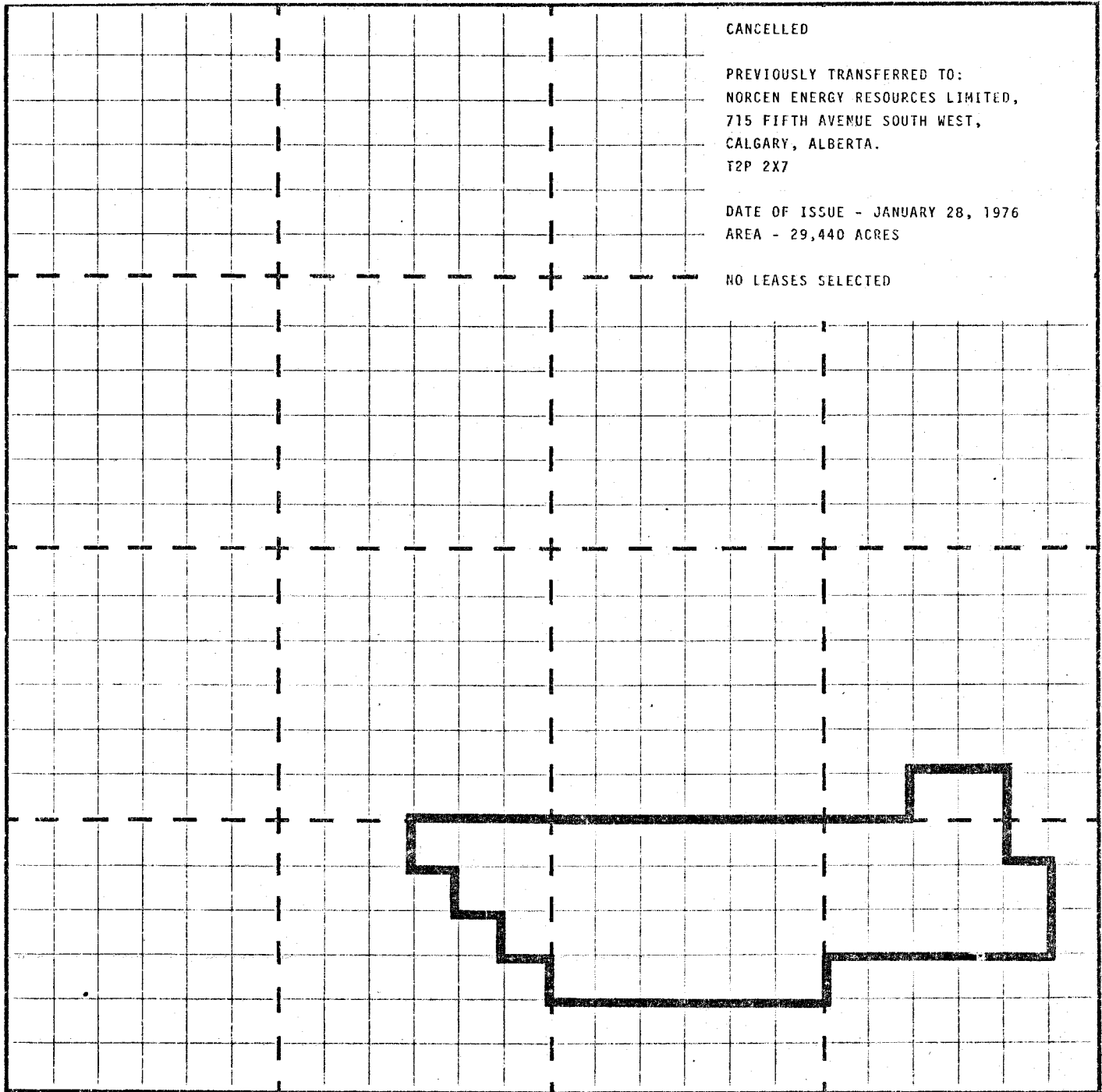
19770011

EXPL PERMIT 209

164

19770011

QUARTZ MINERAL EXPLORATION PERMIT No. 209



R.

R.3

R.2

R. 1 W. 4 M.

TP.

