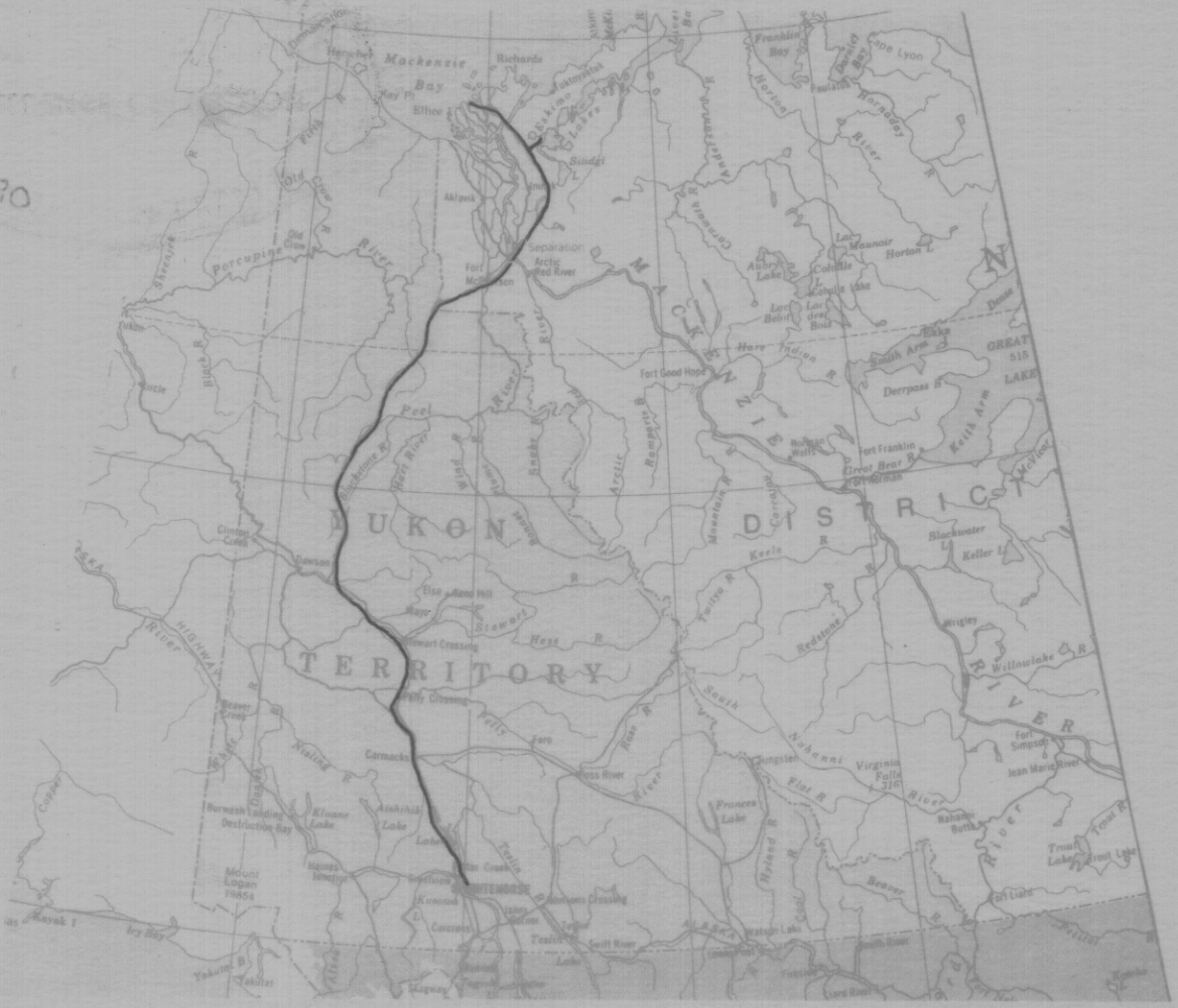
DEMPSTER LATERAL DRILLING PROGRAM

VOLUME 2

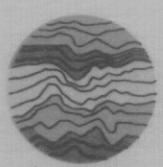
ERN ENVIRONMENTAL
PRO



FOOTHILLS PIPE LINES (YUKON) LTD.

D001647

OCTOBER, 1978



KLOHN LEONOFF CONSULTANTS LTD.

Civil · Geotechnical · Hydraulic

KLOHN LEONOFF CONSULTANTS LTD.
Civil · Geotechnical · Hydraulic

October 31, 1978

OUR FILE NO.: AL1023

Foothills Pipe Lines (Yukon) Ltd.
1600 Bow Valley Square II
205 - 5th Avenue S.W.
Box 9083
Calgary, Alberta
T2P 2W4

NORTHERN ENVIRONMENTAL
REFERENCE COLLECTION
PROTECTION BRANCH

Attention: Dr. F.C. Yip, P. Eng.
Head, Geotechnical Program

Dear Dr. Yip.

Re: Dempster Highway Lateral
Drilling Program

Please find attached Volume II of the test hole data pertaining to the Dempster drilling program.

Yours very truly,

KLOHN LEONOFF CONSULTANTS LTD.

THE ASSOCIATION OF
PROFESSIONAL ENGINEERS
OF ALBERTA
PERMIT NUMBER
P 433
KLOHN LEONOFF
CONSULTANTS LIMITED

PROFESSIONAL ENGINEER
ALBERTA

A.L. Edgeworth, P. Eng.

ALE/dm

SYMBOLS AND TERMS USED IN THE REPORT

ADDITIONAL SYMBOLS

⊙ - moisture content

■ - unconfined strength as per spring calibrated pocket penetrometer

B - disturbed bag sample

SY - undisturbed SHELBY TUBE sample

SPT - Standard Penetration Test (6 in. Blow Counts)

BURMISTER CLASSIFICATION SYSTEM

STANDARD TERMS FOR IDENTIFYING COHESIVE SOILS

DEGREE OF PLASTICITY	PLASTICITY INDEX	WRITTEN IDENTIFICATION
Non to slight plasticity	0 - 5	Silt
Slight Low	5 - 10	Silt and Clay
Medium High	10 or 30 30 or more	Clay and Silt Clay

STANDARD TERMS FOR IDENTIFYING COHESIONLESS SOILS

MAJOR SOIL COMPONENTS >50% BY Wt.	MINOR SOIL COMPONENTS	MINOR SOIL PROPORTIONS	PROPORTION DEFINITION BY Wt.
GRAVEL SAND SILT	gravel sand silt	and	35 to 50%
		some	20 to 35%
		little	10 to 20%
		trace	1 to 10%

EXAMPLE:	PROPORTIONS
GRAVEL	> 50%
-some sand	20 to 35%
-little silt	10 to 20%

SOIL STRENGTH GUIDELINE

POCKET PENETROMETER FOR COHESIVE SOILS	
UNCONFINED COMPRESSIVE STRENGTH T/Ft.²	CONSISTENCY
0.25	Very Soft
0.25 - 0.50	Soft
0.5 - 1.0	Firm
1.0 - 2.0	Stiff
2.0 - 4.0	Very Stiff
>4.0	Hard

STANDARD PENETRATION TEST FOR COHESIONLESS SOILS	
BLOWS / 6 inches	DENSITY
0 - 2	Very Loose
2 - 5	Loose
5 - 15	Med. Dense
15 - 25	Dense
>25	Very Dense

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 to slight plastic low medium high	0 0 0 to 5 5 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 to slight plastic low medium high	0 0 0 to 5 5 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%

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-132

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	

APPROVED: A. L. EDGEWORTH

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.3m PEAT - non woody - fine fibrous - amorphous granular - dark brown - gravel inclusions
	C		1		Nbe		
1	C		2		Vx		
	C		3				1.25m ORGANIC SILT AND PEAT - trace fine sand - silt and peat lamina-tions & layers - dark brown - ice lenses 3mm-5mm spaced @ 3mm-30mm
	C		4		ICE+		
2	C		5		Nbe Vx		
	C		6		Nbe		
3	C		7				2.85m
	B		8				GRAVEL - coarse to fine - little to some sand - little silt and clay - brown
	B		9		N		
4							
5							5.60m
							END OF HOLE 1. Test hole located east of Dempster highway and north of an airstrip. 2. The site is fairly level with small hummocks and poor drainage. 3. The site is moss covered with spruce in surrounding areas. 4. Test hole augered to 0.4m, then cored to 2.85m and then drilled to 5.6m with air circulation. 5. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, and 4.0m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

