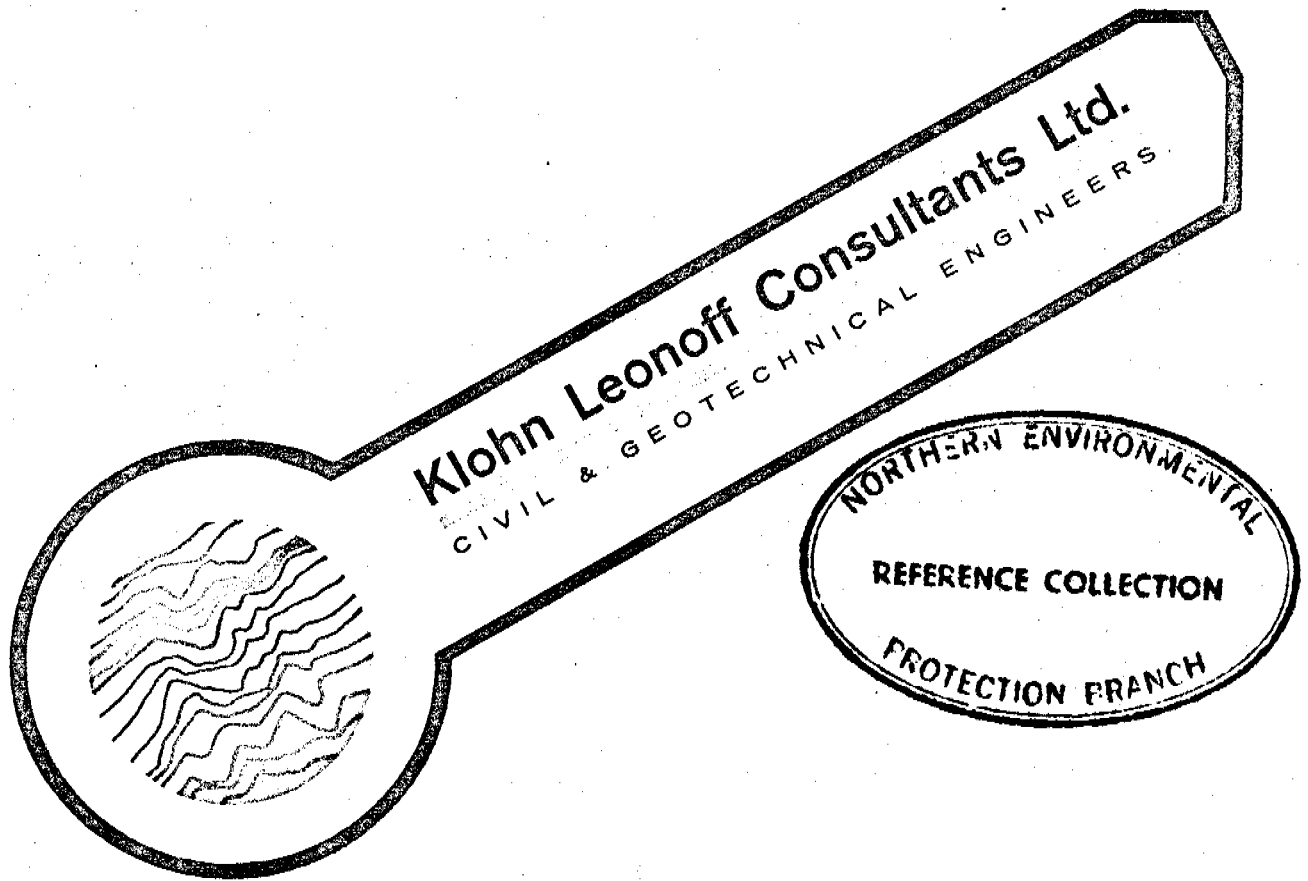


REPORT

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FOOTHILLS PIPE LINES LTD.



TEST HOLE LOGS

FOOTHILLS YUKON PIPELINE ROUTE

DECEMBER 21, 1976

AL0728

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Klohn Leonoff Consultants Ltd.

CIVIL & GEOTECHNICAL ENGINEERS
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December 20, 1976

Foothills Pipe Lines Ltd.
1600 Bow Valley Square 2
205 - 5th Ave. S.W.
Calgary, Alberta
T2P 2V7

Attention: Dr. F.C. Yip, P. Eng.

Re: 1976 Yukon Drilling Program

Dear Sir:

This report entitled, "Test Hole Logs Foothills (Yukon) Pipeline Route" contains the detailed test hole logs and classification data for the recently completed drilling program in the Yukon. This is a data report only. An assessment of the test holes will be made at a later date.

Yours very truly,

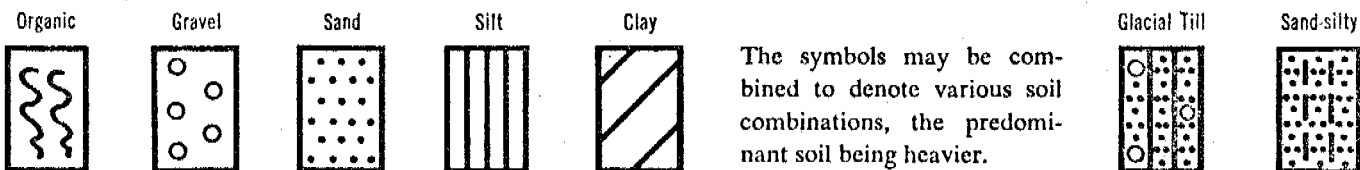
KLOHN LEONOFF CONSULTANTS LTD.

for *F B Claridge*
D.M. Davison, P. Eng.

DHD/mk

SYMBOLS AND TERMS USED IN THE REPORT

SYMBOLS



CLASSIFICATION BY PARTICLE SIZE

Boulders—larger than 8 inches
Cobbles—3 inches to 8 inches

Gravel—#4 sieve to 3 inches
Sand—#200 sieve to #4 sieve

Silt—0.002 mm. to #200 sieve
Clay—finer than 0.002 mm.

DENSITY OF SANDS AND GRAVELS

Descriptive Term	Relative Density	Standard Penetration Test
Very loose	0 - 20%	0 - 4 blows per ft.
Loose	20 - 40%	4 - 10 blows per ft.
Medium dense	40 - 70%	10 - 30 blows per ft.
Dense	70 - 90%	30 - 50 blows per ft.
Very dense	90 - 100%	Over 50 blows per ft.

NOTES

1. Relative density determined by laboratory tests.
2. Standard Penetration Test uses 140 lb weight, 30 inch drop, 2" O.D. Sampler
3. The silt content of sand and the sand content of gravel is estimated for the sample classifications. The terms used and the relative percentage inferred by each term are as follows:

and (35% - 50%), silty (20% - 35%), some (10% - 20%), trace (0% - 10%)

CONSISTENCY OF CLAYS AND SILTS

Descriptive Term	Unconfined Compressive Strength—Tons Sq. Ft.	Remarks
Very soft	less than 0.25	Can penetrate with fist
Soft	0.25 to 0.50	Can indent with fist
Firm	0.50 to 1.0	Can penetrate with thumb
Stiff	1.0 to 2.0	Can indent with thumb
Very stiff	2.0 to 4.0	Can indent with thumb-nail
Hard	4.0 and greater	Cannot indent with thumb-nail

DESCRIPTIVE SOIL TERMS

Well graded having wide range of grain sizes and substantial amounts of all intermediate sizes.

Poorly graded predominantly of one grain size.

Slickensided refers to a clay that has planes that are slick and glossy in appearance; slickensides are caused by shear movements.

Sensitive exhibiting loss of strength on remolding.

Fissured containing cracks, usually attributable to shrinkage. Fissured clays are sometimes described as having a nugget structure.

Stratified containing layers of different soil types.

Organic containing organic matter; may be decomposed or fibrous.

Peat a fibrous mass of organic matter in various stages of decomposition. Generally dark brown to black in color and of spongy consistency.

SUPPLEMENTARY TERMS IDENTIFYING THE COMPOSITION OF SOILS

Component	Identification	Terms Identifying Proportions	Defining Range Percentage by Weight	Degree of Plasticity	Plasticity Index
Principal Component	GRAVEL SAND SILT SILT and CLAY CLAY and SILT CLAY		50 or more	non plastic non plastic non plastic low medium high	0 0 0 1 to 10 10 to 30 30 and over
Minor Component	gravel sand silt silt and clay clay and silt clay	and some little trace	35 to 50 20 to 35 10 to 20 1 to 10	non plastic non plastic non plastic low medium high	0 0 0 1 to 10 10 to 30 30 and over

TYPES OF SAMPLES

B	disturbed sample
SPT	standard penetration test 1 3/8 inch diameter
3"SS	split tube sample 3 inch diameter
C	core sample 3 inch diameter
SY	Shelby Tube sample 3 inch diameter

CLASSIFICATION SYSTEM FOR ICE

Non Visible Ice (N)	Nf Nbn Nbe	Poorly bonded Well bonded Excess Ice
Visible Ice Less than 1 inch thick	Vx Vc Vr Vs	Individual ice crystals or inclusions Ice coatings or particles Random or irregularly oriented ice formation Stratified or distinctly oriented ice formation
Visible Ice Greater Than 1 inch thick	ICE+ ICE	Ice with soil inclusions Ice without soil inclusions

GROUND ICE CONTENT - % BY VOLUME

Low --<10% Med. - 10% to 20% High -->20%

TEST HOLE LOG

HAMMER WT.		lbs.	SYMBOL		PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.										
HT. DROP		ins.			N.R.C.	N.F.	ELEVATION		0.2	0.6	1.0	1.4	1.8						
SAMPLE DATA						CLASS	or F.	DESCRIPTION OF MATERIAL	FIELD VANE Δ LAB VANE ∇ UNCONF.		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT				
DEPTH	TYPE	BLOW FT.	No.						X	-----	0	-----	X	10	30	50	70	90%	
5	B		1					PEAT - some organic silt - dark brown (Ice lenses 1/64" spaced @ 1/8") 5.0											
	B		2			NF													
	C		3			Vs, Vr Nbe													
10	C		4					SILT - organic - trace fine sand - slightly laminated and stratified - peat inclusions and layers to 1 ft. - grey (Ice lenses 1/64" spaced @ 1/16") (Ice lenses 1/128" spaced @ 1/64") (Ice lenses 1/32" spaced @ 1/64") (Ice lenses and crystals @ 1/64" spaced 1/8") (Ice lenses 4" thick spaced @ 4") 20.5											
	C		5			Vx Vs Nbe													
	C		6			Nbn													
15	C		7																
	C		8			Vs													
	C		9			Vs													
20	C		10																
	C		11			Vx Vs													
	C		12			Vs													
25	C		13					SILT - organic - trace fine sand - grey (Ice lenses 1/64" spaced @ 1/4") (Ice lenses 1/128" spaced @ 3/8") 29.0											
	C		14			Vr													
	C		15																
30	C		16					SAND AND SILT - silt stratifications - grey (Ice lenses 1/64" spaced @ 1/4")											
	C		17			Vr													
35																			
						Nbe													
40																			



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 1.3 2550' L. of C.L.
HOLE No. A - 1
DATE Sept. 3/76 PLATE

TEST HOLE LOG

HAMMER WT. lbs.		HT. DROP ins.		SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.				
					N.R.C.	N.F. or F.	ELEVATION	0.2	0.6	1.0	1.4	1.8
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	FIELD VANE	LAB VANE	UNCONF.		
DEPTH	TYPE	BLOW No.						PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
								X	0	X		
								10	30	50	70	90%
	SPT	17		Vs Vr		(As above)						
45				N		(Ice lenses 1/128" spaced @ 1/16")	46.0					
50	B	18		N		GRAVEL - little sand - trace silt - grey						
	SPT	>50					52.0					
55						END OF HOLE						
Notes:												
1. Located on high ground sloping 13% to north.												
2. Dense spruce to 40', thick moss cover. Area is well drained.												
3. Drilling mud used from 30' to 52'.												



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 1.3 2550' L. of C.L.
HOLE No. A - 1
DATE Sept. 3/76 PLATE



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JOB No. AL0709

PROJECT Alcan Pipeline

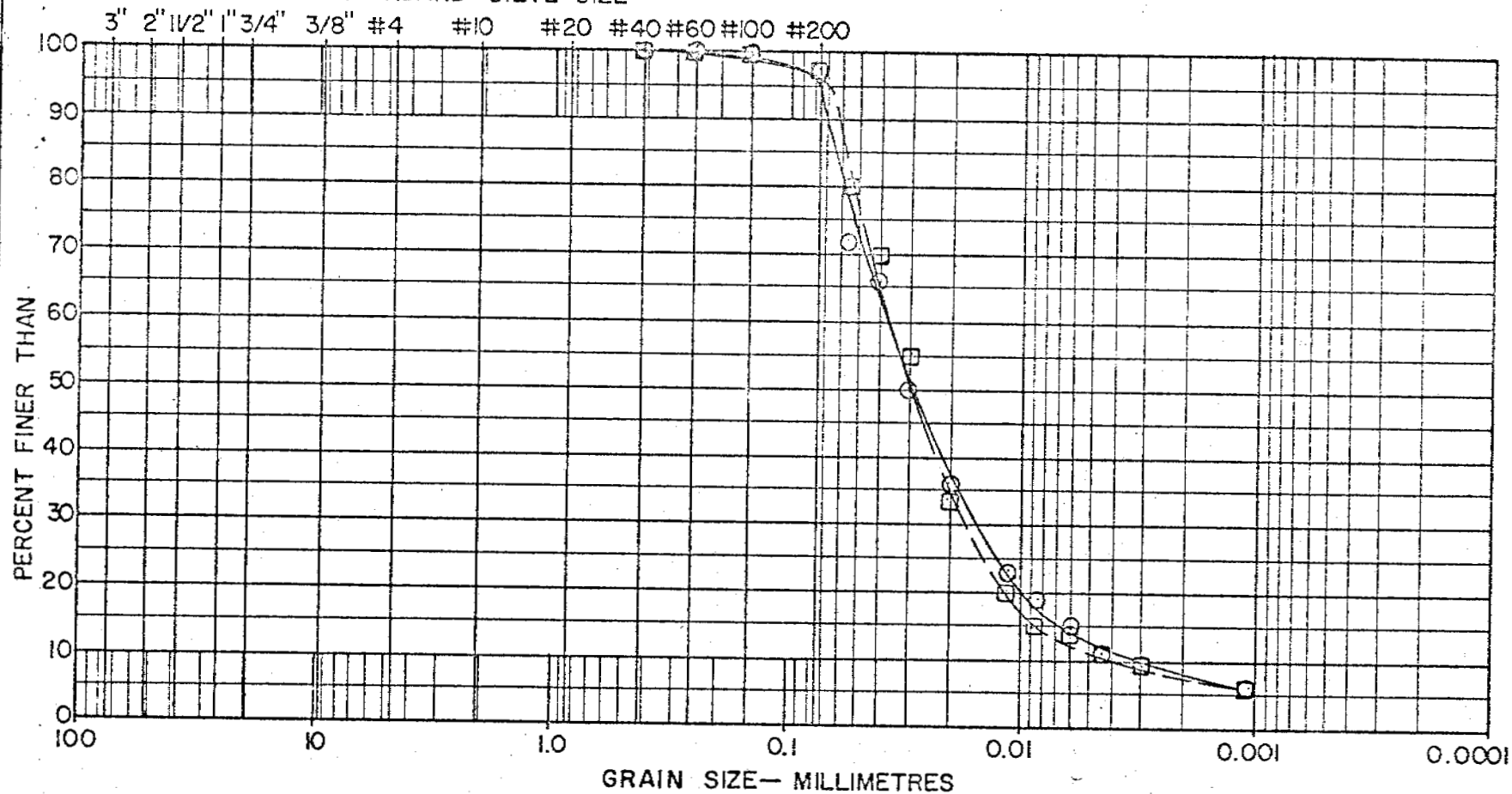
LOCATION

HOLE No. A-1 DEPTH

DATE Sept./76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 Ins.						ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA				N.R.C.	N.F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT	
DEPTH	TYPE	BLOW COUNT	No.	CLASS	or F.			X	0	0	X		
	B		1		NF	PEAT - organic silt stratifications - dark brown (Ice lenses 1/16" spaced @ 1/8") (Ice lenses 1/64" spaced @ 1/8")							
	C		2	Vx, Vs									
5				Vs				4.5					
	C		3			ICE - medium hard - cloudy							
	C		4										
	C		5										
10	C		6										
	C		7										
	C		8			12.0	SILT - coarse - trace fine sand - non plastic - laminated - grey (Ice lenses 1/64" spaced @ 1/8")						
15	C		9	Vs									
	C		10	Vx									
20	C		11			(Ice lenses 1/64" spaced @ 1/8")							
25					Nbe								
30	SPT	56 60 60	12			(Ice lenses 1/64" spaced @ 1/8")							
				Vs									
35					N								
40													



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 CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
 PROJECT Alcan. Pipeline
 LOCATION MP 1.2 2750' L. of C.L.
 HOLE No. A - 2
 DATE Sept. 3/75 PLATE

TEST HOLE LOG

HAMMER WT. lbs.		HT. DROP ins.		TESTS	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.				
SAMPLE DATA		N.R.C. N.R. or F.			ELEVATION	0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.						
DEPTH	TYPE	BLOW 6" No.	CLASS		DESCRIPTION OF MATERIAL	PLASTIC LIMIT X	WATER CONTENT 0	LIQUID LIMIT X				
						10	30	50	70	90%		
45	B	13	N	SAND AND GRAVEL - grey	48.0							
	SPT	>60										
50				END OF HOLE								
Notes: 1. Area slopes gently 4% north, open with few spruce to 10'. Thick peat cover, free water in depressions. 2. Drilling mud used from 20' to 48'.												



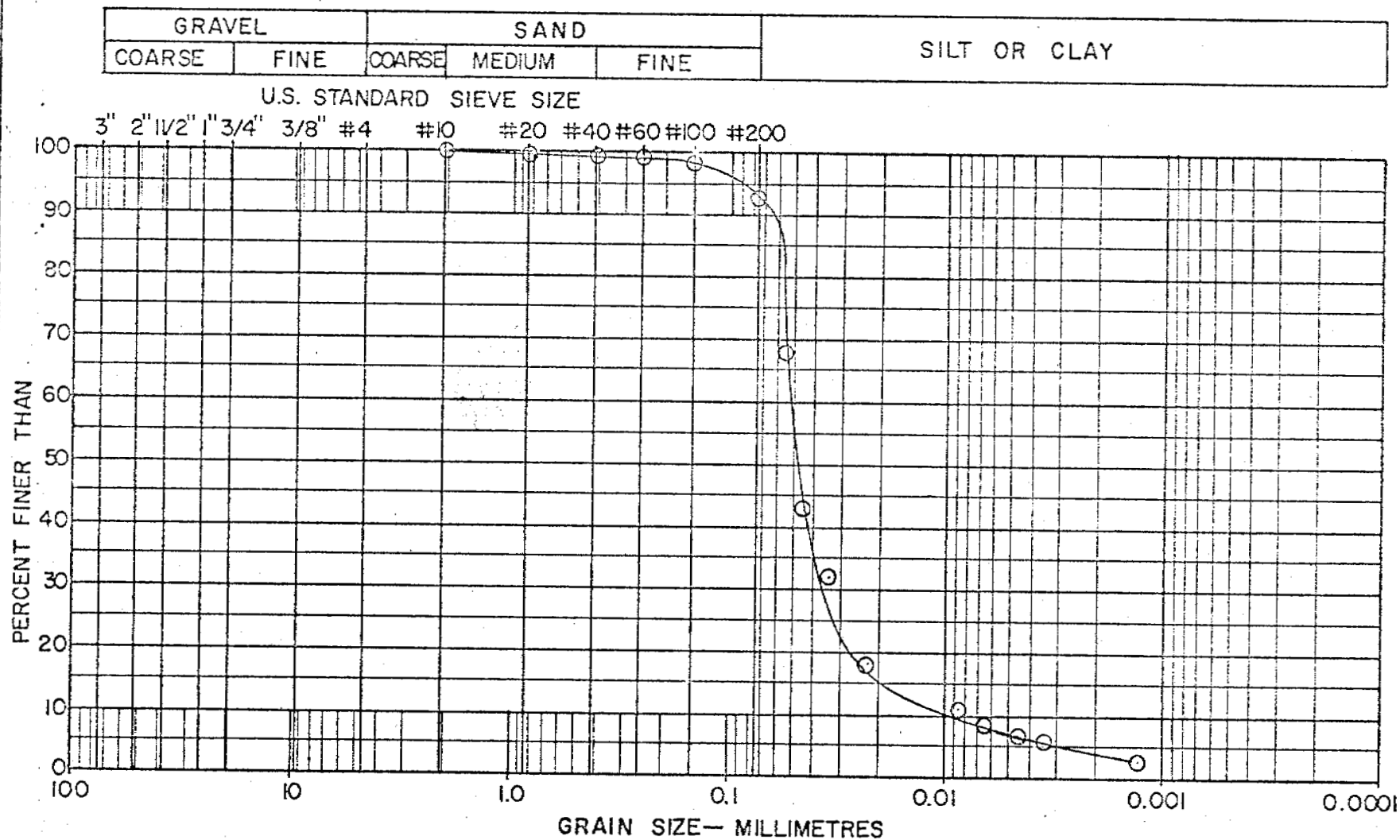
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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	HP 1.2 2750' L. of C.L.
HOLE No.	A - 2
DATE	Sept. 3/76 PLATE



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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	A-2
DEPTH	
DATE	Sept./76



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.						
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8						
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT				
DEPTH	TYPE	BLOW	No.					X	0	X				
								10	30	50	70	90%		
5	B		1		NF	PEAT - silt stratifications - dark brown - (ice lenses 1/32" spaced @ 1/8")								
	B		2											
	C		3				Vr							
	C		4				Vs Vx							
10	C		5		8.0	SILT - organic - trace sand - peat stratifications - grey								
	C		6				Vs							
	C		7				Nbn	SILT - coarse - little fine sand - slightly laminated - grey (ice lenses 1/64" spaced @ 1/32")						
	C		8											
15	C		9			(occasional ice lense 1/32" thick)								
	C		10				Vr							
	C		11				Nbn							
	C		12				Vr							
20	C		13			(Ice lenses 1/64" spaced @ 1/8")								
	C		14				Vr							
	C		15				Nbn							
	C		16				Vr							
25	C		17			(Occasional ice lense to 1/64" thick)								
	C		18				Vr							
	C		19				Nbn							
	C		20				Vr							
30	SPT	75 81	21			GRAVEL AND SAND - trace silt - grey								
			22											
			23											
			24											
35			25											
			26											
			27											
			28											
40			29											
			30											
			31											
			32											



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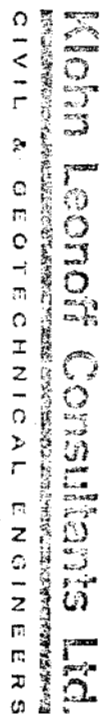
JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	HP 1.2 2950' L. of C.L.
HOLE No.	A - 3
DATE	Sept. 4/76 PLATE

TEST HOLE LOG

[illegible]

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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 1.2 2950' L. of C.L.
HOLE No.	A - 3
DATE	Sept. 4/76 PLATE

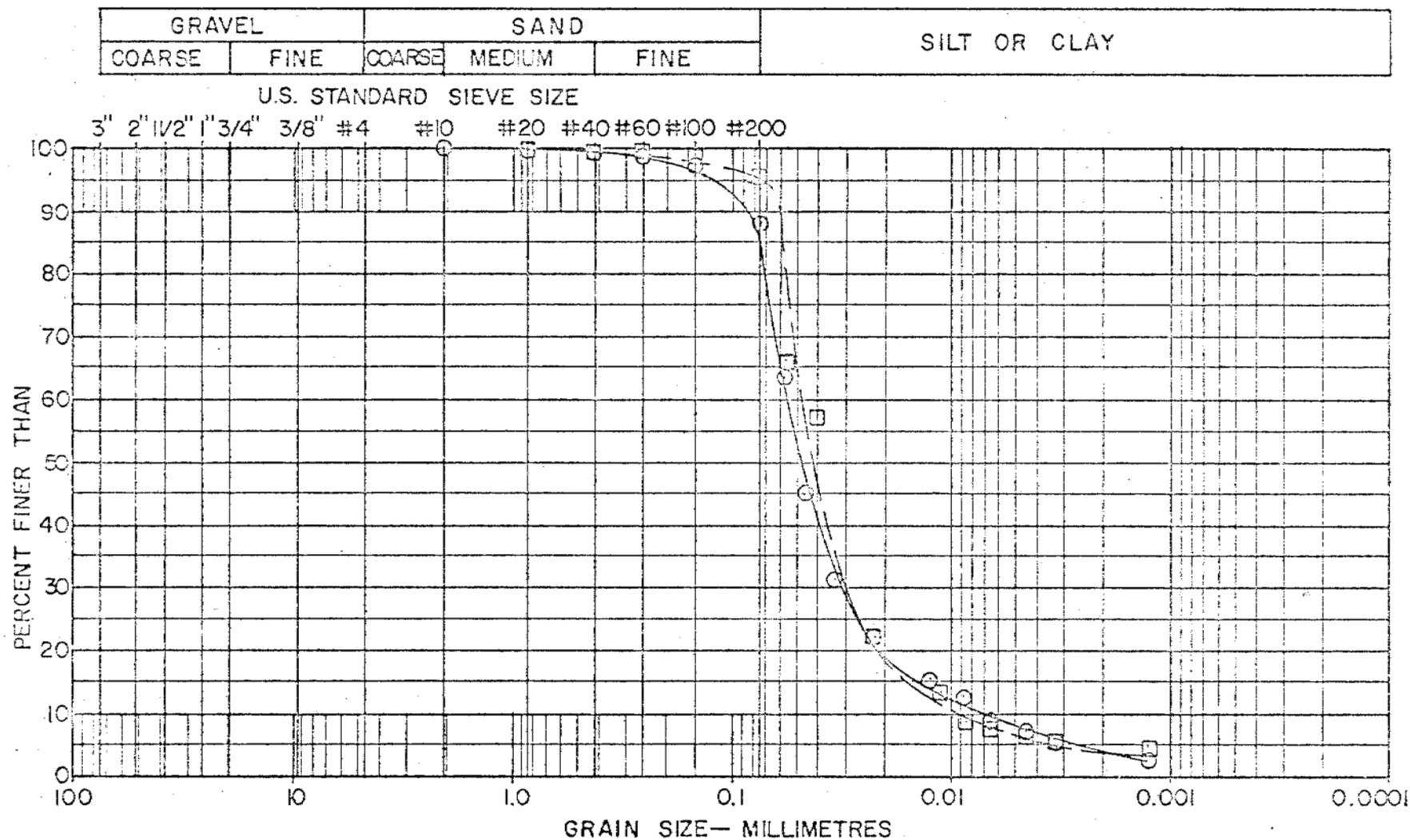


PROJECT A lean Pipeline

1. LOCATION

HOLE NO.	A-3	DEPTH
1	10	10
2	20	20
3	30	30
4	40	40
5	50	50
6	60	60
7	70	70
8	80	80
9	90	90
10	100	100
11	110	110
12	120	120
13	130	130
14	140	140
15	150	150
16	160	160
17	170	170
18	180	180
19	190	190
20	200	200
21	210	210
22	220	220
23	230	230
24	240	240
25	250	250
26	260	260
27	270	270
28	280	280
29	290	290
30	300	300
31	310	310
32	320	320
33	330	330
34	340	340
35	350	350
36	360	360
37	370	370
38	380	380
39	390	390
40	400	400
41	410	410
42	420	420
43	430	430
44	440	440
45	450	450
46	460	460
47	470	470
48	480	480
49	490	490
50	500	500
51	510	510
52	520	520
53	530	530
54	540	540
55	550	550
56	560	560
57	570	570
58	580	580
59	590	590
60	600	600
61	610	610
62	620	620
63	630	630
64	640	640
65	650	650
66	660	660
67	670	670
68	680	680
69	690	690
70	700	700
71	710	710
72	720	720
73	730	730
74	740	740
75	750	750
76	760	760
77	770	770
78	780	780
79	790	790
80	800	800
81	810	810
82	820	820
83	830	830
84	840	840
85	850	850
86	860	860
87	870	870
88	880	880
89	890	890
90	900	900
91	910	910
92	920	920
93	930	930
94	940	940
95	950	950
96	960	960
97	970	970
98	980	980
99	990	990
100	1000	1000

DATE 'Sept. /76



REMARKS:  Sample 6 at 8' - 9'

 Sample 12 at 21' - 22'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC WATER LIQUID LIMIT CONTENT LIMIT X-----0-----X				
DEPTH	TYPE	BLOW 6 in	No.						10 30 50 70 90%				
45	SPT	44 56	12	Nbn Vr		(As above)							
50						(Occasional ice lenses to 1/128")							
55													
60	B		13	N		56.0							
						59.0							
END OF HOLE													
Notes: 1. Located 80' east of H-F products line right-of-way. 2. Terrain slopes 4% northeast. Moderate spruce 10' to 25'. 3. Drilling mud used from 20' to 59'. 4. Thermistors installed at 2', 5' and 10'.													



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0702
PROJECT	Alcan Pipeline
LOCATION	MP 1.0 300' L. of C.L.
HOLE No.	A - 4
DATE	Sept. 4/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

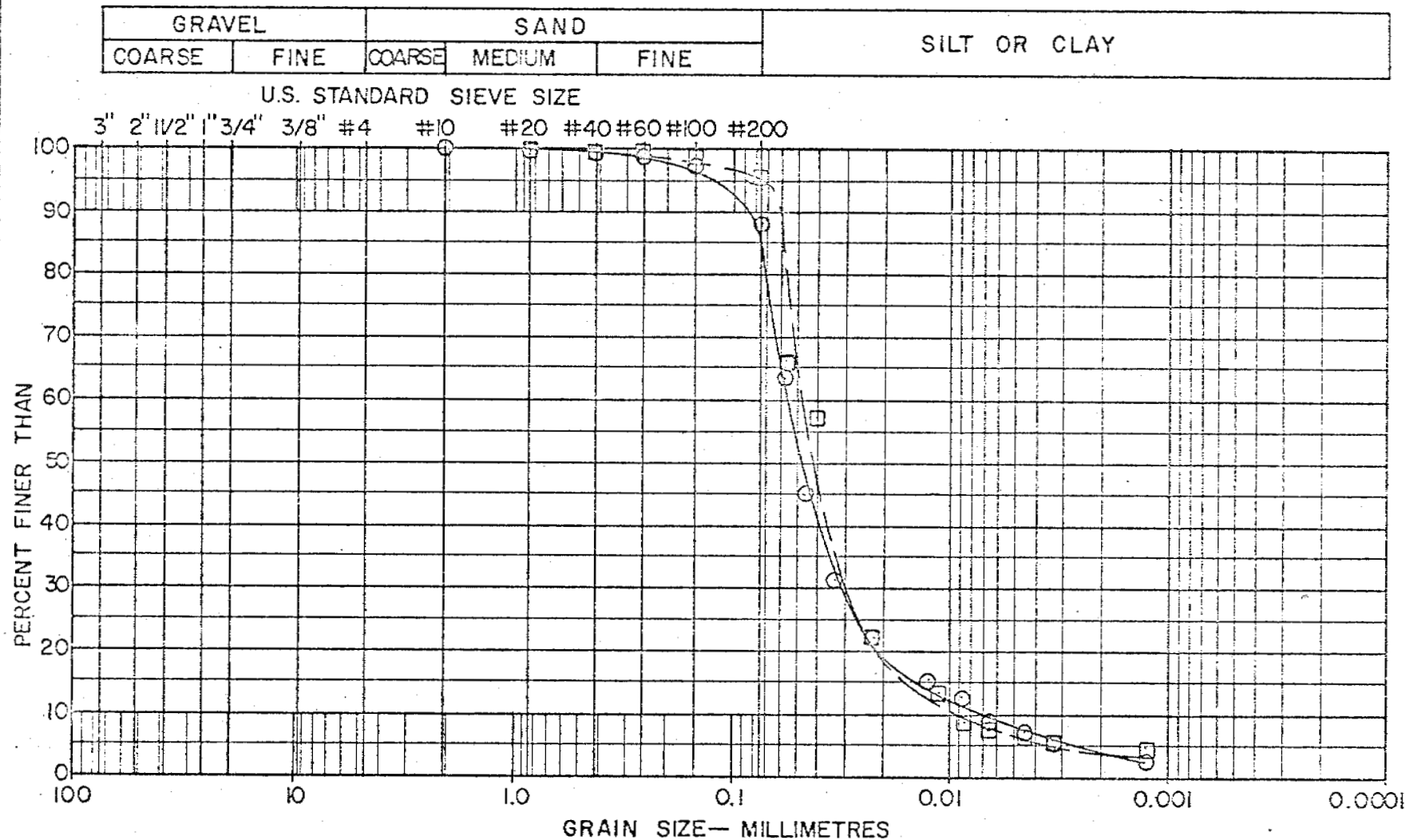
JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. A-3 DEPTH

DATE Sept./76



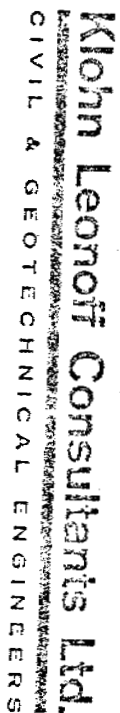
TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA														
DEPTH	TYPE	BLOW 6" No.	No.			DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%						
5	B		1		NF	PEAT AND ORGANIC SILT - stratified & laminated - dark brown (Ice lenses 1/64" spaced @ 1/4")							113	
	C		2	Vr Vx										163
			3	Vx Vr										200
10	C		4	Vr Vx Vs		(Ice lenses and crystals 1/32" spaced @ 1/2") 8.0							120	
			5										120	
			6										120	
15	C		7			SILT - organic - trace fine sand - peat stratifications and inclusions - grey (Ice lenses 1/64" spaced @ 1/8")							108	
			8	Vr Vx									187	
			9										158	
20	C		10	Vs		19.0 SILT - organic - trace fine sand - laminated - grey (Ice lenses 1/128" spaced @ 1/16")							104	
													116	
													146	
25						(Occasional ice lense to 1/128")							169	
													200	
													200	
30	SPT	51 58	11	Nbn Vr									107	
													191	
													153	
35													134	
													150	
													150	
40													15	

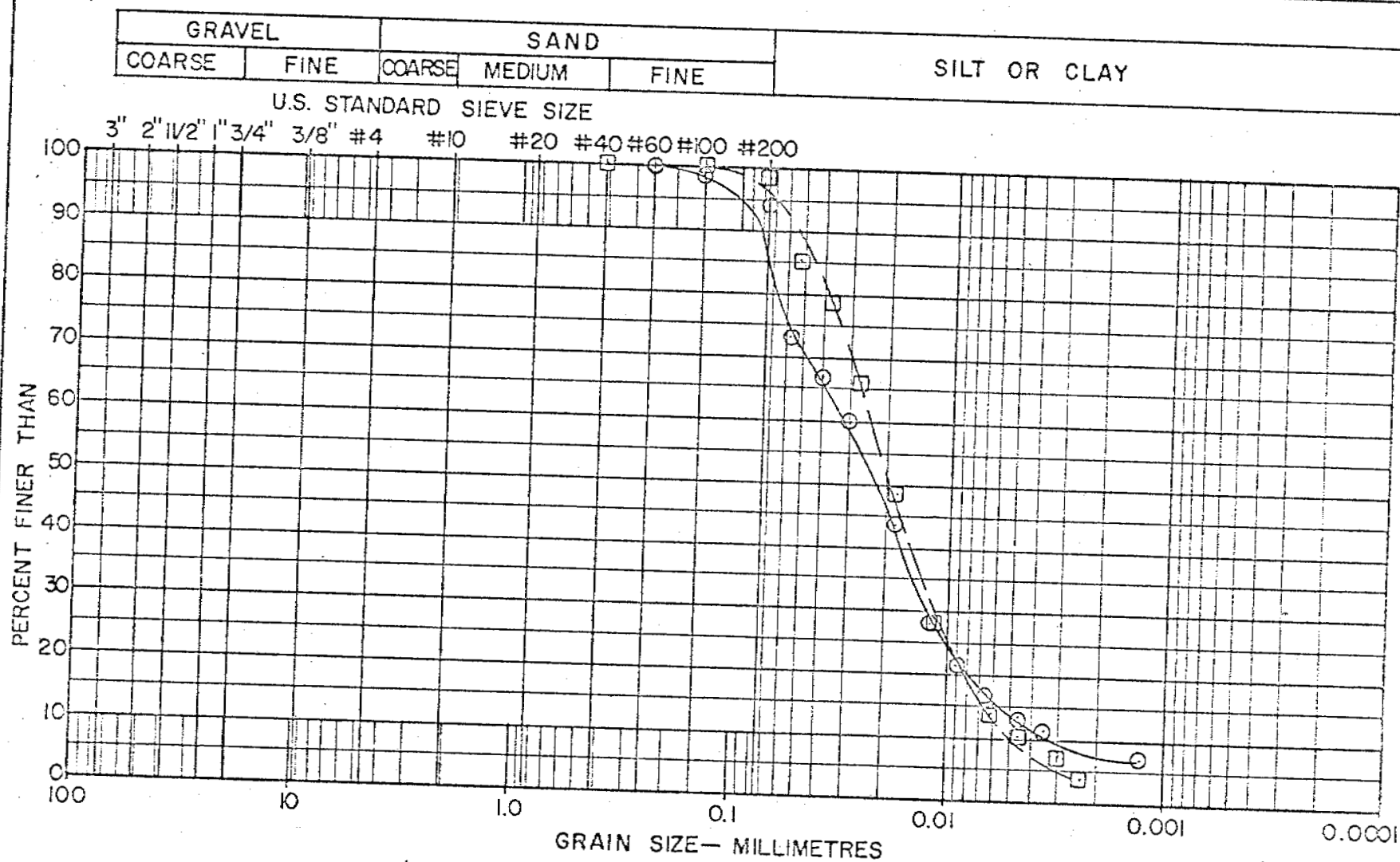


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 CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0702
 PROJECT Alcan Pipeline
 LOCATION MP 1.0 300' L. of C.L.
 HOLE No. A - 4
 DATE Sept. 4/76 PLATE



JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	A-4
DEPTH	
DATE	Sept/76



REMARKS:  Sample 2 at 3' - 4'

 Sample 6 at 10' - 11'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT.		lbs.		SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP		ins.			ELEVATION		0.2 0.6 1.0 1.4 1.8						
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL		FIELD VANE		LAB VANE		UNCONE
DEPTH	TYPE	BLOW 6"	No.		CLASS				PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
									X	0	X	X	X
								10	30	50	70	90%	
45	SPT	44 >50	19	Nbn Vr		As above (Ice lenses 1/16" spaced @ 1")							
50							50.0						
55	SPT	51 >50	20	Nbn Vr		SILT - coarse - little fine sand - grey (Occasional ice lense 1/32")							
60													
65	SPT	66 >50	21	Nbn			63.0						
65													
65	B		22	N		SAND AND GRAVEL - trace silt - grey							
70							68.0						
						END OF HOLE							
Notes:													
1. Located 100' west of eroded gully formed along old caterpillar trail.													
2. Terrain slopes very gently 1% northeast. Open, occasional willow and spruce 5' to 10'. Poorly drained area, free water in depressions.													
3. Drilling mud used from 30' to 68'.													



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 2.4 1000' L. of C.L.
HOLE No. A - 5
DATE Sept. 1/76 PLATE

TEST HOLE LOG

HAMMER WT. lbs.		HT. DROP in.		SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
					N.R.C.	N.F.	ELEVATION						
SAMPLE DATA					CLASS	or F.	DESCRIPTION OF MATERIAL						
DEPTH	TYPE	BLOW No.											
	B		1										
	B		2			NF							
	C		3		Vs Vr Vx		4.0	PEAT AND ORGANIC SILT - laminated - dark brown (Ice lenses 1/8" spaced @ 1/2")					228
5	C		4										155
	C		5					ICE - medium hard - porous and cloudy					
	C		6										
10	C		7										
	C		8			Ice							
	C		9										
15	C		10										
	C		11										
20	C		12				22.0						
	C		13		Vr Vx			PEAT & ORGANIC SILT - dark brown (Ice lenses 1/64" spaced @ 1/2") (Ice crystals 1/16" spaced @ 1/2")					187
25	C		14										200
	C		15					(Ice lenses 1/32" spaced @ 1/4")					176
	C		16		Vr Vx			(Ice crystal 1/32" spaced @ 1/2")					151
30	C		17				30.0						138
													184
													192
													200
													159
													175
													152
													240
35	SPT	32 39 72	18		Nbn Vx Vr			SILT - organic - peat stratifications - dark brown (Ice lenses 1/32" spaced @ 1/2")					
40													



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION HP 2.4 1000' L. of C.L.
HOLE No. A - 5
DATE Sept. 1/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 6 ins.					N.R.C.	N.F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA					N.R.C.	N.F.	DESCRIPTION OF MATERIAL		FIELD VANE LAB VANE UNIFORM				
DEPTH	TYPE	BLOW No.	No.	CLASS	or F.	PLASTIC LIMIT			WATER CONTENT	LIQUID LIMIT			
X-----X													
10 30 50 70 90%													
	SPT	55 50	18				As above						
45													
50	SPT	71 50	19										
55													
60	B		20				gravel layer						
							61.0						
65	SPT	45 70	21				SAND AND GRAVEL - little silt - grey						
	B		22										
							68.0						
70							END OF HOLE						
							<u>Notes:</u> 1. Located on H-F products line right-of-way. 2. Terrain slopes gently south-east. Light spruce to 15'. Poorly drained area, free water in depressions. 3. Drilling mud used from 24.5' to 68'. Loss of circulation at 61'.						