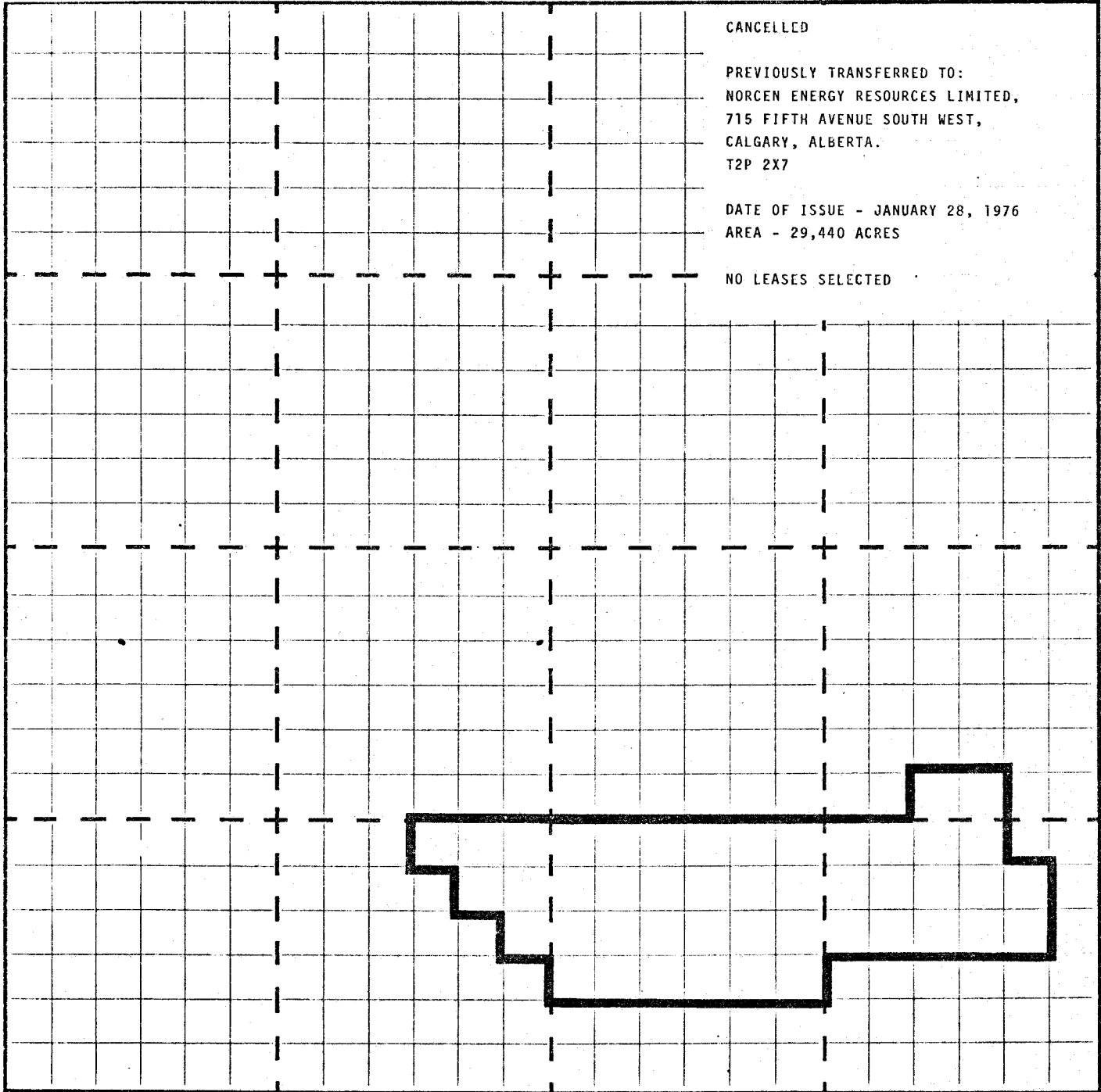
TP.

TP.106

TP.105

19770011

QUARTZ MINERAL EXPLORATION PERMIT No. 209a



CANCELLED

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NO LEASES SELECTED

TP.

TP.

TP.106

TP.105

R.

R.3

R.2

R. 1 W. 4 M.