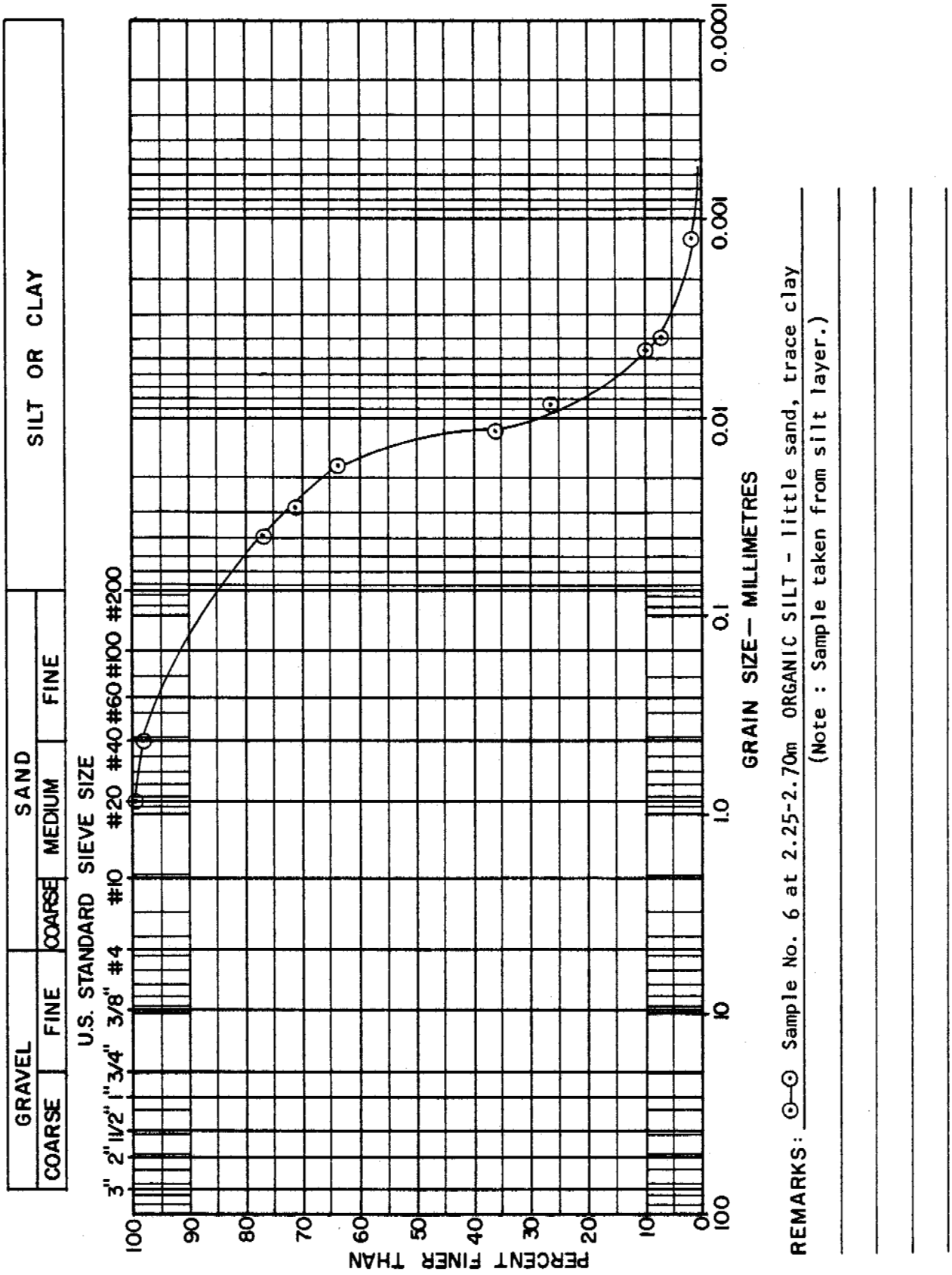
514.%
713 %
310%
645.%
301 %
113 %
445.%
224.%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-132
DATE	JUly 20/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 6 at 2.25-2.70m ORGANIC SILT - little sand, trace clay
(Note : Sample taken from silt layer.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-132 DEPTH
DATE	Aug 25/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 132

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.40 - 0.75	994	62.0
5	1.75 - 2.25	999	62.4
7	2.70 - 2.85	1080	67.4

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-133

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.25m PEAT
	C		1		Vr		0.55m - seams of organic silt - brown
1	C		2		ICE+		
	C		3		Vs Vx		ORGANIC SILT AND CLAY - trace fine sand - peat inclusions - slight plasticity - nuggety structure
2					ICE+		- dark brown
	C		4		Vs Vx		← ice lenses 1mm-5mm spaced @ 1mm-10mm
	C		5				← ice lenses 10mm-17mm spaced @ 2mm-5mm
3							3.00m
4					ICE+		ICE + ORGANIC SILT
	SPT	37 74	6				
5							5.10m.
	SPT	100 for 7.5 cm	7		Vx Vr		GRAVEL - pieces of shaly siltstone - black - harder drilling at 8.0m
6							
7							
8	B		8				8.00m
							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

106%
265%
277%
381%
282%
553%
263%
178%

NOTES:
1. Test hole located at base of hill east of Engineer Creek.
2. The site is moss covered with small hummocks and slopes down to west at 2-3%
3. Sparse spruce in immediate area of test hole. (Cont'd.)

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JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-133
DATE	July 21/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
DESCRIPTION OF MATERIAL
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

NOTES:
4. Test hole augered to 0.35m, then cored to 3.8m and then drilled to 8.0m with air circulation.

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JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-133
DATE	July 21/78 PLATE

K.L.C. - METRIC

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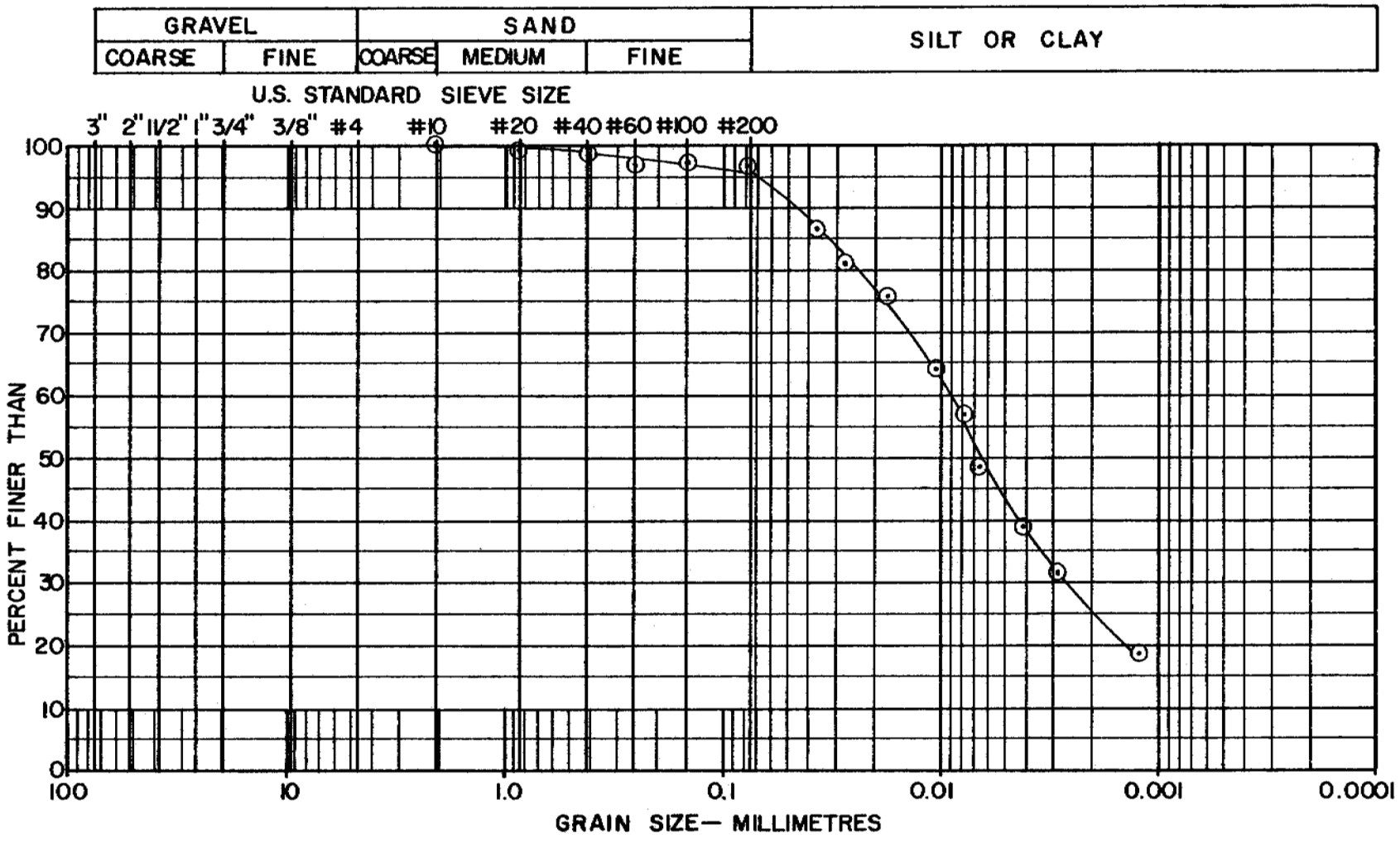
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-133 DEPTH
DATE Aug. 25/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 6 at 4.5-4.8m ORGANIC SILT - some clay, trace fine sand

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 133

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.00 - 1.25	983	61.4
4	1.85 - 2.20	1093	68.2
5	2.20 - 2.55	1064	66.4

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VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-134

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	C		1
1	C		2
	C		3
2	C		4
	C		5
3	C		6
	C		7
	C		8
4	C		9
	C		10
	C		11
	C		12
5	B		13
6			
7			
	B		14
8			
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
Nbe Vx	
Nbe Vr	
Vx Vr	

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.3m

PEAT
- amorphous and granular
- containing non woody fine fibres
- brown
- ice lenses 1/4mm-2mm spaced @ 1/4mm-1mm

ICE+ (30mm layer)
3.55m

ORGANIC SILT
- trace of fine sand
- slight plasticity
- brownish grey
- ice lenses 10mm-20mm spaced @ 20mm-30mm

4.85m

GRAVEL
- coarse to fine
- pieces of fractured shale and gravel
- little sand
- trace to little silt
- black

(Cont'd)

502%
114%
835%
1481%
737%
577%
856%
521%
150%
117%
109%

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-134
DATE	July 21/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11							As above
12							
13	B		15				13.00m.
							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

NOTES:
1. Test hole located on an old winter road on a flat terrace east of a hill.
2. Ground is moss covered and soggy.
3. Vegetation consists of sparse black spruce
4. Test hole augered to 0.35m, then cored to 5.0m and then drilled to 13.0m with air circulation.