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 CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
 PROJECT Alcan Pipeline
 LOCATION HP 2.4 200' R. of C.L.
 HOLE No. A - 6
 DATE Sept. 2/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.									
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8									
SAMPLE DATA					N.R.C.	N.E. or F.	DESCRIPTION OF MATERIAL		FIELD VANE		LAB VANE		UNCOR.					
DEPTH	TYPE	BLOW No.			CLASS	F.			PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT							
									X	0	X	10	30	50	70	90%		
	B		1				PEAT											
	B		2			NF	- trace silt - dark brown											
	C		3															
5							4.0											
	C		4		Vs			SILT										
	C		5				- organic specks - trace of sand - peat stratifications - grey											
	C		6				(Ice lenses 1/32" spaced @ 1/2") (Ice lenses 1/32" spaced @ 1/4")											
10	C		7		Vs Vx													
	C		8				(Ice lenses 1/64" spaced @ 1/4")											
	C		9				(Ice lenses 1/64" spaced @ 1/4")											
15	C		10		Vs													
	C		11				(Ice lenses 1/64" spaced @ 1/2")											
	C		12															
20	C		13		Vs Vr													
	C		14				(Ice lenses 1/64" spaced @ 3/4")											
	C		15															
25	C																	
30	SPT	66 >50	16															
					Nbn													
35	SPT	60 60 >50	17															
40																		

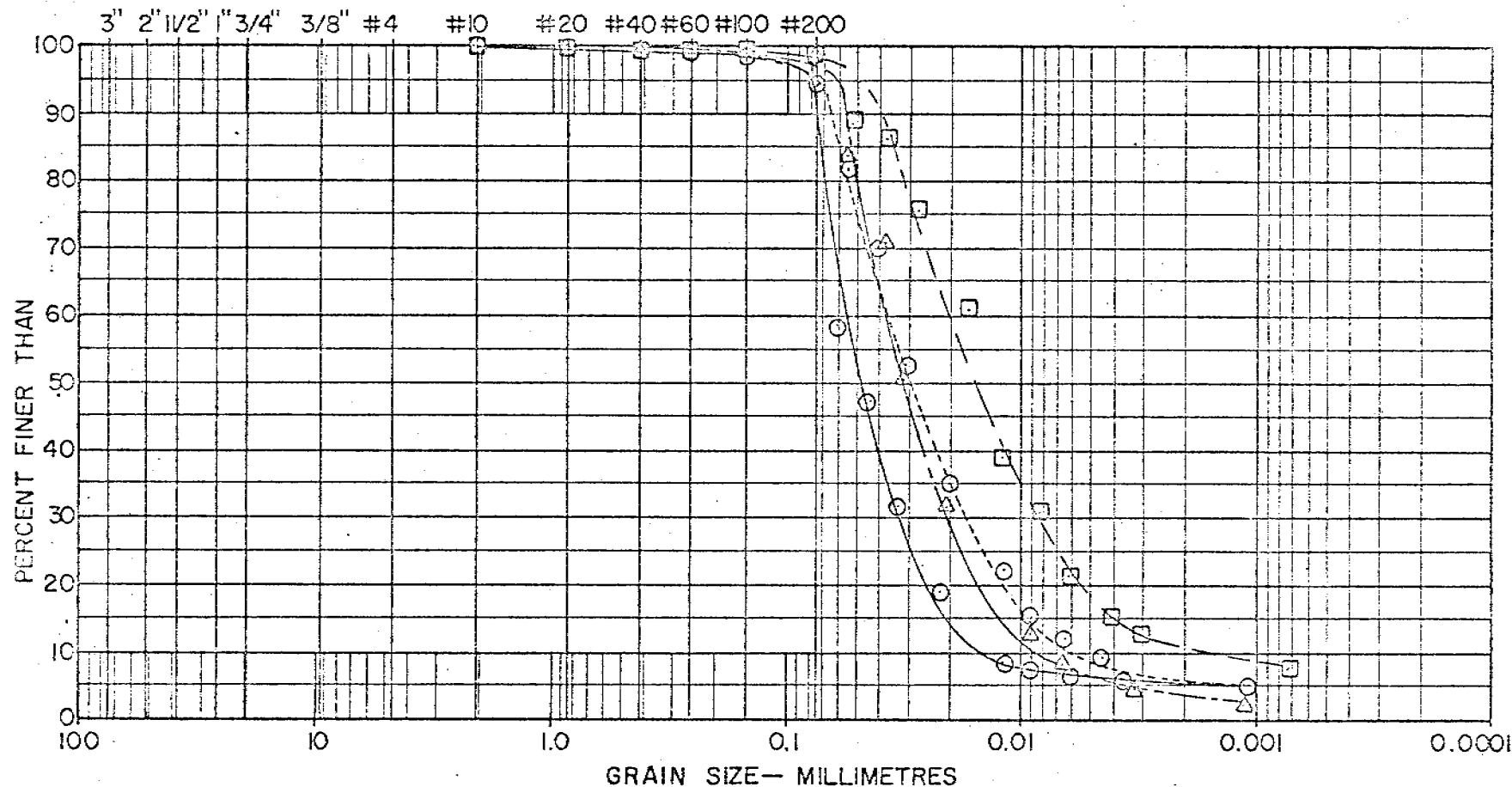


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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 2.4 200' R. of C.L.
HOLE No. A - 6
DATE Sept. 2/76 PLATE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 5 at 7 1/2' - 8 1/2'

□—□ Sample 7 at 11 1/2' - 12 1/2'

△—△ Sample 10 at 14 1/2' - 15 1/2'

○-----○ Sample 13 at 20' - 21'

JOB No. A10709

PROJECT Alcan Pipeline

LOCATION

HOLE No. A-6 DEPTH

DATE Oct./76

TEST HOLE LOG

HAMMER WT. lbs.		HT. DROP ins		SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
					N.R.C.	N.F.	ELEVATION		FIELD VANE Δ LAB VANE $\square$ UNCONF				
SAMPLE DATA					CLASS	or F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
DEPTH	TYPE	BLOW No.											
5	B	1					6" MOSS - organic cover						
	B	2			NF		SILT						
	C	3					- organic						
							- trace fine sand						
10	C	4			Vs		- peat stratifications						
	C	5					- dark brown						
	C	6					(ice lenses 1/64" spaced @ 1/32")						
	C	7			Vs		SILT						
15	C	8					- coarse						
	C	9			Nbe		- trace fine sand						
	C	10			Vs		- organic inclusions						
	C	11					- brown						
20	C	12					(ice lenses 1/64" spaced @ 1/4")						
	C	13			Nbn								
	C	14			Nbe		SILT						
	C	15					- coarse						
25	SPT	16	54				- trace sand						
	B	17	100				- slightly laminated						
	B	18	Ref				- grey						
	B	19					(ice lenses 1/64" spaced @ 1")						
30	B	20			N		SAND AND GRAVEL						
	B	21					- trace silt						
	B	22					- cobbles						
	B	23											
35		24					END OF HOLE						
		25					Notes:						

Notes:

1. Terrain slopes 8% southwest. Moderately dense spruce to 25'.
2. Drilling mud used from 23' to 31'.



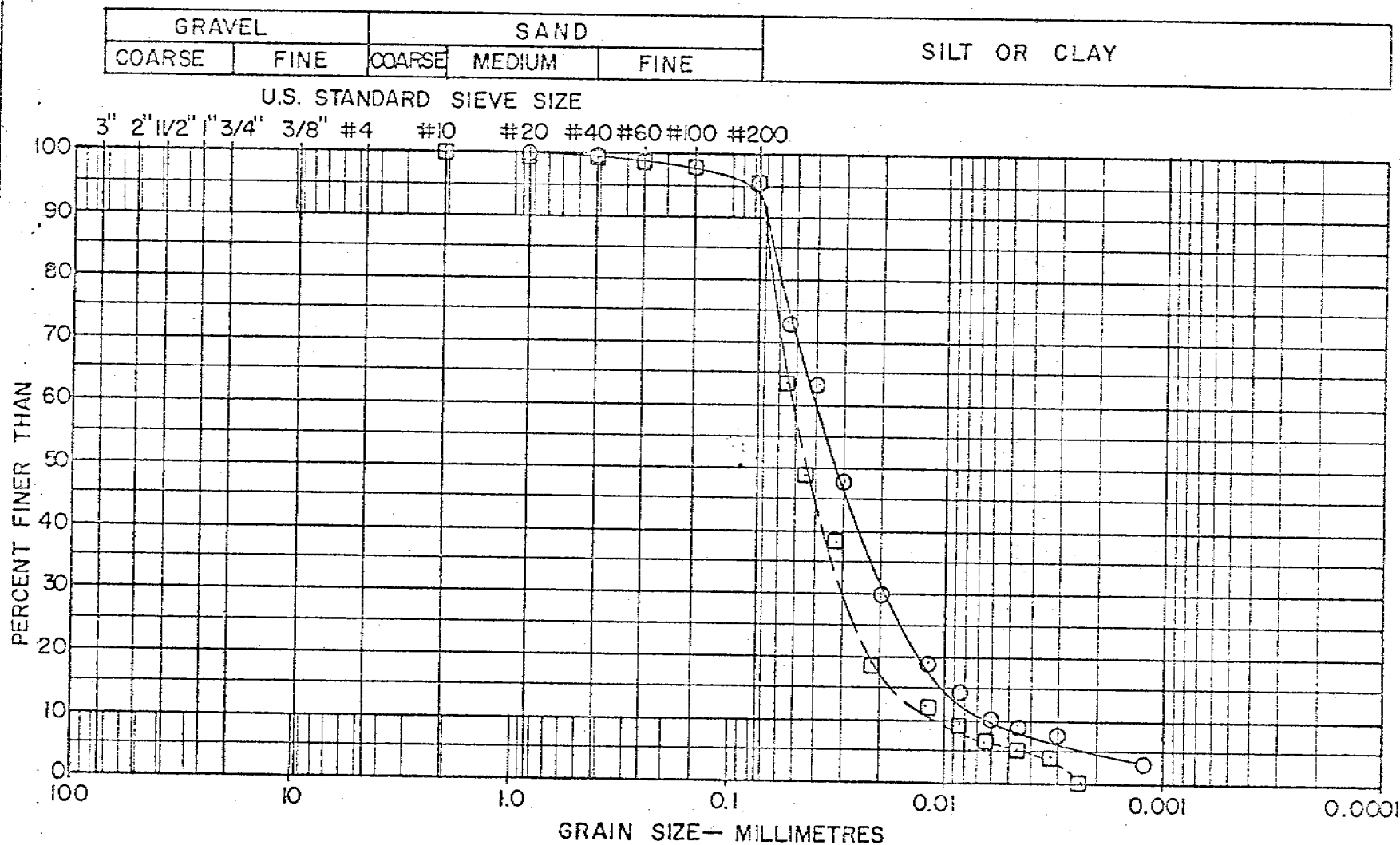
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 4.3 - 850' L. of C.L.
HOLE No. B - 1
DATE Aug. 31/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	B-1
DATE	Sept./76
DEPTH	



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8					
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE	LAB VANE	UNCONS.	PLASTIC LIMIT	WATER CONTENT
DEPTH	TYPE	BLOW 6" No.	No.										
5	B		1	NF		PEAT AND ORGANIC SILT - layered - dark brown (Ice lenses 1/64" spaced @ 1/8")							
	B		2										
	C		3										
	C		4		Vs								
10	C		5				(Ice lenses 1/32" spaced @ 1/4") (Ice lenses 1/32" spaced @ 1") (Ice lenses 1/32" spaced @ 1/4")						
	C		6		Vs Nbe								
	C		7		Vs Nbe								
	C		8		Vs Vr	13.0							
15	C		9				SILT - organic - trace sand - peat stratifications - grey (Ice lenses 1/64" spaced @ 1/8") (Ice crystals 1/32" spaced @ 1") (Ice lenses 1/64" spaced @ 1/16")						
	C		10		Vx Vs								
	C		11	Vs									
	C		12										
20			13										
			14										
25	SPT	64 50	15										
			16										
30	B		17										
			18										
35	B		19										
			20										

END OF HOLE

Notes:

1. Terrain slopes at 10% southwest.
Moderately dense spruce to 25'
2. Thermistors installed at 2', 5' and 10'.
3. Drilling mud used from 18.5' to 35'



Klohn Leonoff Consultants Ltd.
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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 4.3 500' L. of C.L.
HOLE No.	B - 2
DATE	Aug. 31/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

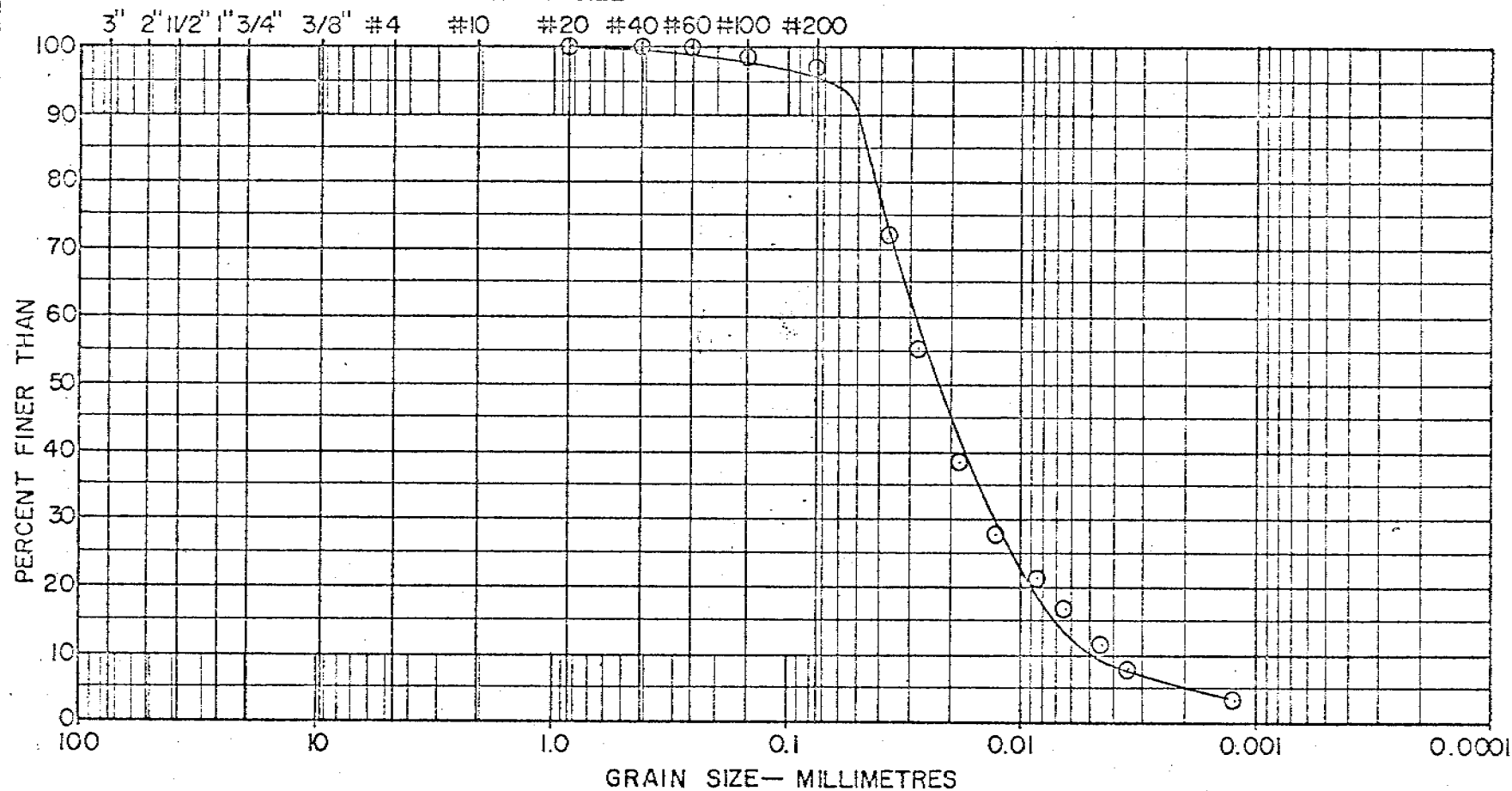
LOCATION

HOLE No. B-2 DEPTH

DATE Sept./76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.E. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		FIELD VANE LAB VANE UNCONF.			
DEPTH	TYPE	BLOW COUNT	No.							PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
									X	0	X		
									10	30	50	70	
												90%	
	B		1		NF		3" MOSS - organic cover						
	C		2		Vs		SILT AND CLAY						
							- trace fine sand						
							- organic inclusions						
							- low plasticity						
							- brown						
5	C		3		Nbe Vs	5.0	(Ice lenses 1/4" thick spaced @ 3/4")						
							(Ice lenses 1/128" spaced @ 1/32")						
	C		4		Nbe								
10	C		5		Nbn	12.0	SILT AND SAND						
							- laminated						
							- organic inclusions						
							- grey						
	C		7		Vx		SAND						
15					Nbn		- fine to medium						
	C		8		NF		- trace silt						
					Nbn		- organic inclusions						
							- grey						
	C		9		Nf		(Ice crystals 1/8" spaced @ 1/2")						
20	SPT	>45	10			18.5							
	B		11				SAND AND GRAVEL						
							- trace silt						
							- cobbles						
25	B		12		N								
	B		13			27.0							
30							END OF HOLE						
							Notes:						
							1. Located on H-F products line right-of-way.						
							2. Terrain is flat lying and poorly drained.						
							3. Drilling mud used from 18.5' to 27'.						



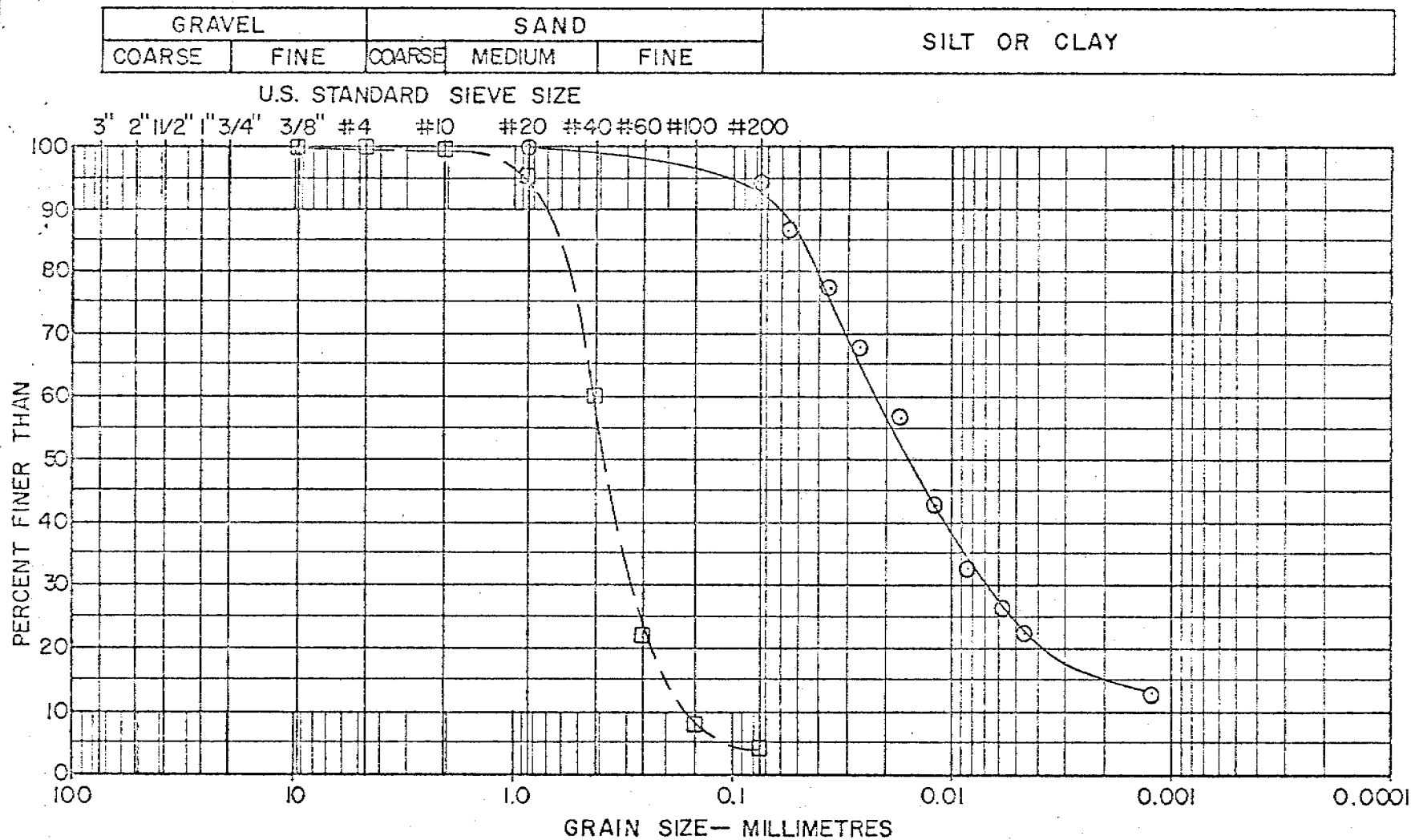
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	HP 7.4 550' L. of C.L.
HOLE No.	C - 1
DATE	Aug. 29/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION _____
HOLE No. C-1 DEPTH _____
DATE Sept./76



REMARKS: ○ — Sample 3 at 4' - 5'
□ — Sample 8 at 15' - 8" - 16'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							FIELD VANE Δ LAB VANE $\square$ UNCONS.					
DEPTH	TYPE	BLOW No.	No.				DESCRIPTION OF MATERIAL				PLASTIC LIMIT X	WATER CONTENT 0
								10 30 50 70 90%				
	B		1	III			0.5	MOSS - organic cover				
	B		2			NF		CLAY AND SILT				
								- trace fine sand				
5	C		3		Nbn			- organics inclusions				
					Nbe			- med. plasticity				
					Vs		6.0	- grey				
	C		4					SAND				
								- fine				
	C		5		Nbe		9.0	- little silt				
10								- organic inclusions				
	C		6		Vr			- grey				
								SILT AND SAND				
	C		7		Nbe		12.5	- organic inclusions				
	B		8					- grey				
15	B		9					SAND				
								- fine				
	SPT	3	10			NF		- some silt				
		15						- organic specks				
		7					20.0					
20	SPT	18	11					SAND AND GRAVEL				
		32						- trace silt				
								- grey				
25	B		12									
	B		13									
							28.0					
30								END OF HOLE				
Notes:												
1. Located adjacent to open, swampy area, about 150' south-east of old meander channel of Mirror Cr.												
2. Terrain is flat and poorly drained. Moderate spruce growth 5' to 20'.												
3. Drilling mud used from 16.5' to 28'.												



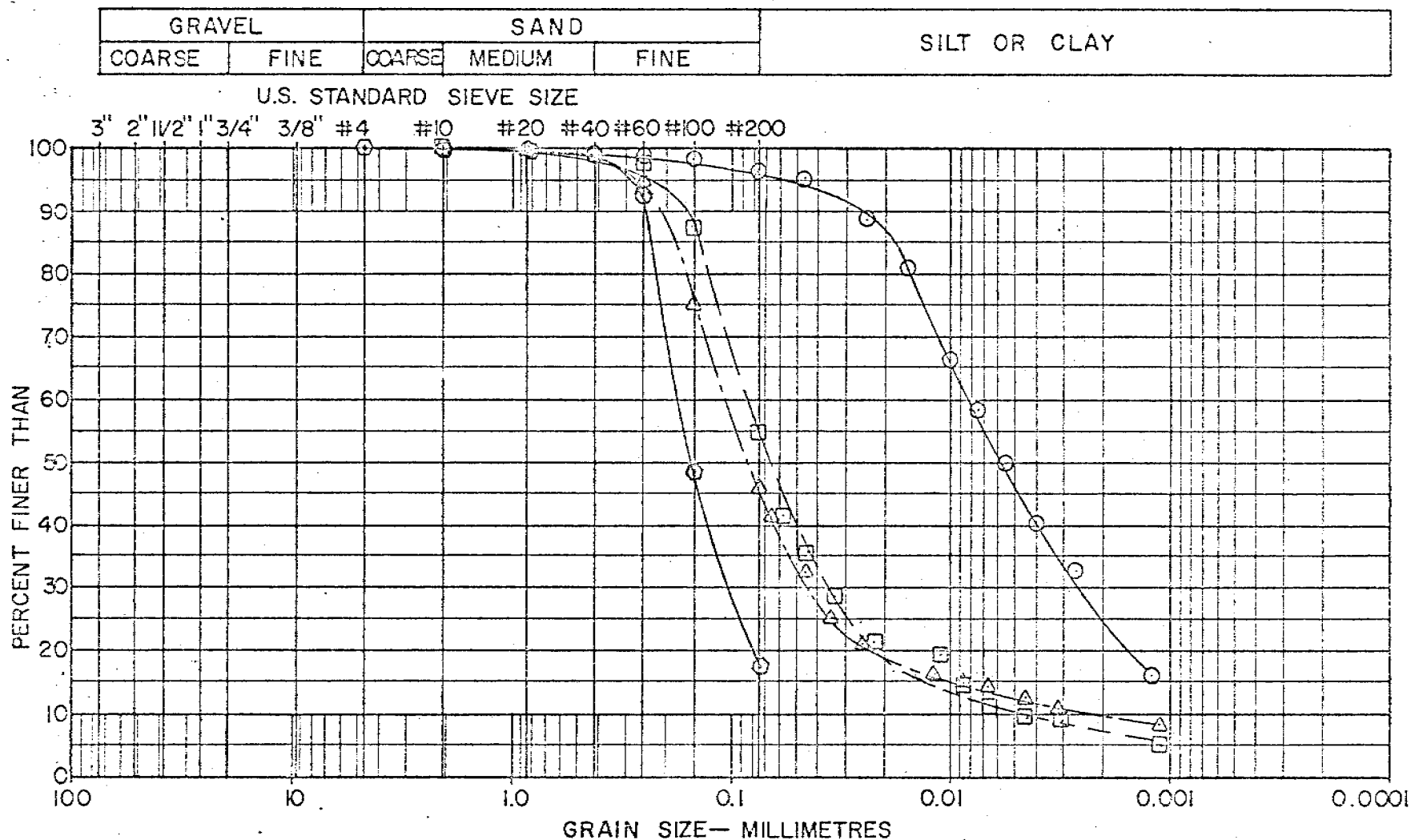
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION NP 7.4 1180' R. of C.L.
HOLE No. C - 2
DATE Aug. 29/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ FT.						
HT. DROP 30 ins							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.						
SAMPLE DATA					N.R.C.	N.F.	DESCRIPTION OF MATERIAL			PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT	
DEPTH	TYPE	BLOW No.	No.		CLASS	or F.				X	X	X	X	X	
								3" MOSS - organic cover							
	B		1					SAND							
	B		2					- fine							
	B		3					- little silt							
								- trace organics							
5	C		4		Nbe	NF	3.5	- grey							
					Vs		6.0	SILT							
	C		5					- trace of sand							
	C		6					- organic inclusions							
10	C		7		Nbn			- grey							
								SAND AND SILT							
	C		8					- laminated & stratified							
								- trace organics							
								- grey							
15	B		9					(Ice lenses 1/32" spaced @ 1/8")							
	SPT	3	10												
		10													
		32													
20						NF									
							19.0								
	B		11					GRAVEL							
								- fine							
								- little sand							
								- grey							
25	B		12				25.0								
								END OF HOLE							
								Notes:							
								1. Located 200' northwest of old meander channel of Mirror Cr.							
								2. Terrain is flat with moss cover. Moderate spruce growth to 30'.							
								3. Drilling mud used from 14.5' to 25'.							



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JOB No. AL0709
 PROJECT Alcan Pipeline
 LOCATION MP 7.5 930' R. of C.L.
 HOLE No. C - 3
 DATE Aug. 30/76 PLATE

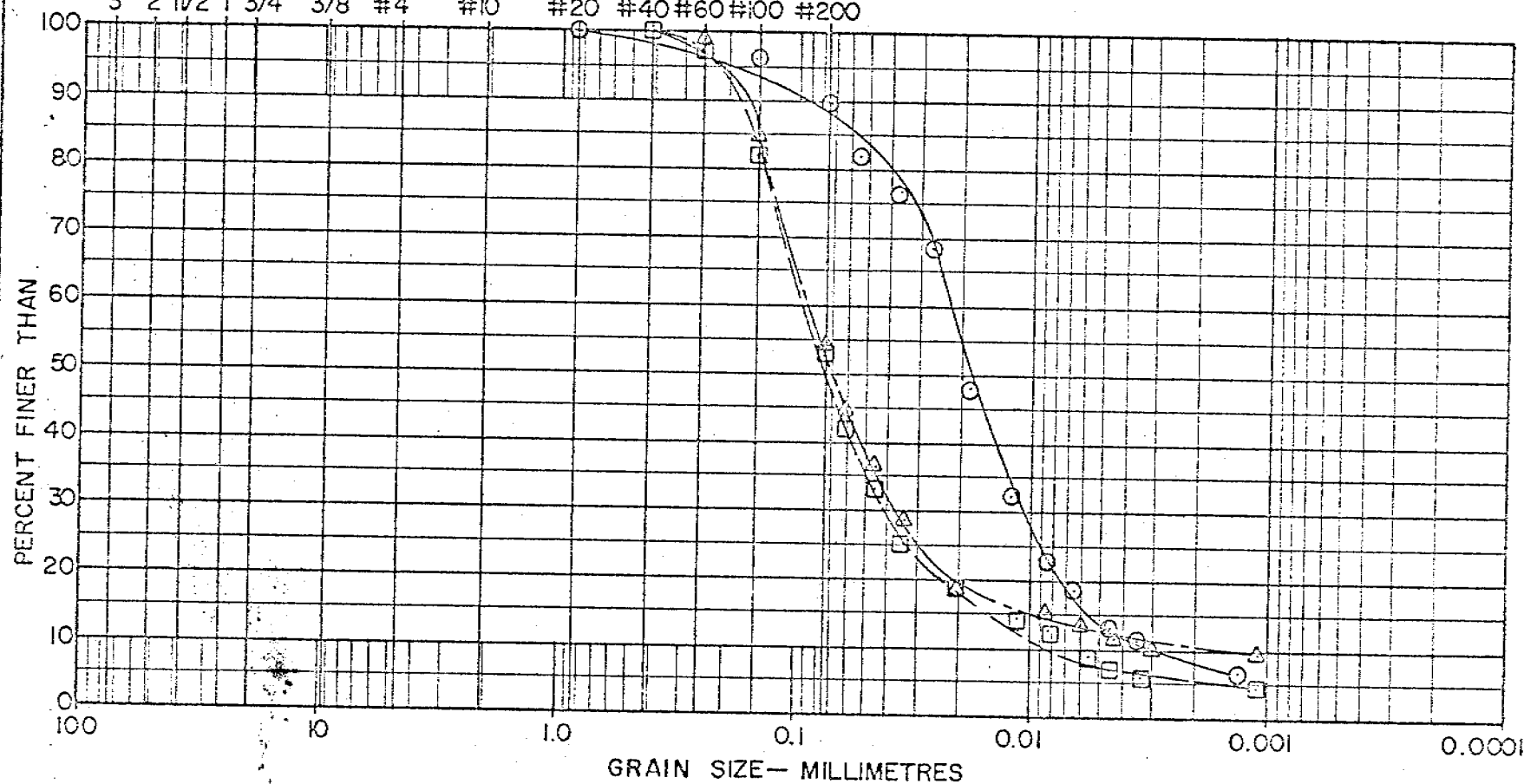


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GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							FIELD VANE LAB VANE TUNGONE					
DEPTH	TYPE	BLOW No.	No.	DESCRIPTION OF MATERIAL				PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
				2" MOSS - Organic cover				X	0	X		
5	B		1									
	B		2									
	B		3			NF	3.0					
	C		4		Vs							
	C		5		Vs							
10	C		6		Vs, Vr Nbe							
	C		7									
	C		8		Vr, Vs							
	C		9		Vs							
	C		10		Nbe							
15							13.5					
20	B		10									
	SPT	7 13	11									
25	B		12				23.0					
	B		13									
	B		14				28.0					
30												

Notes:

1. Located on flat terrain adjacent to two ponds. Spruce to 15'.
2. Drilling fluid used from 19 to 28'.
3. Thermistors installed at 2', 5' and 10'.



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 7.6 600' R. of C.L.
HOLE No. C - 4
DATE Aug. 30/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.

AL0709

PROJECT

Alcan Pipeline

LOCATION

HOLE No.

C-4

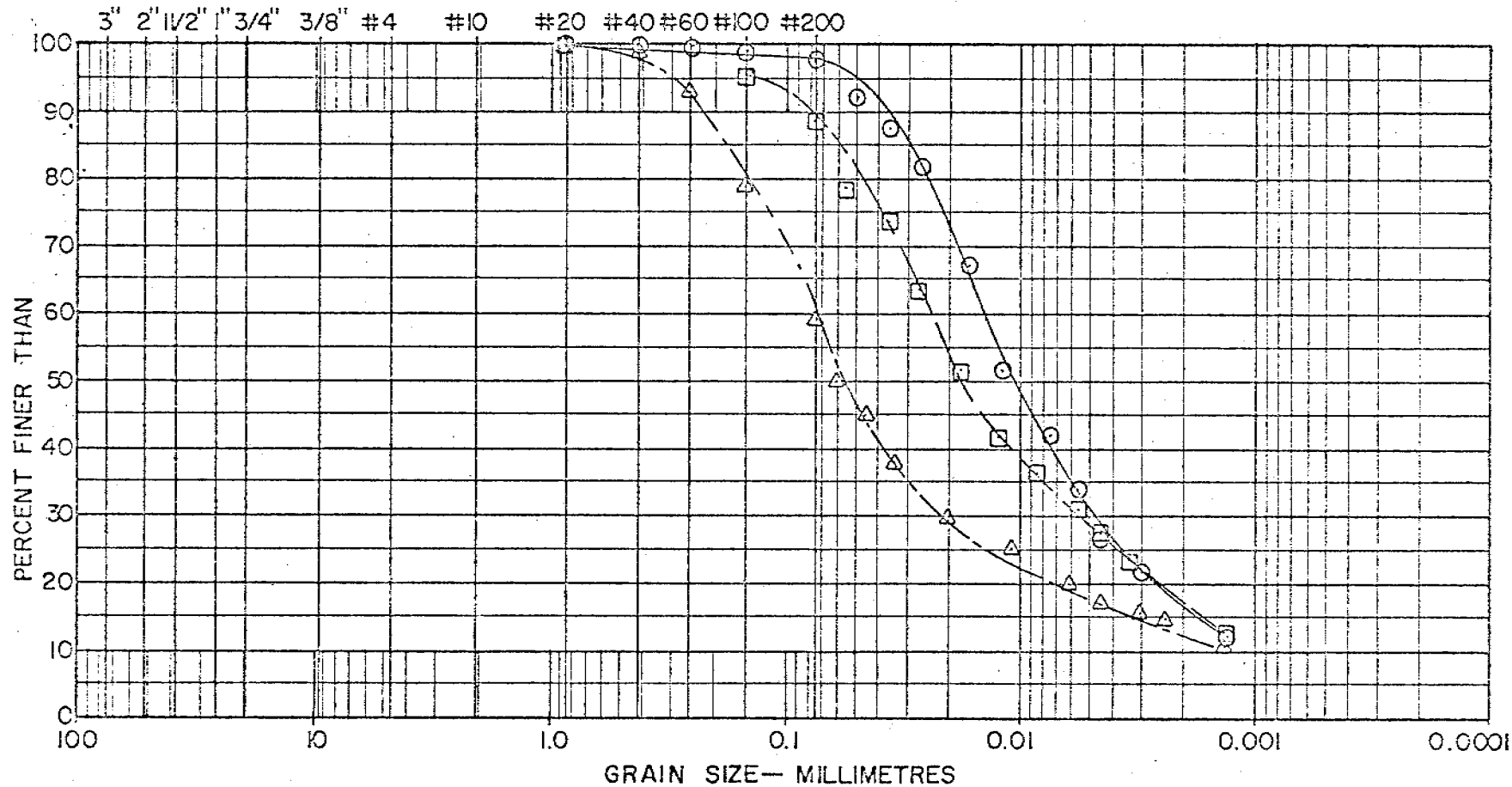
DEPTH

DATE

Sept./76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE TILSON				
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%				
DEPTH	TYPE	BLOW 6"	No.										
	B		1	II		NF	3.5	PEAT - dark brown					
	B		2		Nbe								
5	B	15 70 >50	3	N			12.0	SAND AND GRAVEL - trace silt - cobbles - grey					
	SPT		4										
	B		5										
10	B		6										
	B		7										
15	END OF HOLE												
Notes:													
1. Located 300' southwest of MP 326 of H-F products line.													
2. Terrain is flat and open, with occasional spruce to 5'. 2" of free water on ground surface at site.													
3. Water used as drilling fluid. Hole terminated at 12' due to gravel sloughing.													



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 10.5 200' R. of C.L.
HOLE No. D - 1
DATE Aug. 27/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8					
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE LAB VANE UNCONF.					
DEPTH	TYPE	BLOW No.								PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
								X	0	X				
								10	30	50	70	90%		
5	B	1		N	NF	1.5	PEAT - dark brown							
	B	2				4.5	SILT - little sand - little gravel - grey							
	B	3												
10	B	4					10.0	GRAVEL - little sand - trace silt - cobbles - grey						
	B	5					12.0	SAND AND SILT - trace gravel & cobbles						
15	B	6					14.0	SAND AND GRAVEL - cobbles						
						END OF HOLE								
Notes: 1. Located between D-1 and D-3 on H-F products line right-of-way. 2. Terrain is flat and open. 4" of free water on ground surface at site. 3. Drilling mud used from 12' to 14'. Unable to drill below 14' due to hole caving in.														

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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 10.5 50' l. of C.L.
HOLE No.	D - 2
DATE	Aug. 26/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE CONE				
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL			PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
DEPTH	TYPE	Blow No.			CLASS					X	0	X	
5	B	14 28 44	1	Nbn	NF	2.0	PEAT - pockets of sand and silt						136
	B		2									188	
	B		3										
	SPT		4										
10	B		5	Vs		5.0	SAND - fine to coarse - trace gravel - trace organics						
	B		6										
	B		7										
	B		8										
15	B		9	N		6.0	SILT - trace of sand & gravel						
	B		10										
20						18.0	GRAVEL - little sand - trace silt - cobbles						
END OF HOLE													
Notes:													
1. Located 300' northeast of H-F products line.													
2. Terrain is flat and open with occasional spruce to 5'.													
3. Drilling mud used from 6' to 18'.													
4. Ice lenses encountered between 5' and 6' are 1/64" thick and spaced at 1/2".													



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 10.5 300' L. of C.L.
HOLE No.	D - 3
DATE	Aug. 28/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		FIELD VANE LAB VANE UNICONE			
DEPTH	TYPE	BLOW No.	No.							PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
		6"							X	0	X		
									10	30	50	70	
												90%	
	B		1	III	Vs		1.0	ORGANIC COVER					
	SPT	29	2	III	Ice			SILT					
	C	39	3	III	VF			- trace sand					
5	B	35	4	III	Vs		4.0	- slightly laminated					
								- grey					
								(Ice lenses 1/16" spaced @ 1/4")					
	B		4	III									
10	B		5	III	N			GRAVEL					
								- little sand					
	B		6	III			12.0	- cobbles					
15								END OF HOLE					
								Notes:					
								1. Located 1500' southeast of D-1, and 300' southwest of H-F products line.					
								2. Terrain is flat, with light spruce growth from 5' to 20'.					
								3. Drilling mud used from 4' to 12'.					
								4. Unable to drill below 12' due to sloughing of gravel.					



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION HP 10.8 200' R. of C.L.
HOLE No. D - 4
DATE Aug. 28/76 PLATE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

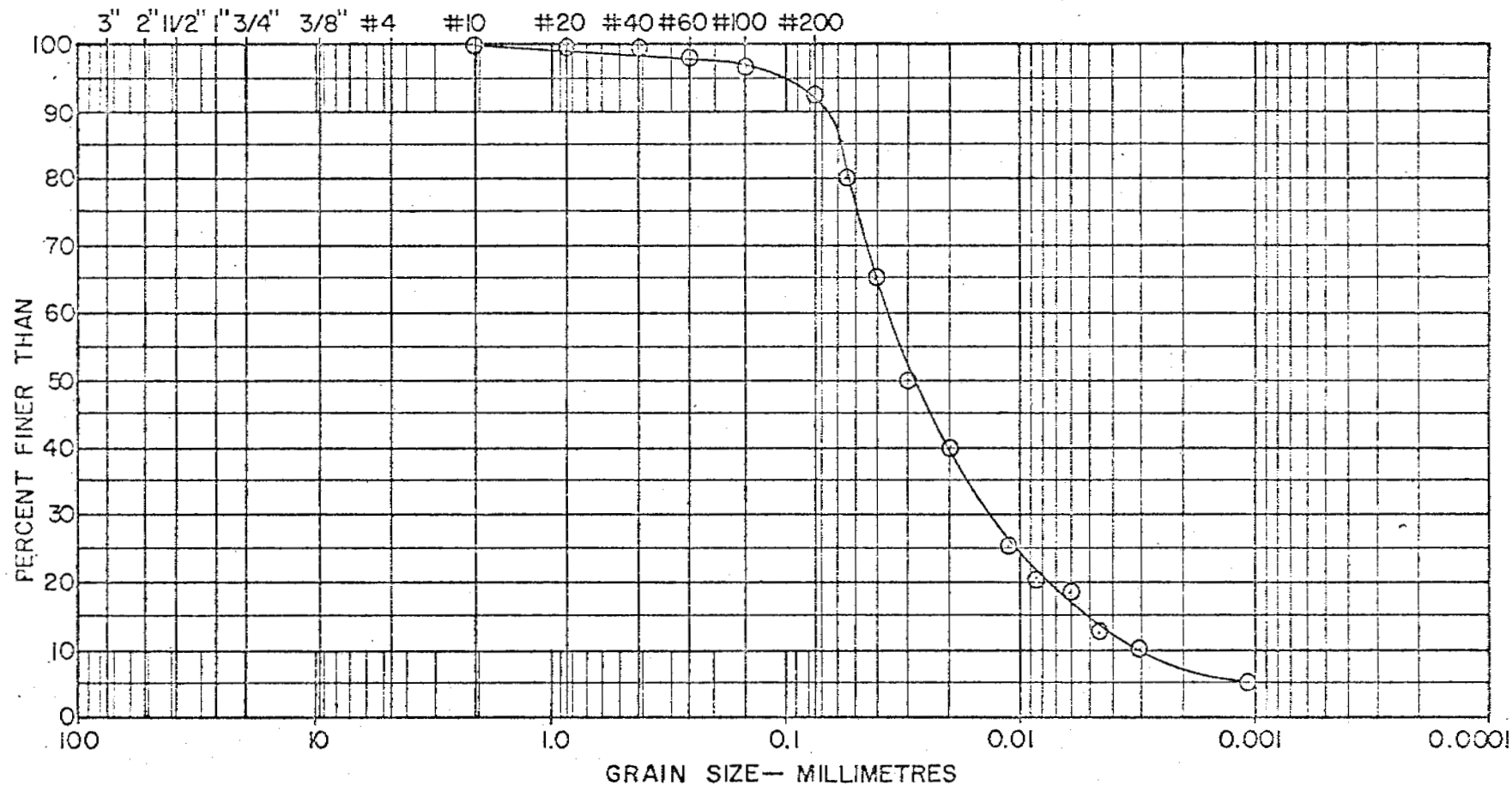
LOCATION

HOLE No. D-4 DEPTH

DATE 18/10/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 3 at 3.5' - 4'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE Δ LAB VANE Δ UNCONF.				
DEPTH	TYPE	BLOW No.								PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
								X-----X	0-----0	X-----X			
								10	30	50	70	90%	
	B	1			NF	6"	Organic cover						
	B	2					GRAVEL						
5	B	3			N		- fine to coarse						
	B	4					- some sand						
	B	5					- trace silt						
10							- cobbles						
						10.0	cobble or bedrock						
15							END OF HOLE						
							Notes:						
							1. Located 1500' southeast of D-3 and 300' northeast of H-F products line.						
							2. Terrain is flat, with moderate spruce growth from 5' to 20'.						
							3. Drilling mud used from 2' to 10'.						
							4. Hole caving in during drilling and terminated on large cobble or bedrock at 10'.						



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	HP 10.8 200' L. of C.L.
HOLE No.	D - 5
DATE	Aug. 29/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8					
SAMPLE DATA					CLASS	DESCRIPTION OF MATERIAL	FIELD VANE LAB VANE CONE							
DEPTH	TYPE	BLOW 6"	No.				PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
						X - - - - - 0 - - - - - X								
						10 30 50 70 90%								
5	B		1	III	NF	1.0	PEAT - moss, organic cover							133
	C		2		Nbe		SILT - organic - trace sand - peat inclusions - grey (Ice lenses 1/32" spaced @ 1/8") (Ice lenses 1/64" spaced @ 1/32")							232
					Vr									133
					Vs									135
														168
														105
			3		Vs								150	
10	C		4											
	C		5		Vs		SILT - coarse - trace sand - laminated - trace organics - grey (Vs ice is 1/64" spaced @ 1/2")							
				Vr										
				Nbe										
			Vs											
15	C		6			14.0								
					N		SAND AND GRAVEL - cobbles							
20						18.0								
							END OF HOLE							

Notes:

1. Located 450' southwest of H-F products line.
2. Terrain slopes gently 1-2% to northeast, with very light spruce growth to 5'.
3. Drilling mud used from 12.5' to 18'.
4. Unable to recover samples below 13' because of loss of circulation.



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 16.6, 700 R. of C.L.
HOLE No. E - 1
DATE Sept. 5/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

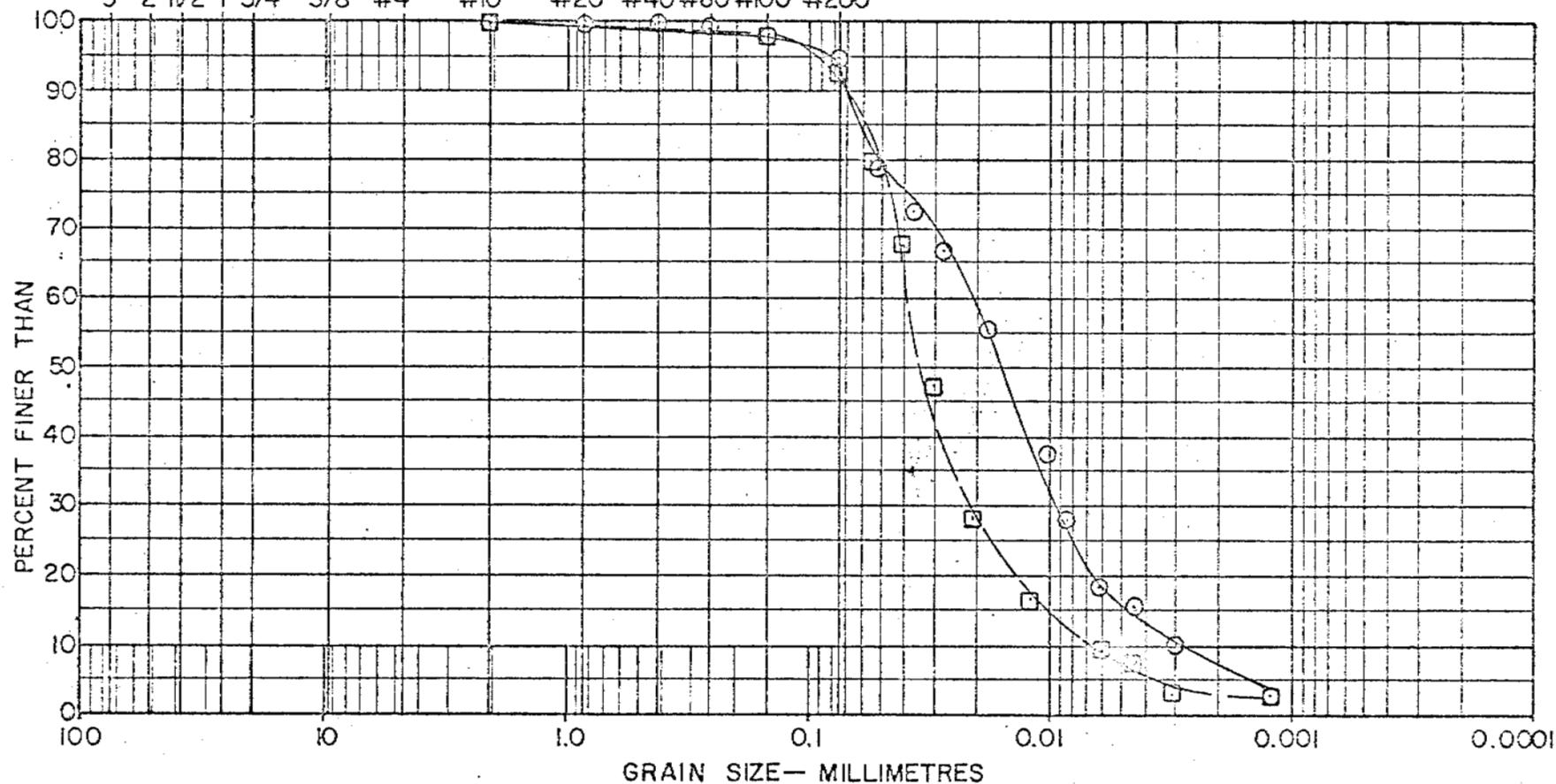
HOLE No. E-1 DEPTH

DATE Sept./76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2 1/2" 1 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: ○—○ Sample 2 at 2' - 3'

□—□ Sample 6 at 10' - 11 1/4'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2	0.6	1.0	1.4	1.8	
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	FIELD VANE		LAB VANE		UNCONF.		
DEPTH	TYPE	BLOW No.	No.					PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT				
		6"						X	0	X	X	X		
								10	30	50	70	90%		
	B		1			NF	PEAT - dark brown							
	B		2											
5	C		3		Vs	SILT - coarse - trace fine sand - organic inclusions - grey (Ice lenses 1/128" spaced @ 1/32")	3.0							
	C		4											
	C		5											
	C		6		Vr									
10	C		6											
					Nbe		10.0							
	B		7		N	GRAVEL - trace sand - trace silt - trace cobbles								
15	B		8											
	B		9											
	SPT	Ref	10				18.0							
20							END OF HOLE							
							Notes:							
							1. Located on H-F products line right-of-way.							
							2. Terrain slopes very gently 1-2% to northeast. Area is poorly drained with free water ponded in depressions							
							3. Drilling mud used from 10' to 18'.							



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JOB No.	AI0709
PROJECT	Alcan Pipeline
LOCATION	HP 16.6 220 R. of C.L.
HOLE No.	E - 2
DATE	Sept. 5/76 PLATE



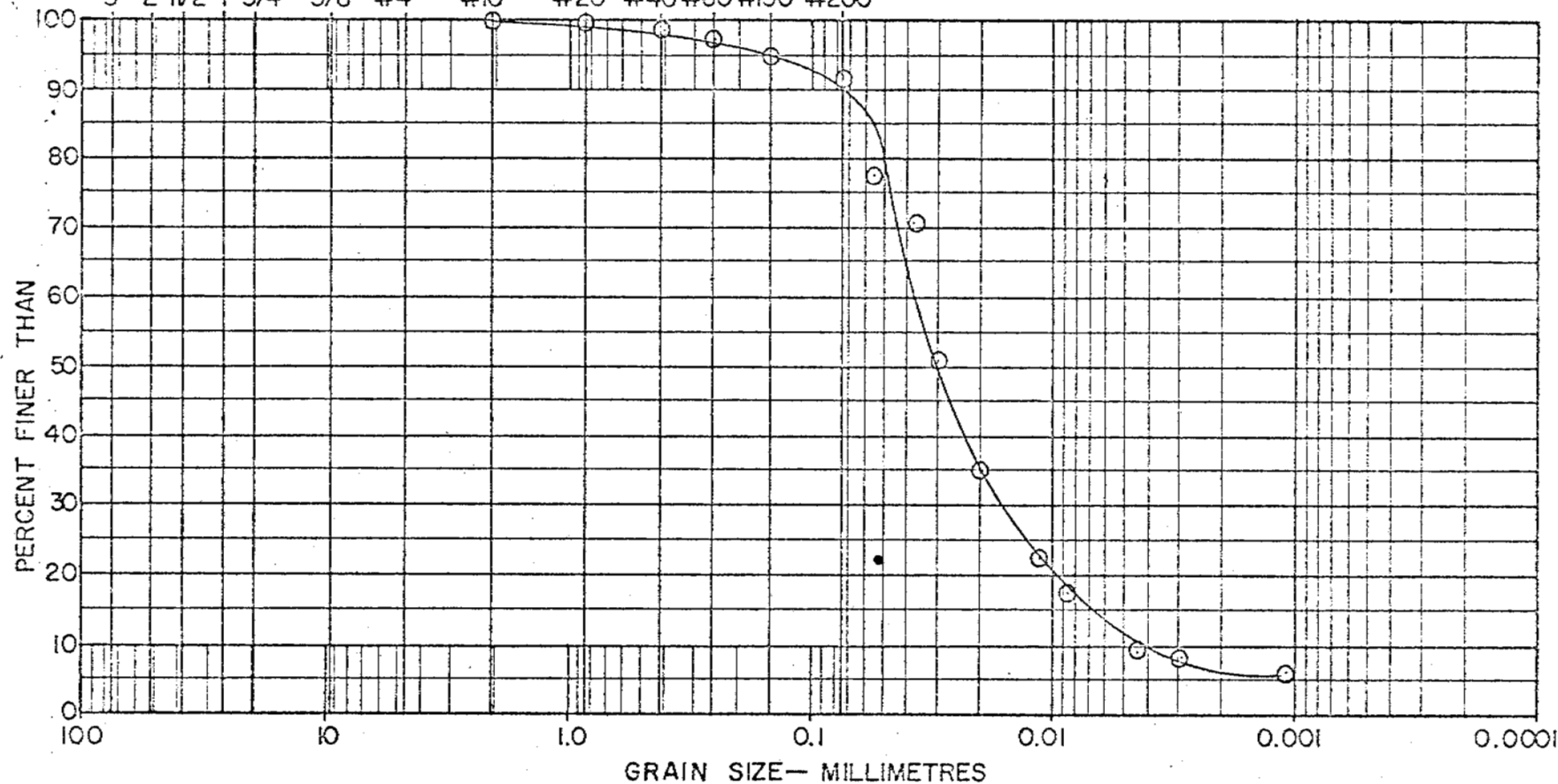
Kohn Leonoff Consultants Ltd.
 CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alean - Pipeline
LOCATION	Site E
HOLE No.	E - 2
DATE	DEPTH

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: ○—○ Sample 5 at 7 1/4'-8'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				LOGS	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCOND.				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%				
DEPTH	TYPE	BLOW No.											
5	B	1	III		NF	1.0	PEAT - moss, organic cover					230	
	C	2		Vs Ice			SILT - trace sand - organic specks - brown					184	
	C	3		Vs		6.0	(Ice lenses 1/4" spaced @ 1/2") (Ice lenses 1/64" spaced @ 1/8")					103	
10	B	4					GRAVEL - little sand - trace silt - trace cobbles						
	B	5			N								
	B	6				12.0							
15						END OF HOLE <u>Notes:</u> 1. Located about 450' east of dried tributary channel of Enger Creek, and about 1000 ft. east of E - 2. 2. Terrain is flat with sparse spruce to 20', and is poorly drained with ponded water in depressions. 3. Drilling mud used from 6' to 12'. 4. Unable to drill below 12' due to sloughing of gravel. 5. Thermistors installed at 1' and 6'. 2, 5, 10'							



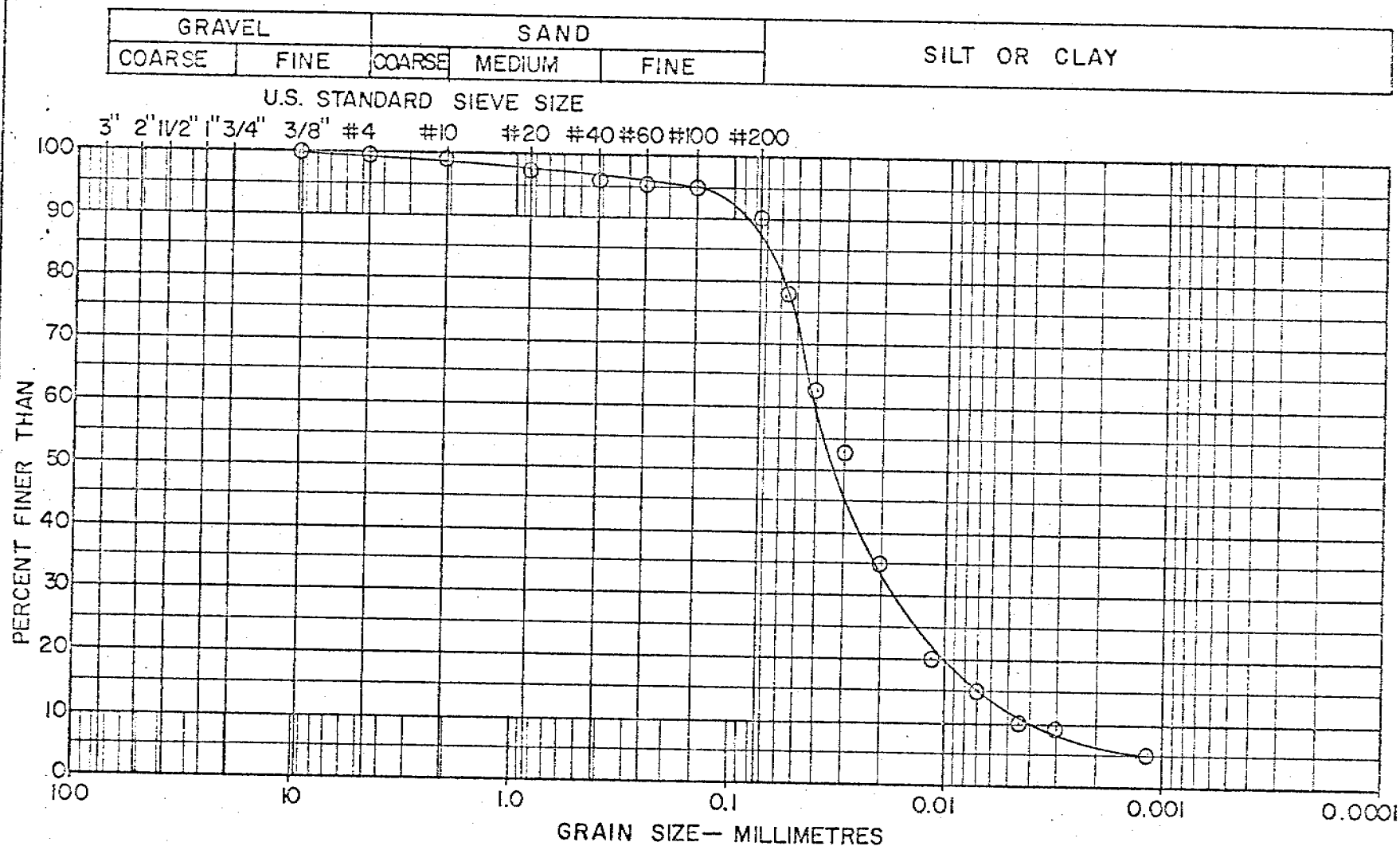
Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 16.6 600' L. of C.L.
HOLE No.	E - 3
DATE	Sept. 5/76 PLATE



Mohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	E-3
DEPTH	
DATE	Oct./76



REMARKS: ○—○ Sample 2 at 3' - 4'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.							
HT. DROP 30 ins.							ELEVATION		FIELD VANE Δ LAB VANE Δ UNCONF							
SAMPLE DATA					N.R.C.	N.F.			PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
DEPTH	TYPE	BLOW No.		CLASS	or F.	DESCRIPTION OF MATERIAL			X	0	X	10	30	50	70	90%
5	B		1		NF	PEAT & ORGANIC SILT										210
	B		2			- layered										158
	C		3	Vs		- wood specks										177
				Vr		- dark brown										150
	C		4	Vx		(Ice lenses 1/32" spaced @ 1/4")										130
10	C		5	Vs		(Ice lenses 1/16" spaced @ 1/2")										150
				Vx												129
				Vr												181
	C		6	Nbe		(Ice lenses 1/128" spaced @ 1/32")										118
				Vs												205
15				Vr		(Ice lenses 1/128" spaced @ 1/32")										238
	C		7	Nbe												122
																135
	C		8	Vs		(Ice lenses 1/32" spaced @ 1/8")										140
																143
20	C		9			(Ice lenses 1/32" spaced @ 1/8")										146
																157
	C		10													232
																228
																191
25																232
																228
																166
30	SPT	25 39 >50	11			29.0										
	B		12	N		GRAVEL AND SAND - trace silt										
35	B		13													
	B		14			35.0										
40						END OF HOLE										



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JOB No. AL0709
PROJECT Alcar Pipeline
LOCATION MP 24.9 150' L. of C.I.
HOLE No. F - 1
DATE Sept. 29/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE CONE				
SAMPLE DATA					N.R.C.	N.F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW No.	No.	CLASS	or F.	X-----X			0		X		
						Notes: 1. Located 200' northeast of H-F products line. 2. Terrain is rolling and slopes 5% to the southwest. Moderate spruce growth to 30'. 3. Drilling mud used from 18.5' to 35'. 4. Thermistors installed at 2', 5' and 10'.		10	30	50	70	90%	



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 CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 24.9 150' L. of C.L.
HOLE No.	F - 1
DATE	Sept. 29/76 PLATE

TEST HOLE LOG														
HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW 6"	No.											
5	B		1	III	NF		PEAT						317	
	B		2				3.0	- dark brown						265
	B		3			N	3.5	BEDROCK OR BOULDER?						
							END OF HOLE							
							Notes:							
							1. Located on H-F products line right-of-way.							
							2. Terrain slopes 5% to the south-west. Up to 4" of water is ponded in depressions at the site.							
							3. Drilled with tricone rock bit and drilling mud from 3.0' to 3.5' for 1 hr. duration.							

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.

AL0709

PROJECT

Alcan Pipeline

LOCATION

MP 24.9 250' R. of C.L.

HOLE No.

F - 2

DATE

Sept. 6/76

PLAYE

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CIVIL & GEOTECHNICAL ENGINEERS

TEST HOLE LOG

HAMMER WT. 140 lbs				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins					N.R.C. CLASS	N.F. or F.	ELEVATION		FIELD VANE Δ LAB VANE ∇ TUNCON $\square$				
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW No.	No.										
5	B	20 26 25	1				1.0	MOSS - organic cover					
	B		2										
	B		3										
	B		4										
	SPT		5		Nbn		6.5	(Ice lenses 1/16" spaced @ 1/4")					
					Vs								
					Nbe								
10	B		6					SAND AND GRAVEL					
								- trace silt					
								- cobbles					
	B		7										
15													
								15.0	boulder or bedrock				
END OF HOLE													
Notes:													
1. Located 300' southwest of F-2, and H-F products line.													
2. Terrain slopes 8% to the south-west, with moderate spruce growth to 30'.													
3. Drilling mud used from 5' to 15'.													
4. Refusal to drilling on boulder or bedrock at 15'.													



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION HP 24.9 520' R. of C.L.
HOLE No. F - 3
DATE Sept. 6/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

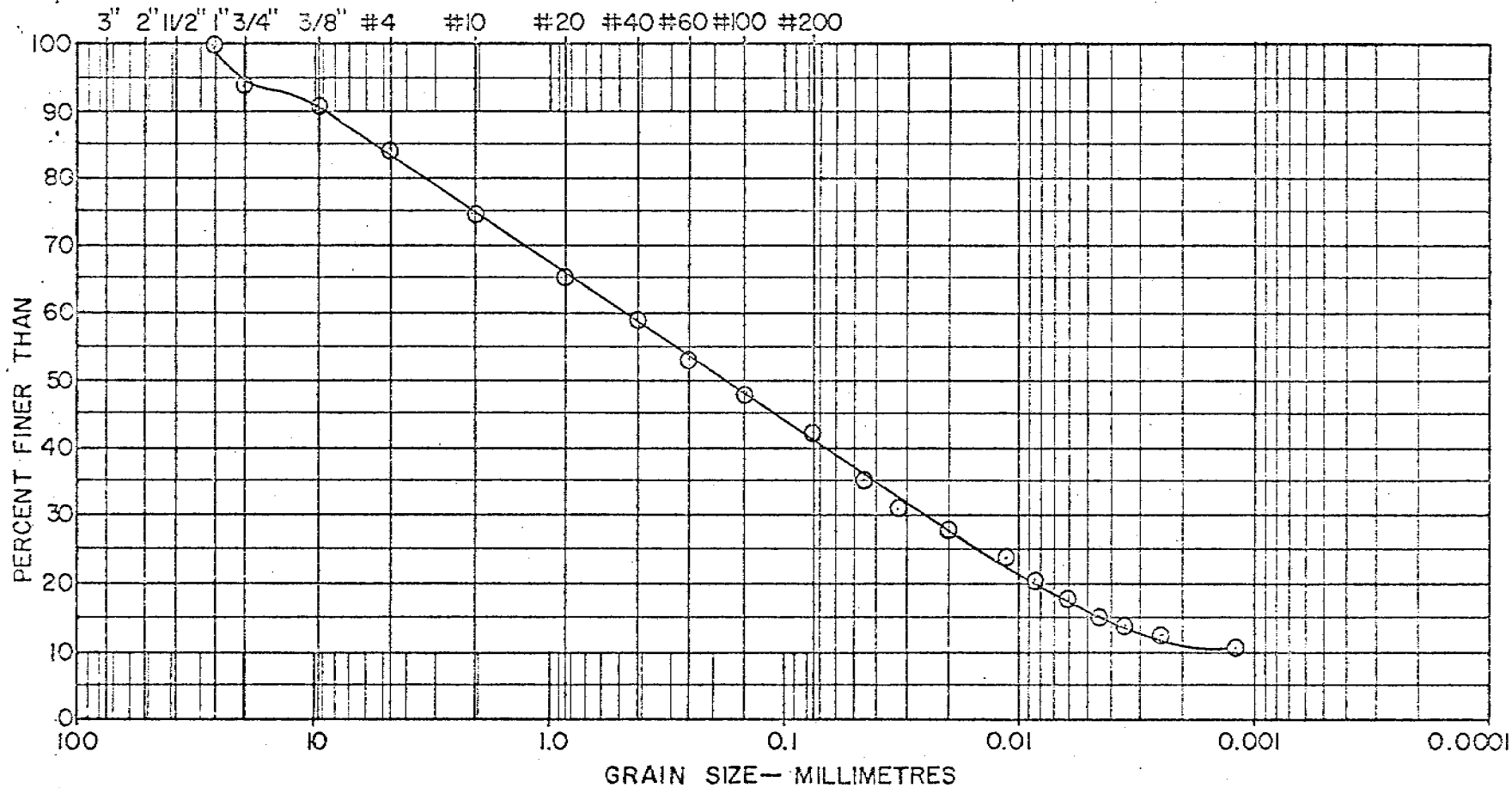
LOCATION

DEPTH

DATE Sept./76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 3 at 2' - 3'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							DESCRIPTION OF MATERIAL		FIELD VANE Δ LAB VANE □ UNCONF.				
DEPTH	TYPE	FLOW 6"	No.	CLASS					PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
									X	0	X		
									10	30	50	70	
												90%	
5	B		1		NF	PEAT & ORGANIC SILT - dark brown ← (Ice lenses 1/64" spaced @ 1/8")						521	
	C		2	Vr	← (Ice lenses 1/32" spaced @ 1/4") ← (Ice lenses 1/16" spaced @ 3/4") 8.75							499	
	C		3	Vx								511	
			4	Vr								108	
			5	Vx								309	
10	C		6	Vr		SAND AND GRAVEL - trace cobbles						339	
	B		7	N							236		
15	B				15.0 ↙ boulder						228		
	B										242		
						END OF HOLE						333	
						Notes:						281	
						1. Located in N-S trending valley about 0.5 miles east of Alaska Hwy.						202	
						2. Terrain slopes 3% to the north. Area is open with sparse spruce to 10'. Water is ponded between large peat tussocks.						172	
						3. Drilling mud used from 9' to 15'.							
						4. Refusal to drilling on boulder at 15'.							



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 32.7 900' L. of C.L.
HOLE No.	G - 1
DATE	Sept. 7/76
PLATE	

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE Δ LAB VANE TUNICONE				
DEPTH	TYPE	BLOW No.	No.								PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT
									X	0	X		
									10	30	50	70	90%
5	B		1		NF	PEAT & ORGANIC SILT - wood specks - silt laminations - dark brown (occasional ice lenses 1/32")						186	
	C		2	Nbe Vr									786
													297
												439	
												473	
												278	
10	C		3	Nbe Vx	(Ice crystal 1/4" spaced @ 3/4")							269	
												290	
												256	
												123	
												172	
												240	
15	C		5	Nbe Vr Vx	(Ice lenses 1/16" spaced @ 3/4")							172	
												188	
20	B		7	N	GRAVEL - some sand - trace silt - cobbles								
	B		8										
	B		9										
25						21.0							
END OF HOLE													
Notes:													
1. Located in N-S trending valley about 0.5 miles east of Alaska Hwy.													
2. Terrain slopes 3% to the north. Area is open with sparse spruce to 10'. Water is ponded between large peat tussocks.													
3. Drilling mud used from 13.5' to 21'.													
4. Thermistors installed at 2', 5' and 10'.													



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 32.7 880' L. of U.L.
HOLE No. G - 2
DATE Sept. 7/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
DEPTH	TYPE	BLOW No.	No.	CLASS		X			0	X			
5	B	>50	1			NF	1.0	MOSS - organic cover					
	B		2	N				GRAVEL - fine - some sand - little silt and clay - grey					
	SPT		3										
	B		4										
	B		5										
10							8.0	bedrock					
								END OF HOLE					
								Notes:					
								1. Located on ridge west of site G-1 and G-2.					
								2. Terrain slopes 17% to the northeast. Dense spruce to 30'.					
								3. Drilling mud used from 2' to 8'.					



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION HP 32.8 620' L. of C.L.
HOLE No. G - 3
DATE Sept. 8/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.										
HT. DROP 30 ins					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.										
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT						
DEPTH	TYPE	BLOW 6"	No.																
5	B		1	NF	10.0	GRAVEL AND SAND - some silt - brown	10	30	50	70	90%								
	B		2																
	B		3																
	B		4																
	B		5																
10	B		6																
	B		7																
	B		8																
	B		9																
	B		10																
15	B		11																
	B		12																
	B		13																
20	B		14																
	B		15																
25																			
END OF HOLE																			
Notes:																			
1. Located on H-F products line right-of-way.																			
2. Terrain slopes gently north. Gravel & sand are exposed along products line which is overgrown with poplar, birch, alder and buckbrush to 10'. Tree cover adjacent to products line is dense spruce to 40'.																			
3. Hole dry augered from 0' to 10'. Drilling mud used from 10' to 22'.																			
4. No permafrost encountered.																			



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 32.7 160' R. of C.L.
HOLE No. G - 4
DATE Sept. 7/76 PLATE

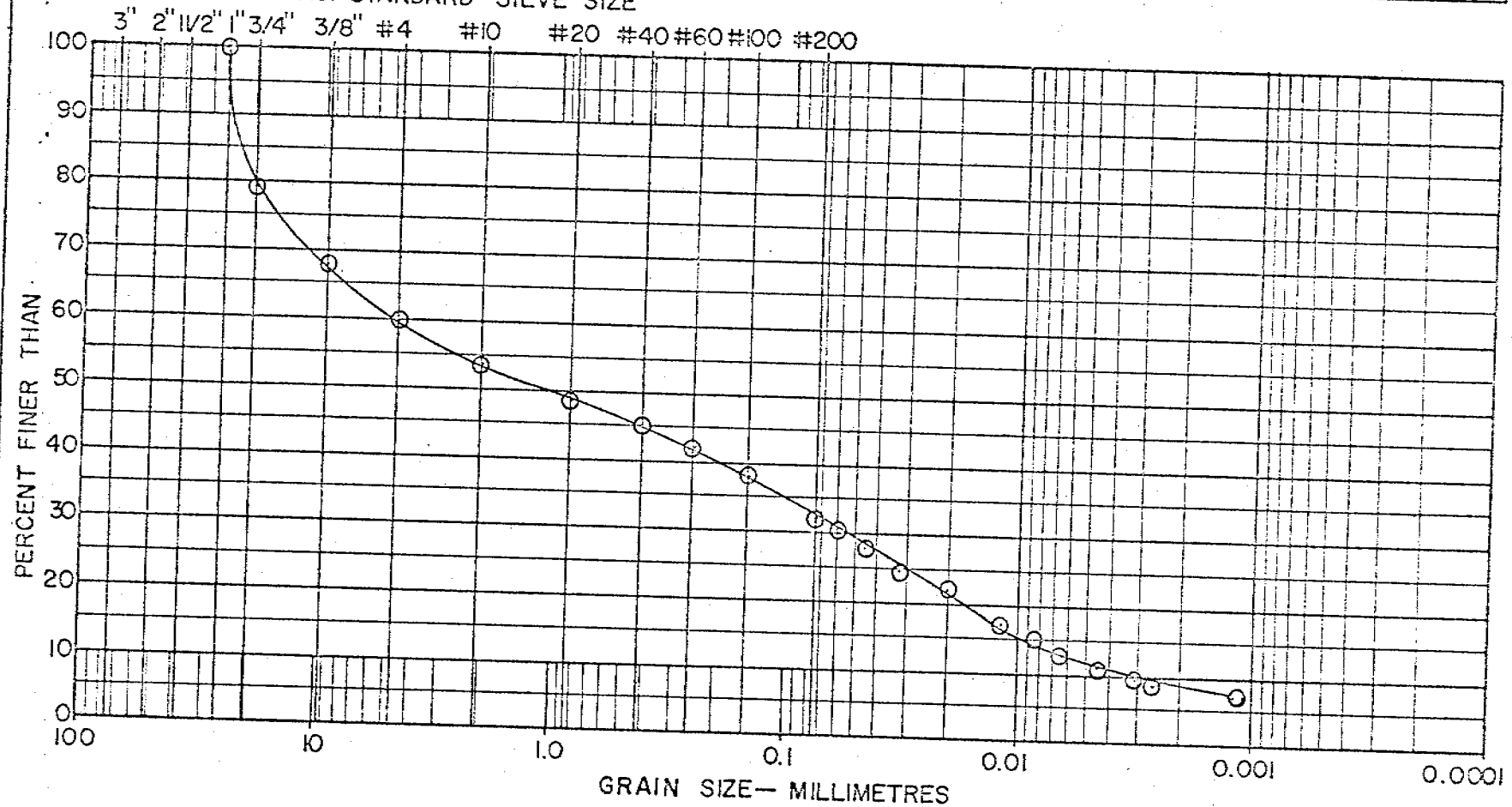


John Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	G-4
DATE	Sept./76
DEPTH	

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○ — ○ Sample 3 & 4 at 2' - 3' / 4' - 5'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOLS	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.						
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8						
SAMPLE DATA					NR.C. N.F. or F.		DESCRIPTION OF MATERIAL		FIELD VANE		LAB VANE		UNCORR.		
DEPTH	TYPE	BLOW No.			CLASS				PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT				
5	B	44 >60	1	[Symbol]		NF	0.5	MOSS - organic cover						159	
	B		2				SAND AND SILT - trace fine gravel - peat inclusions								
	C		3										Vr		
			4										Nbe		
10	SPT		5	[Symbol]	N			4.0	GRAVEL AND SAND - trace silt - brown						
	B		6												
	B		7												
	B		8												
	B		9												
	B		10												
15	B		11												
	B														
20							18.0	END OF HOLE							

Notes:

1. Located 300' east of H-F products line, about 1700 north of a tributary of Sanpete Creek
2. Terrain slopes 4% to the south. Light spruce averaging 10' to 15'.
3. Drilling mud used from 4' to 18'.
4. Hole terminated at 18' due to continuous sloughing of gravel.



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 37.2 150' L. of C.L.
HOLE No.	H - 1
DATE	Sept. 8/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.						
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE CONE						
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT		
DEPTH	TYPE	BLOW 6"	No					X	0	X	X	0	X	
								10	30	50	70	90%		
5	B		1		NF	PEAT - dark brown (Ice lenses 1/16" spaced @ 1/2")						148		
	B		2											203
	B		3											127
	C		4				Nbe							254
	C		5				Vr							192
10												315		
	C		6	Nbe		(Ice lenses 1/32" spaced @ 1/4") (One ice lense of 3" at 7') 9.0						312		
			7	Vr								376		
	C											371		
	C		8									266		
B		9	N								274			
15	B		10			GRAVEL AND SAND - trace silt and clay - trace cobbles						338		
	B					14.0								
END OF HOLE														
Notes: 1. Located on H-F products line right-of-way. 2. Terrain is rolling & hummocky. Site slopes 5% northerly, and free water is ponded in depressions. Vegetation on products line is mostly grass. 3. Drilling mud used from 9.5' to 14'. Completion loss of circulation at 13'. 4. One-half hour after completion of drilling, artesian water began flowing from hole. Hole was sealed with cement and calcium chloride.														



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 CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 38.0 150' R. of C.L.
HOLE No.	H - 2
DATE	Sept. 9/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		FIELD VANE LAB VANE UNCONF.			
DEPTH	TYPE	BLOW 6"	No.							PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
								X-----0-----X					
								10 30 50 70 90%					
5	B	>20	1			NF	0.5	MOSS - organic cover					
	B		2										
	B		3	Nbe									
	B		4	Nbe			3.5	GRAVEL & SILT AND CLAY - little sand - grey					
	C		5	Vr			5.0	PEAT AND SILT - some sand (Ice lenses 1/64" spaced @ 1/8")					
10	B		6										
	SPT		7										
			8										
	B		9										
	B		10										
15	B		11										
	B		12										
20													
25							22.0						
								END OF HOLE					
								Notes:					
								1. Located 100' east of H-F products line.					
								2. Terrain is gently rolling and slopes 12% northerly at H-4. Light spruce 10' to 15'.					
								3. Drilling mud used from 5' to 22'.					



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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 38.1 160' L. of C.L.
HOLE No.	H - 4
DATE	Sept. 10/76 LATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.								
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION	FIELD VANE Δ LAB VANE ∇ CONE								
SAMPLE DATA							DESCRIPTION OF MATERIAL	PLASTIC LIMIT X-----X	WATER CONTENT 0-----0	LIQUID LIMIT X-----X						
DEPTH	TYPE	BLOW No.									10	30	50	70	90%	
5	B		1	NF												
	B		2													
	C		3		Vr	3.5	PEAT & ORGANIC SILT - some sand in lenses - wood specks, layered - greyish brown									
	C		4		Vs	6.0	SAND - some silt - organic inclusions									
10	C		5		Vs	8.0	PEAT & ORGANIC SILT (Ice lenses 1/6" spaced @ 1/8")									
	C		6		Vs											
	C		7		Nbe		SAND - fine to coarse - little silt - trace fine gravel - slightly stratified - peat inclusions - grey									
15	C		8		Vs											
	C		9		Vr											
	C		10		Nbe		PEAT - silt & clay laminations									
20	SPT	>50	11		Nbn	16.0	SILT & CLAY - organic inclusions									
	B		12				GRAVEL - fine - some sand - trace silt - brown									
	B		13													
	B		14													
	B		15													
25																
	B															
30																

END OF HOLE

Notes:

1. Located about 1 mile west of Alaska Hwy. MP 1172.5, on the lower slopes of Miles Ridge.
2. Terrain slopes 5-6% easterly. Very light spruce 5' to 10'.
3. Drilling mud used from 18.5' to 27'.
4. Refusal to drilling on boulder or bedrock at 27'.



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 41.5 400' R. of C.L.
HOLE No. 1 - 1
DATE Sept. 10/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan - Pipeline

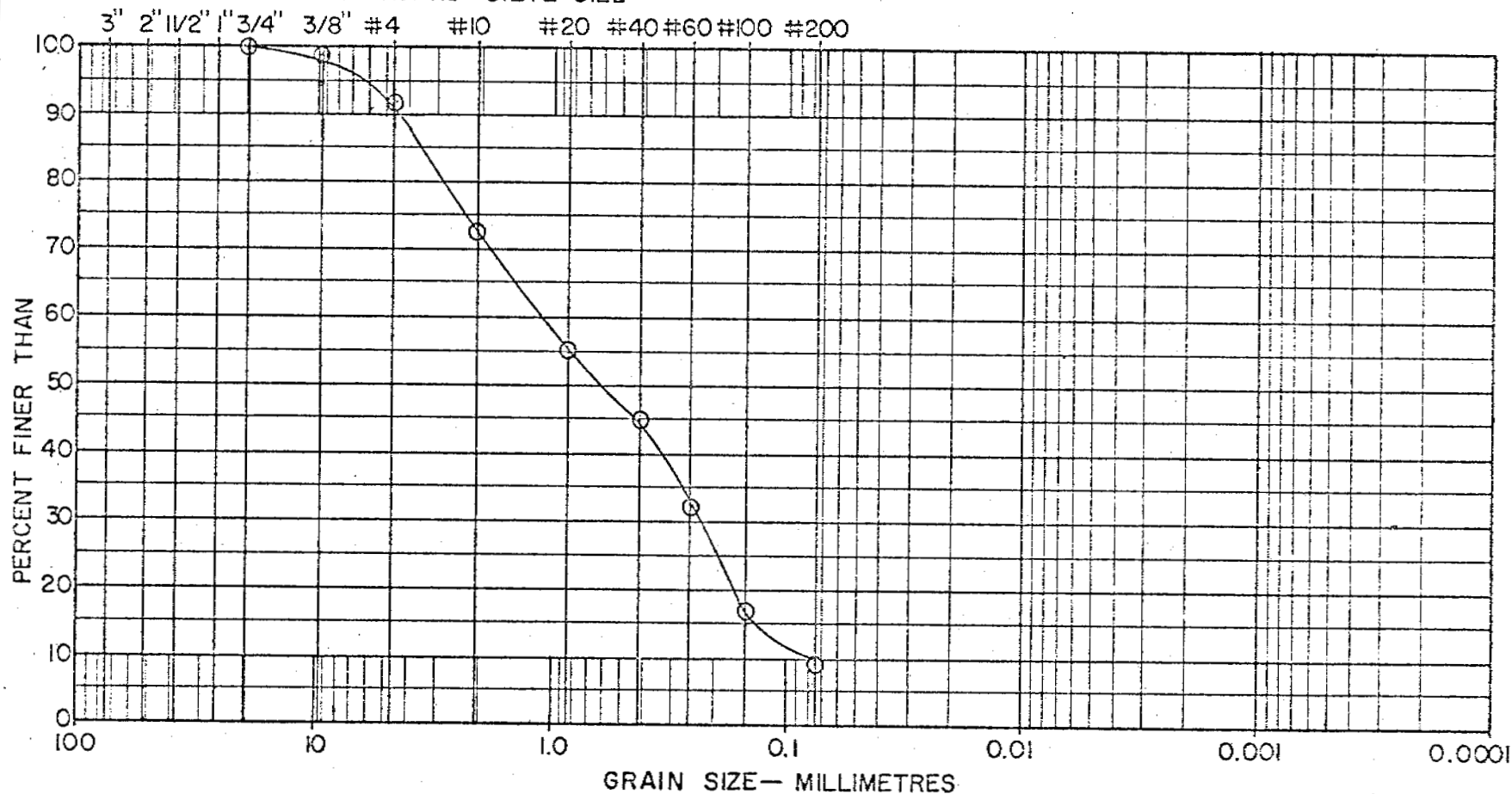
LOCATION Site 1

HOLE No. 1 - 1 DEPTH

DATE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 8 at 13'-14'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA									FIELD VANE LAB VANE CONE				
DEPTH	TYPE	BLOW 6"	No.			DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT					
								X	0	X			
								10	30	50	70	90%	
	B		1	TT			PEAT					171	
	B		2			2.0	- moss, organic cover - pockets of silt					119	
	B		3										
5	B		4		NF	4.0	SILT AND SAND - organic specks						
	SPT	2 3 4	5			5.0	SAND - some gravel - little silt						
	B		6										
10	B		7				SILT AND CLAY - some sand in lenses - trace gravel in layers - low plastic, brown						
	SPT	19 13 25	8			10.0							
						11.5	GRAVEL - fine - little sand						
15													
							END OF HOLE						

Notes:

1. Located 300' east of 1-1 on H-F products line right-of-way.
2. Terrain slopes 5-6% easterly. Area is poorly drained with free water ponded in depressions between peat tussocks.
3. Drilling mud used from 10' to 11.5'.
4. Test hole terminated at 11.5' when artesian water began flowing at 2 to 5 g.p.m. Hole was sealed with cement and calcium chloride.
5. Thermistors installed at 2', 5' and 10'.