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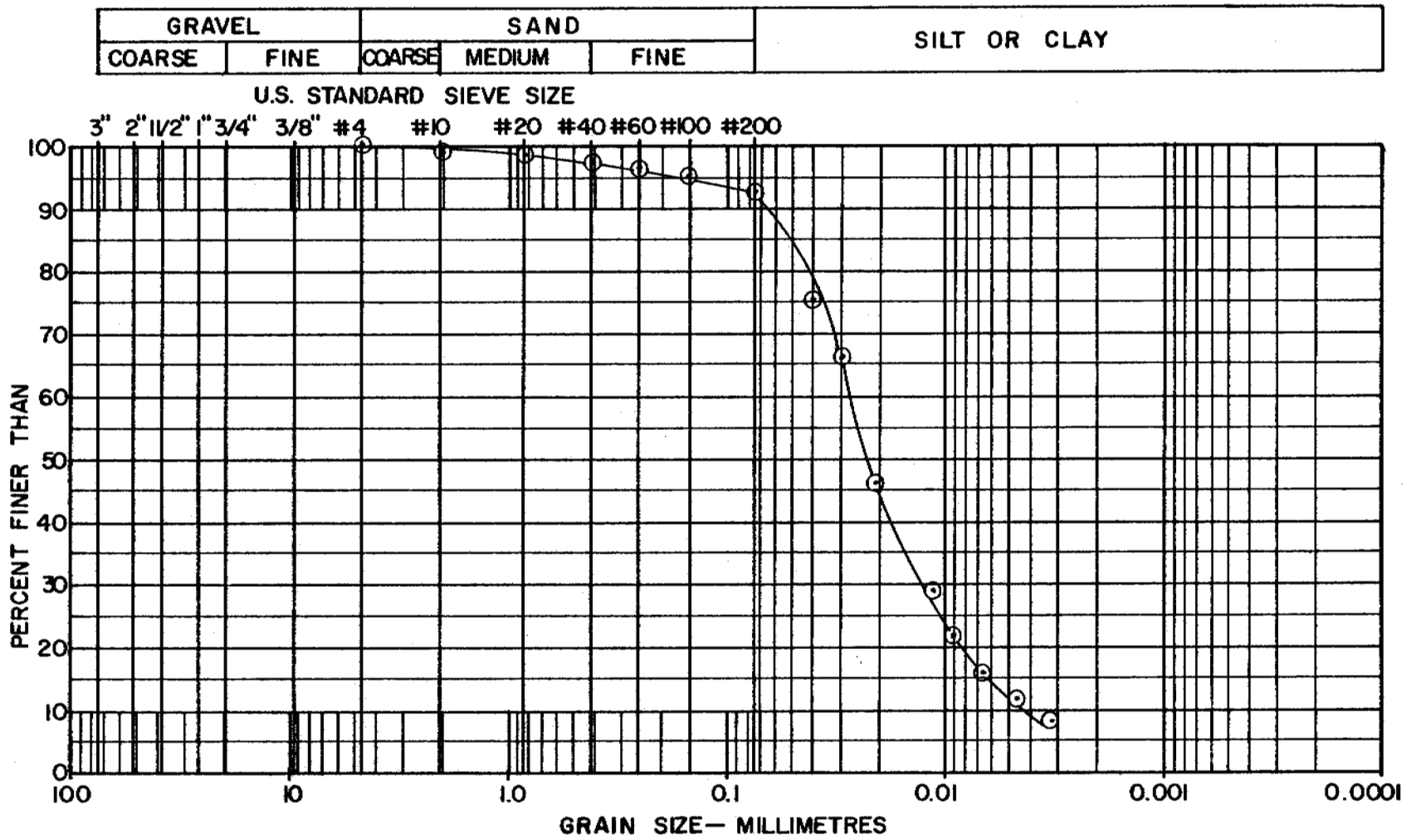
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-134
DATE	July 21/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-134 DEPTH
DATE Aug. 28/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No.10 at 4.0-4.25m ORGANIC SILT - trace fine sand

240

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 134

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.70 - 1.00	920.8	57.5
6	2.75 - 3.10	935.9	58.4
12	4.55 - 4.90	1526.5	95.3

KLOHN LEONOFF CONSULTANTS LTD. CIVIL • GEOTECHNICAL • HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM			
	TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-135			
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.	DATE OF ISSUE: OCTOBER 1978 APPROVED: A. L. EDGEWORTH	PROJECT No.: AL1023	AIRPHOTO SCALE: 1" = 2000' (approx)	REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

LOCATION Sapper Hill
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.2m PEAT
	C		1				0.4m - fibrous - brown
1.0	C		2		Vr		← ICE+ (28mm layer)
	C		3		Vs		ORGANIC SILT - trace to little sand - fine to medium - non to slight plasticity - root fibers - sand and silt pockets - brown - ice lenses ½mm-3mm spaced @ 1mm-15mm
2.0	C		4		Vx		
	C		5				
3.0							little to some gravel below 1.6 m.
	C		6				
	C		7				
	C		8				
4.0							4.55m
	SPT	16/60	9		ICE		4.75m ICE
5.0							ORGANIC SILT - little sand - trace gravel - sand, silt and organic pockets - organic odor - dark brown
	SPT	68/71	10		Vr		
6.0							
	SPT	73/101	11				← ice lenses 1/4mm-1/2mm spaced @ 1/2mm-2mm
7.0							7.40m
8.0					Vx		GRAVEL - coarse to fine - some coarse to fine sand - little to some silt and clay - dark grey brown
	B		12		Vr		
9.0							
	B		13				9.80m (Cont'd.)
10.0							END OF HOLE

140.5%
196%
124%
148%
119%
141%

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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	Yukon
HOLE No.	78-135
DATE	July 21/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
ORGANIC CONTENT % UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X---------0---------X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Test hole located on a hillside sloping south towards Sapper Hill at 2% and is less than 100m from creek.
2. The site is grass and moss covered with peat tussocks.
3. Vegetation consists of sparse black spruce.
4. Test hole augered to 0.2 m, then cored to 3.8 m and drilled to 9.8 m using air circulation.
5. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0 and 4.0 m.

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CIVIL & GEOTECHNICAL ENGINEERS

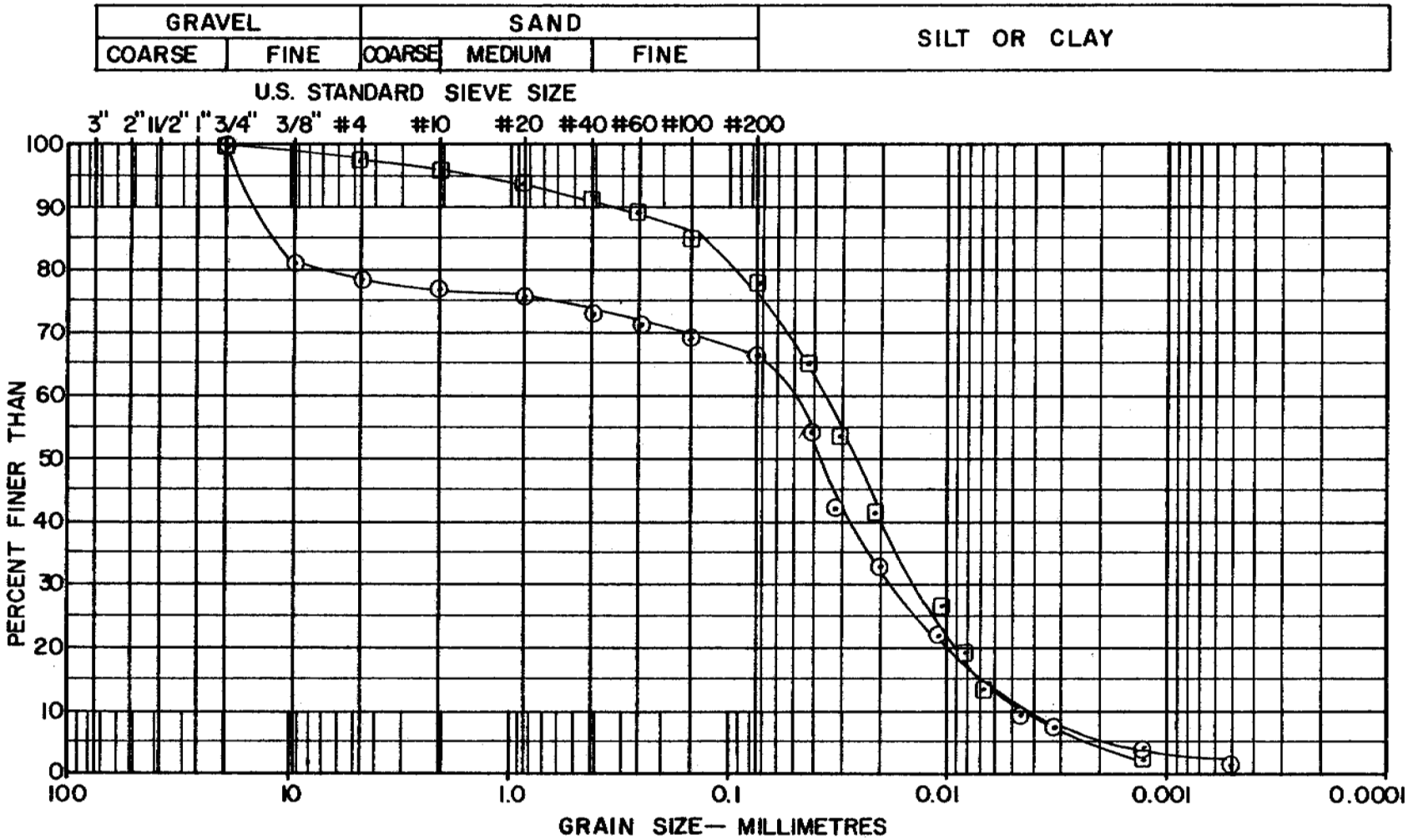
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	Yukon
HOLE No.	78-135
DATE	July 21/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-135 DEPTH
DATE Aug. 25/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 4 at 1.6-1.95m ORGANIC SILT - little gravel, trace to little sand