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. A10709
PROJECT Alcan Pipeline
LOCATION MP 41.5 160' R. of C.L.
HOLE No. 1 - 2
DATE Sept. 10/76 PLATE



John Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

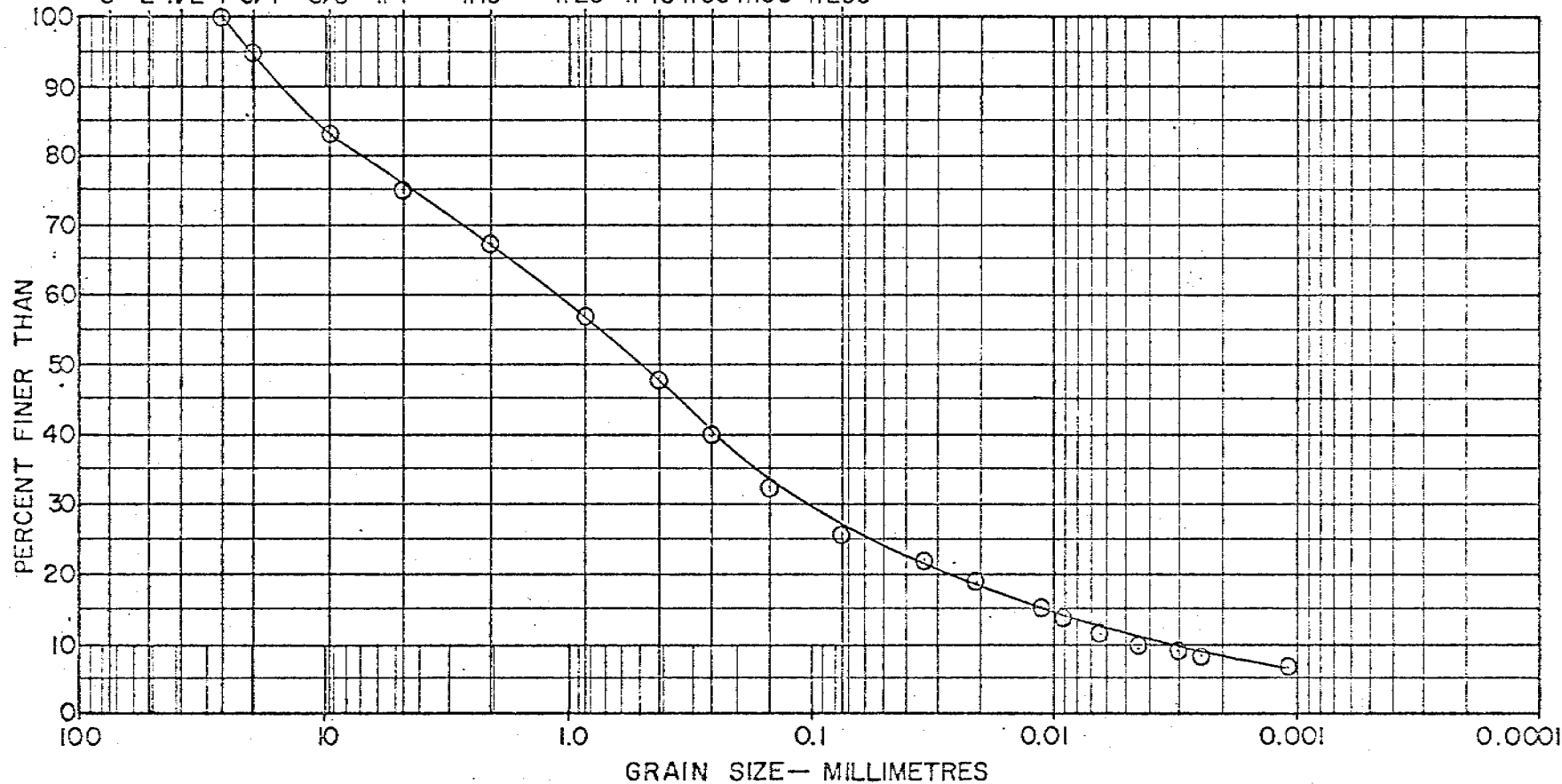
HOLE No. 1-2 DEPTH

DATE Sept./76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: ○—○ Sample 4 at 4' - 5'

TEST HOLE LOG

HAMMER WT. 140 lbs				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					ELEVATION				0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA									FIELD VANE LAB VANE TUNGONE				
DEPTH	TYPE	BLOW 6"	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT X	WATER CONTENT 0	LIQUID LIMIT X		
								10	30	50	70	90%	
5	B		1		NF	1.0	MOSS - organic cover					185	
	B		2			SILT						293	
	C		3	Vr		- organic						147	
			Vs	- stratified with peat							151		
			Nbe	- sand lenses							304		
C	4		Vx	(Ice lenses 1/16" spaced @ 3/4")							228		
	Vs		PEAT & ORGANIC SILT								300		
C	5			- little sand in lenses							228		
				- layered							180		
10	C		6	Vx		(Ice lenses 1/8" spaced @ 3/4")						206	
15	C			Vs		(Ice lenses 1/32" spaced @ 1/8")							273
		7								215			
										263			
		8	Vs	(Ice lenses 1/64" spaced @ 1/16")						125			
		Vr								257			
20	C	9									147		
											196		
		10	Vr	(Ice lenses 1/32" spaced @ 1/4")						322			
		Vs								259			
											171		
25	C		Vs	(Ice lenses 1/8" spaced @ 1/2")									
		Vr											
30	SPT	50	12			26.0	CLAY AND SILT					166	
		59		Vs	- trace sand								
35	SPT	56		Vr	- laminated								
		41		30.0	- grey								
40		76	13			(Ice lenses 1/64" spaced @ 1/8")							
		78			SAND								
							- fine to coarse						
							- some silt and clay						
							- laminated						
							- grey						
							clay and silt layer						



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION HP 43.0 900' L. of C.L.
HOLE No. J - 1
DATE Sept. 11/76 PLATE

[illegible]

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 43.0 900' E. of C.L.
HOLE No.	J - 1
DATE	Sept. 11/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.							
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8							
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
DEPTH	TYPE	BLOW No.						X	0	X					
								10	30	50	70	90%			
5	B	1		Nbe	NF	PEAT - lenses of sand and organic silt - wood specks - black						156			
	B	2													291
	B	3													269
	C	4													261
	C	5													560
	C	6													389
10	SPT	7		Vs Vr Nbe	8.5	(Ice lenses 1/8" spaced @ 1") GRAVEL - some sand - trace silt - clay seams - well graded						236			
	B	8													200
	B	9													137
	B	10													108
	B	11													
	B	12													
15	B	13		N	23.0	GRAVEL AND SAND - trace silt - trace cobbles & boulders (fine gravel and till)									
	B	14													
	B	15													
	B	16													
	B	17													
	B	18													
20	B	19			32.0	END OF HOLE									
	B	20													
	B	21													
	B	22													
	B	23													
	B	24													
25	B	25													
	B	26													
	B	27													
	B	28													
	B	29													
	B	30													
30	B	31													
	B	32													
	B	33													
	B	34													
	B	35													
	B	36													
35	B	37													
	B	38													
	B	39													
	B	40													
	B	41													
	B	42													

Notes:

1. Located 300' from crest of west bank of the White River.
2. The upland area is well drained and vegetated with dense spruce to 40' & alder & deciduous bushes to 10'.



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 43.2 950' L. of C.L.
HOLE No. J - 2
DATE Sept. 11/76 PLATE

[illegible]

Klohn Leonoff Consultants Ltd.
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TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.																
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE CONE																
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL			PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT											
DEPTH	TYPE	BLOW 6"	No.		CLASS					X-----0-----X		10 30 50 70 90%													
5	B	24 33 31	1	(Symbol: Circle with dots)		NF	GRAVEL - trace sand - trace cobbles - fine, gap-graded - grey	12.0 SAND - medium to coarse - trace gravel - grey	(Symbol: Circle with dot) (Symbol: Circle with dot) (Symbol: Circle with dot) (Symbol: Circle with dot) (Symbol: Circle with dot) (Symbol: Circle with dot) (Symbol: Circle with dot)																
	B		2																						
	B		3																						
10	B		4																						
	SPT		5																						
			6																						
15	B		7																						
END OF HOLE																									
Notes:																									
1. Located on active flood plain of the White River. 2. Terrain is flat and open. Gravel and sand is exposed on the ground surface. 3. Drilling mud used from 3' to 15'. 4. Hole terminated at 15' due to severe sloughing of gravel and loss of circulation.																									



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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 43.8 1600' L. of C.L.
HOLE No.	J - 4
DATE	Sept. 13/76 PLATE

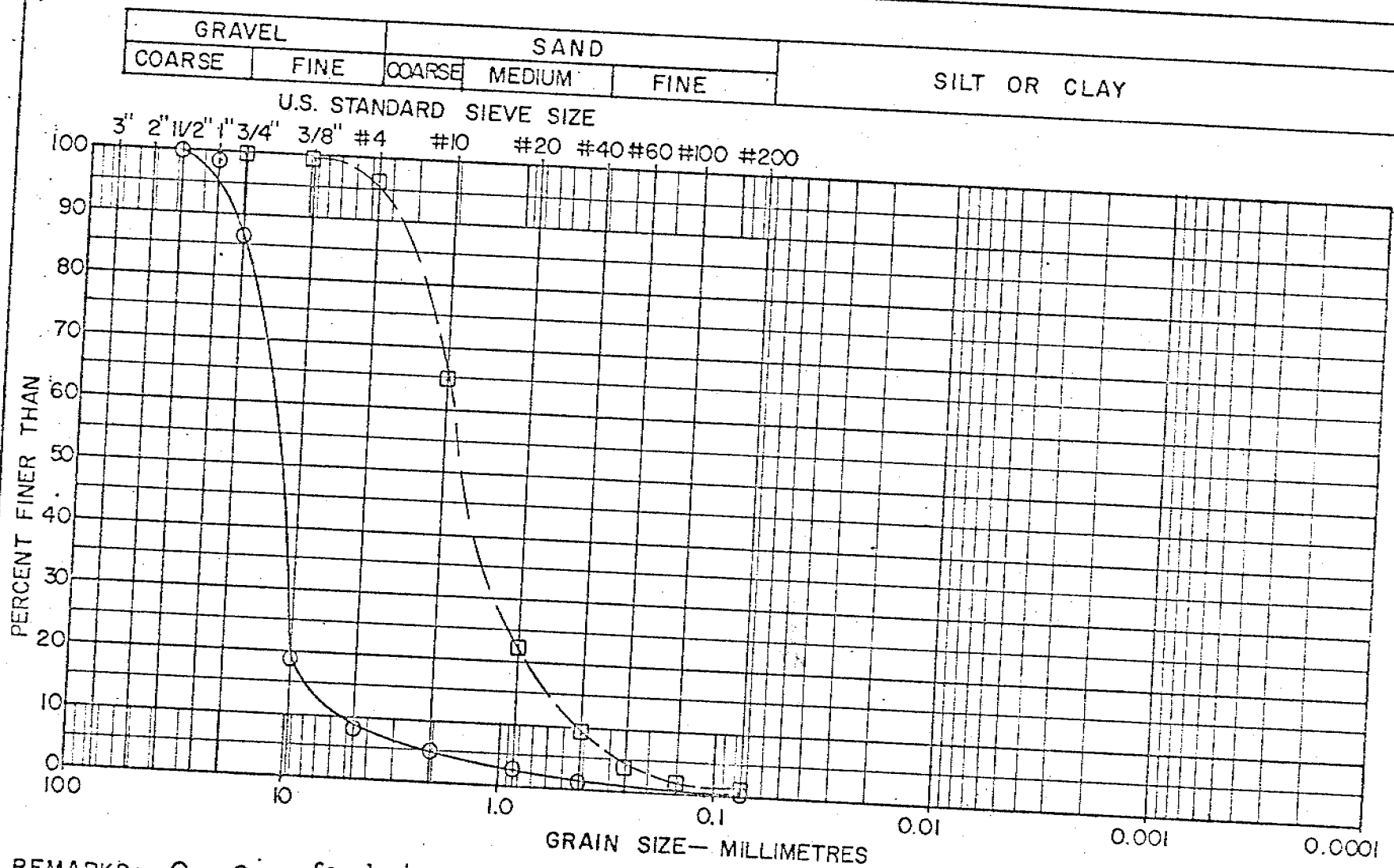
A10700

Alcan 01-11-11

Index

4 DEPTH

6



REMARKS:  Sample 4 at 5' - 6'

 Sample 7 at 12' - 15'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA					N.R.C.	N.F. or F.			PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X					
DEPTH	TYPE	BLOW 6"	No.		CLASS		DESCRIPTION OF MATERIAL		10 30 50 70 90%					
5	B	37 51	1			PEAT & ORGANIC SILT							309	
	B		2		NF	- roots & wood specks						179		
	C		3		Vs	- layers of organic silt & fine sand						108		
					Vr	- greyish brown						180		
10	C		4		Nbe	← (Ice lenses 1/32" spaced @ 3/8")							205	
													224	
	C		5		Vs								307	
	C		6		Nbe	← (Ice lenses 1/64" spaced @ 1/2")							293	
15					Vr	← (Ice lenses 1/16" spaced @ 1/2")								
	C		7		Vx	12.0							108	
												123		
	C	8		Nbe	15.0	SAND						216		
20	SPT	9				- medium								
						- trace silt, grey								
						Gravel								
	B	10		Vs	SILT AND SAND									
25				Nbe	- organic inclusions									
					← (Ice lenses 1/128" spaced @ 1/32")									
					19.0									
					20.0	GRAVEL								
					21.0	BEDROCK								
						END OF HOLE								
						Notes:								
						1. Located on the gently sloping terrain of the Koidern River valley.								
						2. Terrain is vegetated with grass, peat tussocks, and sparse spruce to 10'. Drainage is poor with ponded water in depressions.								
						3. Drilling mud used from 15' to 21'.								
						4. Thermistors installed at 2', 5' and 10'.								

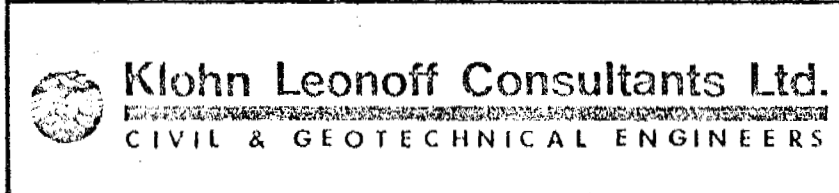


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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 48.1 300' R. of C.L.
HOLE No. K - 1
DATE Sept. 14/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.			
HT. DROP 30 ins.						ELEVATION		0.2 0.6 1.0 1.4 1.8			
SAMPLE DATA				N.R.C. N.F.		DESCRIPTION OF MATERIAL		FIELD VANE LAB VANE UNCONF.			
DEPTH TYPE BLOW No.				CLASS or F.				PLASTIC LIMIT WATER CONTENT LIQUID LIMIT			
								X 0 X			
								10 30 50 70 90%			
5	B	1	1	NF		MOSS - organic cover		169			
	B					2.0	COBBLES, ROCK DEBRIS				
	B					3.0					
	B	3				BEDROCK					
						6.0					
10						END OF HOLE					
						Notes:					
						1. Located on high level terrain.					
						2. Terrain slopes about 10% north and 8% east. Dense spruce growth to 40'.					
						3. Drilling mud used from 2' to 6'.					



JOB No.	AI0709
PROJECT	Alcan Pipeline
LOCATION	MP 50.3 1400' R. of C.L.
HOLE No.	K - 3
DATE	Sept. 14/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.						
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8						
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE LAB VANE UNCONF						
DEPTH	TYPE	BLOW No.	No.							PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT			
								X	0	X					
								10	30	50	70	90%			
5	B		1		NF	PEAT - wood fibres								270	
	B		2												166
	C		3				Nbe								143
	C		4				Vs Vr Nbe								225
10	C		5		Ice	ICE - medium hard - porous								278	
	C		6												202
	C		7												
	C		8												
15	SPT	45 >100	9		Nbe	SILT - some sand, little gravel - non plastic	14.25								
	B		10				16.0								
20						GRAVEL AND SAND - little silt and clay	18.5								
END OF HOLE															
Notes:															
1. Located in valley of Ruby Ranges, adjacent to a small water course that flows into Long's Creek.															
2. Terrain slopes gently 5% easterly. Light spruce 10' to 25'. Area is poorly drained with water often ponded between peat tussocks.															
3. Drilling mud used from 15' to 18 1/2'.															
4. Loss of circulation from 16' to 18 1/2'. Soil possibly not frozen in this zone.															



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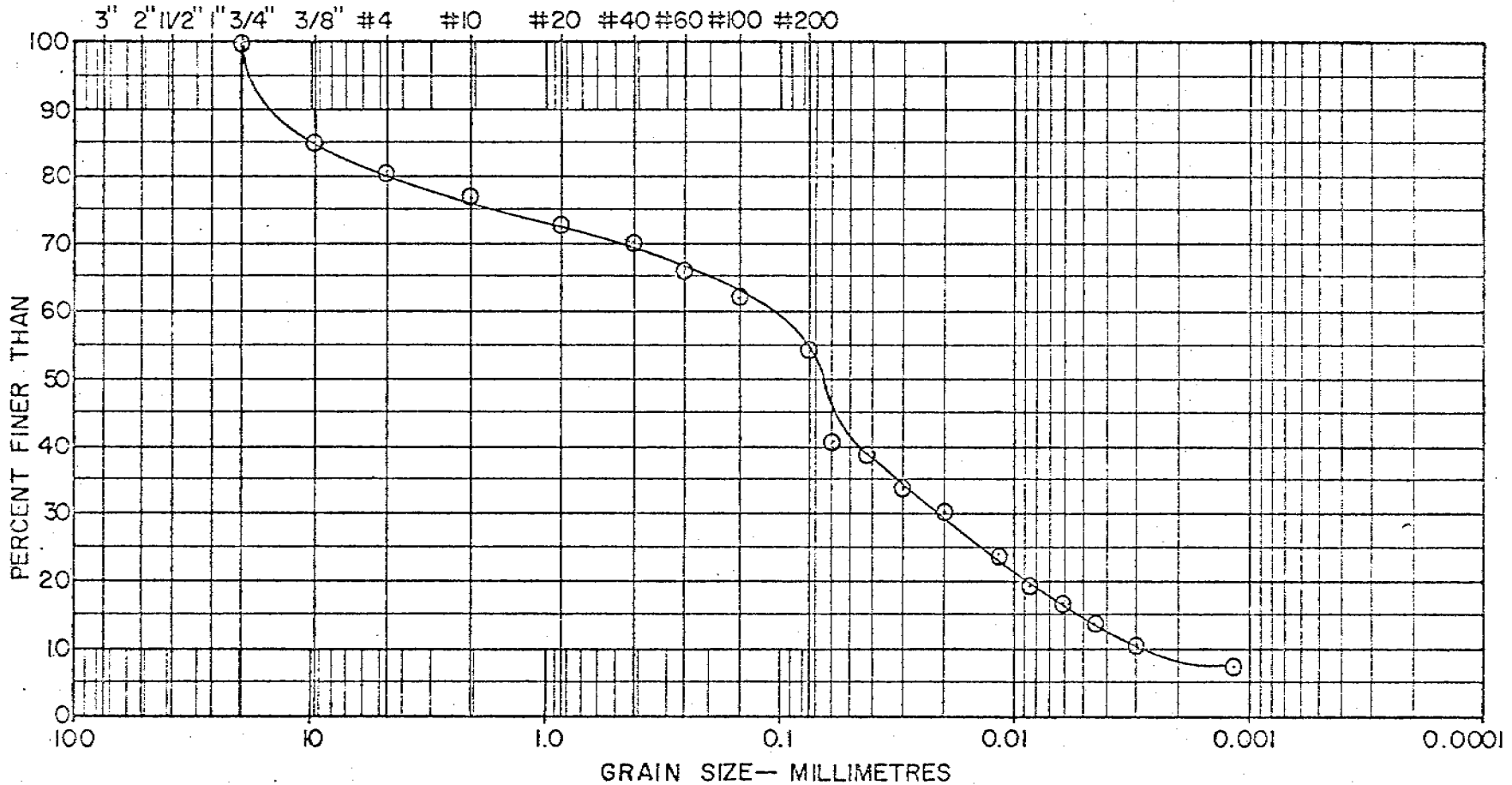
JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 52.6 600' L. of C.L.
HOLE No. L - 1
DATE Sept. 14/76 PLATE



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GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



GRAIN SIZE CURVE

REMARKS: ○—○ Sample 8 at 14.5' - 15.5'

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. L-1 DEPTH

DATE 18/10/76

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE Δ LAB VANE □ CONE				
DEPTH	TYPE	Blow 6"	No.							PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
								X-----0-----X					
								10 30 50 70 90%					
5	B		1		NF		PEAT						
	B		2				- dark brown						
	C		3				3.0 (Ice lenses 1/32" spaced @ 3/8")						
	C		4				ORGANIC SILT						
	C		5				- peat inclusions & layers						
10	SPT	>50	6		N		GRAVEL						
	B		7				- fine						
	B		8				- little sand						
	B		9				- trace clay and silt						
	B		10				12.0						
15	B		11		N		GRAVEL AND SAND						
	B		12				- little clay and silt						
	B		13				- trace cobbles						
	B		14				- non-to-low plastic						
	B		15										
20	B		16		N								
	B		17										
	B		18										
	B		19										
	B		20										
25	B		21		N		21.0						
	B		22										
	B		23										
	B		24										
	B		25										
END OF HOLE													
Notes:													
1. Located southeast of L-1 in valley of Ruby Ranges, adjacent to a small water course that flows into Long's Creek.													
2. Terrain slopes gently 2% north-easterly. Light spruce 10' to 25'. Area is poorly drained with water often ponded between peat tussocks.													
3. Drilling mud used from 8' to 21'.													
4. Thermistors installed at 2', 5' and 10'.													

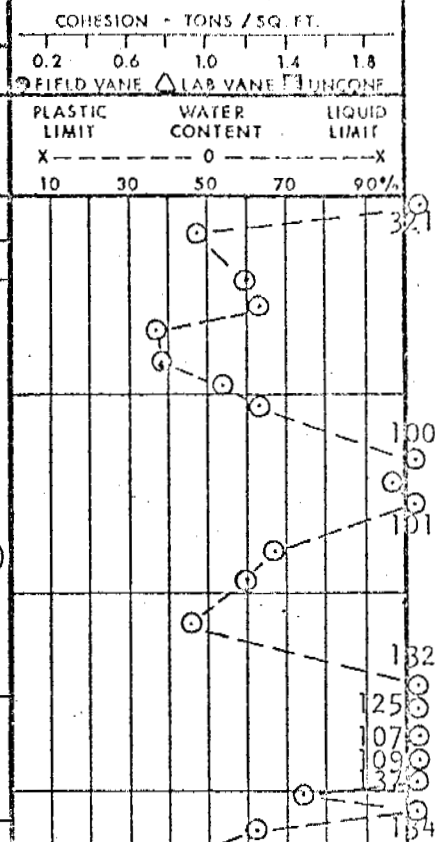


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 52.9 600' L. of C.L.
HOLE No. L - 2
DATE 6/15/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.						
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8							
SAMPLE DATA								FIELD VANE Δ LAB VANE $\square$ UNCONF							
DEPTH	TYPE	BLOW 6"	No.	CLASS		DESCRIPTION OF MATERIAL				PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT			
										X-----X					
										10 30 50 70 90%					
	B		1	II		1.0	PEAT - black								
	B		2		NF	2.0	SAND - fine to medium								
	C		3				VOLCANIC ASH - white								
5	C		4				thin grey brown silt layers								
	C		5	Nbn											
	C		6	Nf											
10	C		7	Vr			(Occasional ice lenses 1/8" thick)								
	C		8				peat and silt inclusions								
	C		9			12.5									
15	C		10	Vs			PEAT & ORGANIC SILT								
	C		11	Vr			- pockets of sand								
	C		12	Vx		15.5	- seams of clay & silt								
	C		13	Vs		16.5	SILT & CLAY - organic								
	C SPT	43 Ref	14	Nbn		18.0	GRAVEL - SAND - SILT (TILL-LIKE)								
20	B		15				SAND								
	B		16				- and gravel								
	B		17	N			- trace silt								
25	B		18				- trace cobbles								
	B		19				- well graded								
	B		20				- grey								
30			21			28.0									
						Notes:									
						1. Located adjacent to H-F products line right-of-way, south of Alaska Highway MP 1150.5 & Koidern R.									
						2. Area surrounding site is flat & swampy, drained by a poorly defined creek.									
						3. Drilling mud used 17' to 28'.									
						4. Thermistors installed at 2', 5' and 10'.									

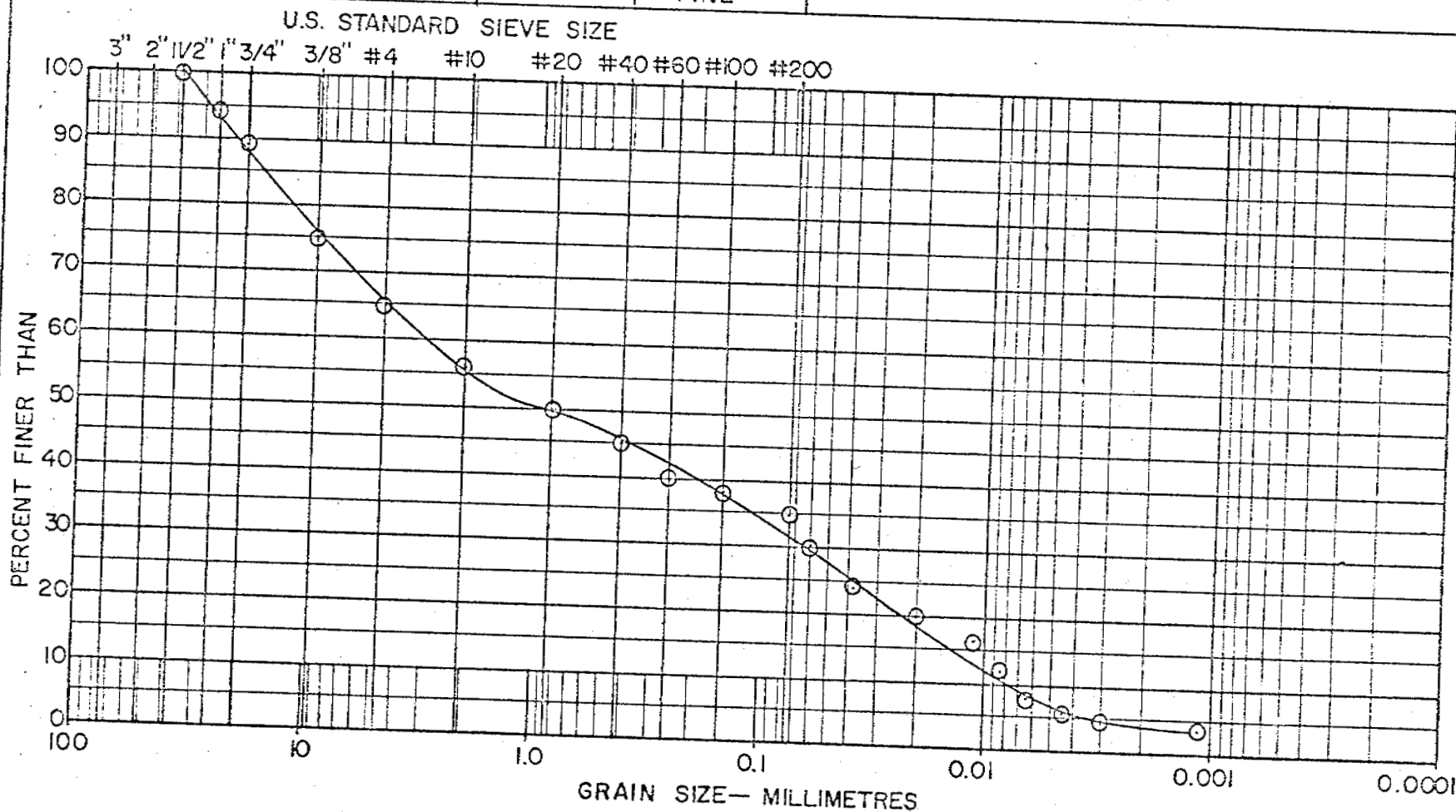


Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 63.4 900' L. of C.L.
HOLE No. M - 1

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. M-1 DEPTH
DATE 18/10/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



REMARKS: ○—○ Sample 10 at 16.5' - 17'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.							ELEVATION	0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL	FIELD VANE Δ LAB VANE Δ UNCONF				
DEPTH	TYPE	BLOW No	CLASS			PLASTIC LIMIT		WATER CONTENT	LIQUID LIMIT			
						X	0	X				
						10	30	50	70	90%		
5	B	59 76 >60	1	11		NF	1.0	PEAT - moss, organic cover			133	
	B		2				VOLCANIC ASH					
	C		3	Nbn		- organic specks						
			4	Vs	- silt layers							
10	C		5			←(Ice lenses 1/128" spaced @ 1/16")						
			6	Nbe		←(Ice lenses 1/32" spaced @ 1/4")						
	C		7	Vs	9.0							
	C		8	Vs Vr	PEAT & ORGANIC SILT							
15	C		9			- dark brown						
	SPT		10	Nbn		←(Ice lenses 1/64" spaced @ 1/4")						
			11		13.5							
20	B		12			SAND						
	B		13			- fine						
	B	14			- little silt							
25					- grey and silt							
					SAND AND GRAVEL							
					- trace silt							
30					- trace cobbles							
					- stratified							
					28.0							
END OF HOLE												
Notes:												
1. Located 300' southwest of M-1.												
Moderate spruce 10' to 20'.												
2. Drilling mud used from 15' to 28'.												
3. Hole terminated at 28' on large boulder.												



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AI.0709
PROJECT Alcan Pipeline
LOCATION MP 63.4 600' L. of C.L.
HOLE No. M - 2
DATE Sept. 15/76 PLATE



John Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

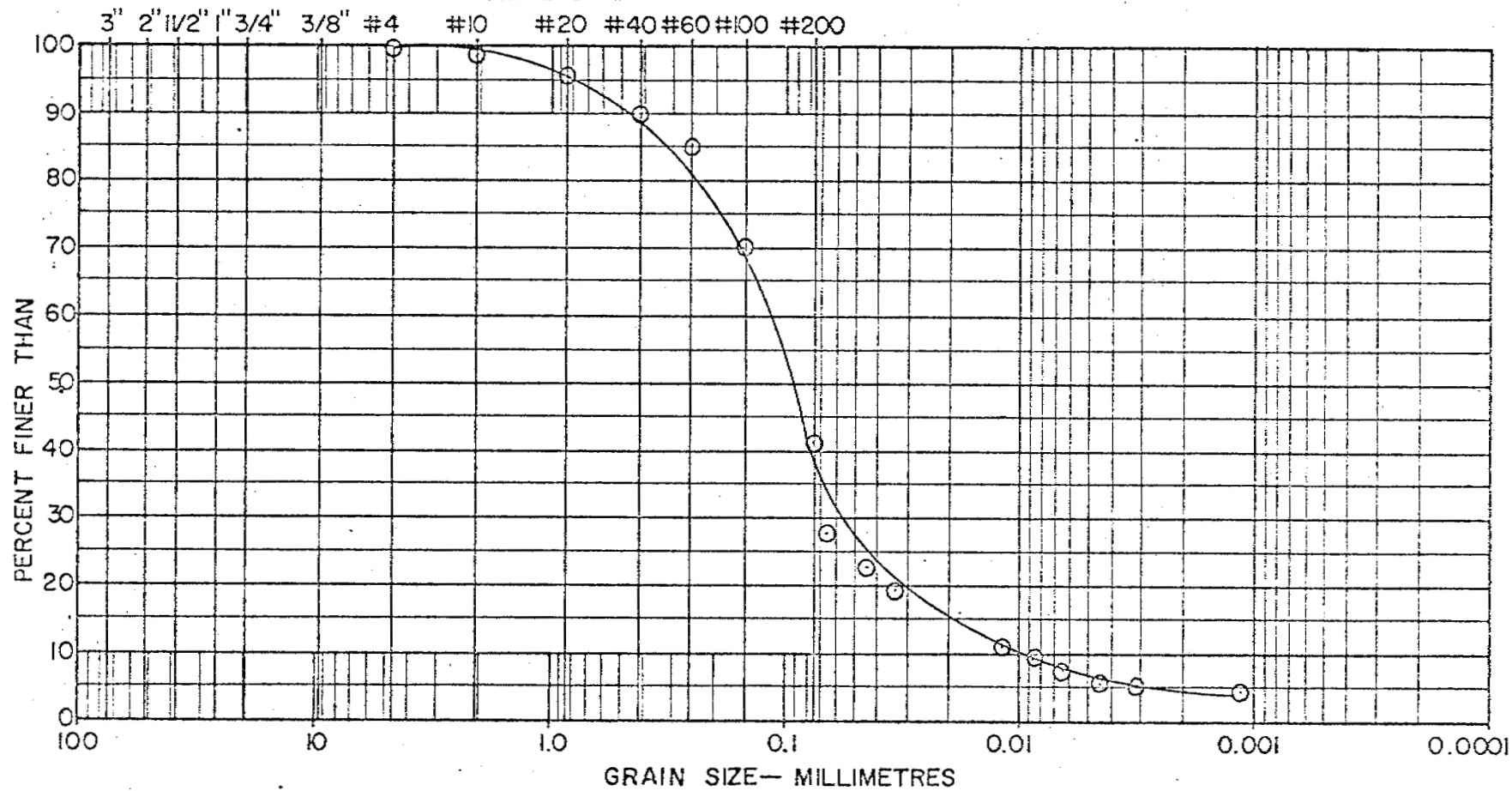
LOCATION

HOLE No. M-2 DEPTH

DATE 18/10/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○ — ○ Sample 9 at 13.5' - 14.5'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.							
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION	DESCRIPTION OF MATERIAL	FIELD VANE LAB VANE UNCONF.							
SAMPLE DATA									PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
DEPTH	TYPE	BLOW 6"	No.									X-----X				
									10	30	50	70	90%			
	B		1	11			0.5	MOSS - organic cover								
	B		2					VOLCANIC ASH								
	B		3					- organic inclusions								
	B		4			NF	4.0	- layered								
5	B		5					SILT & CLAY								
	SY		6					- little sand in lenses								
	C		7					- laminated, low plastic								
	C		8		Vs		7.0	(Ice lenses 1/128" spaced @ 1/16")								
	C		9		Nbe			SAND								
10	C		10					- fine to medium								
	C		11		Vs			- little silt and clay								
	C		12		Vr		11.5	organic silt								
	B		13				13.0	SILT								
15								- some fine sand								
								- layered								
	B		14				16.0	SILT & CLAY								
					N			- some gravel								
							18.5	- little sand, low plastic								
20								GRAVEL								
								- and sand								
								- trace cobbles								
								bedrock								
								END OF HOLE								

Notes:

1. Located on H-F products line right-of-way.
2. Terrain slopes gently at 1% easterly. Grass and small willows have overgrown the products line. Slight ponding of water.
3. Drilling mud used from 13' to 22'.
4. Hole collapsing during drilling.



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 74.5 200' R. of C.L.
HOLE No. N - 1
DATE Sept. 16/76 PLATE



John Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

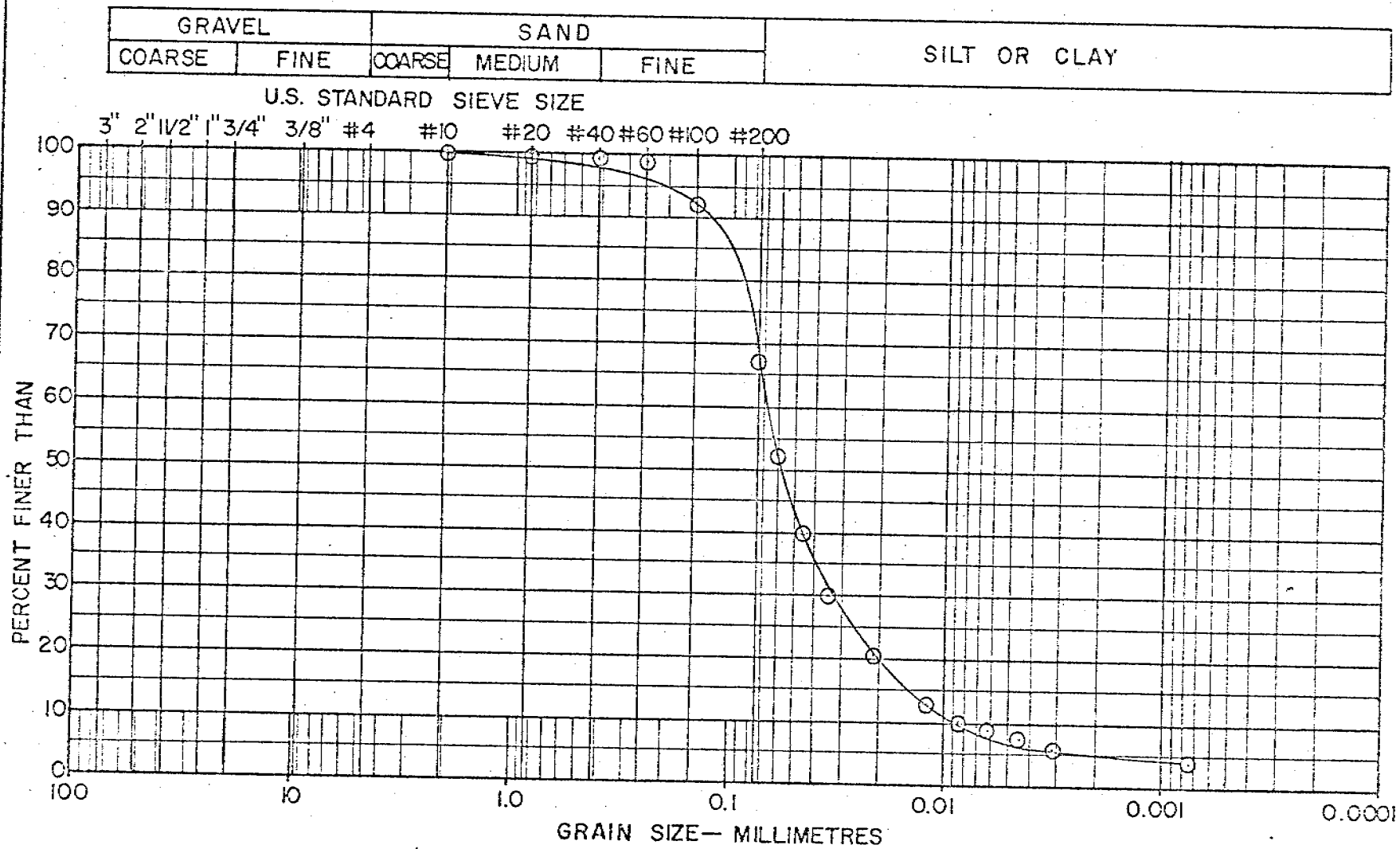
JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. N-1 DEPTH

DATE 18/10/76



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X 10 30 50 70 90%				
DEPTH	TYPE	BLOW No.											
5	B	1	II			1.0	PEAT - moss, organic cover						
	B	2			NF	2.5	VOLCANIC ASH - white						
	C	3		Vs		4.5	PEAT & ORGANIC SILT (Ice lenses 1/64" spaced @ 1/32")						
	C	4		Vs									
	C	5		Vs									
10	SPT	6		Nbn		8.0	SILT AND SAND - organic layers (Ice lenses 1/64" spaced @ 1/8")						
	B	7					(Ice lenses 1/16" spaced @ 1/4")						
	B	8					sand lense, clean						
15	B	9		N			GRAVEL - some sand - trace silt - trace cobbles - well graded - rounded to subrounded						
	B	10											
	B	11											
20	B	12											
	B					22.0							
25						END OF HOLE							
Notes:													
1. Located 200' southwest of MP 262 on H-F products line.													
2. Terrain slopes 6% southerly. Dense spruce to 30'.													
3. Thermistors installed at 2', 5' and 10'.													
4. Drilling mud used from 8' to 22'.													