⊡—⊡ Sample No. 10 & 11 at 5.5-6.8m ORGANIC SILT - little sand, trace gravel

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 135

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.10 - 1.60	1220	76.1
8	3.45 - 3.80	1375	85.8

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-136

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

PERMAFROST

LOCATION Ogilvie River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.3m
	C		1		Nbe		PEAT - fibrous - dark brown
1	C		2		Vs Vr		ORGANIC SILT AND CLAY - some fine to medium gravel - some coarse to fine sand - slight plasticity - gravel pockets - grey (COLLUVIUM)
		34					
		42					
2	SPT	57	3				
		24					2.40m
		31	4		ICE		- ice lenses 1mm-7mm spaced @ 1mm-5mm
3	SPT	38					
4							ICE
5							
6							5.90m
		46			Vr		ORGANIC SILT - little sand - fine to coarse - little gravel - peat inclusions
7	SPT	61	5				7.20m - brown
8					ICE		ICE 7.70m
		47					ORGANIC SILT - trace fine sand - trace fine gravel - peat inclusions - brown
9	SPT	62	6		Vr		Ice lenses 1mm-5mm thick
10							(Cont'd.)

142%
114%
190%
209%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-136
DATE	July 22/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.3m PEAT - fibrous - dark brown
	C		1		Nbe		
1	C		2		Vs Vr		ORGANIC SILT AND CLAY - some fine to medium gravel - some coarse to fine sand - slight plasticity - gravel pockets - grey (COLLUVIUM)
		34					
		42					
2	SPT	57	3				
		24					2.40m - ice lenses 1mm-7mm spaced @ 1mm-5mm
		31			ICE		
3	SPT	38	4				
4							ICE
5							
6							5.90m
		46			Vr		ORGANIC SILT - little sand - fine to coarse - little gravel - peat inclusions
	SPT	61	5				
7							7.20m - brown
					ICE		ICE
8							7.70m
		47					ORGANIC SILT - trace fine sand - trace fine gravel - peat inclusions - brown
	SPT	62	6		Vr		
9							Ice lenses 1mm-5mm thick
10							(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

142%
114%
190%
209%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-136
DATE	July 22/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11							- As Above -
12							12.00m
13					ICE		ICE
14	B		7				13.5m ORGANIC SILT AND CLAY - some gravel- fine to medium - some sand- coarse to fin - slight to low plasticity - dark brown
15						NF	
16							16.00m
							END OF HOLE

NOTES:
1. Test hole located east of the Ogilvie River on edge of a mountain
2. The site is mossy with fair drainage and slopes south-west at 5-8%
3. Vegetation consists of moderate spruce to 4-12 m.
4. Bedrock is exposed at points higher and lower on the slope.
5. Test hole augered to 0.4m, then cored to 0.9m and drilled to 16.0m with air circulation.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-136
DATE	July 22/78 PLATE

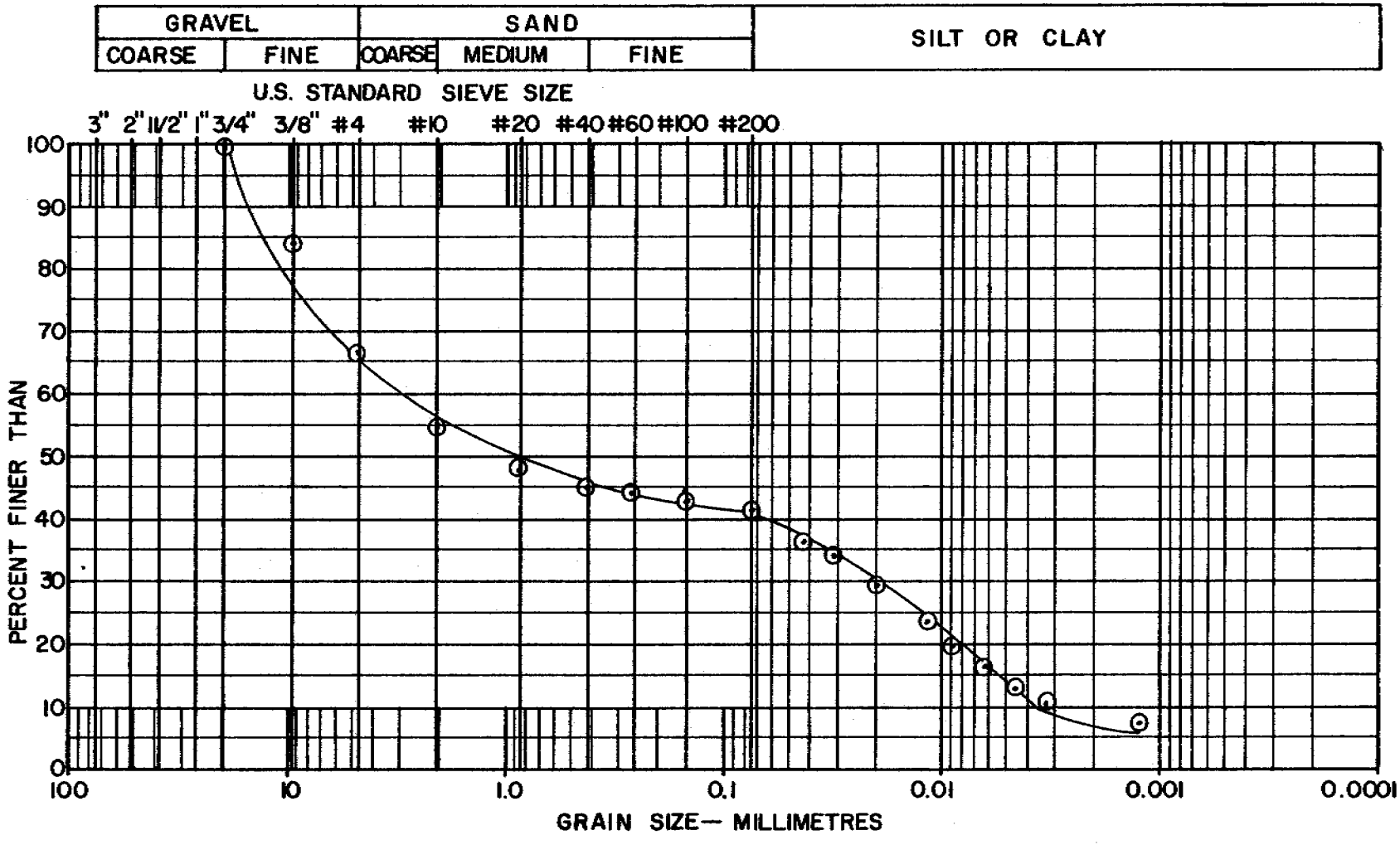
K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-136 DEPTH
DATE Sept. 7/78

250

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.5-1.95m ORGANIC SILT - some gravel, some sand

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 136

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.4 - 0.65	1445.4	90.2

KLOHN LEONOFF CONSULTANTS LTD. CIVIL ● GEOTECHNICAL ● HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-137		
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.	DATE OF ISSUE: OCTOBER 1978 APPROVED: A. L. EDGEWORTH	PROJECT No.: AL1023	AIRPHOTO SCALE: 1" = 2000' (approx) REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		1
	B		
	C		2
2			
	B		3
3			
	B		4
4			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.4m
Vx Vr Vs	
Vx	
N	

LOCATION Ogilvie River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER - moss

ORGANIC SILT
- little gravel -fine to med.
- trace fine sand
- non to slight plasticity
- brown
- some gravel - coarse

1.90m

GRAVEL
- some sand - fine to coarse
- little silt
- grey brown

3.90

BEDROCK
- very hard drilling

4.50m

END OF HOLE

NOTES:
1. Test hole located on a terrace west of the Dempster Highway and Ogilvie River.
2. The site is mossy with good drainage sloping easterly at 10-15%
3. Vegetation consists of sparse to moderate black spruce 5-6m.
4. Bedrock is exposed on the edge of the terace.
5. Test hole augered to 0.5m, then cored to 0.8m and then drilled to 4.5m with air circulation.