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 74.5 100' R. of C.I.
HOLE No.	N - 2
DATE	Sept. 16/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan - Pipeline

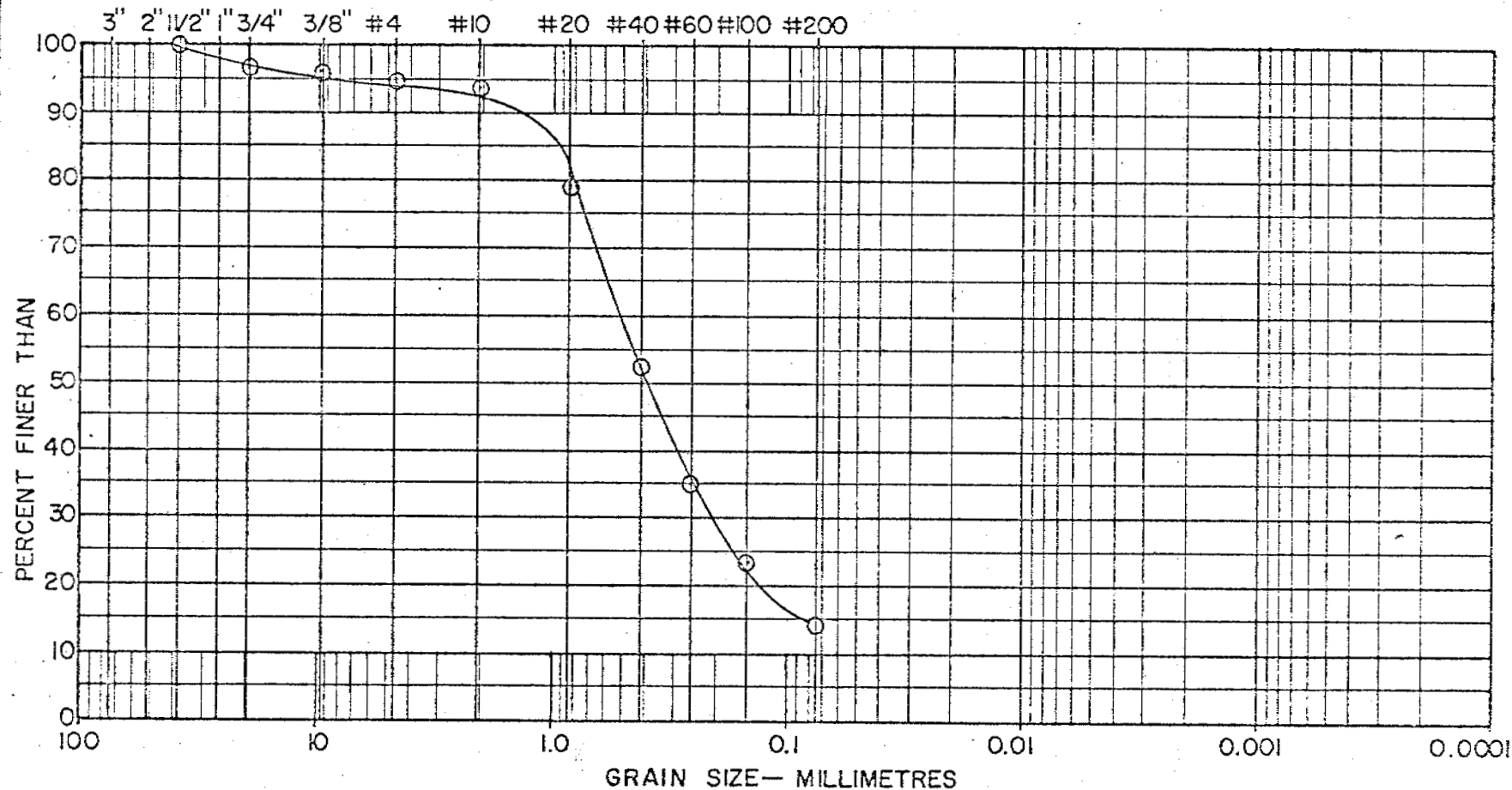
LOCATION

HOLE No. N - 2 DEPTH

DATE Oct. 76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 5 at 7 1/4'-8'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8					
SAMPLE DATA								FIELD VANE LAB VANE UNCONF.					
DEPTH	TYPE	BLOW 6"	No.	CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT WATER CONTENT LIQUID LIMIT							
						X-----0-----X 10 30 50 70 90%							
5	B		1		NF 4.5	SILT - organic - little sand - dark brown - volcanic ash							
	B		2										
	B		3										
	B		4										
	B		5										
10	C		6	Nbe	PEAT & ORGANIC SILT - wood inclusions & thin layers - layered - greyish brown (occasional ice lense 1/32")								
	C		7	Nbe Vs Vr									
	C		8										
	C		9	Nbe									
15	C		10	Vs	(Ice lenses 1/28" spaced @ 1/32")								
	C		11	Nbe									
	C		12	Vr									
20	B		13		SILT - little sand - organic inclusions (Ice lenses 1/64" spaced @ 3/8")								
	B		14										
	B		15										
25	B		16	N	GRAVEL AND SAND - trace silt - trace cobbles - stratified								
	B		17										
30	B		18		boulder or bedrock								
	B		19										
END OF HOLE													
Notes:													
1. Located on the H-F products line right-of-way, about 300' north of Donjek R. bridge.													
2. Site is overgrown with grass and willows to 5'.													
3. Drilling mud used from 19' to 29'.													
4. Hole caving below 20' during drilling.													



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 80.1 500' R. of C.L.
HOLE No. 0 - 1
DATE Sept. 17/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.						
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8						
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT				
DEPTH	TYPE	BLOW No.	No.					X	0	X				
								10	30	50	70	90%		
5	B		1			NF	PEAT & ORGANIC SILT - wood specks - dark brown							
	B		2											
	C		3		Nbe									
			4		Nf									
	C		5		Nbe Vr									
10	C		6				8.8							
15	C		7				ICE & SOIL INCLUSIONS of peat, organic silt, and fine sand							
	C		8											
	C		9											
	C		10											
	C		11											
20	C		12				13.5							
25			13				SILT - organic - trace sand - wood specks - non plastic, brown (Vertical ice lenses 1/2" thick)							
			14											
			15											
			16											
			17											
30	SPT	39 50 57	18				23.0							
30	B		19				SILT - coarse - some fine sand - organic specks - shell fragments - stratified							
			20											
			21				28.0							
			22				30.0							
			23				BEDROCK - fractured							
			24				END OF HOLE							

Notes:

1. Located 200' west of northwest bank of Donjek River.
2. Terrain is undulating. Dense spruce to 40'.
3. Drilling mud used from 10' to 30'.
4. Thermistors installed at 2', 5' and 10'.



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 80.1 300' R. of C.L.
HOLE No. 0 - 2
DATE Sept. 17/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.								
HT. DROP 30 ins							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.								
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT				
DEPTH	TYPE	BLOW No.			CLASS				X		0		X				
5	B	16 15 20	1	NF		1.0	SILT - trace sand										
	B		2														
	B		3														
	B		4														
	B		5														
10	SPT		6						10.0								
	B		7														
15	B		8							SAND							
	B		9							- medium to coarse							
							- trace fine sand										
20						17.0	- trace fine gravel										
							- stratified										
							- grey										
							END OF HOLE										
								Notes: 1. Located on old flood plain adjacent to H-F products line right-of-way. 2. Terrain is flat and vegetated with grass, willow & alder. 3. Drilling mud used from 5' to 17'. 4. Hole terminated at 17' due to loss of circulation.									



Klohn Leonoff Consultants Ltd.
 CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 80.5 300' R. of C.L.
HOLE No.	0 - 3
DATE	Sept. 17/76 PLATE



Mohn Leonoff Consultants Ltd.
 CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

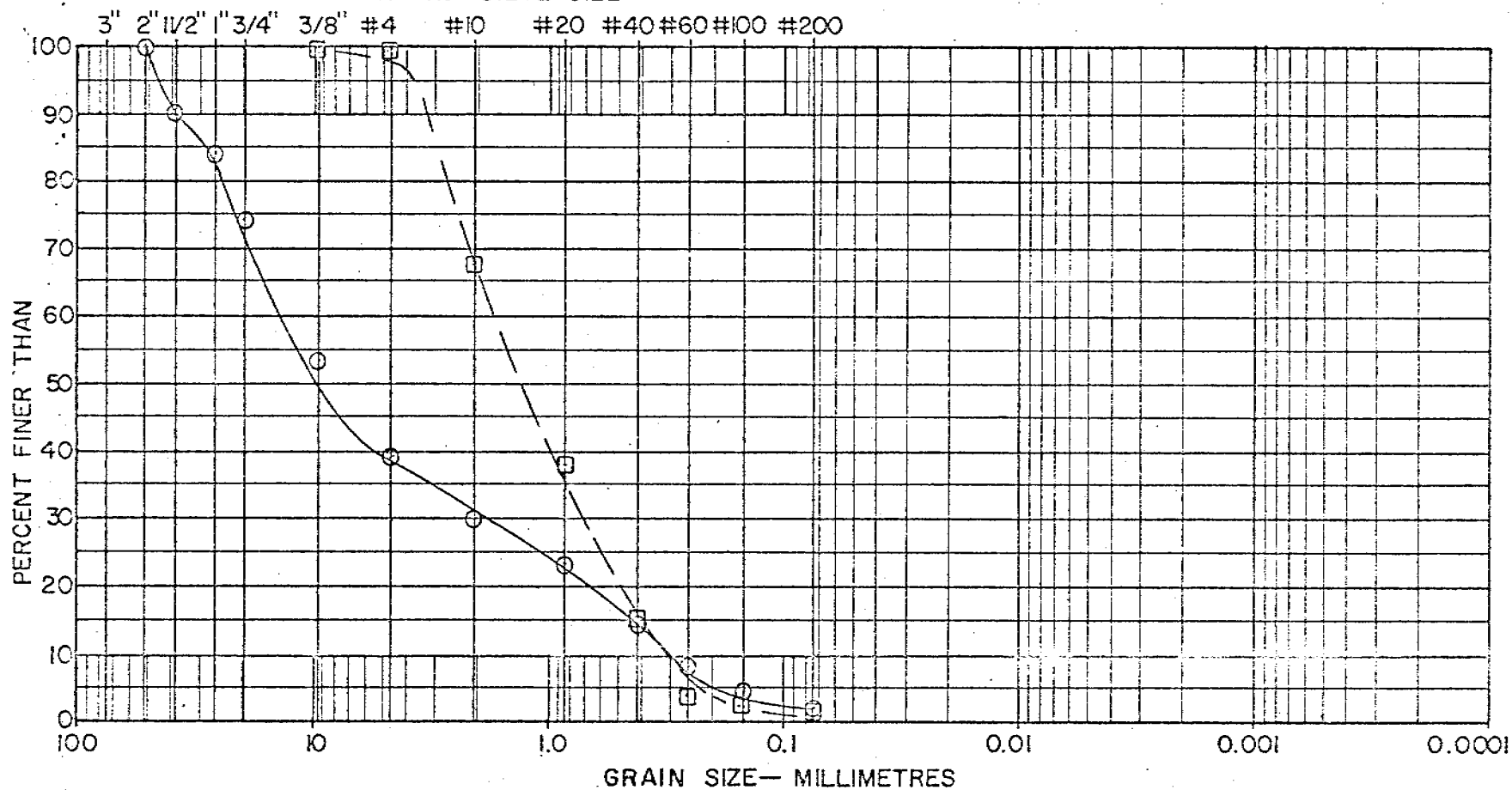
LOCATION

HOLE No. 0-3 DEPTH

DATE Oct. 13/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.																										
HT. DROP 30 ins					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.																										
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X																										
DEPTH	TYPE	BLOW 6"	No.							10	30	50	70	90%																					
5	B	35 59	1	T	NF	4.25	PEAT - dark brown volcanic ash (One ice lense 1" thick)																												
	B		2																																
	B		3																																
	C		4																																
	C		5																																
10	B		6	T	Vx	6.5	PEAT																												
	B		7																																
	SPT		8																																
	B		9																																
15	B		10	T	Vr	8.0	SAND - and gravel - trace cobbles																												
	B	11																																	
20	B	12	T	N	10.0	SAND - little silt - trace gravel																													
	B	13																																	
	B	14	T	N	12.0	CLAY & SILT & GRAVEL & SAND (TILL-LIKE) (Ice lenses to 3/4" @ 11.5')																													
	B	15																																	
	B	16	T	N	19.0	SAND AND GRAVEL - trace silt and clay - trace cobbles boulder or bedrock																													
	B	17																																	
	B	18	T	N	END OF HOLE																														
	B	19																																	
	B	20	T	N																															
	B	21																																	
	B	22	T	N																															
	B	23																																	
	B	24	T	N																															
	B	25																																	
	B	26	T	N																															
	B	27																																	
	B	28	T	N																															
	B	29																																	
	B	30	T	N																															
	B	31																																	
	B	32	T	N																															
	B	33																																	
	B	34	T	N																															
	B	35																																	
	B	36	T	N																															
	B	37																																	
	B	38	T	N																															
	B	39																																	
	B	40	T	N																															
	B	41																																	

Notes:

1. Located on H-F products line right-of-way adjacent to Alaska Highway.
2. Terrain slopes 1% easterly. Open, free water ponded on ground surface.
3. Drilling mud used from 5' to 19'.



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 89.1 100' L. of C.L.
HOLE No.	P - 1
DATE	Sept 18/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.							
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.							
SAMPLE DATA							CLASS	PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X 10 30 50 70 90%								
DEPTH	TYPE	BLOW No.	No.	DESCRIPTION OF MATERIAL												
5	B	28 34 43	1	NF	Nbe Vr Vs Vx	PEAT - seams of organic silt and sand volcanic ash (Ice lenses 1/16" spaced @ 1/2") 5.0									147	
	B		2												145	
	B		3												165	
	B		4												731	
	C		5												223	
10	SPT		6			7.0	ORGANIC SILT - trace sand (Ice lenses to 1/16" Ice incl. to 1")								178	
	B		7			SAND - fine to coarse - little clay and silt - little gravel - trace cobbles - non to low plastic										
	B		8													
	B		9													
	B		10													
15						18.0										
20						END OF HOLE										
							Notes:									
							1. Terrain slopes 1-2% easterly. Open, grass cover, with free water ponded on ground surface.									
							2. Drilling mud used from 7' to 18'.									
							3. Hole terminated at 18' due to loss of mud seal caused by washing out and caving of volcanic ash layer.									



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 89.2 1100' L. of C.L.
HOLE No. P - 2
DATE Sept. 18/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.							
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8							
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		FIELD VANE Δ LAB VANE $\square$ UNCONF.						
DEPTH	TYPE	BLOW / 6"	No.					PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	X - - - - - X					
5	B	38 58	1	Ice & Soil	NF	0.3'	MOSS - organic cover									
	B		2			2.0	VOLCANIC ASH									
	B		3			2.5	PEAT & ORGANIC SILT									
	C		4				SILT AND CLAY									
							- trace fine sand & gravel									
10	C		5	Vr												
				Vx												
	C		6	Vs												
				Vr												
				Vs												
15	B		7	Vr			7.5	(Ice lenses 1/32" spaced @ 1/8")								
	C	8				10.0	SILT AND CLAY									
							- some sand,									
							- trace gravel									
20	B	9	N				(TILL-LIKE)									
	B	10														
	B	11														
25	B					20.0	bedrock									

END OF HOLE

Notes:

1. Terrain flat. Open area 100' to west slopes 3% southerly. Dense spruce to 40'.
2. Drilling mud used from 8.5' to 20'.
3. Thermistors installed at 2', 5' and 10'.
4. Volcanic ash layer caving during drilling.



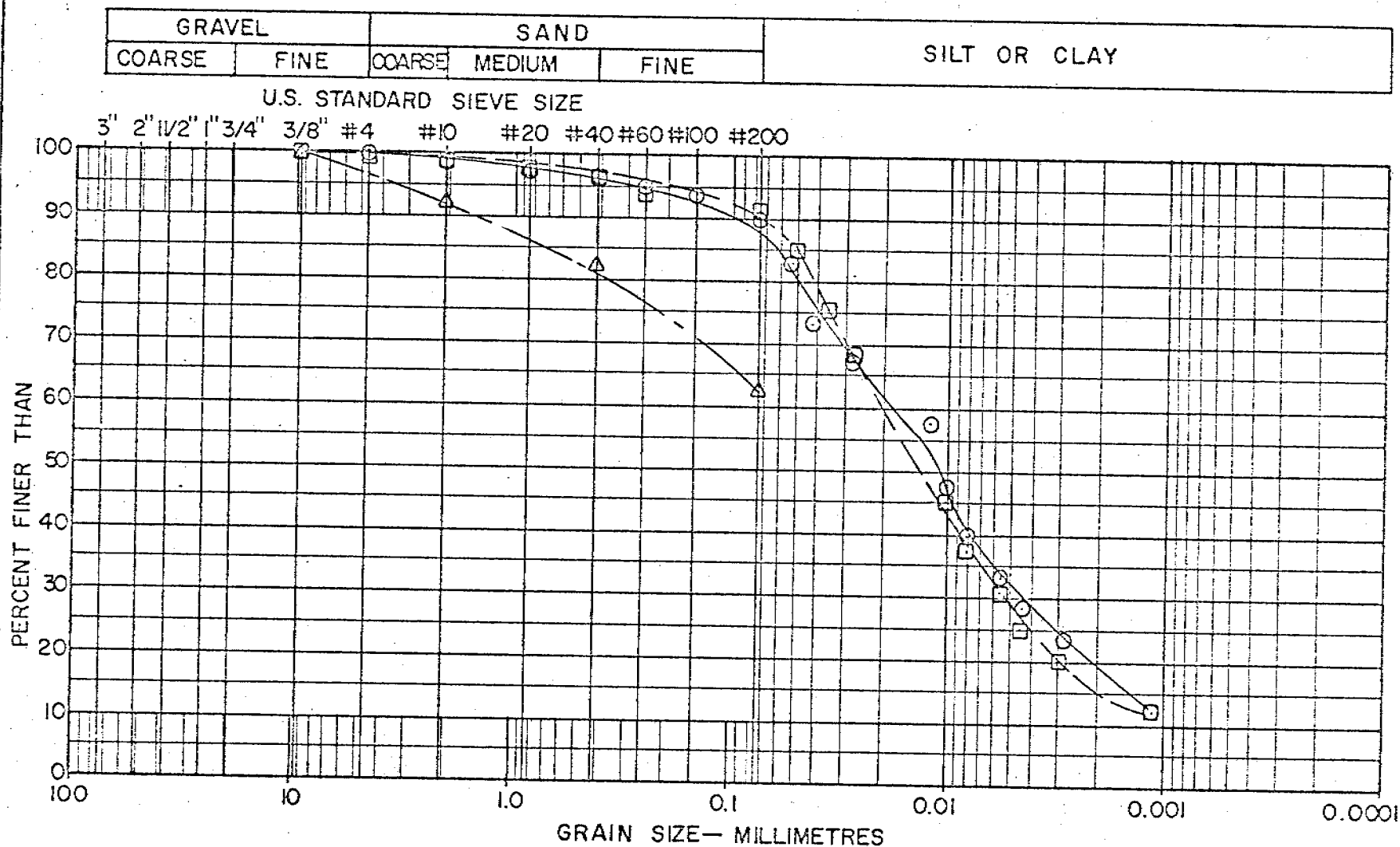
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 89.2 1900' L. of C.L.
HOLE No. P - 3
DATE Sept. 19/76 PLATE



John Leonoff Consultants Ltd.
 CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
 PROJECT Alcan Pipeline
 LOCATION
 HOLE No. P-3 DEPTH
 DATE 18/10/76





Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.

AL0709

PROJECT

Alcan Pipeline

LOCATION

HOLE No.

0-1

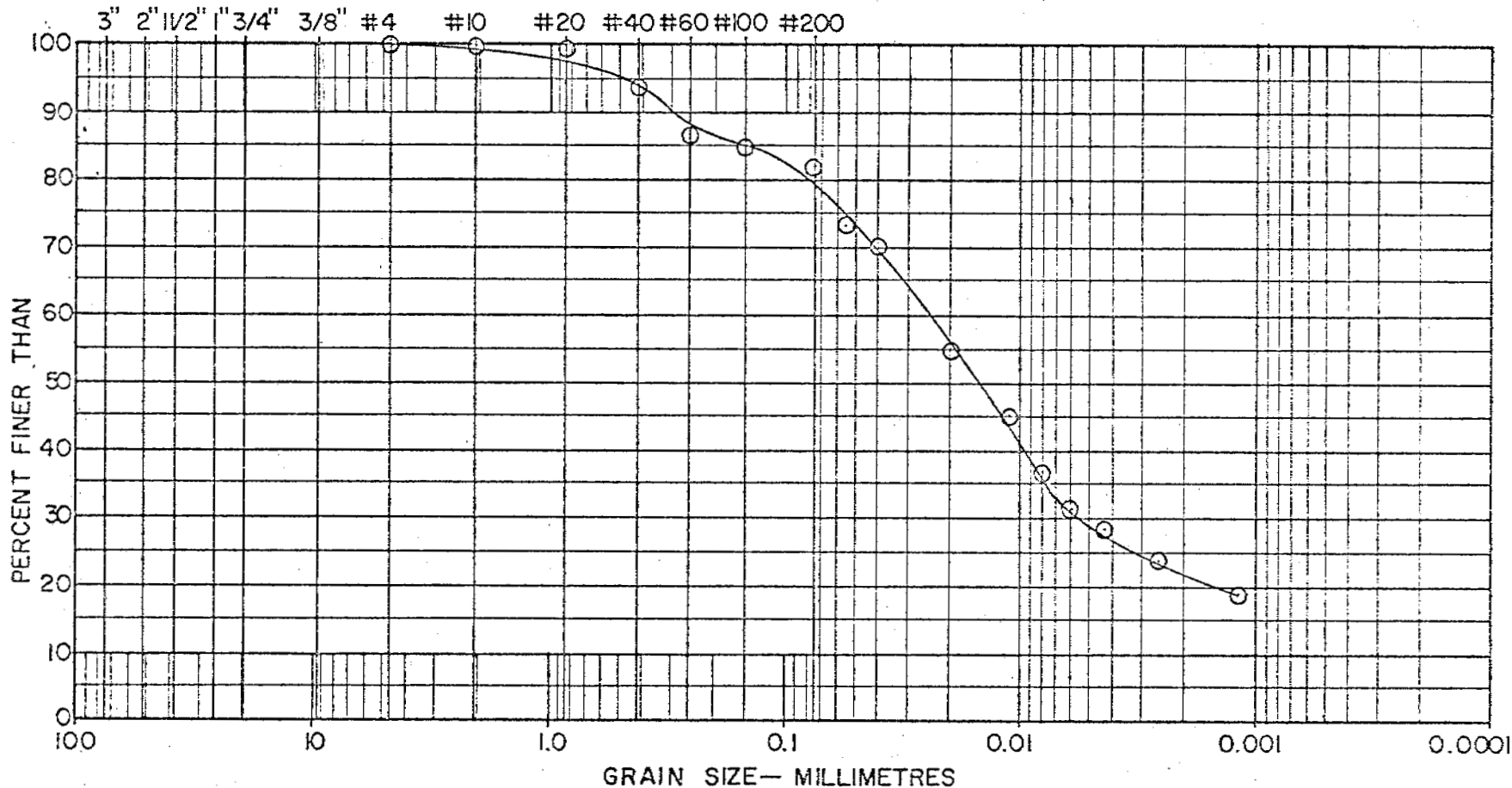
DEPTH

DATE

19/10/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: Sample 3 at 2' - 3'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL		FIELD VANE Δ LAB VANE $\square$ UNCONF				
DEPTH	TYPE	BLOW/6"	No.			PLASTIC LIMIT			WATER CONTENT	LIQUID LIMIT	X-----X		
	B		1	TT		1.2	MOSS						
	B		2				- organic cover						
	B		3				- 4" volcanic ash layer						
	B		4										
5	B		5			5.0	CLAY & SILT						
							- little sand						
							- trace gravel						
							- medium plastic						
	B		6				GRAVEL AND SAND						
							- trace silt						
10						10.0	- trace cobbles						
								END OF HOLE					
								Notes:					
								1. Terrain is flat, open and grass covered. Free water ponded in depressions.					
								2. Drilling mud used from 4' to 10'.					
								3. Hole terminated at 10' due to thawing and caving of subsoils.					



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 102.4 1500' L. of C.L.
HOLE No. Q - 1
DATE Sept. 19/77 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.										
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8										
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		FIELD VANE		LAB VANE		UNCONF.					
DEPTH	TYPE	BLOW 6"	No.								PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT						
								X	0	X									
								10	30	50	70	90%							
5	B	2 2 3	1	NF		2.0	SILT												
	B		2				- little sand												
	B		3				- grey												
	B		4				4.0						CLAY AND SILT						
	B		5										- trace sand						
10	SY	6	5.5			SILT													
	SPT	7				- little sand													
15	SY	1 3 4	8						SAND										
			SPT												9	- fine, uniform			
			SPT												10	- trace to little silt			
20	SPT	4 5 5	11						- slightly stratified										
			12						- grey										
			13						27.0						SILT				
25	SPT	1 1 2	14												- trace sand				
			15	- grey															
30	SPT	1 1 2	16	32.0	SILT AND CLAY														
			17		- trace sand														
35	B	1 1 2	18	35.0	- grey														
			19		SAND														
40			20		- fine														
			21		- trace silt														
			22		- grey														
					(continued)														



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 146.7 1003' L. of C.L.
HOLE No. R - 1
DATE Sept. 20/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							FIELD VANE Δ LAB VANE $\square$ UNCONF.					
DEPTH	TYPE	BLOWY 6"	No.	DESCRIPTION OF MATERIAL				PLASTIC LIMIT X --- 0 --- X				
								10 30 50 70 90%				
45	SPT	12 15 15	15	(As above) SAND - fine, uniform - trace silt - non-plastic - grey								
50	SPT	7 11 10	16									
55												
60												
61.5	B		17									
65				END OF HOLE Notes: 1. Located northeast of bridge on Slims River flood plain. 2. Terrain is flat, open, with sparse grass on ground surface. 3. Drilling mud used from 5' to 61.5'.								



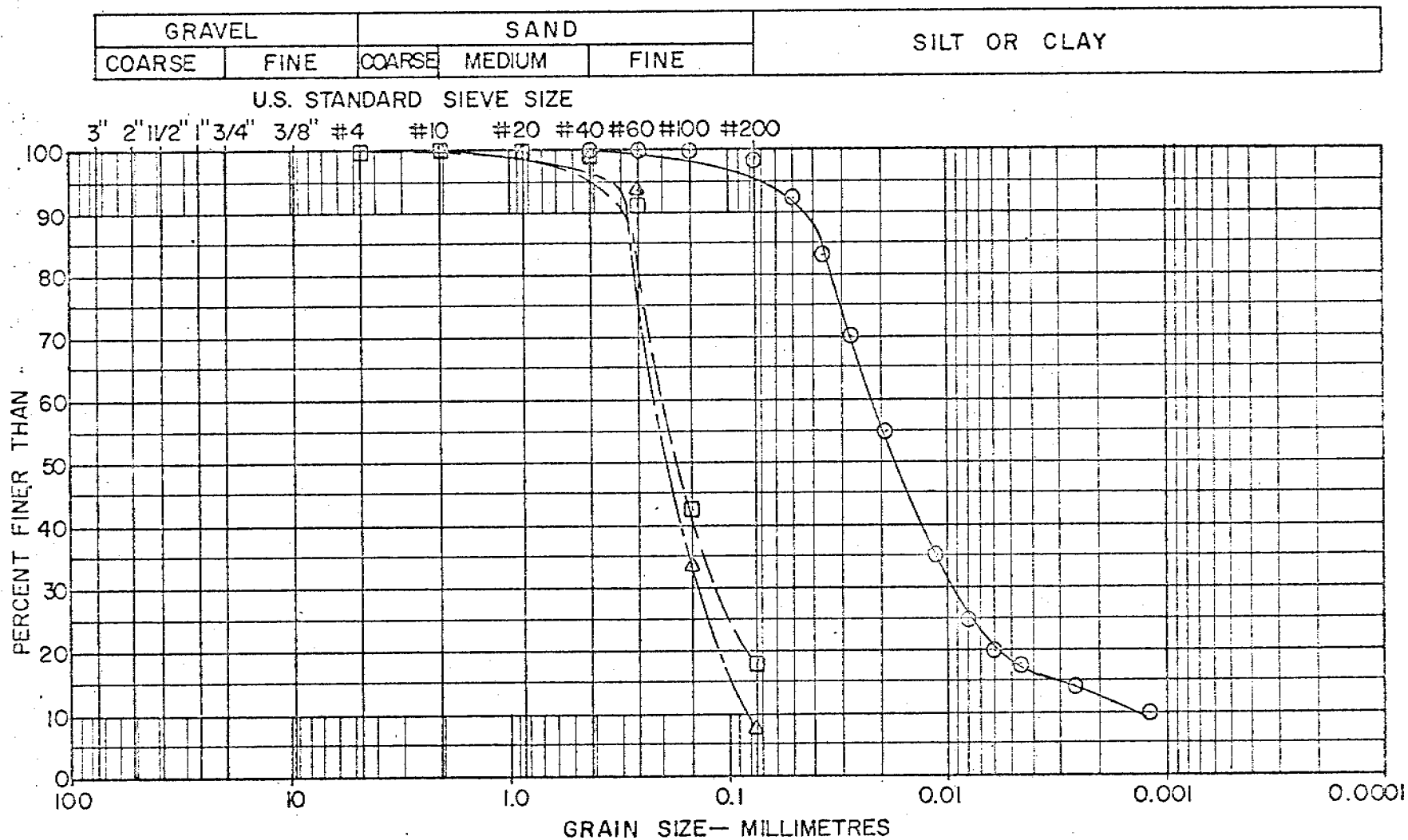
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION NP 146.7 1003' L. of C.L.
HOLE No. R - 1
DATE Sept. 20/76 PLATE



John Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. **AL0709**
PROJECT **Alcan Pipeline**
LOCATION
HOLE No. **R-1** DEPTH
DATE **19/10/76**



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins					ELEVATION		0.2 0.6 1.0 1.4 1.8							
SAMPLE DATA					N.R.C.	N.F. or F.	FIELD VANE LAB VANE UNCONF							
DEPTH	TYPE	BLOW 6" No.	No.	CLASS	F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT			
							X	10	30	50	70	90%		
45						(As above) SAND - fine - little to some silt - trace clay - slightly stratified - grey								
50														
55														
60														
	SPT	3	13				61.5							
						END OF HOLE								
						Notes:								
						1. Located southeast of Slims River Bridge on mud flat.								
						2. Terrain is flat, open with sparse grass cover on ground surface.								
						3. Drilling mud used from 9' to 61.5'.								



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 147.3 2376' L. of C.L.
HOLE No.	R - 2
DATE	Sept. 21/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.							
HT. DROP 30 ins					N.R.C. CLASS	N.F. or F.	ELEVATION		0.20.61.01.41.8 FIELD VANELAB VANEUNCONE							
SAMPLE DATA							DESCRIPTION OF MATERIAL									
DEPTH	TYPE	BLOWZ 6"	No.													
5	B		1		NF	5.0	SILT		○							
	B		2				- trace fine sand			○						
	SY		3				- trace clay									
	SPT	3 4	4		NF	7.5	SAND		○							
	B		5				- and silt									
10	SPT	13	6				SAND		○							
	B		7				- fine uniform									
15	SPT	30 26 11	8				SAND		○							
			9				- fine									
			10				- trace silt									
20	SPT		11				- slightly stratified		○							
			12				- grey									
			13													
25	SPT	4 1 1	14		NF	18.0	SILT		○							
			15				- some fine sand									
			16				- grey									
30	SPT	6 7 7	17			22.0	SAND		○							
			18				- fine									
			19				- some silt									
35	SPT	3 6 6	20		NF	30.0	- slightly stratified		○							
			21				- grey									
			22													
40	SPT	4 6 6	23			32.0	SILT AND CLAY		○							
			24				- trace sand									
			25				SAND									
			26	- fine												
			27	- little to some silt												
			28	- trace clay												
			29	- slightly stratified												
			30	- grey												

(continued)



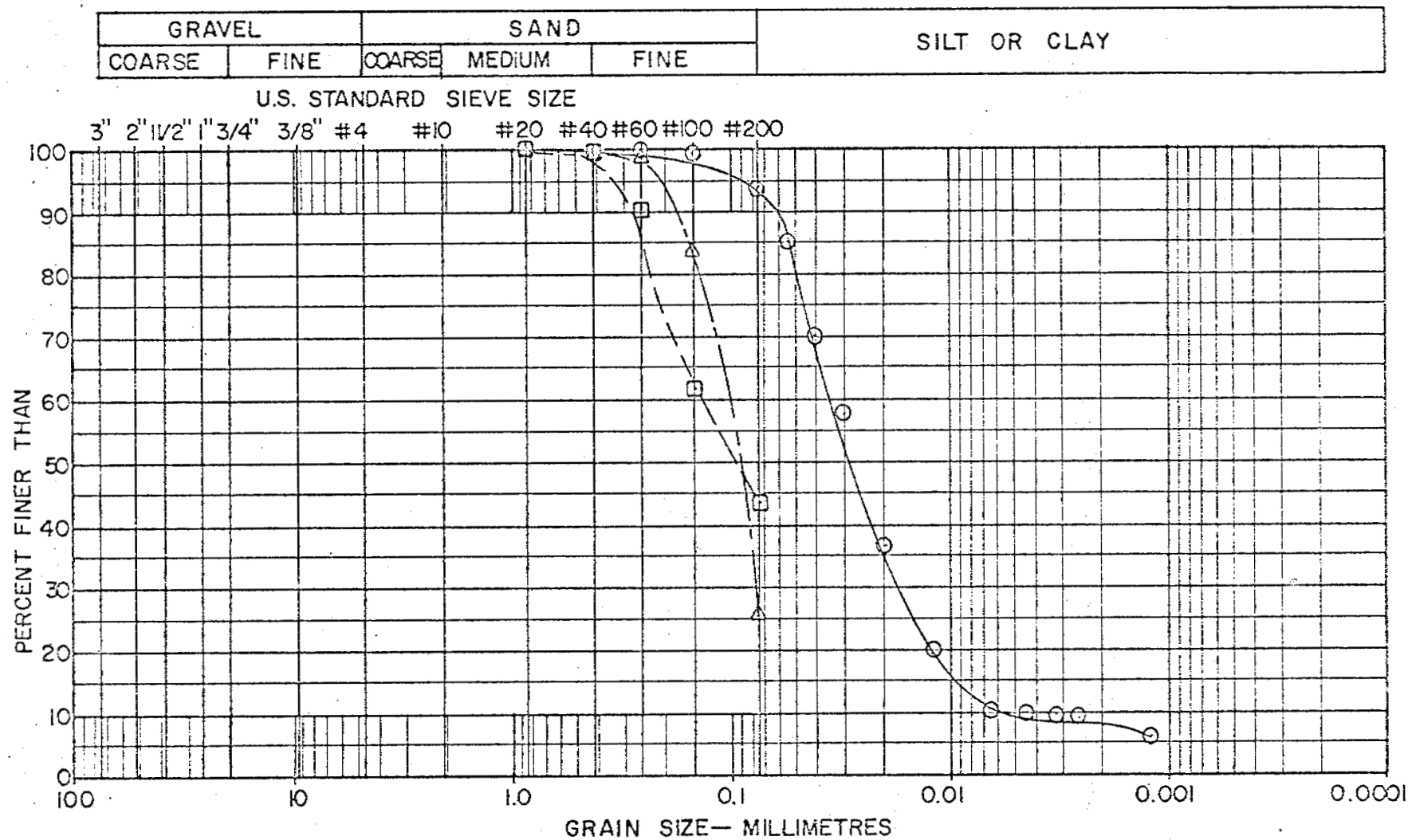
Kiohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 147.3 2376' L. of C.L.
HOLE No.	R - 2
DATE	Sept. 21/76 PLATE



John Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: — Sample 2 at 4'

— Sample 4 at 6' - 7 1/2'

--- Sample 9 at 25' - 26 1/2'

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. R-2 DEPTH

DATE 19/10/76

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.												
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.												
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X												
DEPTH	TYPE	BLOW 6"	No.						10	30	50	70	90%								
5	B		1	NF		1.0	Clayey SILT - little sand														
	B		2			2.0	SAND - little clayey silt														
	B		3			GRAVEL AND SAND - little clayey silt															
	B		4																		
	B		5				5.0														
10	SY SPT	20 19 23	6			NF			9.0	CLAY & SILT AND SAND - some gravel - medium plastic - hard (TILL-LIKE)											
		7																			
15	SPT	9 43 Ref	8						NF		15.0	GRAVEL - and sand - little silt - stratified									
	B		9																		
20	B		10								NF		17.5	SAND - some fine gravel - trace silt, grey							
	B		11																		
25	B		12										NF		20.0	GRAVEL - some fine gravel - well graded					
	B	13																			
	B	14	NF		24.0			SAND - some gravel - little silt - stratified, grey													
					NF											END OF HOLE					

Notes:

1. Located on original Alaska Highway right-of-way.
2. Terrain slopes 8% easterly. Dense poplar & spruce to 25'.
3. Hole caving below 13' during drilling.



Klohn Leonoff Consultants Ltd.
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JOB No.	AL0709
PROJECT	Alcar. Pipeline
LOCATION	MP 179.2 700' L. of C.L.
HOLE No.	T - 1
DATE	Oct. 3/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

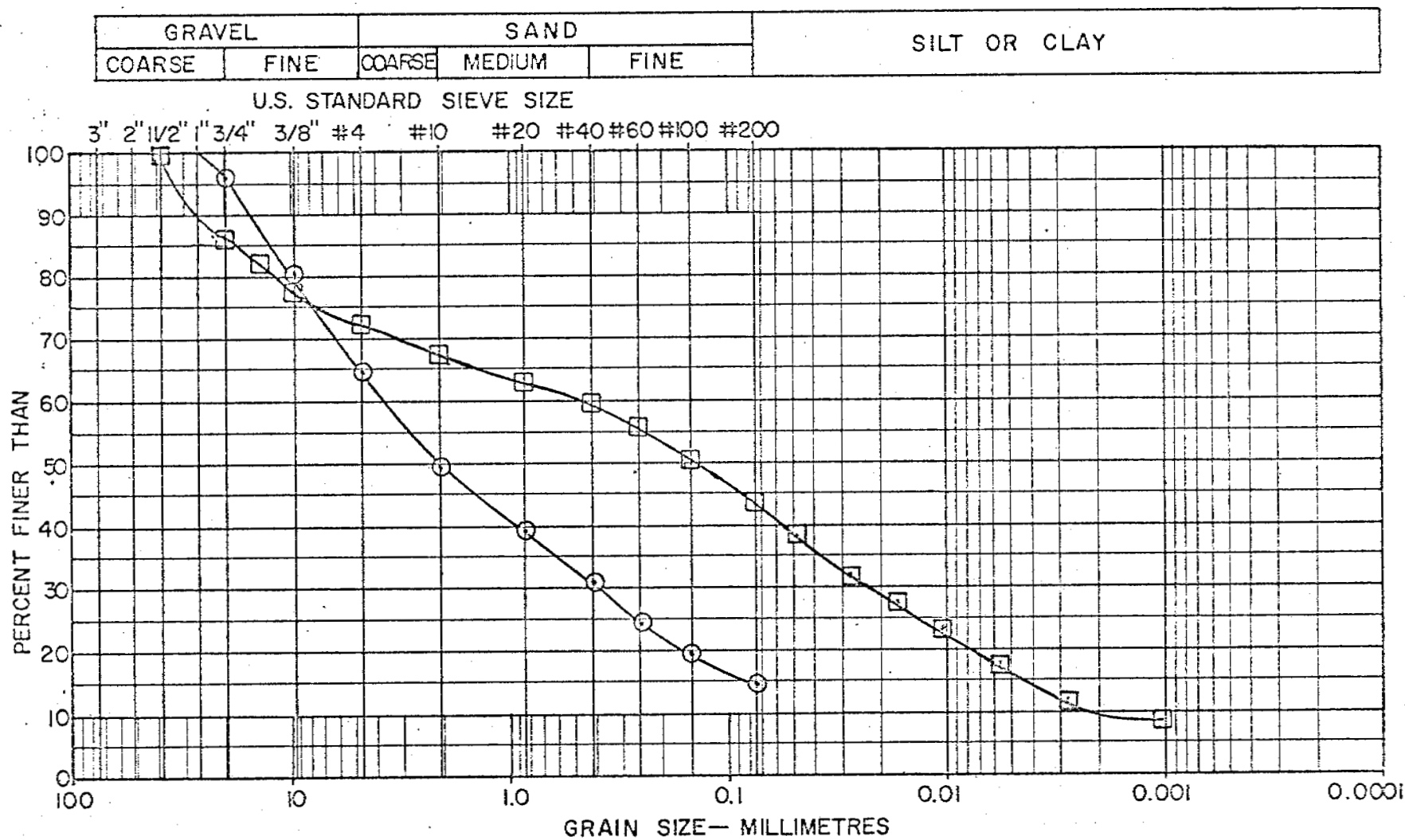
JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. T-1 DEPTH

DATE Nov. 8, 1976



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE Δ LAB VANE CONE				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW No.	No.							X	0	X	X
5	B	7 5 7	1	TT	NF	0.7	PEAT						
	B		2										
	B		3										
	B		4										
	B		5										
10	SY	8 10 15	6			5.0	low plasticity - no gravel						
	SPT		7			7.0	SAND - little silt - wet						
	B		8										
15	SY	11 13 14	9			10.0	CLAY & SILT - pockets of sand and silty clay - laminated, grey						
	SPT		10										
			11										
20	SY	11 15 15	11				SILT & CLAY - thin laminations of high plastic silty clay - trace sand & gravel - laminated - low to med plastic - brownish grey with bluish grey seams						
	SPT		12										
			13										
25	SY		14		22.5								
	SPT												
END OF HOLE													
Notes:													
1. Located on cut line for original Alaska Hwy right-of-way.													
2. Terrain slopes gently 3% south-easterly. Burnt deadfall, alder and spruce to 5'.													
3. Seepage encountered at 6'-7' during drilling. Standpipe piezometer installed to 22.5'.													
4. Drilling mud used from 10' to 22.5'.													



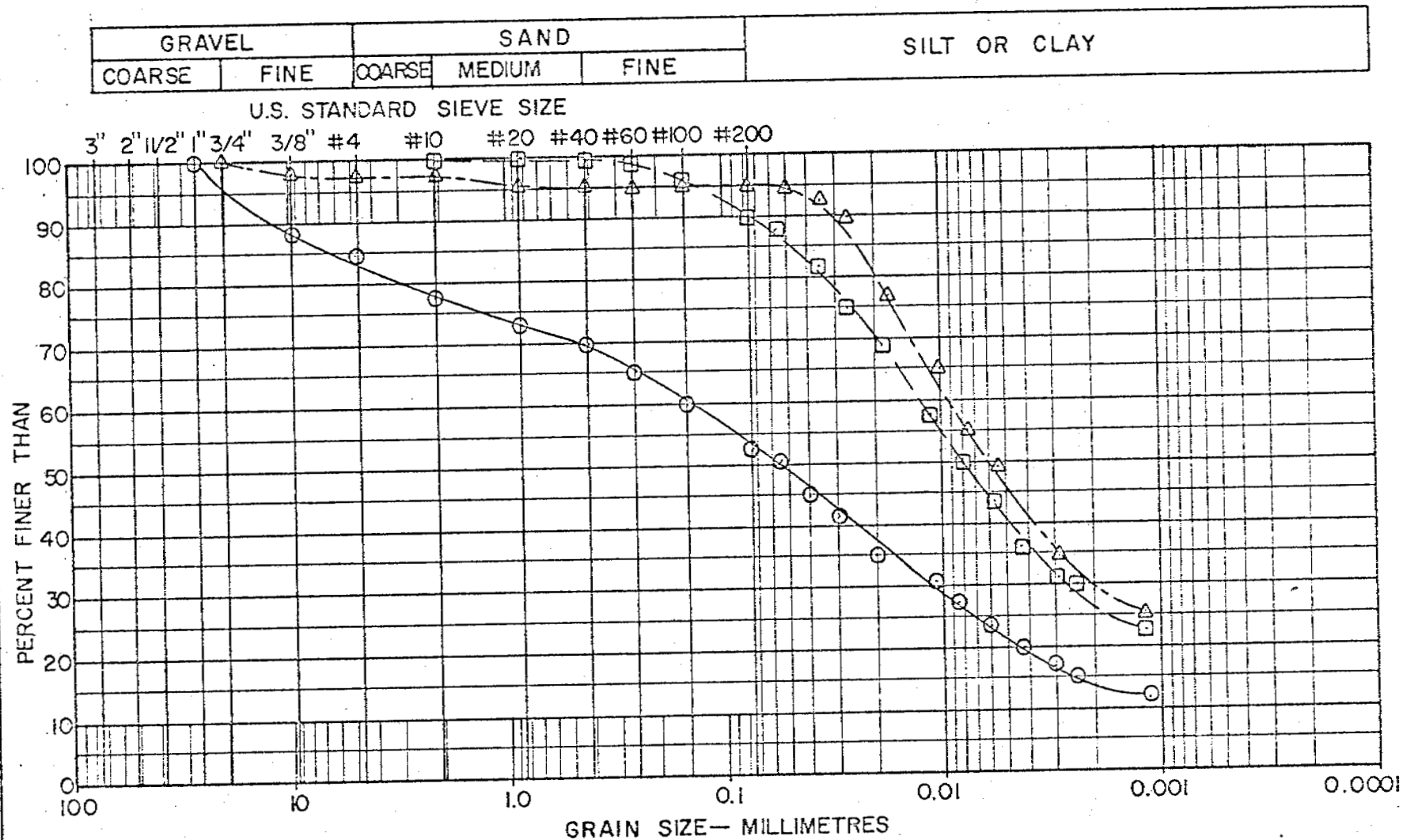
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 177.0 200' L. of C.L.
HOLE No. T - 2
DATE Oct. 3/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. T-2 DEPTH
DATE 19/10/76



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X 10 30 50 70 90%			
DEPTH	TYPE	BLOW No.	No.										
5	B	5 6 13	1		NF	1.0	MOSS - organic cover						
	B		2			Clayey SILT AND SAND - some gravel - slight plasticity - well graded - grey with brown							
	B		3										
	B		4										
	B		5										
10	SY	6				8.0	CLAY AND SILT - trace sand - trace fine gravel - grey						
	SPT	7											
	B	8											
15	SY	9				13.0	SILT AND CLAY - trace sand - stratified with gravel and fine sand - grey						
	SPT	10											
	B	11											
20	SY	12				18.0	GRAVEL AND SAND - some silt and clay						
	SPT	13											
						END OF HOLE							
						Notes:							
						1. Located in open meadow area sloping gently easterly. Dense spruce to 50' surround meadow.							
						2. G.W.L. at 2' during augering.							
						3. Drilling mud used below 5'. Test hole collapsed at 3' on completion.							



Klohn Leonoff Consultants Ltd.
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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	T - 3
DATE	Oct. 4/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

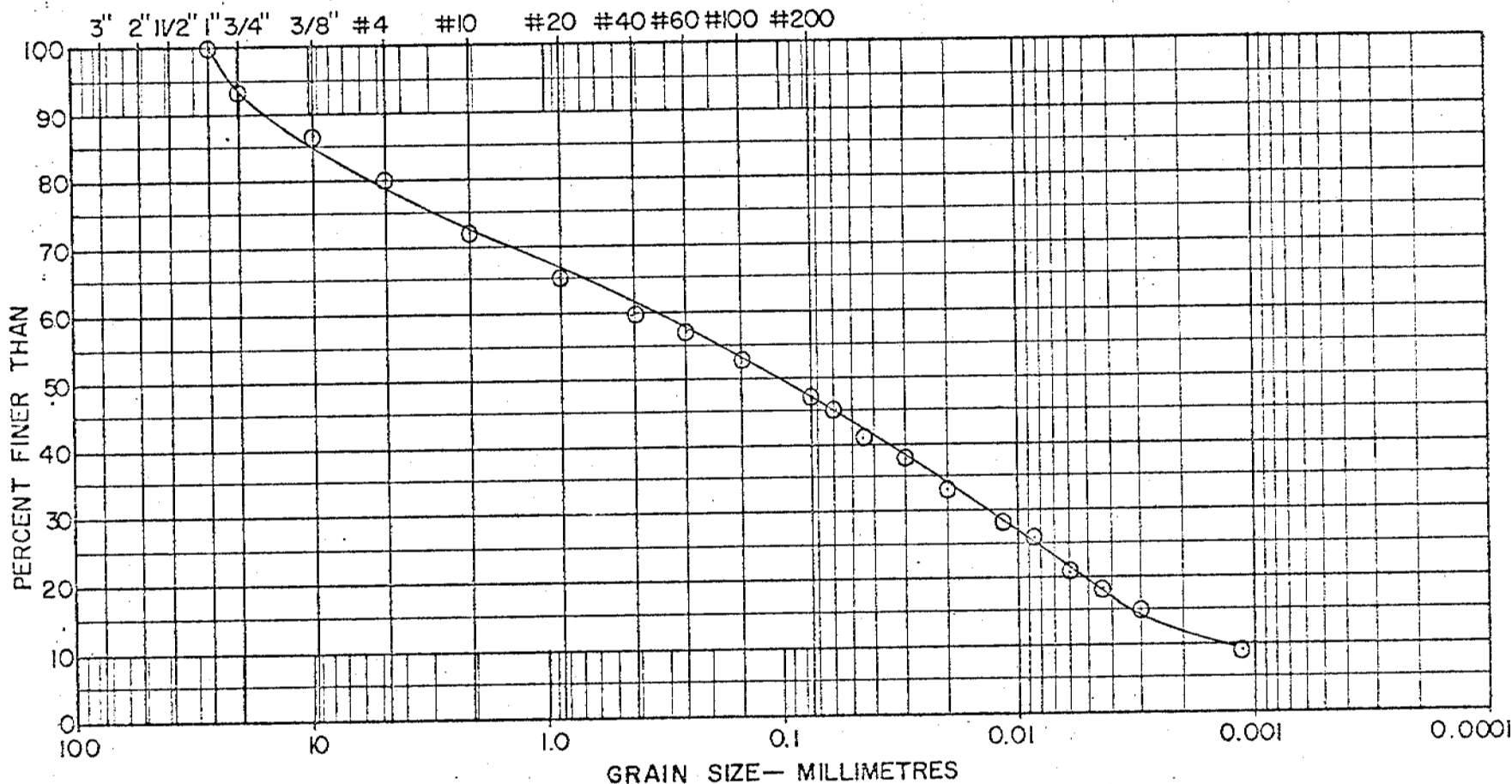
LOCATION

HOLE No. T-3 DEPTH

DATE 19/10/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○ — ○ Sample 6 at 5' - 6'

GRAIN SIZE CURVE

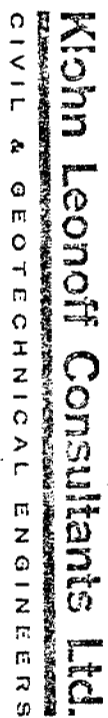
TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 Ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X			
DEPTH	TYPE	BLOW 6"	No.										
5	B	32 41 41	1	TT	NF	1.0	PEAT - black						
	B		2				CLAY & SILT - layers of silty clay - little fine sand - grey						
	B		3										
	C		4				6.0	SILT & CLAY - and sand - trace gravel (Ice lenses to 1/8", incl. to 1") interbedded gravel and sand					
10	SPT		5	Vr Vx									
			6										
15	SPT	Ref		Vr Nbn		12.0	SILT - and sand - trace fine gravel - stratified - grey						
	B		7										
20	B		8	N		18.0	GRAVEL & SAND - trace cobbles - well graded boulders						
	B		9				22.0						
25						END OF HOLE Notes: 1. Located in a valley in rolling terrain. 2. Burned deadfall, spruce and alder to 3'. 3. Drilling mud used from 9' to 22'. 4. Test hole terminated on cobbles at 22'.							



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 235 - Yukon
HOLE No. U - 1
DATE Oct. 2/76 PLATE

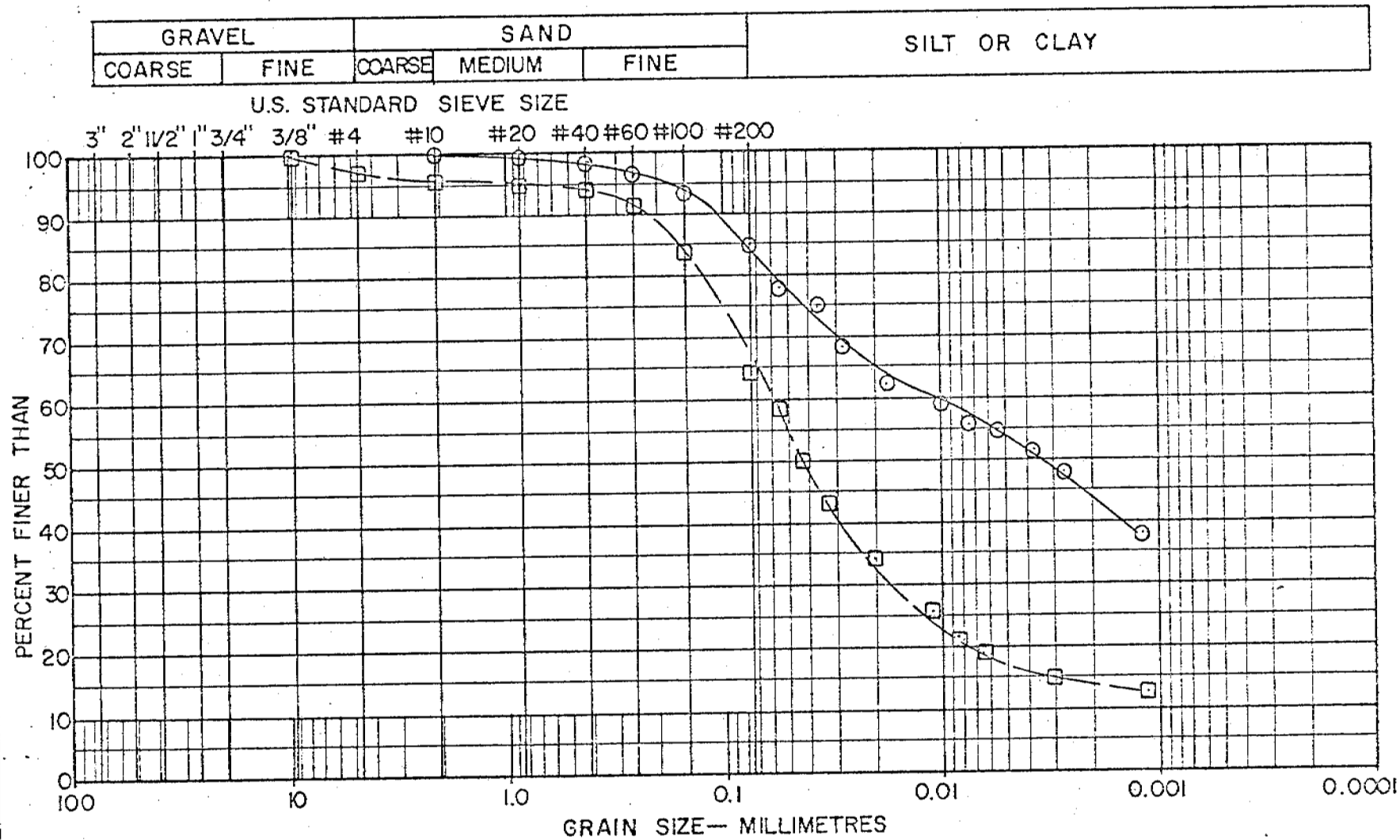


AL0709

Alcan Pipeline

DEPT#

9/10/76



REMARKS:  Sample 3 at 4' - 5'

 Sample 8 at 15' - 17.5'

TEST HOLE LOG

HAMMER WT. 140 lbs				SYMBOL	PERMAFROST		LOCATION Takhini River	COHESION - TONS / SQ. FT.				
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION	0.2	0.6	1.0	1.4	1.8
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE	LAB VANE	UNCONF.	
DEPTH	TYPE	BLOW No.						PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
		6"						X	0	X		
								10	30	50	70	90%
0.1	SILT - topsoil		1									
			2									
5	B		3									
	B		4									
	SY	7	5									
	SPT	9	6									
		10										
10			7									
	SY	10	8									
	SPT	8	9									
		9										
15			10									
	SY	6	11									
	SPT	7	12									
		12										
20			13									
	B	5	14									
	SPT	8										
		11										
25			12									
	SY	5	13									
	SPT	8	14									
		14										
30			15									
	B	5	16									
	SPT	7	17									
		11										
35			18									
			19									
			20									
			21									
			22									
			23									
			24									
			25									
			26									
			27									
			28									
			29									
			30									
			31									
			32									
			33									
			34									
			35									
			36									
			37									
			38									
			39									
			40									

(Continued)



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 240.3 C.L.
HOLE No. V - 1
DATE Sept. 25/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.							
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8							
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT				
DEPTH	TYPE	BLOW No.	No.					X	0	X					
45	SY SPT	6 8 11	15 16			NF	(As above) CLAY & SILT - trace sand - laminated - firm to stiff - grey								
50	SY SPT	6 11 16	17 18												
55															
60															
65															
70															
75	SY		19												
80															

Notes:

1. Located on upland, 100' from edge of slope, on west side Takhini River.
2. Vegetation in burned area is grass, few poplar 5' to 10' and sparse spruces to 35'.



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION HP 240.3 C.L.
HOLE No. V - 1
DATE Sept. 25/76 PLATE

TEST HOLE LOG

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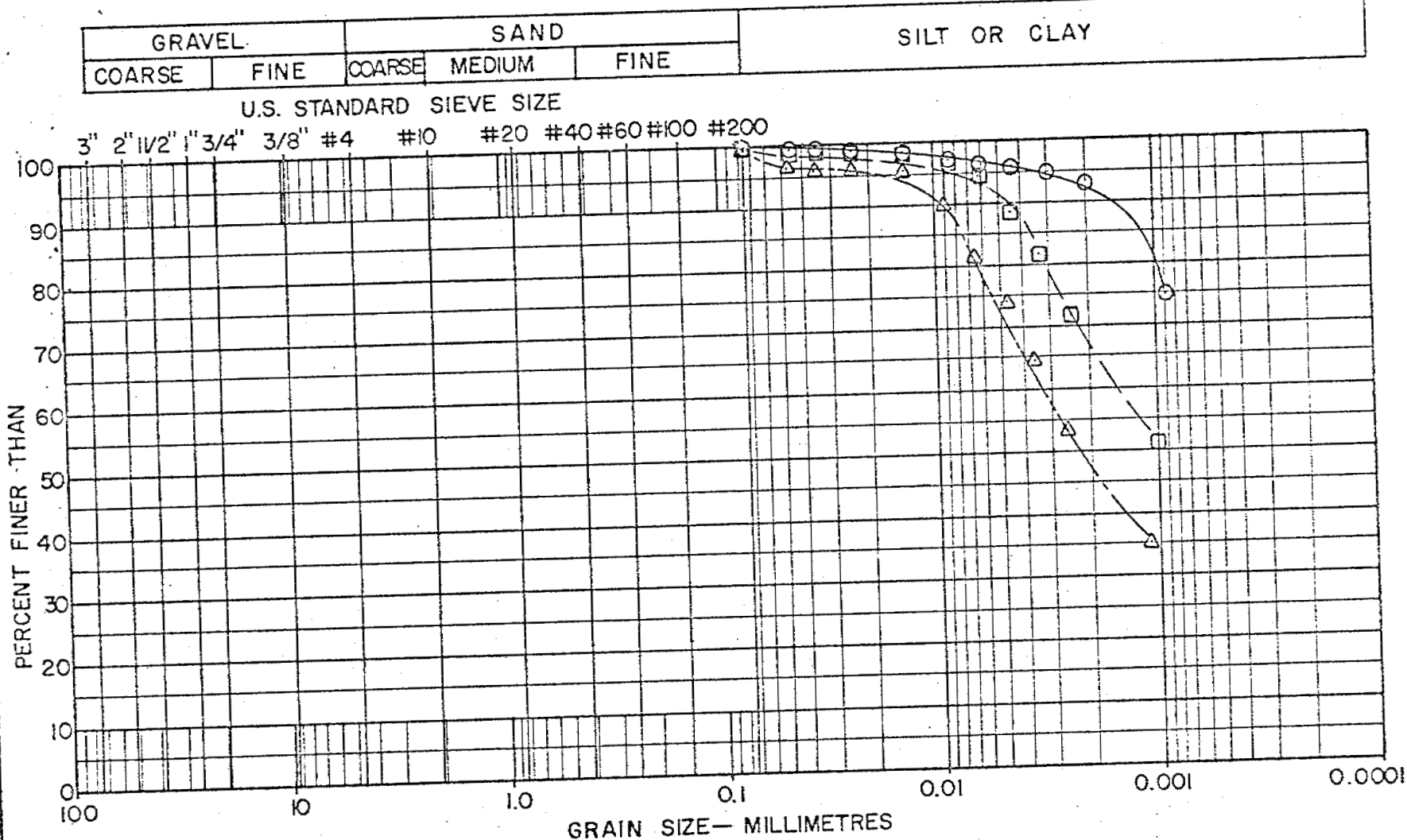
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 240.3 C.L.
HOLE No.	V - 1
DATE	Sept. 25/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan - Pipeline
LOCATION
HOLE No. V - 1 DEPTH
DATE Nov. 76



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION Takhini River		COHESION - TONS / SQ. FT.								
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8		FIELD VANE Δ LAB VANE $\square$ UNCONF.						
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL			PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT			
DEPTH	TYPE	BLOW 6"	No.		CLASS					X	---	0	---	X	10	30	50
5	B		1	N.F.		CLAY & SILT - little sand in seams - trace fine gravel - medium plastic - laminated, brown	8.0										
	B		2														
	SY	7	3														
	SPT	9	4														
10	B		5				SAND & GRAVEL - trace silt and clay - well graded - brown	15.0									
	SY	14	6														
	SPT	15	7														
	B		8														
15	SPT	3	9				CLAY & SILT - trace silty clay in seams - trace sand - trace fine gravel - slightly laminated - medium to high plastic - firm to stiff - grey with rusty zones										
	SY	3	10														
	SPT	5	11														
	SPT		12														
25	SPT		12														
	SY	4	13														
	SPT	5	14														
	SPT																
30	SPT																
	SY	4	13														
	SPT	5	14														
	SPT																
35	SPT				END OF HOLE	32.5											
	SY	4	13														
	SPT	5	14														
	SPT																

Notes:

1. Located on FFP of Takhini R.
2. Terrain is flat, grass covered with poplars to 20'.
3. Drilling mud used 12.5' to 32.5'.
4. Standpipe piezometer installed to 32.5'.



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 240.7 C.L.
HOLE No. V - 2
DATE Oct. 1/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. ALO709

PROJECT Alcan Pipeline

LOCATION

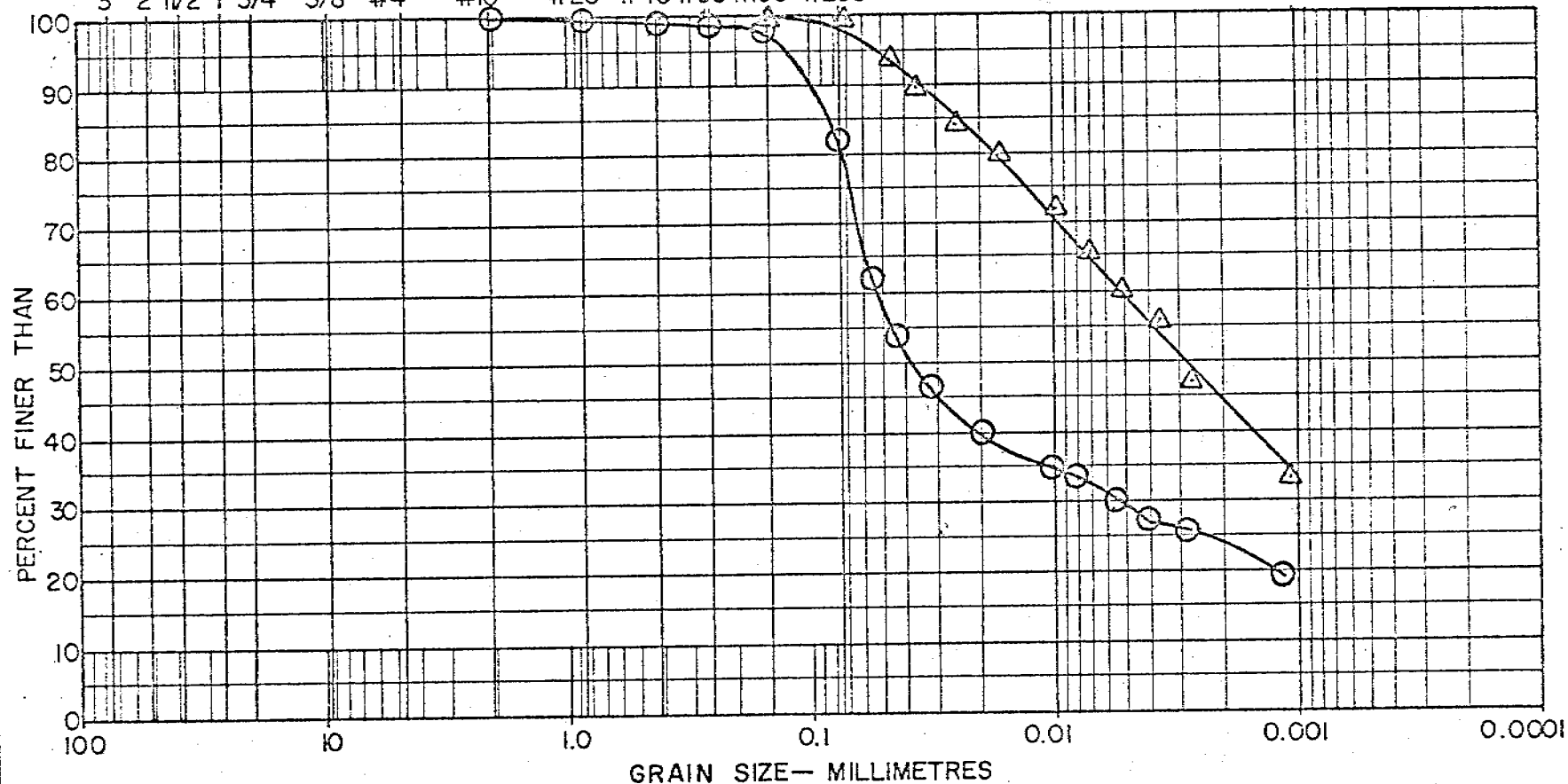
HOLE No. V-2 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: — Sample 2 at 4'

— Sample 11 at 21-22.5'

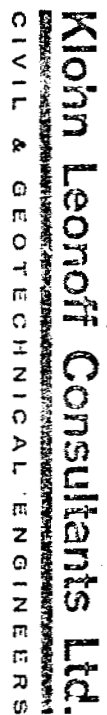
TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.												
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.												
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT							
DEPTH	TYPE	BLOW No.	No.																		
5	B	9 4	1		NF	4.0	SILT & CLAY - some sand - laminated, brown sand lense														
	B		2																		
	B		3																		
	B		4																		
	B		5																		
10	B		6						7.0	SAND - and fine gravel - trace silt, loose											
	SPT	7																			
	B	8																			
	B	9																			
15	SY SPT	50 Ref	10						10.0	CLAY & SILT - stratified with sand - trace of gravel											
			11																		
	B	12																			
	B	13							15.0	GRAVEL - some coarse sand GRAVEL - little sand - trace silt - trace cobbles - brown-grey											
20							END OF HOLE														
							Notes:														
							1. Located in old drainage channel which slopes 3% north-erly.														
							2. Site is old burn area over-grown with grass and pine to 6'. Area surrounding site has moderate spruce to 25' and poplar to 30'.														
							3. Drilling mud used below 2'. Hole terminated at 15' due to complete loss of circulation.														



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0692
PROJECT Alcan Pipeline
LOCATION
HOLE No. W - 1
DATE Oct. 7/76 PLATE



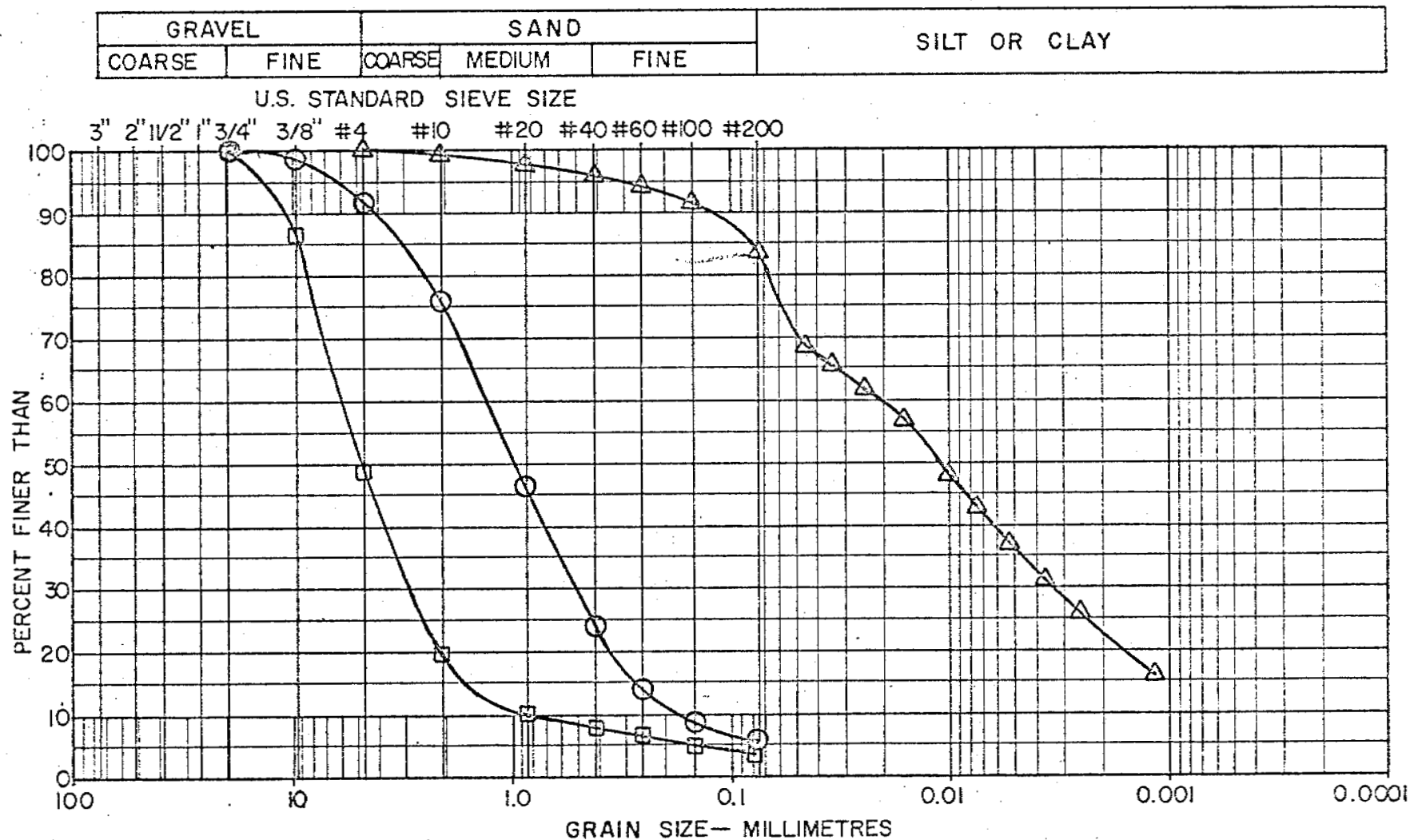
AL0709

Alcan Pipeline

1

DEPTH

Nov 176



REMARKS:  Sample 3 at 2-3'

 Sample 8 at 7.5-8'

 Sample 12 at 11.5-13'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE CONE				
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X				
DEPTH	TYPE	BLOW No.	No.						10	30	50	70	90%
5	B		1		NF	1.0	TOPSOIL - ORGANIC SILT						
	B		2			SILT AND CLAY							
	B		3			- little sand							
	B		4			- some gravel							
	B		5			- trace of organics							
10	SPT	8 33 60	6		5.5	GRAVEL							
				- some sand									
						- trace of silt							
						- cobbles							
						- brown							
						12.0	END OF HOLE						
15						<u>Notes:</u> 1. Located in low lying area approx. 15' lower than surrounding area except to south. 2. Site covered with grass, around the site, spruce trees to 20' and sparse lodge pole pines to 30' are found. 3. Drilling mud used from 5.5' to 12'. 4. Hole caved in at 12'. Lost water at 7' during drilling.							



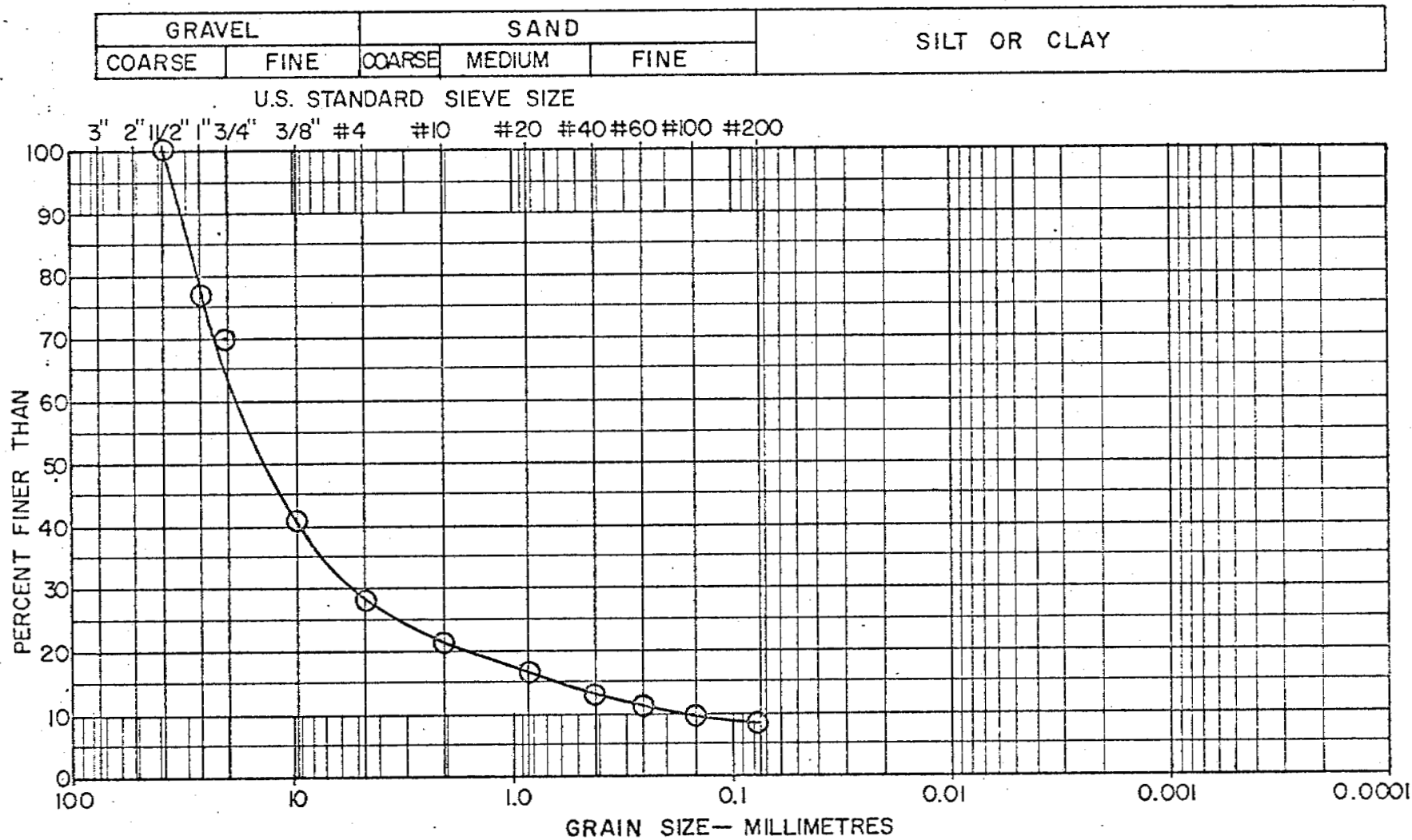
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 CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
 PROJECT Alcan Pipeline
 LOCATION
 HOLE No. W-3
 DATE Oct. 27/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	W-3
DEPTH	
DATE	Nov/76



REMARKS: Sample at 5.5-7'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.											
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.											
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL			PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT								
DEPTH	TYPE	BLOW 6"	No.		CLASS					X	0	X	10	30	50	70	90%			
							0.3	MOSS - organic cover												
	B		1				1.5	SILT - little sand - little fine gravel												
5	B		2				4.5	SAND - some silt - little gravel - brown												
	B		3			NF														
	B		4																	
10	B		5					SAND - and silt												
	B		6				10	- some gravel - cobbles & boulders - brownish grey (TILL)												
END OF HOLE																				
Notes:																				
1. Site located on elevated ground, sloping 3% northerly. Hole is 250' south of swamp.																				
2. Area densely covered with lodgepole pines to 30'.																				
3. Unable to drill past 10' as boulders kept falling down hole.																				
4. Hole augered from 6 to 10'.																				



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. X-1
DATE Oct. 29/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

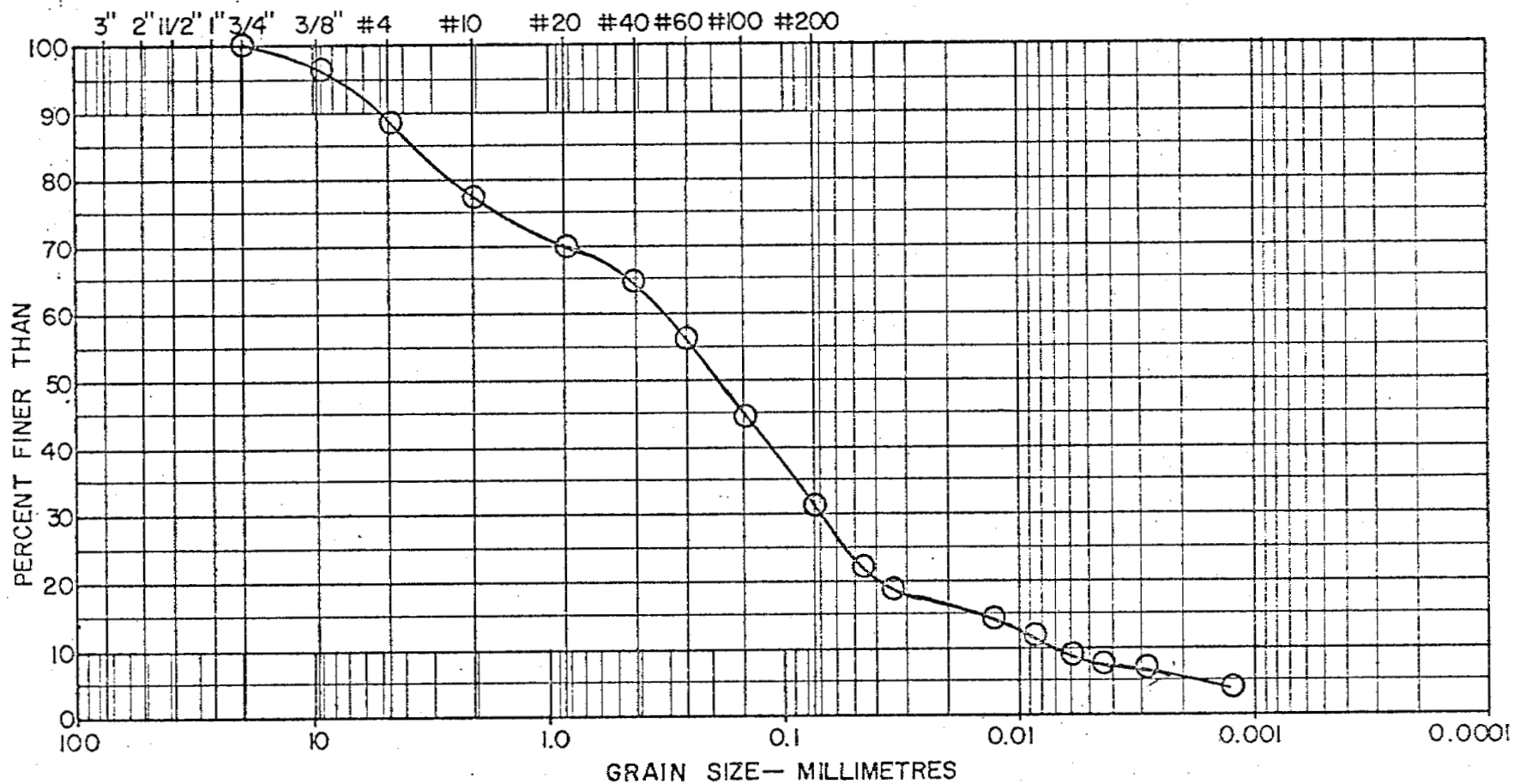
LOCATION

HOLE No. X-1 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 3 at 5-5.5'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%				
DEPTH	TYPE	BLOW No.	No.											
5	B	18 31 27	1	NF		0.3	ORGANIC COVER							
	B		2			4.0	SILT - some sand - little fine gravel - trace of clay - cobbles							
	SPT		3			10.5	SILT AND SAND - little gravel - trace of clay - cobbles and boulders - brownish grey (TILL)							
10							END OF HOLE							
15							Notes:							
							1. Site located 200' south of swamp area, 15' higher than swamp. The ground surface slopes 6% northerly.							
							2. Area is covered with spruce trees to 30', and sparse pines to 30'.							
							3. Hole caved in at 10'.							
							4. Hole drilled with stub auger.							



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JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. X-2

DATE Oct. 29/76 PLATE



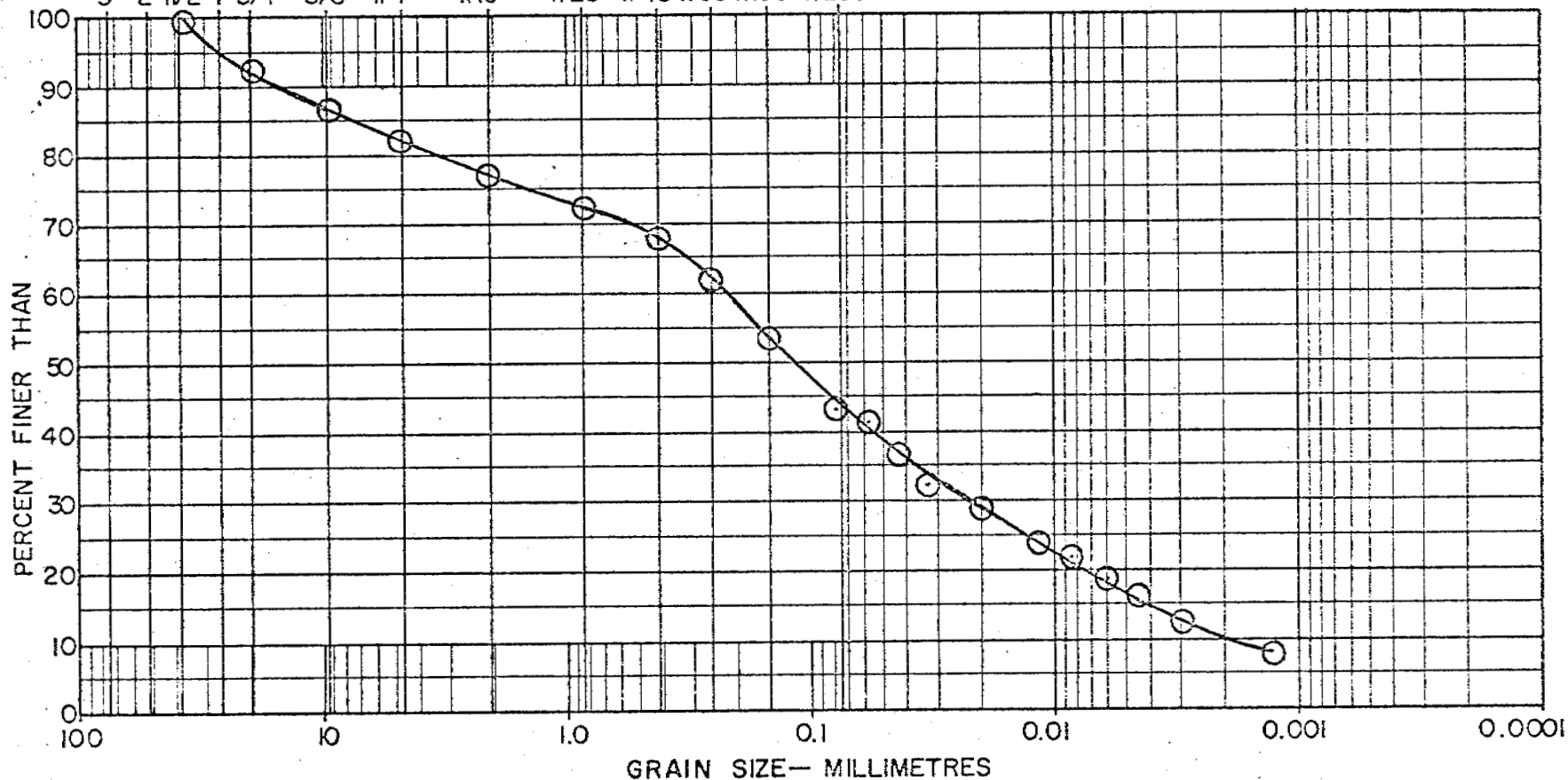
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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. X-2 DEPTH
DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: ○—○ Sample 4 at 7-8'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8					
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW 6"	No.											
5	B	6 13 26	1		NF		0.5	ORGANICS - COVER						
	B		2				▽	GRAVEL - fine to medium						
	B		3				- little sand							
	B		4				- trace of organic silt							
10	SPT	5	5.0				GRAVEL AND SAND							
	B	6	- cobbles											
15	B		7				12.0							
								END OF HOLE <u>Notes:</u> 1. Located at edge of swamp. 2. Swamp covered with grass and sparse, stunted spruce trees. 3. Around swamp, area is covered with spruce trees to 40' and a few pines to 25'. 4. Could not drill deeper as hole kept caving in. 5. Water level encountered at 1.5' below ground surface. 6. Air used as drilling fluid.						