107.3

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-137
DATE	July 22/78 PLATE

K.L.C. - METRIC

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-138

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

LOCATION Ogilvie River
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	
	B					NF	0.3m 0.1m ORGANIC COVER - moss
	C		1		Vs		PEAT - amorphous and granular - layers of organic silt - dark brown and grey
1	C		2		Vr		0.65m SAND 1.15m
	C		3				
2	B		4		Vx Nbe		ORGANIC SILT - little fine sand - roots - non plastic - dark grey and brown - ice lenses 1/2mm-2mm spaced @ 1mm-8mm
	SPT	37 61	5				sand layer
3							
4							
	B		6				GRAVEL - coarse to fine - some sand - little silt - brownish grey - coarser drilling below 4.5m
5							
	B		7				
6							
7							
8							
9							
10							9.80m. END OF HOLE (Cont'd.)

122.4
158

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-138
DATE	July 22/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

NOTES:
1. Test hole located southeast of Ogilvie River on flat alluvial plain.
2. Drainage is poor.
3. Vegetation consists of thick moss with sparse spruce to 2 m.
4. Test hole augered to 0.5m, then cored to 1.15m and then drilled to 9.8m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-138
DATE July 22/78 PLATE

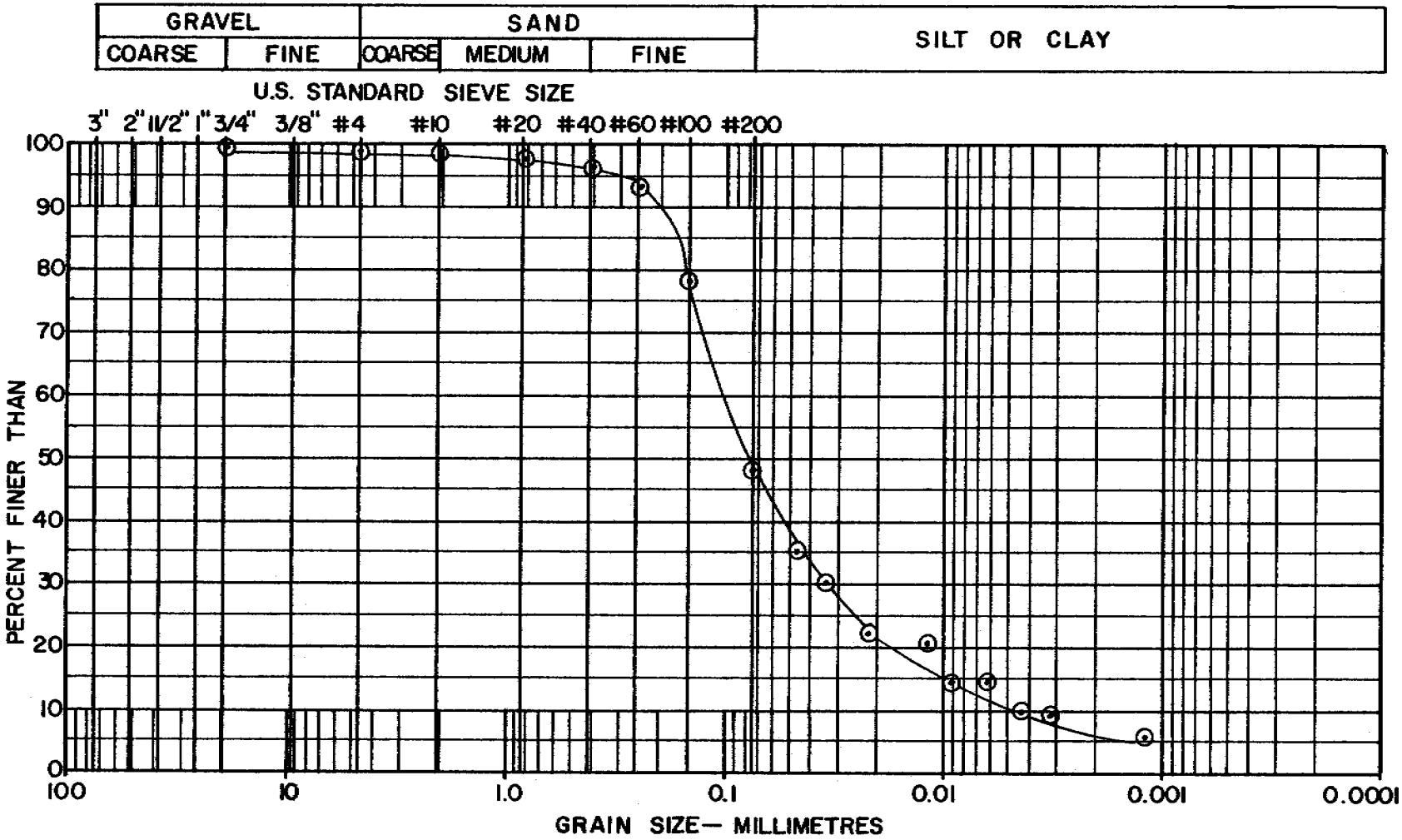
K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-138 DEPTH
DATE Sept. 7/78

257

GRAIN SIZE CURVE



REMARKS: ⊙-⊙ Sample No. 3 at 1.0-1.15m SAND - and silt, trace gravel, trace clay

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-139

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	PEAT
						0.4m	- amorphous and granular
	C		1				- dark brown
1	C		2		Nbe		0.95m
	C		3		Vs		1.30m ORGANIC SILT
	C		4		Nbe		1.60m - trace fine sand
2	B		5				- peat inclusions
							- grey
							- ice lenses 1/2mm-3mm spaced at 2mm-12mm
3						NF	SAND AND SILT
							- trace gravel
							- stratified
							- brownish grey
4							GRAVEL
							- fine to medium
							- some sand
							- little silt
							- very dense below 3.0m
5	SPT	Ref.	6				trace yellow clay
							5.00m
6							GRAVEL
							- fine to medium
							- some sand
							- little silt and clay
							- brownish grey
7	SPT	75 for 10cm	7				
8							
							8.70m BEDROCK
							-hard smooth drilling
9							END OF HOLE

LOCATION Ogilvie River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - 0 - - - - - X
10 30 50 70 90%

43%
161%

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-139
DATE	July 23/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.				SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
HT. DROP 76 cm.							ELEVATION	
SAMPLE DATA					N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X — 0 — X; 10 30 50 70 90%
DEPTH	TYPE	BLOW/15cm.	No.					

NOTES:

1. Test hole located at the base of a hill on west side of Dempster Highway and Ogilvie River.
2. The site is hummocky and mossy with fair to poor drainage.
3. The site slopes ascends to the west at 8% and descends to the east at 2%.
4. Vegetation consists of sparse to moderate black spruce to 3-5m.
5. Test hole augered to 0.45m, then cored to 1.6m and then drilled to 8.7m with mud circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

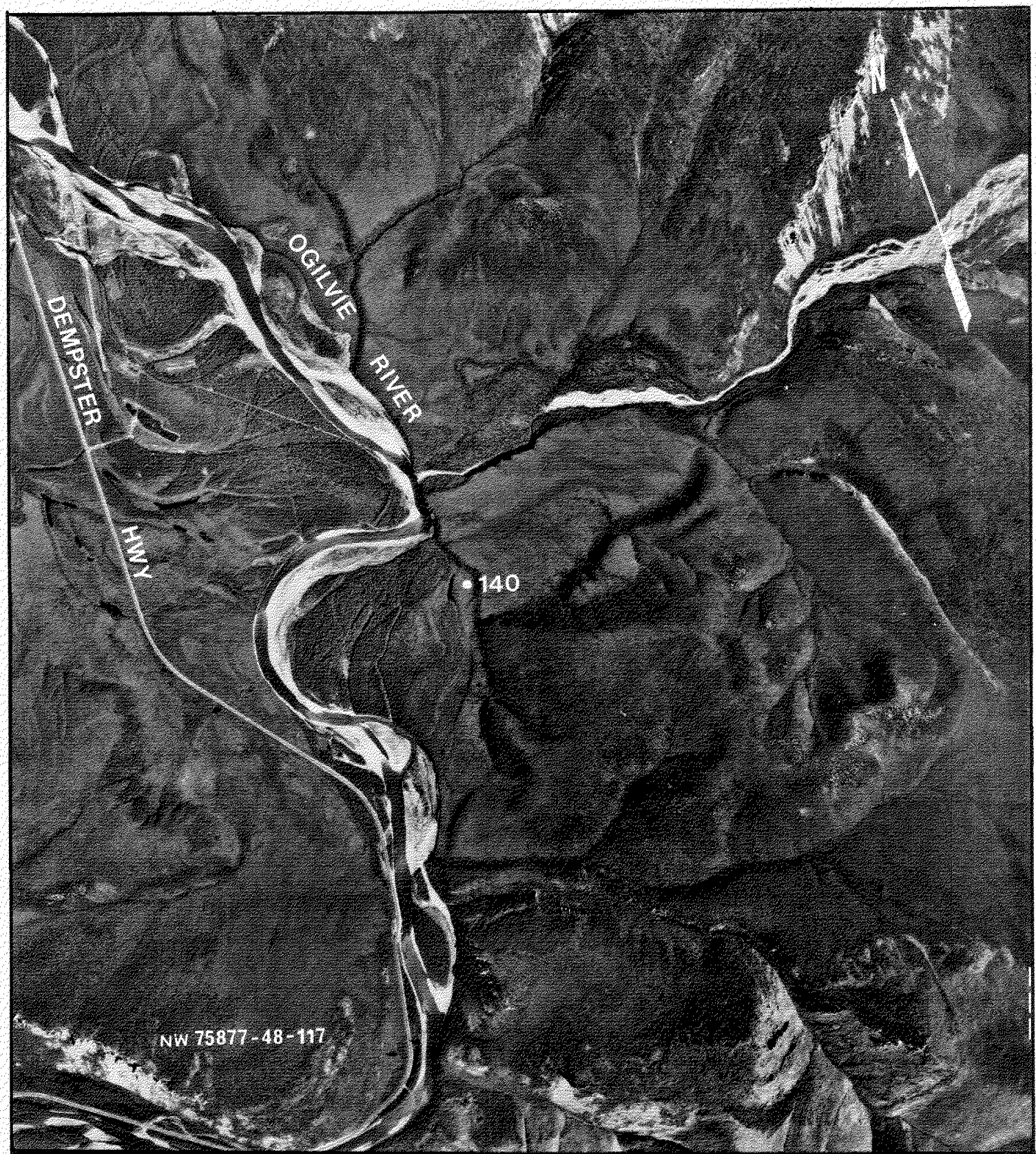
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-139
DATE	July 23/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 139

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.75 - 0.95	1347.6	84.1
3	0.95 - 1.3	1537.8	96.0



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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-140

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.
	B					NF 0.25m
1	C		1		Vs	
	C		2		Nbe	
	C		3			
2					Vx	
	B		4		Vr	
3						
		17				
4	SPT	50	5		Nbe	
					Vx	
5					Vr	
	SPT	Ref.	6			
6						
		24				
	SPT	67	7		Nbn	
7		for			Nbe	
		7.5cm				
8						
9						

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - 0 - - - - - X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER- moss

ORGANIC SILT AND PEAT
- dark brown

1.40m

SAND - fine to medium
- and silt
- stratified
- organic pockets
- brown

GRAVEL AND SAND
- fine to coarse
- trace silt
- organic odour
- dark grey

3.50m

3.90m

SILT
- little fine sand
- trace fine gravel
- slight plasticity
- organic inclusions
- dark brown

GRAVEL
- fine to medium
- some sand
- little silt
- organic silt lamination

6.0m

SILT AND CLAY
- trace fine sand
- low plasticity
- shale like structure
- organic odor
- black

8.70m

END OF HOLE

156%

179%

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-140
DATE	July 23/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.				SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
HT. DROP 76 cm.							ELEVATION	● ORGANIC CONTENT % ■ UNCONF.
SAMPLE DATA					N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X — 0 — X; 10 30 50 70 90%
DEPTH	TYPE	BLOW/15cm.	No.					

NOTES:

1. Test hole located on the alluvial plain east of the Ogilvie River at the base of a scarp
2. The scarp is approximately 30 m high.
3. The site is hummocky with poor drainage.
4. Vegetation consists of moss, grass and 10m black spruce. Black spruce on the scarp to 30m.
5. Test hole augered to 0.45m, then cored to 1.4m and then drilled to 8.7m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

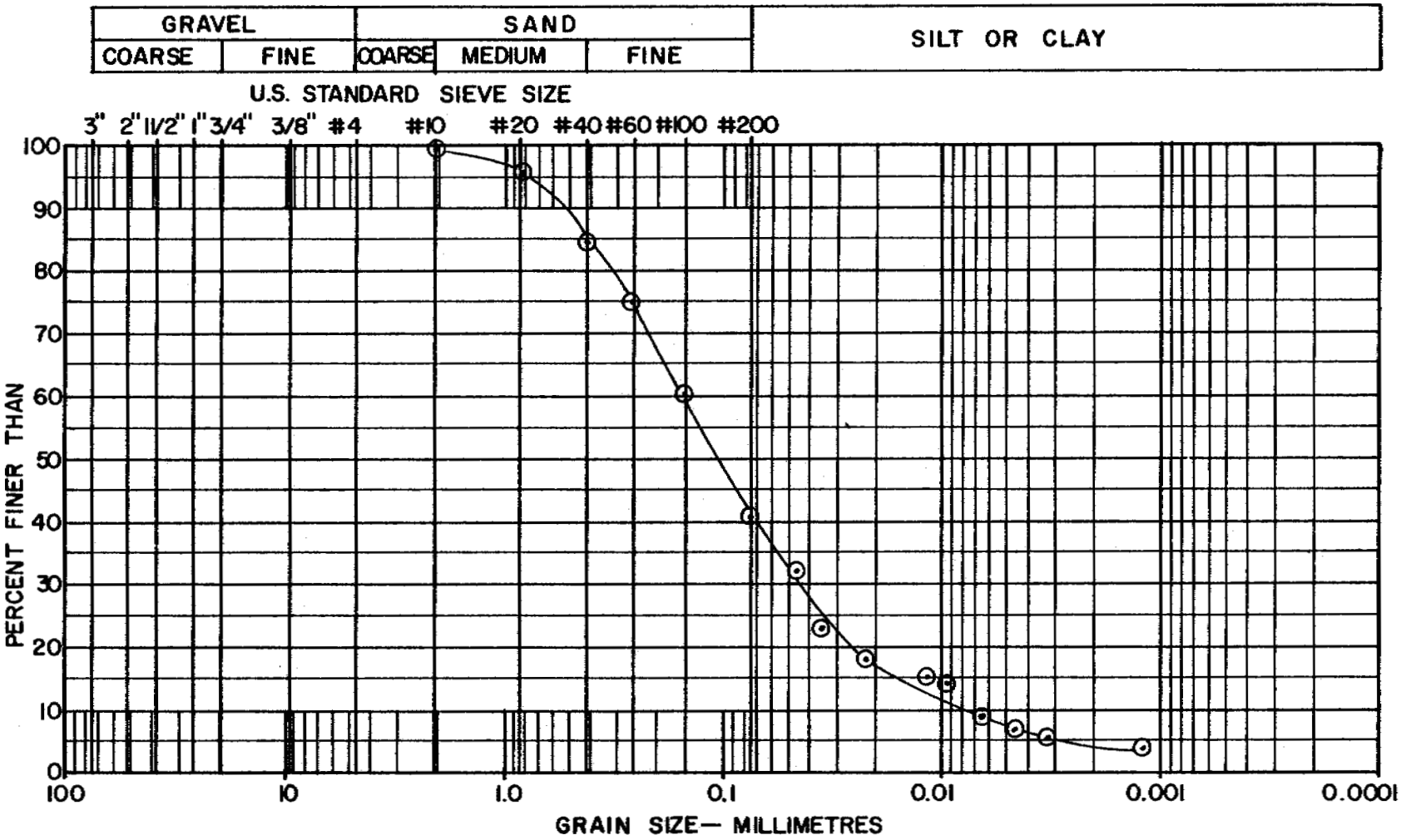
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-140
DATE July 23/78	PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-140 DEPTH
DATE Sept. 7/78

GRAIN SIZE CURVE



REMARKS: ⊙-⊙ Sample No. 3 at 1.10-1.40m SAND - fine to medium, and silt, trace clay

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 140

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.1 - 1.40	2084.9	100.3

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-141

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		
	C		1
	C		2
2	C		3
	C		4
	C		5
3	C		6
	C		7
	C		8
	C		9
4	C		10
	C		11
	C		12
5	C		13
6	SPT	62	14
7			
8	B		15
9	B		16
10	B		17

SYMBOL

PERMAFROST N.R.C. CLASS	N.F. or F.
	NF
Nbe	
ICE	
Vx	
Vr	
ICE+	
Nbe	
Vr	
Vs	
ICE	
N	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.25m 0.1m ORGANIC COVER-moss

ORGANIC SILT AND PEAT
- brown

ICE+ 0.85m

1.10m ICE

ORGANIC SILT AND PEAT
- trace fine sand
- lenses and layers of organic silt and peat
- grey and brown

ice lenses 3mm-10mm spaced @ 5mm-15mm

ice lenses 1/2mm-2mm spaced @ 3mm-8mm

wood chips

ice lenses 100mm thick

ice lenses 1/4mm-1mm spaced @ 1/4mm-3mm

5.8m

6.2m ICE

ORGANIC SILT & CLAY AND ICE
- interlayered
- based on chip samples obtained in air return
- gravel layers from 9.1-10.0m & 10.5-11m

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

180% 165% 577% 215% 332% 293% 243%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-141
DATE	July 23/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		
	C		1
	C		2
2	C		3
	C		4
	C		5
3	C		6
	C		7
	C		8
	C		9
4	C		10
	C		11
	C		12
5	C		13
6	SPT	62	14
7			
8	B		15
9	B		16
10	B		17

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Nbe	
ICE	
Vx	
Vr	
ICE+	
Nbe	
Vr	
Vs	
ICE	
N	

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - 0 - - - - - X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.25m \ 0.1m ORGANIC COVER-moss

ORGANIC SILT AND PEAT
- brown

ICE+ 0.85m

1.10m ICE

ORGANIC SILT AND PEAT
- trace fine sand
- lenses and layers of organic silt and peat
- grey and brown

ice lenses 3mm-10mm spaced @ 5mm-15mm

ice lenses 1/2mm-2mm spaced @ 3mm-8mm

wood chips

ice lenses 100mm thick

ice lenses 1/4mm-1mm spaced @ 1/4mm-3mm

5.8m

6.2m ICE

ORGANIC SILT & CLAY AND ICE
- interlayered
- based on chip samples obtained in air return
- gravel layers from 9.1-10.0m & 10.5-11m

(Cont'd.)