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. X-3
DATE Oct. 28/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							DESCRIPTION OF MATERIAL		FIELD VANE LAB VANE UNCONF.				
DEPTH	TYPE	BLOW No.	No.	CLASS					PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
		6"							X	0	X		
									10	30	50	70	
												90%	
							0.7	MOSS - organic cover					
	B		1					SILT					
	B		2				3.0	- little sand & fine gravel					
5								- trace of clay					
	SPT	3						- trace of organics					
		4						SILT AND CLAY					
	B	5						- some gravel					
10	SY	6				NF		- little sand					
	B							- brown (TILL-LIKE)					
							13.0						
	SY	7						CLAY AND SILT					
15	B	8						- little sand					
	SY	9						- little gravel					
	B	10						- grey, firm					
	SY	11					17.5	(TILL-LIKE)					
20								END OF HOLE					

Notes:

1. Site 30' south of swamp, 10' higher than swamp & 20' lower than rise 50' to north. Slope on rise is 10%.
2. Area covered with pines to 30' & sparse spruce trees to 30'.
3. Free water encountered at 15.5 feet. Hole squeezed from 7'. Stanpipe piezometer installed to 7 ft.
4. Hole drilled with stub auger.



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. X-4
DATE Oct. 28/76 PLATE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

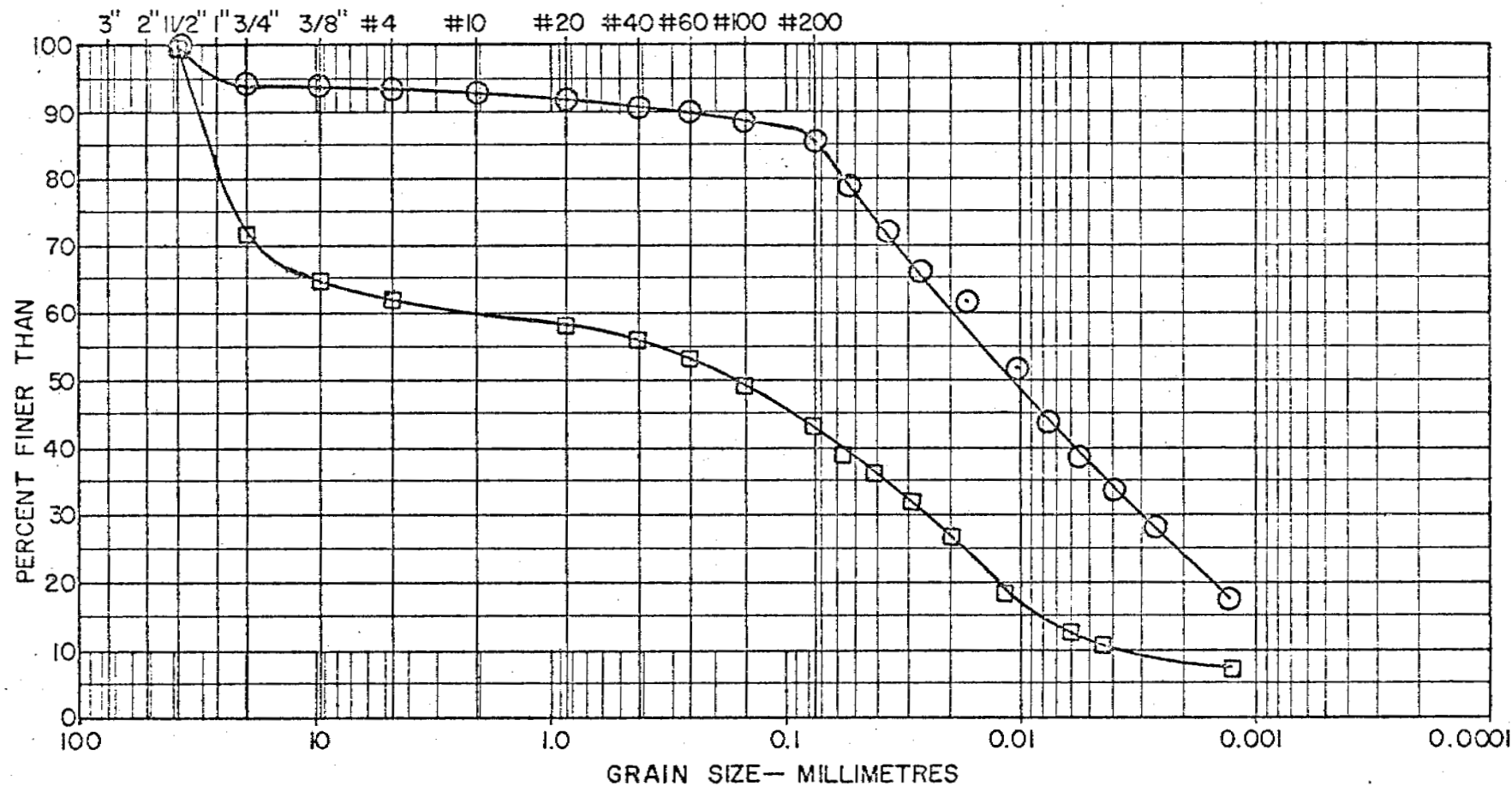
LOCATION

HOLE No. X-4 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW No.	No.							X	0	X	
5	B		1	T T	NF	1.0	MOSS - peat cover						
	B		2			Nbe Vr Vs	4.0	SILT - organic - roots, pieces of wood - light grey					
	C		3			Vs	7.0	SILT - little sand - trace of organics - light grey					
10	B		4		Vs		ICE & SOIL INCLUSIONS						
	C		5			11.5	(50-70% excess ice by volume)					169	
15	B		6		Vs Vx		(Ice lenses 1/4" spaced at 1") (Ice crystals to 2")						
	C		7				SILT - organic - little sand - trace of clay - pieces of wood - grey to brown					142	
20	B		8										
	C		9			20.0	SILT - trace of clay - stratifications of sand - light grey					132	
25	SPT	-	10		NF	24.5							
	B		11			26.0	SAND - fine to med. - clean - dark grey						
30						29.0	SILT - some fine sand - trace of organics - dark grey						
							END OF HOLE						
							Notes:						
							1. Site located on peat plateau 7' above surrounding swamp.						
							2. Sparse spruce trees to 25'.						
							3. Free water encountered at 20.5'. water raised in hole 7' below ground surface.						



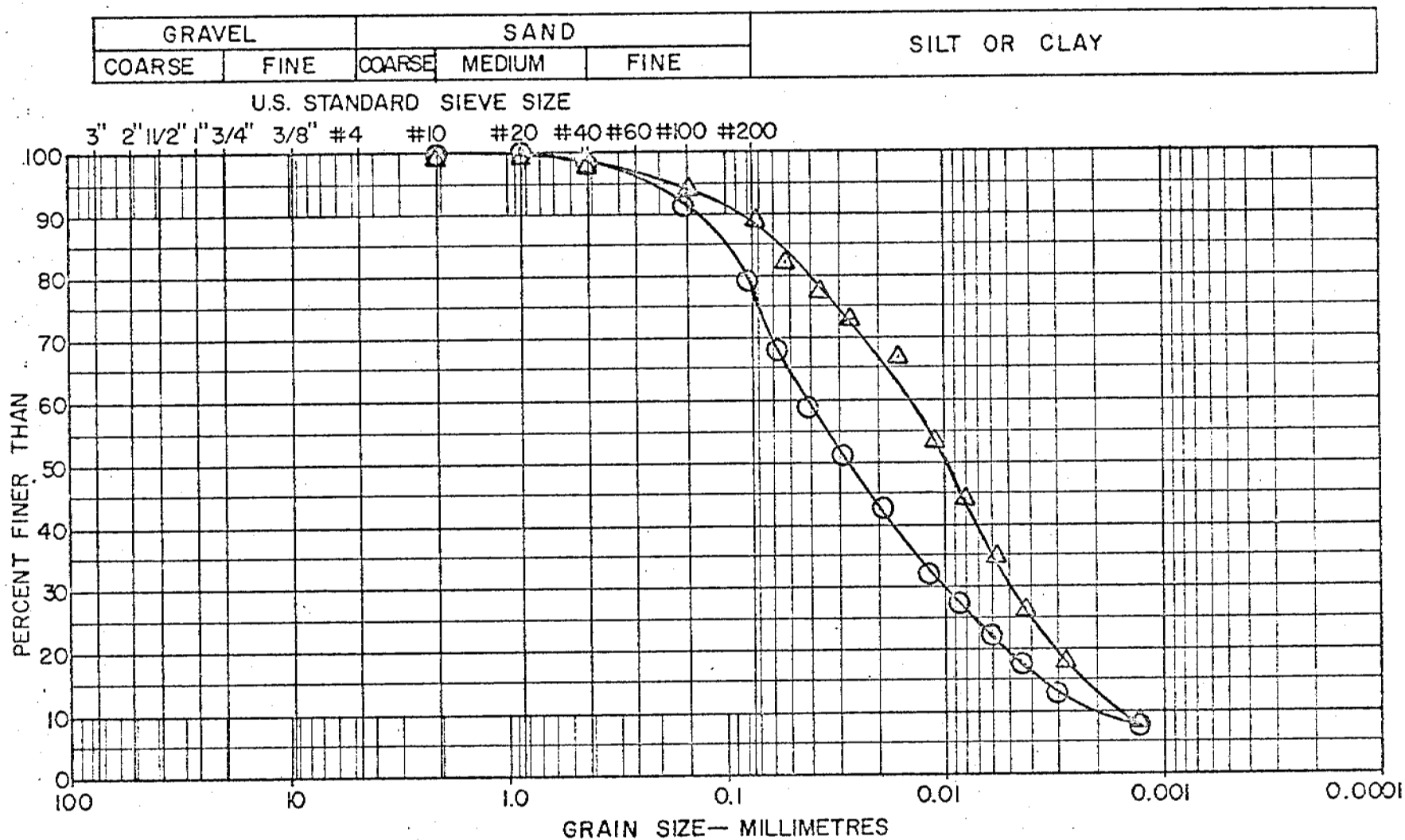
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. Y-1
DATE Nov. 1/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. Y-1 DEPTH
DATE Nov/76



REMARKS: ○—○ Sample 3 at 5-5.5'

△—△ Sample 7 at 15-16.5'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE CONE					
SAMPLE DATA					CLASS		DESCRIPTION OF MATERIAL	PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT			
DEPTH	TYPE	BLOW 6"	No.					X	0	X	10	30	50
5	B	—	1	Vx	NF	MOSS COVER						163	
	B		2			PEAT & ORGANIC SILT							177
	SPT		3			- grey							245
	C		4			(Ice lenses 1/8" spaced @ 1/2")							283
10	C		5	Vs	Vs	5.5						337	
	C		6			ICE							
	C		7			- silt inclusions							
	C		8			(Excess ice 50-70% by volume)							
15	C		9	Vs	Vs								
	C		10										
	C		11										
	C		12										
20	C		13	Vs	Vs	17.5							
	C		14			PEAT & ORGANIC SILT							168
	C		15			- grey							116
	C		16			(Ice lenses 1/8" spaced @ 1/2")							397
25	C		17	Vs	Vs	(Ice lenses 1/64" spaced @ 1/32")						190	
	C	17	24.8										
30						26.0							
						SILT - coarse							
						28.5							
						GRAVEL & COBBLES							
						- boulders							
						END OF HOLE							
Notes:													
1. Located on peat plateau. The peat plateau is about 15' above the surrounding swamp sparse spruce trees to 25'.													
2. Thermistors installed at 2, 5 and 10'.													



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. Y-2
DATE Oct. 31/76 PLATE

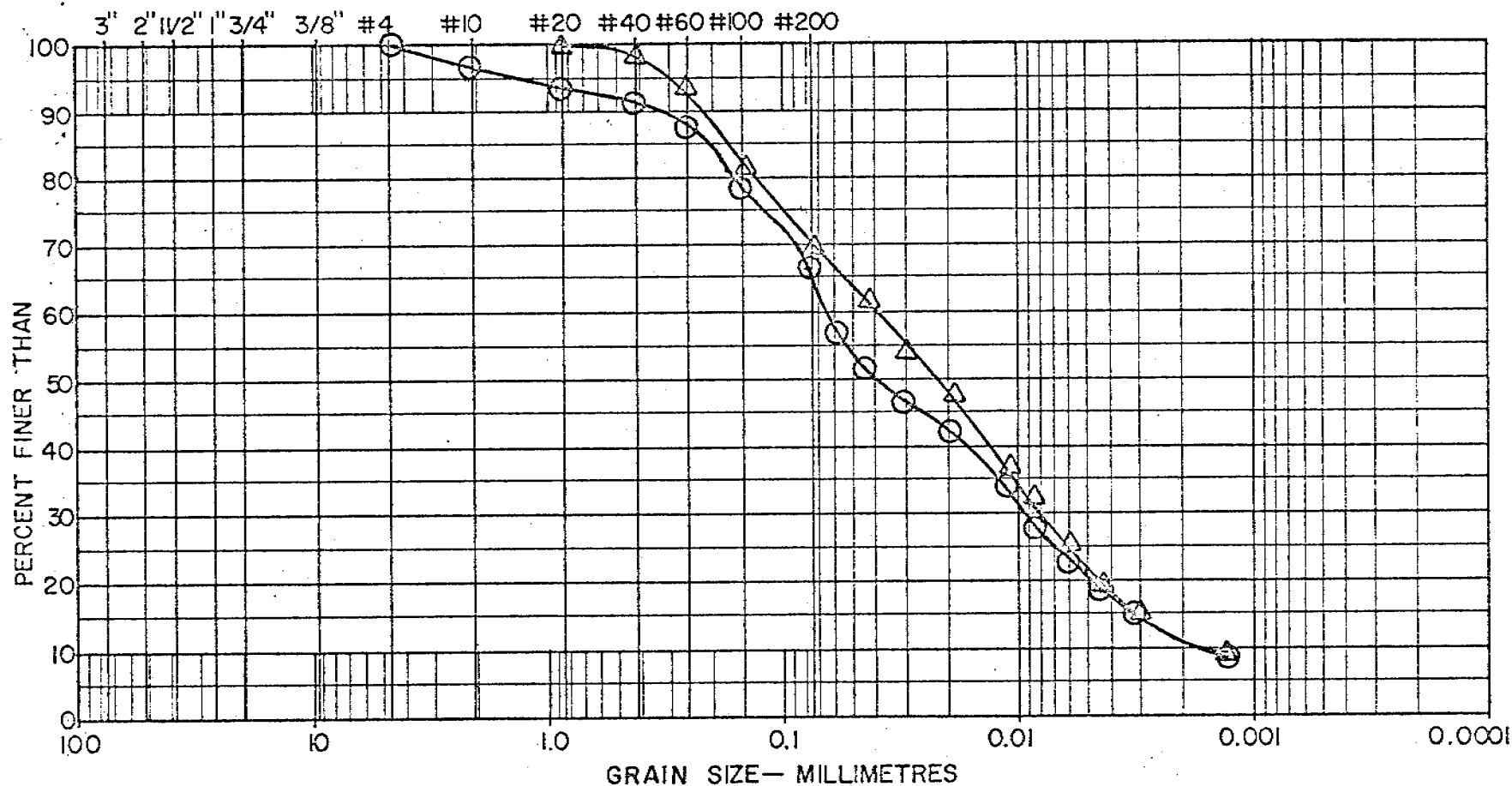


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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. Y-2 DEPTH
DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL		FIELD VANE Δ LAB VANE $\square$ UNCONF.			
DEPTH	TYPE	BLOW 6"	No.							PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT	
								X	0	X			
								10	30	50	70	90%	
	B		1			3"	MOSS, organic cover						
	B		2			2.0	SILT & CLAY - trace of sand & gravel						
5	SPT	11 15 14	3				SILT & CLAY - some sand - little gravel - cobbles - grey						
	B		4										
10	SPT	6 9 20	5		NF		(TILL)						
	B		6							X-X			
15	B		7										
	B		8										
20	B		9										
						22.0							
25							END OF HOLE						
							Notes:						
							1. Located on hill side 15' above a valley. Ground surface slopes 15% northerly. Spruce trees to 45'.						
							2. Thermistors installed at 2, 4.5 and 10'.						



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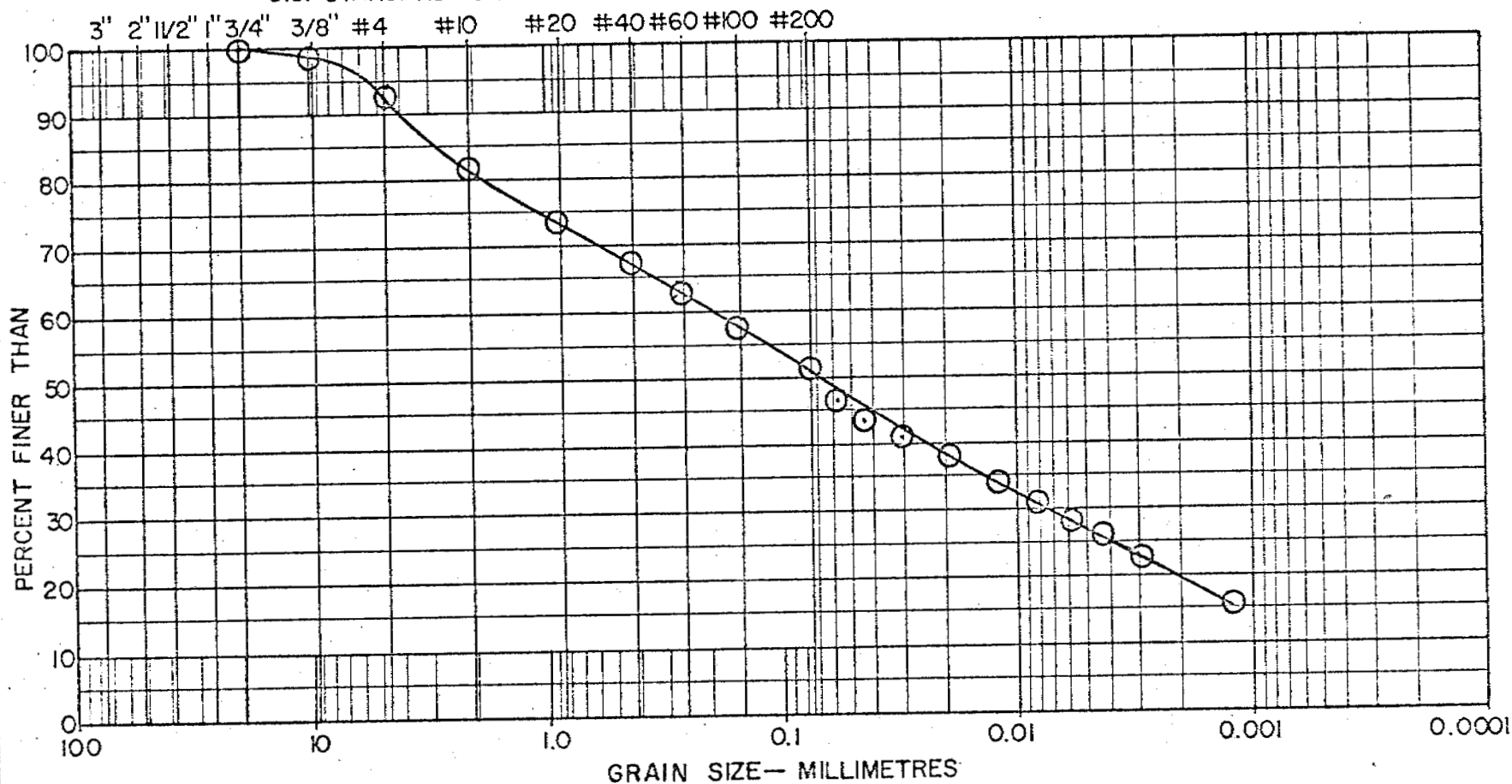
JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	Y-3
DATE	Oct. 31/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



GRAIN SIZE CURVE

REMARKS: Sample 6 at 12-13'

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. Y-3 DEPTH

DATE , Nov/76



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.

AL0709

PROJECT

Alcan Pipeline

LOCATION

HOLE No.

Z-2 DEPTH

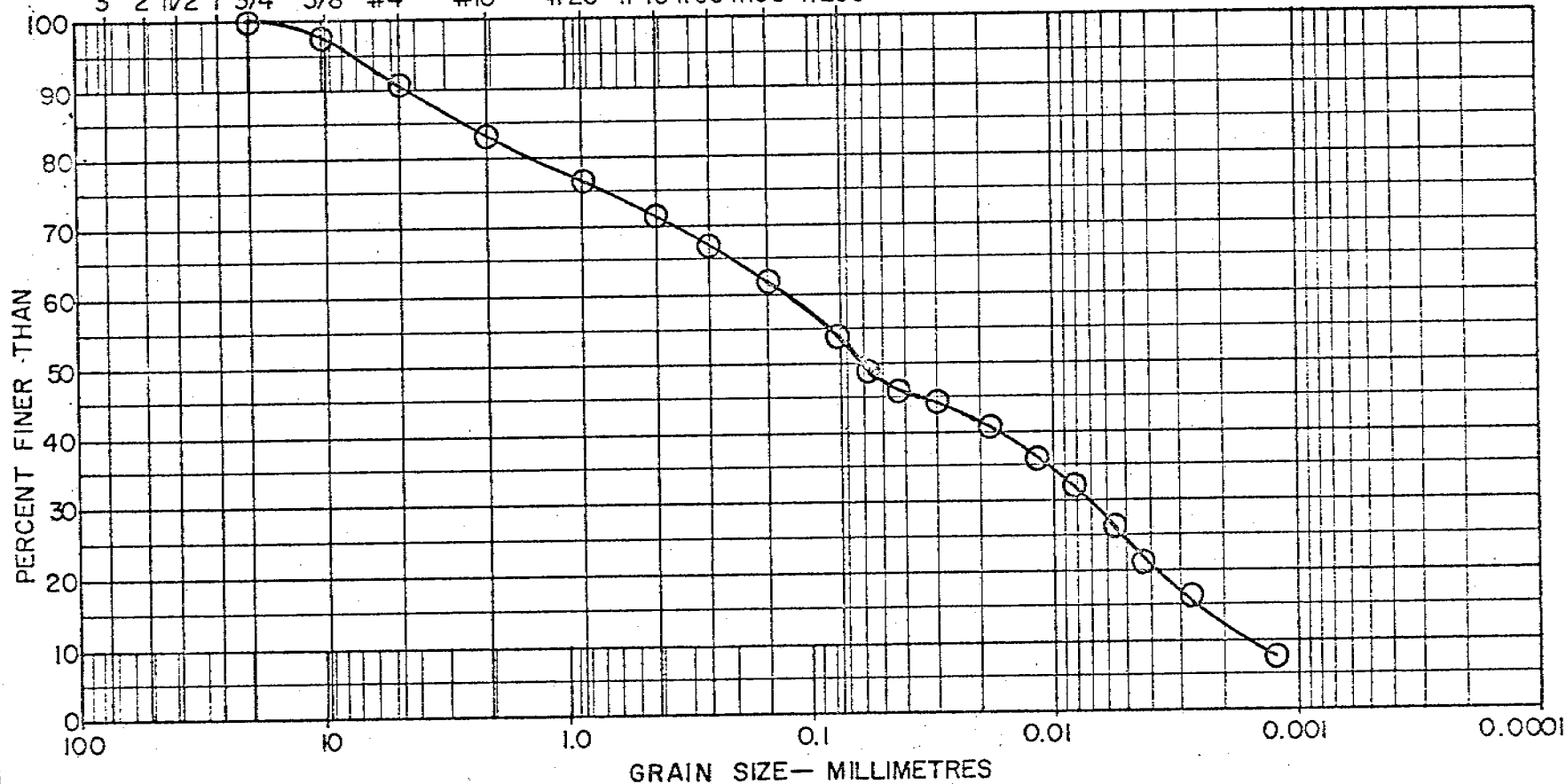
DATE

Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: Sample 4 at 7-8'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST	LOCATION Judas Creek		COHESION - TONS / SQ. FT.						
HT. DROP 30 ins.						N.R.C.	N.F.	ELEVATION		0.2 0.6 1.0 1.4 1.8		FIELD VANE LAB VANE UNCONF.		
SAMPLE DATA								CLASS	DESCRIPTION OF MATERIAL	PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW 6"	No.											
5	B	13 20 25	1	NF		0.5	MOSS - organic cover							
	B		2											
	SPT		3											
10	B	4												
	SPT	15 33	5											
15														
20						17.0								
							Notes: END OF HOLE							
							1. Located on low lying plateau. Elevation is about 8' above the swamp. Hole drilled 150' north-east of swamp edge.							
							2. Vegetation consists of sparse pines to 35', boulders to 16 S.F. are found on the ground surface surrounding the site.							
							3. Hole caved in at 13'. Standpipe piezometer installed to 13'.							
							4. Air used as drilling fluid.							



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CIVIL & GEOTECHNICAL ENGINEERS

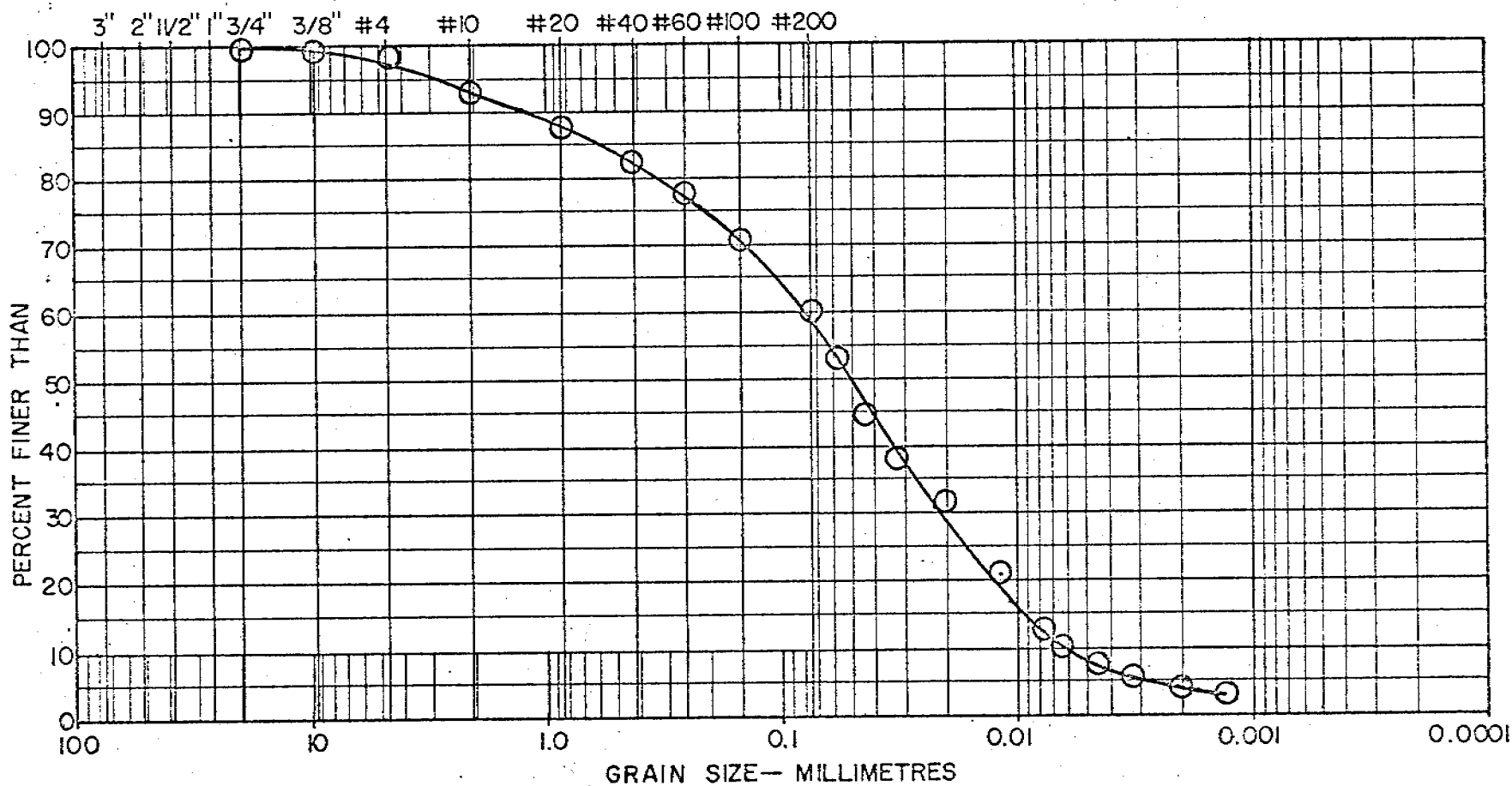
JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	MP 317.0 400' L. of C.L.
HOLE No.	Z-1
DATE	Nov. 2/76
PLATE	



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



GRAIN SIZE CURVE

REMARKS: Sample 2 at 3-4'

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. Z-1 DEPTH

DATE Nov/76

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8					
SAMPLE DATA							CLASS		DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT			
DEPTH	TYPE	BLOW 6"	No.											
1.0	B		1	T T		NF	MOSS - organic cover							
	B		2				SILT & CLAY							
	B		3				- little sand							
	B		4				- little gravel							
	B		5				- cobbles							
	B		6				- grey							
5							(TILL)							
10	SPT	13	13				1 ft. of silty sand							
15	B		6				14.0 boulder							
								END OF HOLE						
								Notes:						
								1. Located on slope about 200' south west of lake. Ground surface slopes 10% in a north-east direction.						
								2. Vegetation of dense spruce trees to 45'.						
								3. Trace of water encountered at 5'. Standpipe piezometer installed to 14'.						
								4. Air used as drilling fluid.						

CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	HP 313.9 2500' L. of C.L.
HOLE No.	Z-2
DATE	Nov. 1/76
PLATE	

TEST HOLE LOG

HAMMER WT. 140 lbs				SYMBOL	PERMAFROST		LOCATION Squanga Lake		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA					N.R.C. N.F.		DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT	
DEPTH	TYPE	BLOW 6" No.	CLASS		or F.	X - - - - - X			0 - - - - - 0		X - - - - - X			
5	B B B B	1 2 3 4		NF	1.0 ORGANIC COVER, Cobbles									
					GRAVEL & SAND - trace of silt - cobbles - grey									
					6.0 Boulder									
10					END OF HOLE									
					Notes:									
					1. Located in clearing. Spruce trees to 40' and lodgepole pines to 35' surrounding the site. Boulders to 9 s.f. found in the vicinity.									
					2. Hole caving in during drilling.									
					3. Hole drilled with stub auger to 6' then attempted with a rock bit without success.									



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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION MP	324.8 850' R. of C.L.
HOLE No.	AA-1
DATE	Nov 3/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION Squanga Creek		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA					N.R.C.	N.F. or F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X ----- 0 ----- X 10 30 50 70 90%					
DEPTH	TYPE	BLOW No.	No.	CLASS										
5	B	1		TT			NF	1.0	MOSS - organic cover					
	B	2							SAND - and gravel - little silt - grey ← Boulder & Cobbles					
	B	3												
10														
					Vr			12.0	(Ice crystals to 1/16")					
15								END OF HOLE						
Notes:														
1. Located in burn area. Ground surface sloping 2% to the north east. Spruce trees to 40'.														
2. Hole caving in during drilling. Thermistors installed at 3,5, and 9.5'.														
3. Water seen on ground surface 50' from hole. Trace of water encountered in hole at 3.5'. Standpipe piezometer installed to 9.5'.														
4. Hole augered to 6' then terminated with a rock bit.														



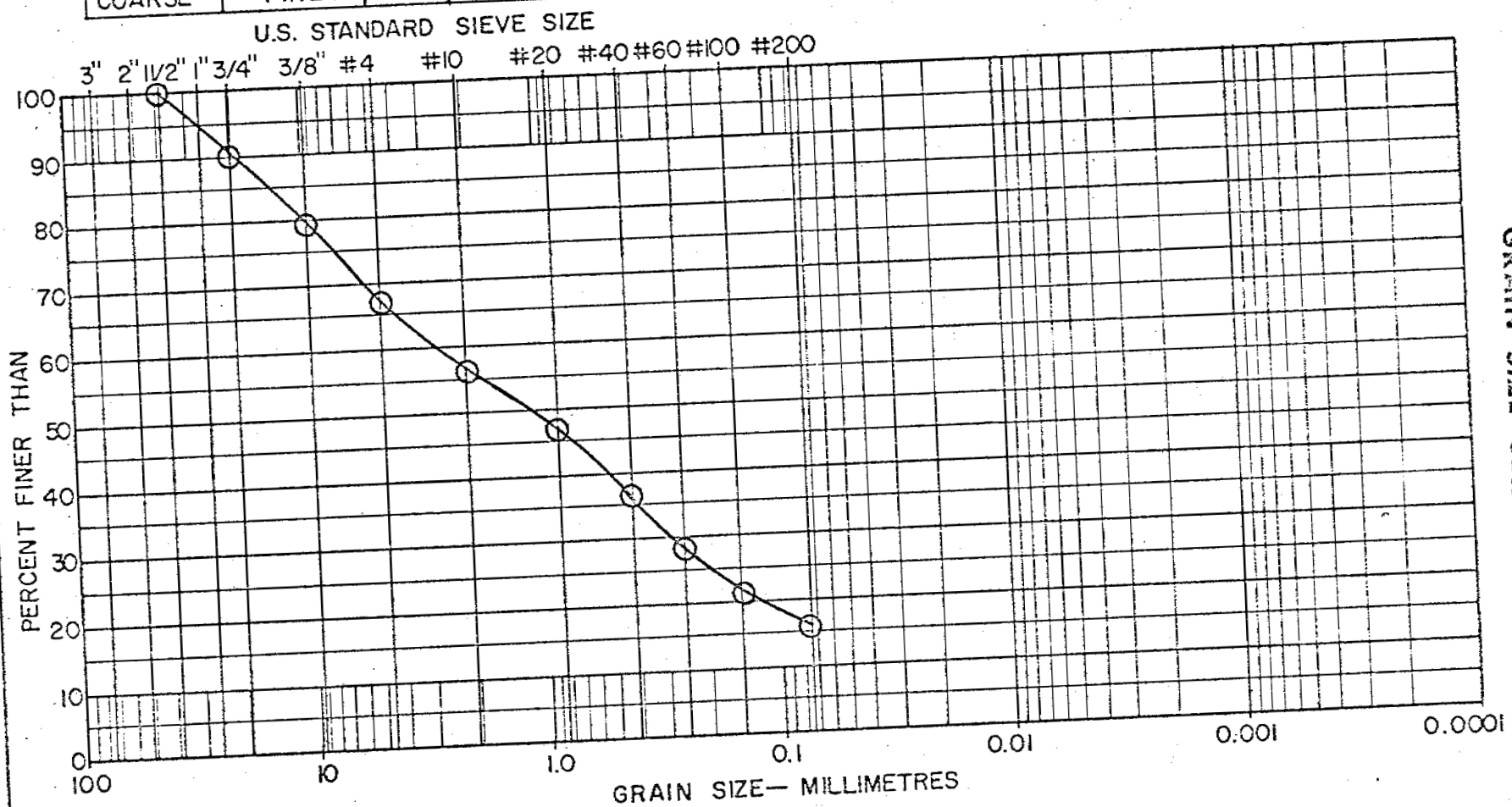
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL0702
PROJECT	Alcan Pipeline
LOCATION	HP 328.3 1500' R. of C.L.
HOLE No.	AA-2
DATE	Nov 3/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



GRAIN SIZE CURVE

REMARKS: ○ — ○ Sample 2 at 3-4'

JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	AA-2
DATE	Nov/76
DEPTH	

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION	COHESION - TONS / SQ. FT.									
HT. DROP 30 ins.					N.R.C.	N.F. or F.	ELEVATION	0.2 0.6 1.0 1.4 1.8									
SAMPLE DATA							DESCRIPTION OF MATERIAL	FIELD VANE Δ LAB VANE $\square$ UNCONF.									
DEPTH	TYPE	BLOW 6"	No.		PLASTIC LIMIT			WATER CONTENT	LIQUID LIMIT	X							
									10	30	50	70	90%				
				T T			0.7	ORGANIC COVER									
	B		1					CLAY AND SILT									
	B		2					- trace of sand									
								- medium plasticity									
5								- slightly laminated and layered									
	B		3					- grey									
							7.0										
	B		4					SAND									
	SPT	9	5					- fine									
10		12						- little silt									
		18						- stratified with silt and clay (1" to 3" layers)									
								- grey									
	B		6														
	SPT	9	7														
15		7															
		10															
	B		8														
	SPT	12	9				18.5										
20		12						SILT AND CLAY									
		13						- trace of sand									
								- laminated with sandy silt and sand									
								- brownish grey									
	B		10				24.0										
25		10						SILT									
	SPT	14	11					- trace of clay									
		14						- trace of sand									
	B		12					- laminated									
	SPT	13	13					- medium grey									
30		15															
		17															
	B		14														
	SPT	14	15														
		15															
		18															
35							35.0										
	B		16					SILT									
	SPT	4	17					- trace of clay									
		6						- trace of sand									
		8						- massive									
								- grey									
40																	



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION MP 338.4 C.L.
HOLE No. BB-1
DATE Nov 4/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.						
HT. DROP 30 ins					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.						
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X 0 X						
DEPTH	TYPE	BLOW No.	No.						10	30	50	70	90%		
	B		1	T F		NF	0.5	ORGANIC COVER							
	B		2												
5	SPT	4 4 4	3				6.5	SAND - fine - trace of silt - slightly laminated - lenses of grey silt - brown							
	B		4												
10	B		5					SILT AND CLAY - some sand - little gravel - medium plasticity - cobbles (TILL)							
	SPT	3 3 4	6												
15															
	SY		7												
	SPT	10 15 28	8				18.0	SHALE							
20							20.0	- laminated, brown							
	SPT	23 26 27	9	21.0	SAND AND SHALE - stratified										
					END OF HOLE										

Notes:

1. Located in burn area. The ground surface slopes 7% easterly. It has a new growth of pines.
2. Ponded water was observed between peat tussocks. At end of drilling, water level was 2' below ground surface. A standpipe piezometer was installed to 19'.
3. Hole drilled with stub auger.



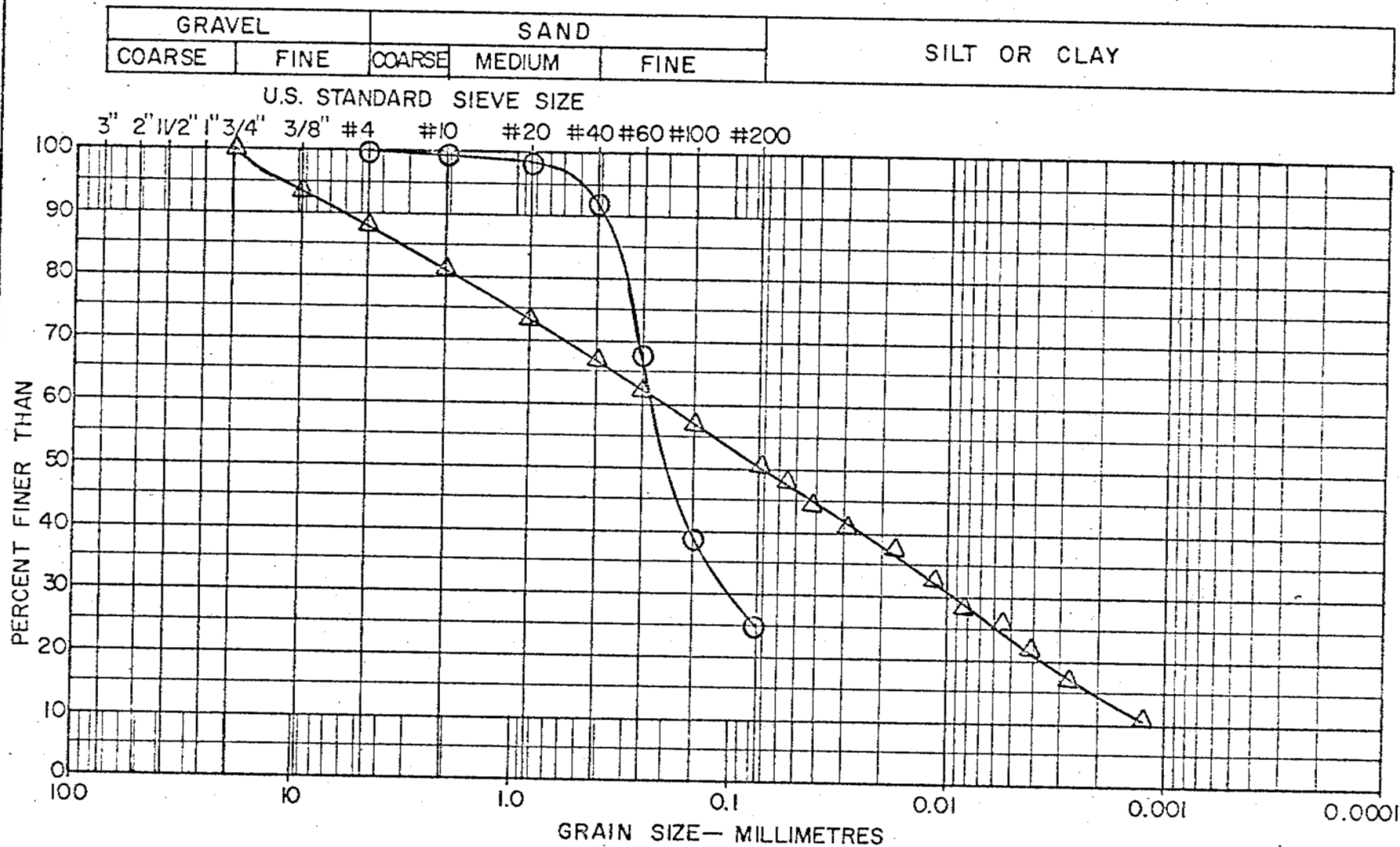
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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION Logjam Creek
HOLE No. CC-1
DATE Nov 5/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.												
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.												
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT								
DEPTH	TYPE	BLOW 6"	No.						X	0	X	10	30	50	70	90%					
5	B	—	1	[Symbol]	NF	0.5	ORGANIC COVER														
	B		2			4.0	SAND AND GRAVEL														
	SY		3				- little organic silt														
	SPT		4			- dark brown															
10	B	5	[Symbol]			NF	15.0	SILT AND CLAY													
	B	6						- some sand													
	B	7						- little gravel													
B	8	- lenses of brown sand																			
B	9	- cobbles																			
15	SPT	10		[Symbol]	NF		15.0	- grey													
	SPT	11						(TILL)													
										Harder											
										END OF HOLE											
								Notes:													
								1. Located in swamp-like area. Water ponded between peat tussocks. Ground surface sloping 4% to the north east. Coarse gravel observed in the creek 30' to the south of hole. Vegetation consists of spruce trees to 30'.													
								2. Water level at 1' in hole.													
								3. Hole drilled with stub auger to 14'. Air used to bypass a 6" cobbles at 14'. Hole subsequently caved in.													



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. CC-2
DATE Nov 5/76 PLATE



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JOB No. ALO/09

PROJECT Alcan Pipeline

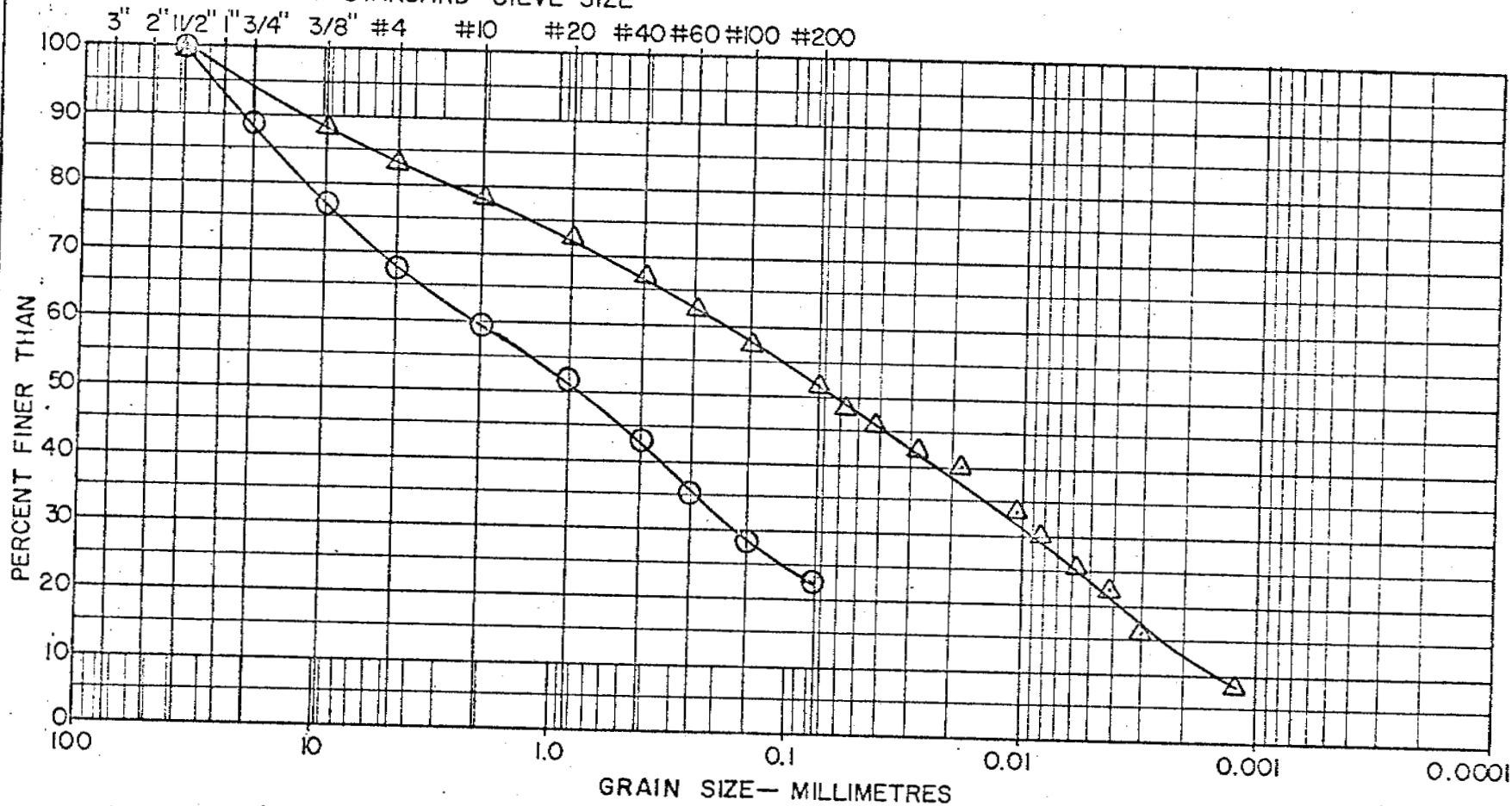
LOCATION

HOLE No. CC-2 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.							
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.							
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%							
DEPTH	TYPE	BLOW No.	No.													
5	B	13 27 17	1	T T	NF	1.0	MOSS - organic cover									
	B		2			7.0	GRAVEL AND SAND - little silt - trace of organics to 2' - cobbles - grey									
	SPT		3													
10	B	>14	4					harder	SAND AND SILT & CLAY - little gravel - low plasticity - cobbles, grey (TILL)							
	SPT		5													
	B		6													
	B		7					12.0								
15						END OF HOLE										
						<u>Notes:</u> 1. Located on hummocky ground. Light vegetation of spruce trees and lodgepole pines. Ground surface slopes 4% northerly. Water ponded between peat tussocks. 2. Water level 2' below ground surface at end of hole. Stand-pipe piezometer installed to 8'. 3. Hole drilled with stub auger.										



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JOB No. AL0709
 PROJECT Alcan Pipeline
 LOCATION
 HOLE No. DD-2
 DATE Nov 6/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

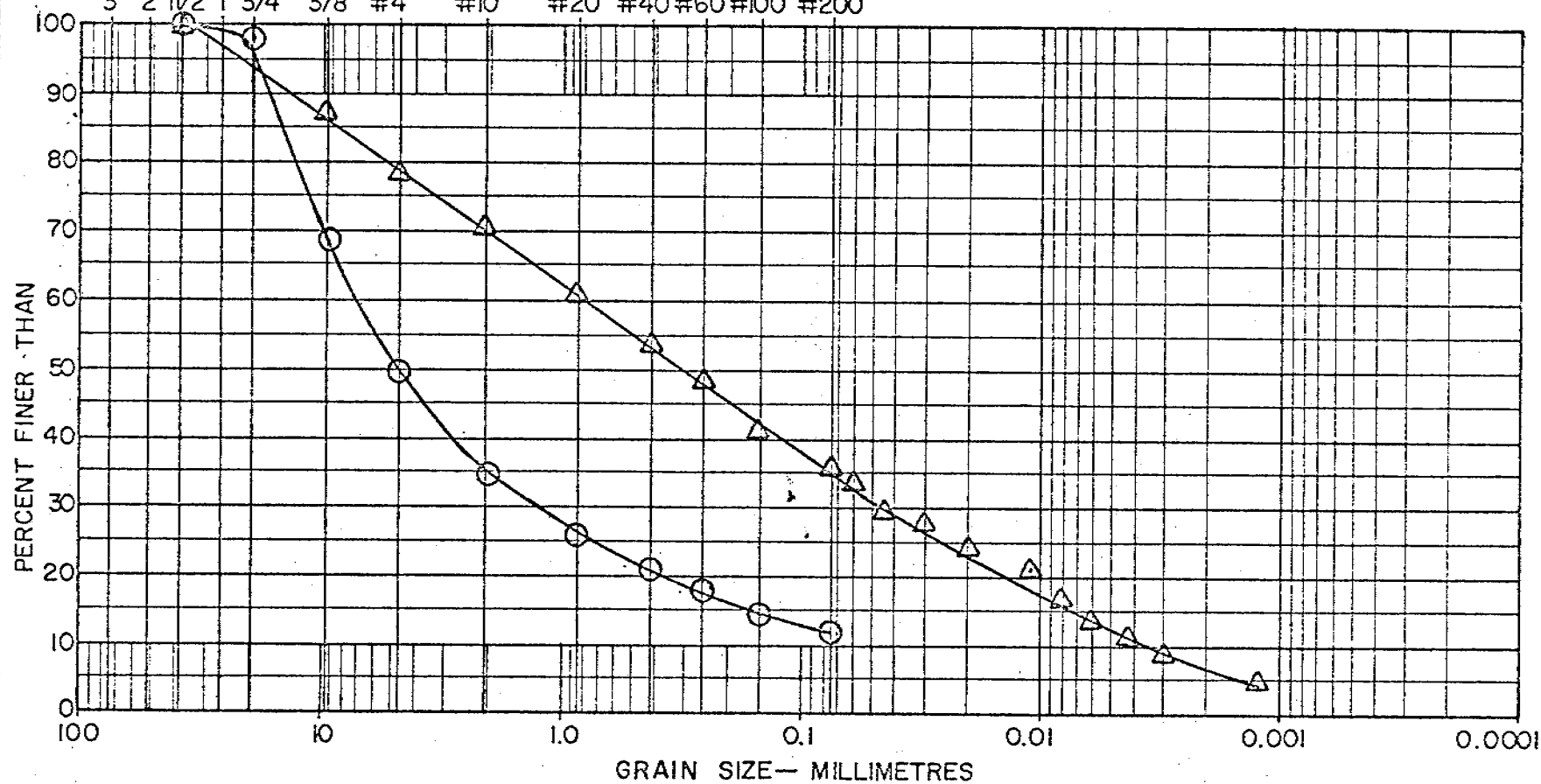
HOLE No. DD-2 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE

3" 2" 1 1/2" 1" 3/4" 3/8" #4 #10 #20 #40 #60 #100 #200



REMARKS: Sample 2 at 3-4'

Sample 4 at 7-8'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.							ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA					N.R.C. N.F.		DESCRIPTION OF MATERIAL		FIELD VANE		LAB VANE		UNCONF.
DEPTH	TYPE	BLOW No.			CLASS	or F.			PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT		
								0.4	ORGANIC COVER				
5	B	1											
	B	2											
	B	3											
	B	4											
10	B	5				NF							
	B	6						10.5					
								12.0	SANDSTONE				
15									END OF HOLE				
Notes:													
1. Located on flat area 200' north east of a hill. Medium dense vegetation of spruce and pines to 30'.													
2. Water level 8' below ground surface at end of drilling.													
3. Hole drilled with stub auger.													



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. FF-1
DATE Nov 7/76 PLATE



Kohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.

AL0709

PROJECT

Alcan Pipeline

LOCATION

HOLE No.

FF-1

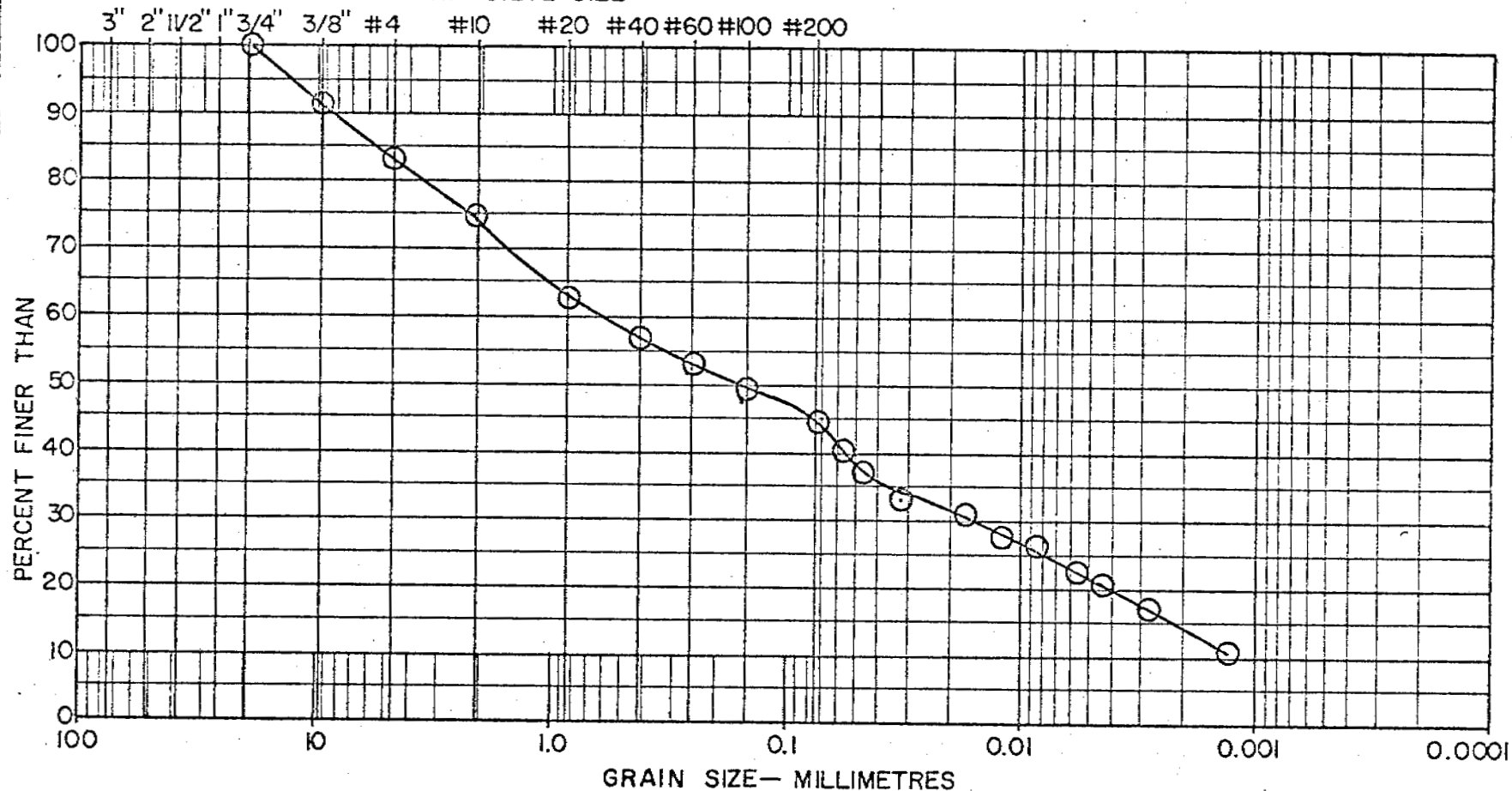
DEPTH

DATE

Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 5 at 8-9'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.									
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.									
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT					
DEPTH	TYPE	BLOW 6"	No.						X	0	X	10	30	50	70	90%		
5	B		1	NF	0.5	GRASS - organic cover												
	B		2		1.7	SILT AND CLAY - trace of sand & organics												
	SPT	10 12 18	3		SAND AND SILT & CLAY - little gravel - low plasticity - brown (TILL)													
10	B	8	4															
	SPT	9 12	5															
	B	7	6															
15	B	>14	7			11.7	SHALE - laminated - siltstone layers - brownish grey											
	SPT		8															
	B		9															
20	B		10			20.0												
END OF HOLE																		
Notes:																		
1. Located on slope adjacent to a creek. Ground surface slopes 15% to south west. Vegetation consists of sparse spruces trees to 20'.																		
2. Air used as drilling fluid.																		



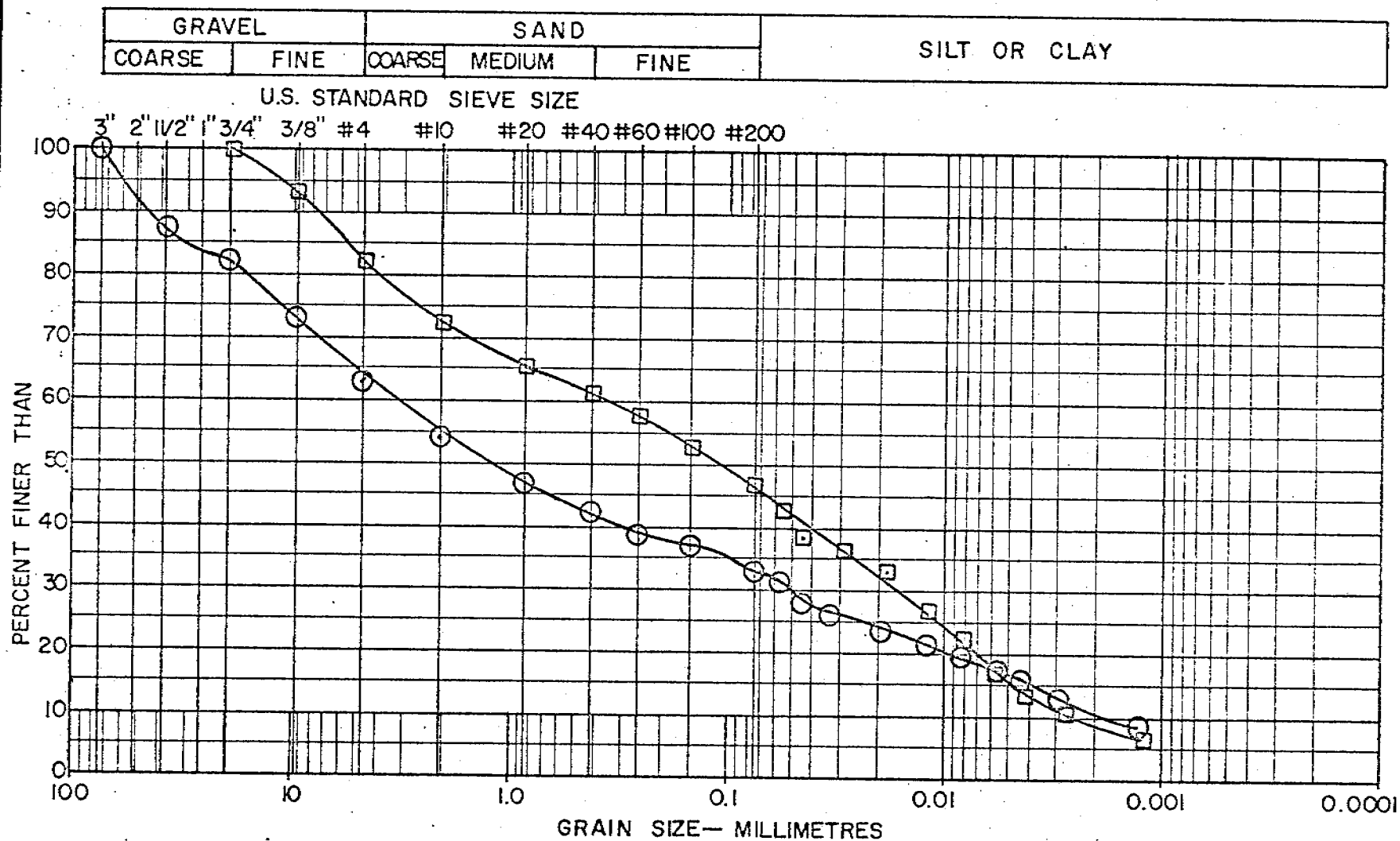
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. FF-2
DATE Nov 7/76 PLATE



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JOB No.	AL0709
PROJECT	Alcan Pipeline
LOCATION	
HOLE No.	FF-2
DEPTH	
DATE	Nov/76



REMARKS: ○—○ Sample 2 at 3-4'

□—□ Sample 4 at 7-8'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.											
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION	DESCRIPTION OF MATERIAL	0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.											
SAMPLE DATA									PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT									
DEPTH	TYPE	BLOW 6"	No.																	
				T T			0.5	ORGANIC COVER												
5	B		1					SAND AND SILT & CLAY - little gravel - low plasticity - cobbles - medium brown (TILL)												
	B		2																	
	SPT	8	3																	
	B	10	4																	
10	SPT	13	5																	
	B	15																		
	SPT	19																		
	B	12	6																	
15	SPT	13	7			NF														
	B	16																		
	SPT	16																		
	B	11	8																	
	SPT	25	9																	
	B	14																		
	SPT	14																		
20	B	10	10																	
	SPT	22	11																	
	B	19																		
	SPT	19																		
25	B		12				23.5	SILTSTONE AND SANDSTONE												
	SPT	—	13					- laminated												
30							28.0	END OF HOLE												
								Notes:												
								1. Located 300' from mountain slope. Ground surface slopes 11% to south east. Dense spruces and pines to 30'.												
								2. Free water encountered at 17'. Standpipe piezometer installed to 24.5'.												



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. FF-3
DATE Nov 7/76 PLATE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins							ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA					N.R.C.	N.F.	DESCRIPTION OF MATERIAL		PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT
DEPTH	TYPE	BLOW No.	No.	CLASS	or F.	X-----X			0-----0		-----X		-----X
	B		1	NF	Harder	1.5 PEAT and organic silt							
5	B		2			SAND AND SILT & CLAY - little gravel - low plasticity - cobbles - medium brown - firm to stiff (TILL)							
	B		3										
	B		4										
10	B		5										
	B		6										
	B		7										
15	B		8			18.0							
20				END OF HOLE									
Notes:													
1. Located on flat ground 150' west of a swampy area. Light forest of spruces to 30' and pines to 25'. Free water between peat tussocks.													
2. Thermistors installed at 2.5, 5 and 10'.													
3. Hole drilled with stub auger.													



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. GG-1
DATE Nov 8/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

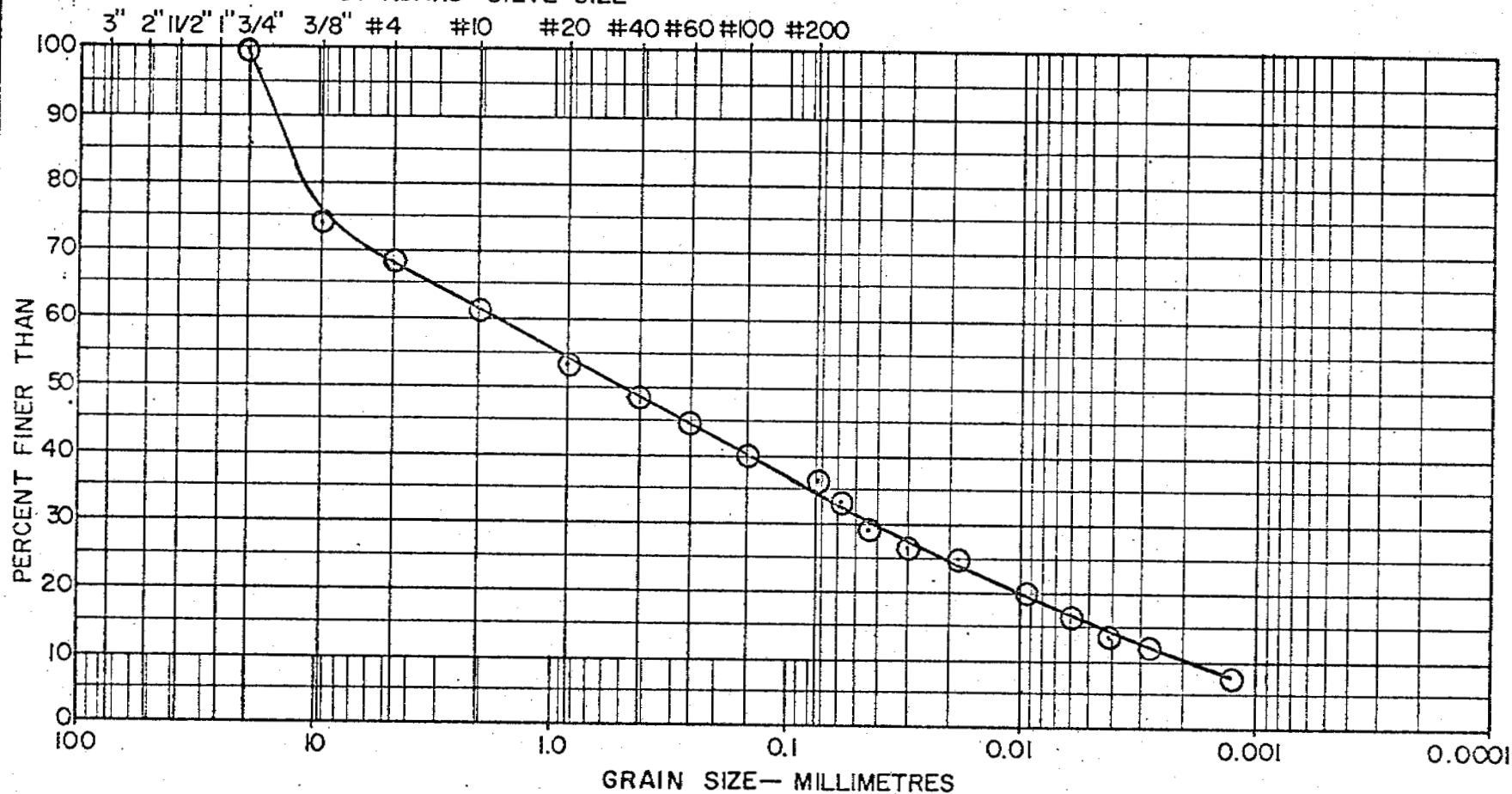
LOCATION

HOLE No. GG-1 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: Sample 6 at 12.5-13'

GRAIN SIZE CURVE

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.					
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.					
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%					
DEPTH	TYPE	BLOW No.												
				T T			0.5	ORGANIC COVER						
5	B	1				NF		SAND AND SILT & CLAY - little gravel - low plasticity - medium brown - firm to stiff (TILL)						
	B	2												
	B	3												
10	B	4												
	B	5												
	B	6												
15								Boulder						
								soft						
							19.0							
END OF HOLE														
Notes:														
1. Located 75' south west of swamp Elevation is about 4' above swamp. The ground surface slopes 6% to north east. Ve- getation cover consists of spruces and pines to 35'. Boulders to 25 s.f. were seen around the site. 2. Water level at 4' at end of drilling. 3. Hole augered to 13'. Air used from 13' down. Hole caved to 6' depth.														



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JOB No. AL0709
 PROJECT Alcan Pipeline
 LOCATION
 HOLE No. GG-2
 DATE Nov 8/76 PLATE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709

PROJECT Alcan Pipeline

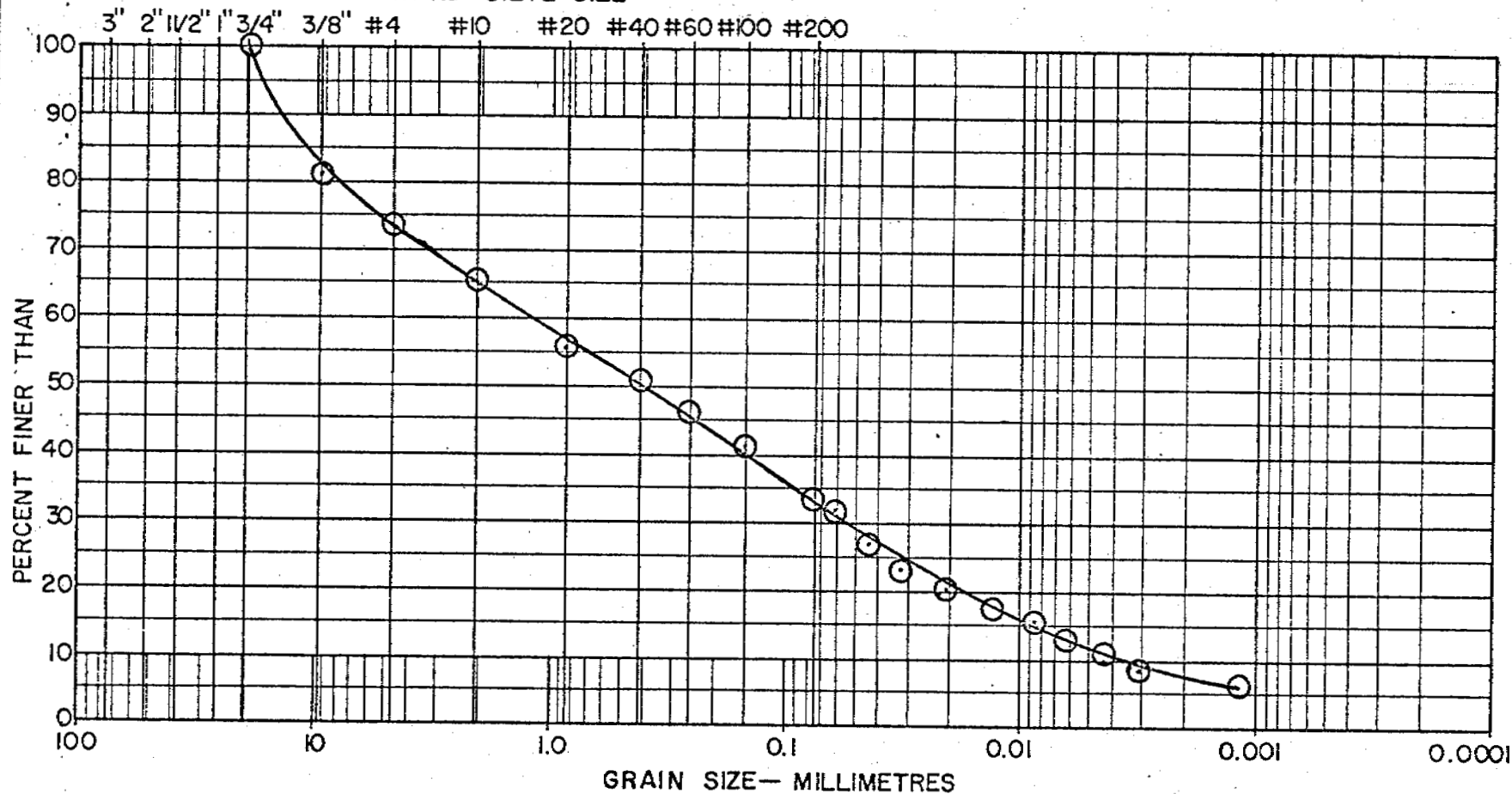
LOCATION

HOLE No. GG-2 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 3 at 6-6.5'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 ins.					N.R.C. CLASS	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8 FIELD VANE LAB VANE UNCONF.				
SAMPLE DATA							DESCRIPTION OF MATERIAL		PLASTIC LIMIT WATER CONTENT LIQUID LIMIT X-----0-----X 10 30 50 70 90%				
DEPTH	TYPE	BLOW 6"	No.										
5	B		1		NF	MOSS COVER							315
	C		2		Vr	PEAT							632
	C		3		Vx	(Ice lenses 1/32" spaced @ 1/4")							827
	C		4		Vs	(Ice lenses 1/64 spaced @ 1/4")							>1000
10	C		5		Vr								930
	C		6		Vx	(Ice lenses 1/64" spaced @ 1/8")							>1000
	C		7		Vs	(Ice lenses 1/64" spaced @ 3/8")							857
	C		8		Vr	(Ice lenses 1/64" spaced @ 1/4")							>1000
15				N		SILT AND CLAY							
						- little sand							
20	SPT	22 7 7	9	Vr	16.0	- trace of gravel							
	B		10	NF	16.5	- grey							
						ORGANIC SILT							
						SAND AND GRAVEL							
						- little silt							
						- grey							
END OF HOLE													

Notes:

1. Located on peat plateau surrounded by a swamp. Hummocky ground and spruce trees to 25'. The hole elevation is about 5' above swamp.
2. At 18' the bottom of the hole caved in and the water raised 5' below ground surface.
3. Thermistors installed at 2, 4.5 and 10'.



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JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. 11-1
DATE Nov 8/76 PLATE



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JOB No. AL0709

PROJECT Alcan Pipeline

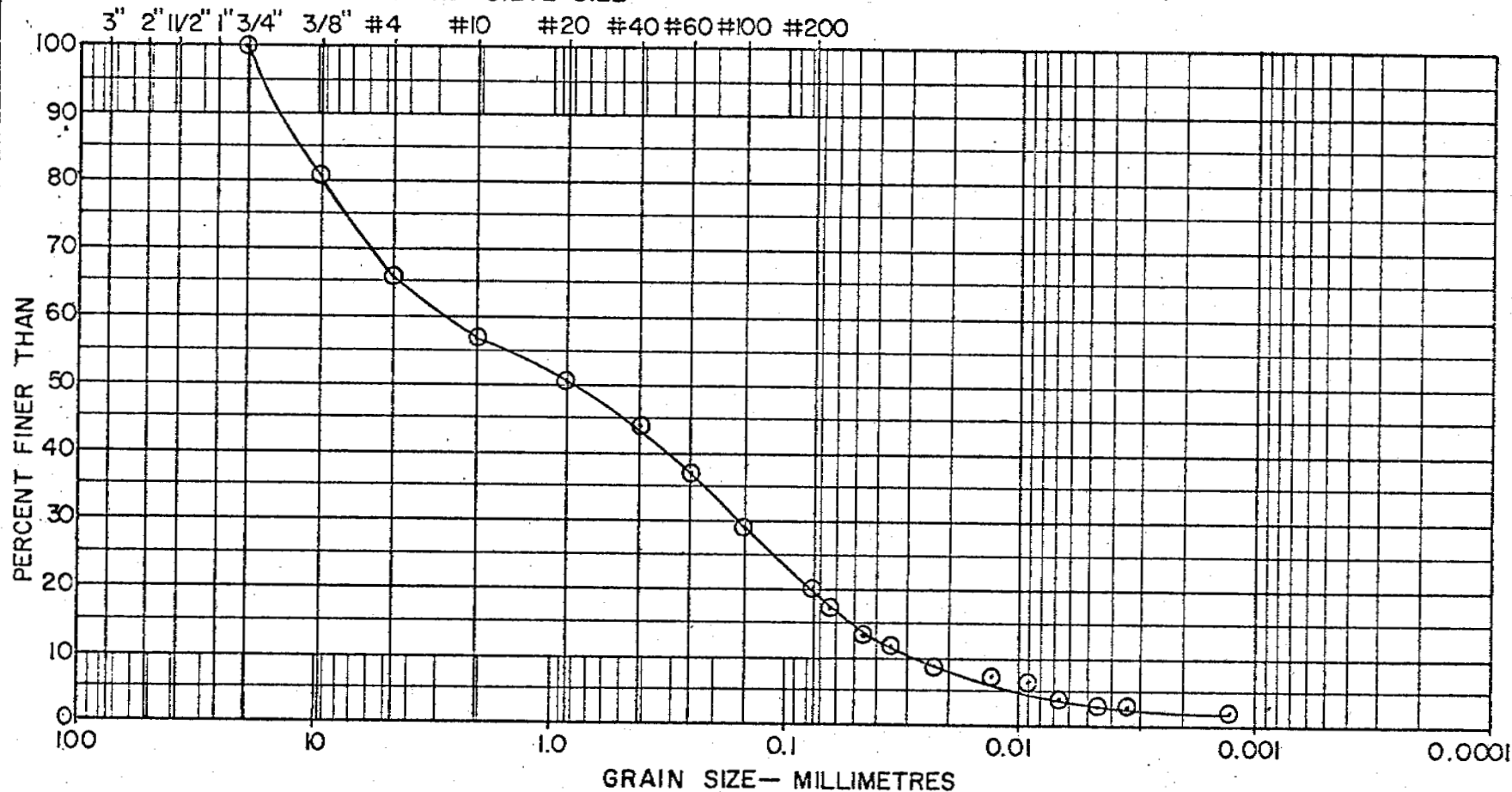
LOCATION

HOLE No. 11-1 DEPTH

DATE Nov/76

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



REMARKS: ○—○ Sample 10 at 18-19'

TEST HOLE LOG

HAMMER WT. 140 lbs.				SYMBOL	PERMAFROST		LOCATION		COHESION - TONS / SQ. FT.				
HT. DROP 30 Ins.					N.R.C.	N.F. or F.	ELEVATION		0.2 0.6 1.0 1.4 1.8				
SAMPLE DATA							CLASS	DESCRIPTION OF MATERIAL	FIELD VANE LAB VANE UNCONF.				
DEPTH	TYPE	BLOW No.	No.								PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT
									X	0	X		
									10	30	50	70	90%
	B		0					MOSS COVER					435
	B		1			NF		PEAT					418
	C		2			Nbe							438
	C		3			Vr							377
5	C		4			Vs		(Ice lenses 1/64" spaced @ 1/4")					445
	C		5			Vs		6.0					636
	C		6			Vs		7.5 ICE & SOIL - silt					
	C		7			Vr		SILT - trace of sand					
10	C		8			Vs		(Ice lenses 1/32" spaced @ 1/4")					
	C		9			Vs		(3" ice layer with silt inclusions)					
	C		10			Vx		10.5					
	B		11			Vx		SAND					
15	SPT	23	12			Vx		- fine					
	B	36	13			Vx		- little gravel					
	B	34	14			Vx		- little silt					
20	B		15			N		SAND AND GRAVEL					
			16			N		- little silt and clay					
			17			N		- cobbles					
25			18			N		- light grey					
			19			N		(TILL)					
			20			N		(Ice crystals to 1/32")					
30			21			NF		27.0					
			22			NF		END OF HOLE					

Notes:

1. Located 35' south of swamp. Elevation is about 3' above swamp. Black spruce trees to 25'.
2. Thermistors installed at 2.5, 5 and 10'.



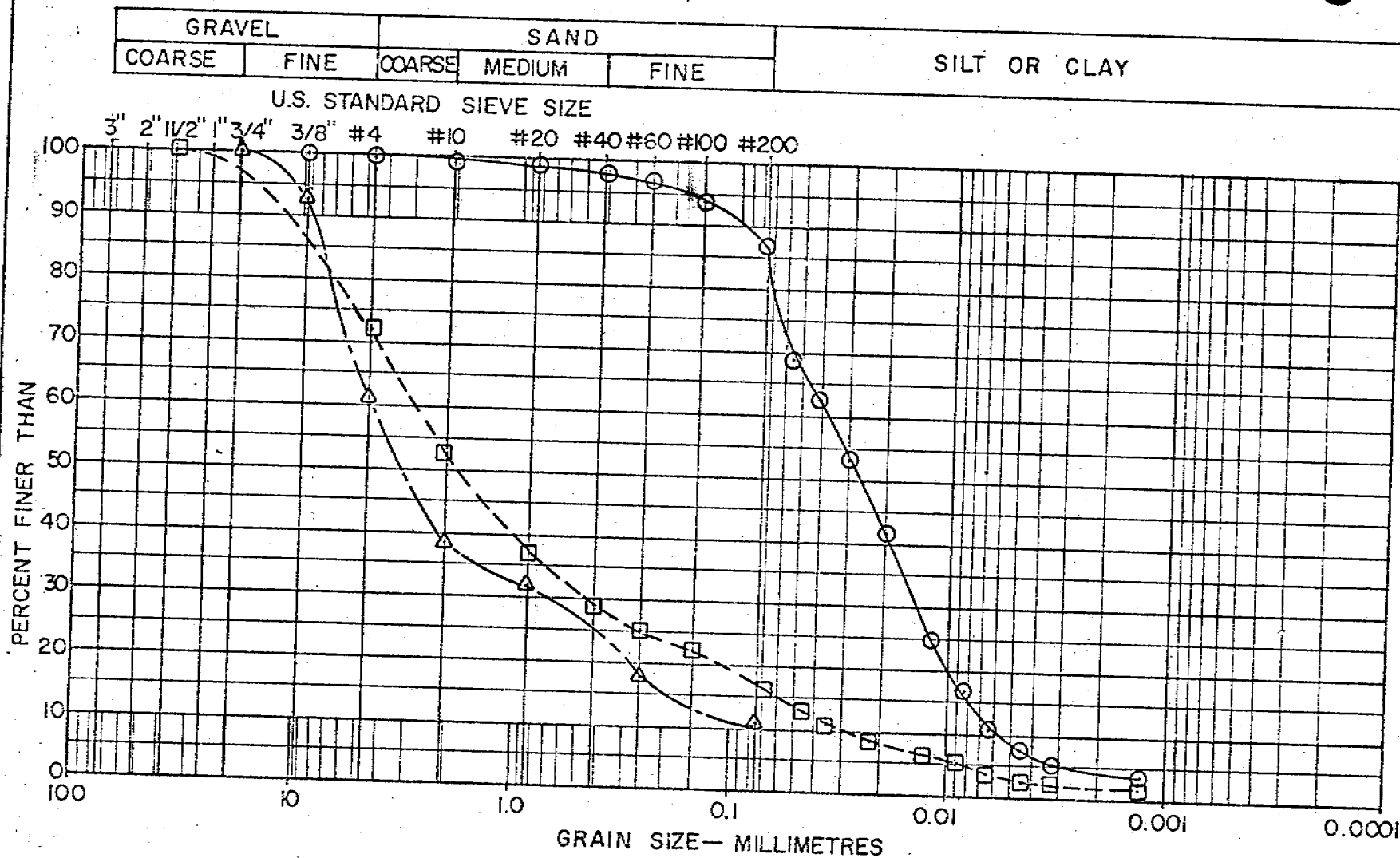
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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0709
PROJECT Alcan Pipeline
LOCATION
HOLE No. 11-2
DATE Nov 9/76 PL 47



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GRAIN SIZE CURVE



REMARKS: ○—○ Sample 5 at 6.5-7.5'

□--□ Sample 9 at 13-13.4'

△--△ Sample 11 at 17-21'

JOB No. AL0709

PROJECT Alcan Pipeline

LOCATION

HOLE No. 11-2 DEPTH

DATE 1 Nov/76