180% 165% 577% 135% 149% 141% 228% 215% 229% 185% 332% 793% 1032% 1203% 140% 243%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-141
DATE	July 23/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11							As above 11.00m
							END OF HOLE

LOCATION
ELEVATION

NOTES:
1. Test hole located east of the Ogilvie River in an area sloping down to the south at less than 1%. A mountain is located to the north of the test hole.
2. The site is hummocky with thick moss, dwarf shrubs and sparse black spruce.
3. Test hole was augered to 0.2m, then cored to 4.2m and then drilled to 11.0m with air circulation.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

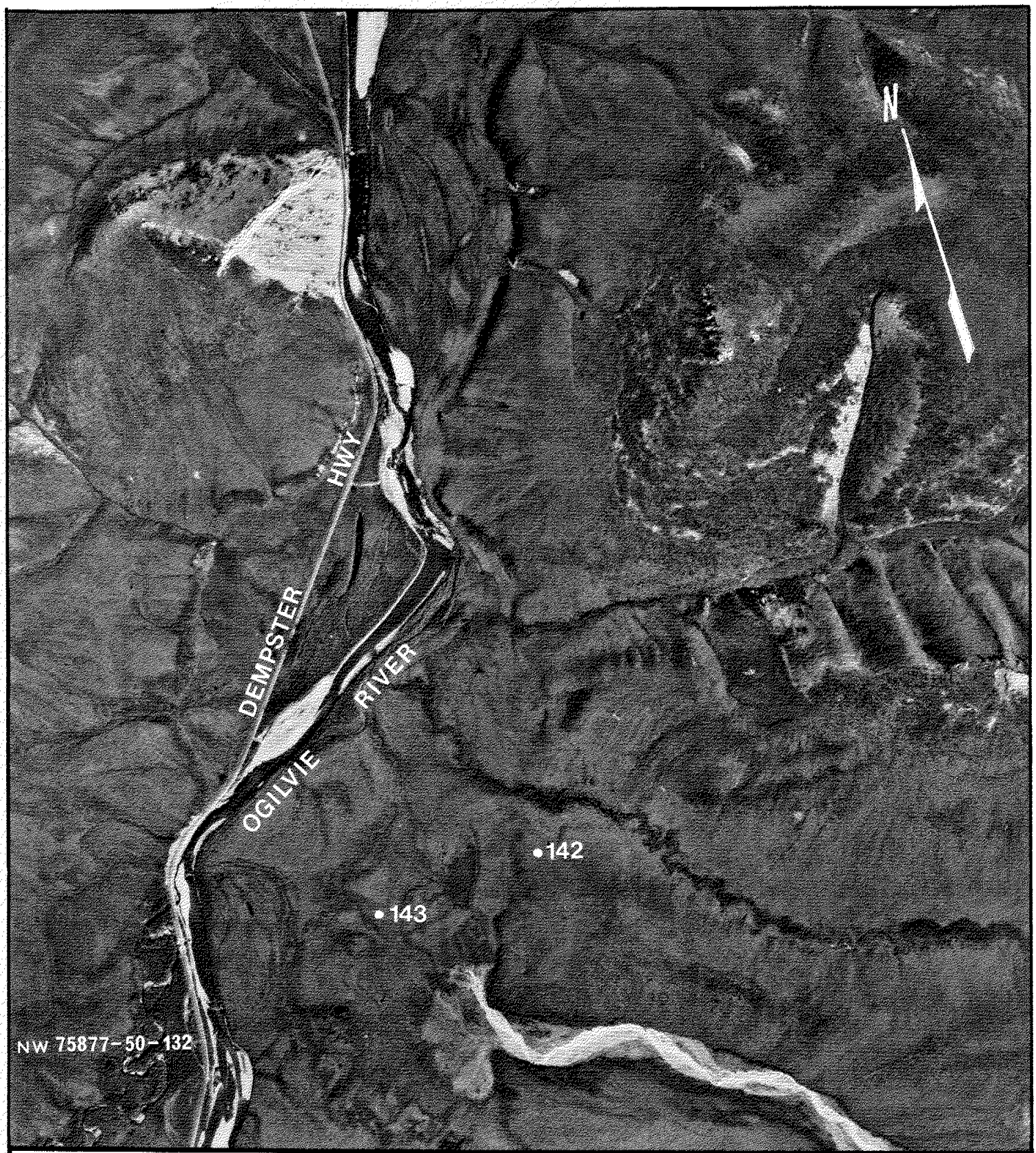
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-141
DATE July 23/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 141

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
4	1.35 - 1.65	1199.0	74.9
7	2.25 - 2.45	1118.8	70.0
9	2.70 - 3.05	1081.0	63.6
11	3.30 - 3.55	1207.5	75.4



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-142

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		
	C		1
	C		2
2	C		3
3			
4			
5			
6	C		4
	C		5
7			
8			
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vs Vr Vx	
ICE	
VrVx Nbe	
ICE	
Nbe	
ICE	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.2m 0.1m ORGANIC COVER

PEAT AND ORGANIC SILT
- amorphous granular
- non woody fine fibres
- dark brown

1.25m

1.5m ICE

1.90m PEAT AND ORGANIC SILT
- dark brown

ICE

ICE

5.20m ORGANIC SILT
- trace to little fine sand
- grey

6.10m ICE

(Cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

185%
138%
162%
211%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	.
HOLE No.	78-142
DATE	July 24/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
DESCRIPTION OF MATERIAL
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ▣ UNCONF
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DEPTH	TYPE	BLOW/15cm.	No.	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
11						As above
12						
13						
14						
15						
16						
17						
18						
19						19.0m
	B		6	N		SILT - trace fine sand - grey
						19.5m
20						END OF HOLE (Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-142
DATE July 24/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

NOTES:
1. Test hole located on hill side sloping west at 5-6%
2. The site is hummocky with fair drainage.
3. Vegetation consists of grass, dwarf shrubs and sparse black spruce to 6m.
4. Test hole augered to 0.4m, then cored to 5.95m and then drilled to 19.5m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

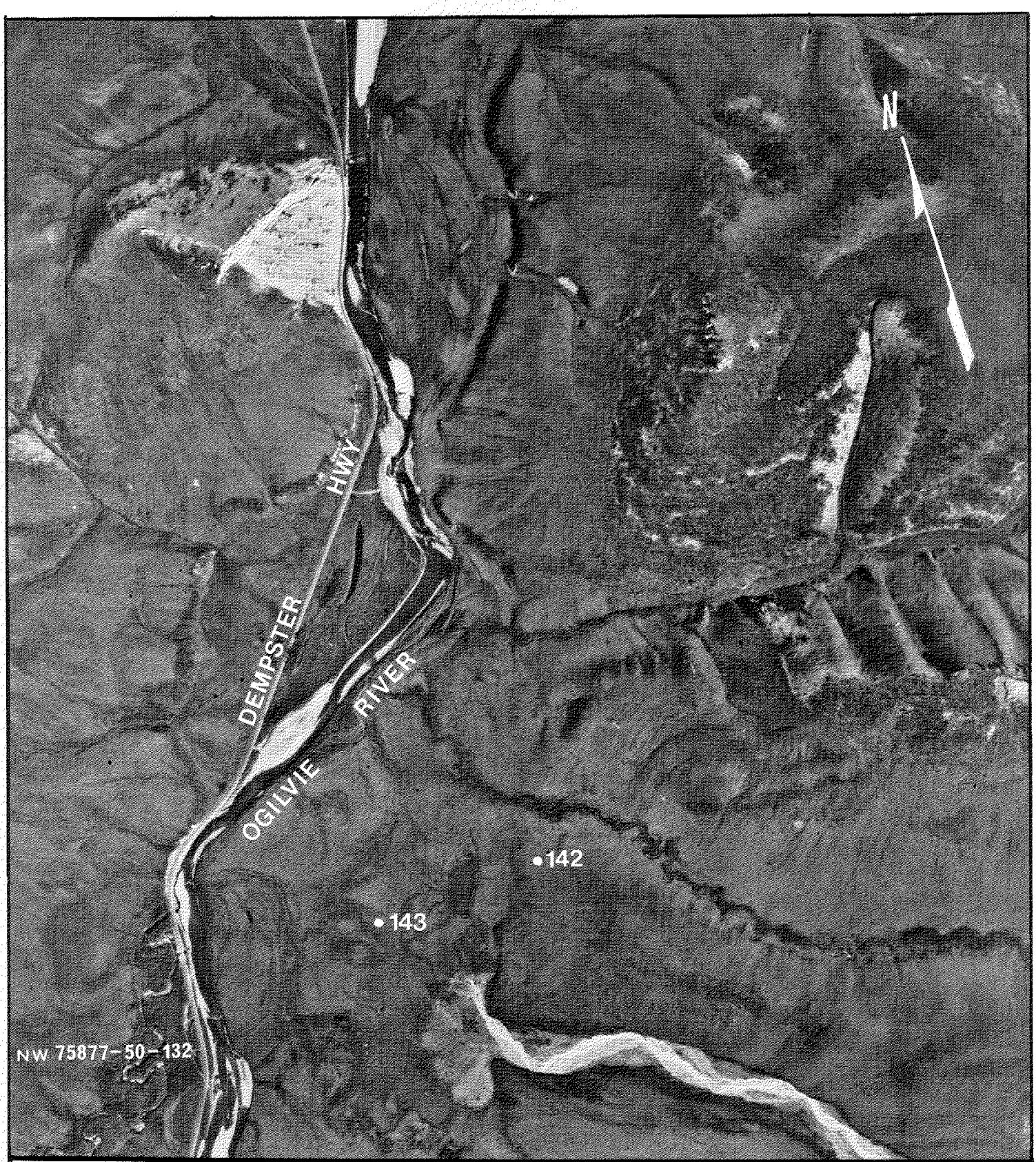
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-142
DATE July 24/78	PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 142

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.8 - 1.2	1191.9	74.4
4	5.45 - 5.75	1402.9	87.6



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-143

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		
	B		1
1	B		2
	B		3
2	B		4
	B		5
3			
4			

SYMBOL

PERMAFROST

N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

PEAT
- dark brown

0.80m

NF

GRAVEL
- some sand
- coarse to fine
- trace silt
- organic pockets
- organic odor
- dark brown

4.50m

END OF HOLE

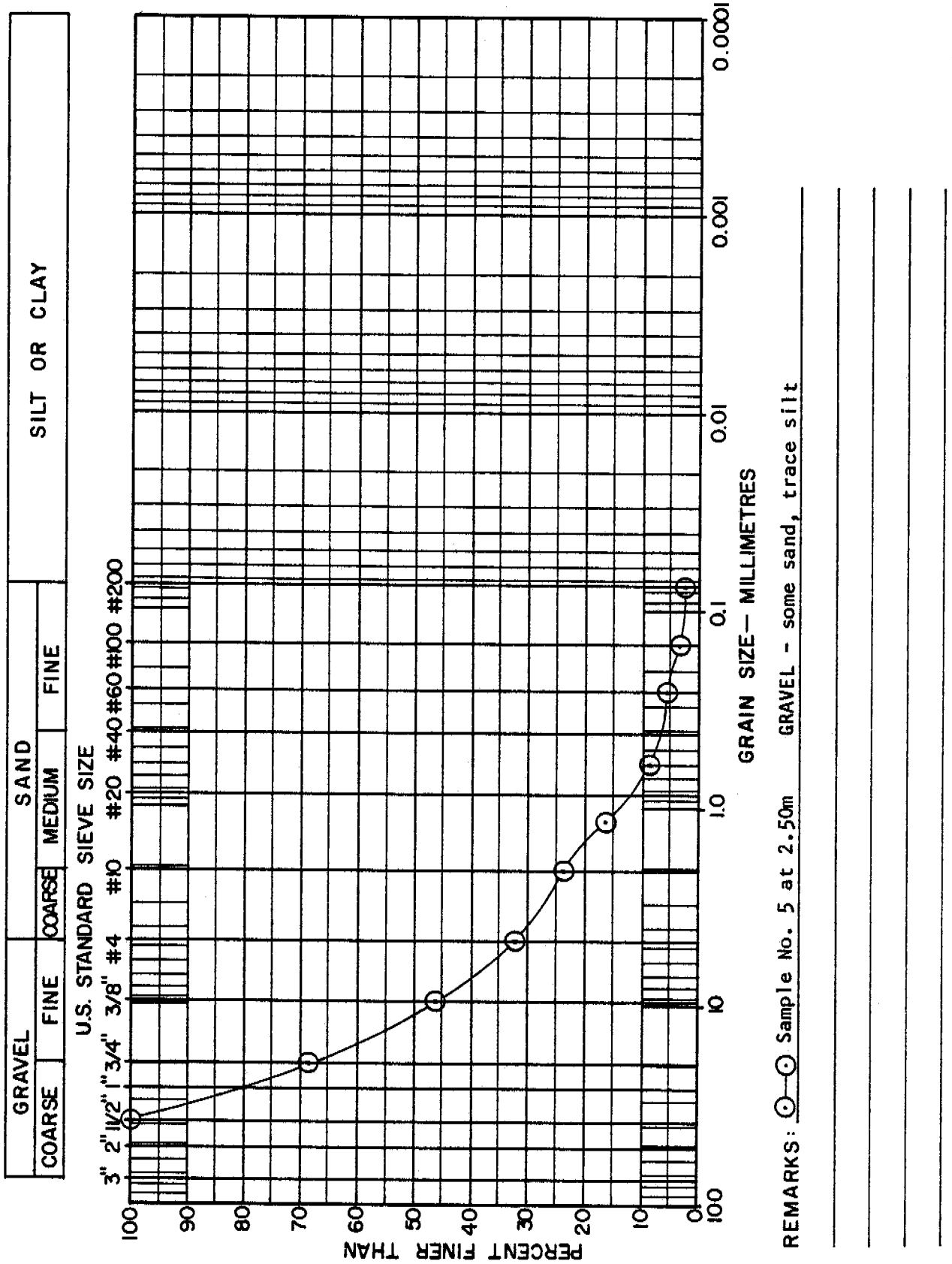
NOTES:
1. Test hole located on the alluvial plain of the Ogilvie River.
2. The site is flat with poor drainage and free water
3. The site is hummocky with moss and grass.
4. Vegetation consists of shrubs to 0.6m and a stand of 20m white spruce to the west.
5. Test hole was augered to 4.0m, and then drilled to 4.5m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-143
DATE	July 24/78 PLATE

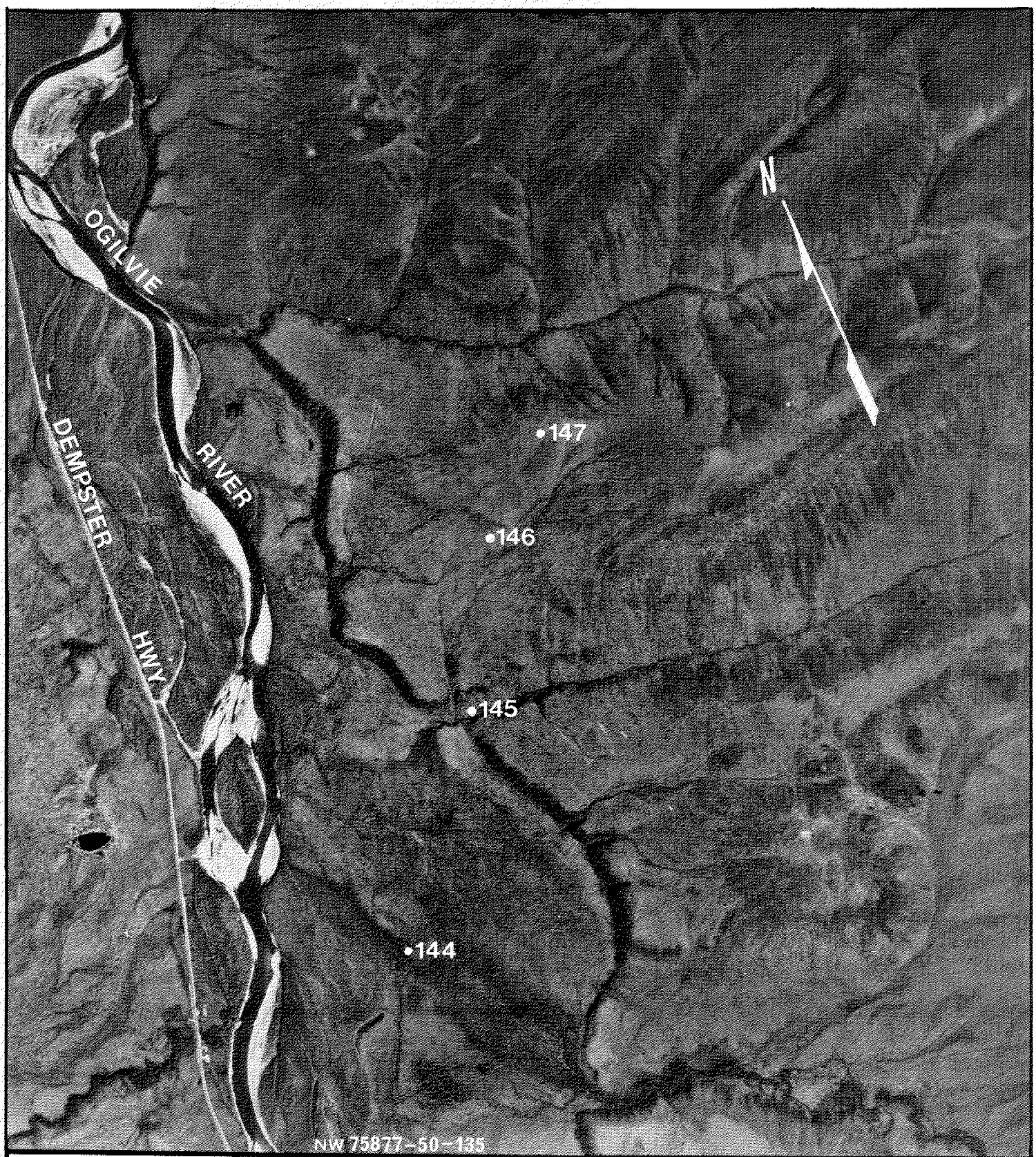
K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-143	DEPTH
DATE Oct.10/78	



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-144

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	C		1
1	C		2
	C		3
	C		4
2	C		5
	C		6
	B		7
3			
	B		8
4			
5			
		13	
		39	
6	SPT	Ref	9
	SPT	Ref	10
	B		11
7			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Nbe Vr	
ICE+	
Vr Vs Vx	
N	
	NF

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.3m
PEAT
- amorphous granular
- woody fine fibres
- brown

0.65m
ICE & PEAT AND ORGANIC SILT
- woody fine fibrous peat
- non plastic organic silt
- brown

1.40m
ORGANIC SILT
- peat inclusions
- non plasticity
- brownish grey
- ice lenses 1/4-3mm @ 1/2-10mm

2.25m
GRAVEL
- some silt and clay
- little sand
- white sand pockets
- shale gragments
- dark brown

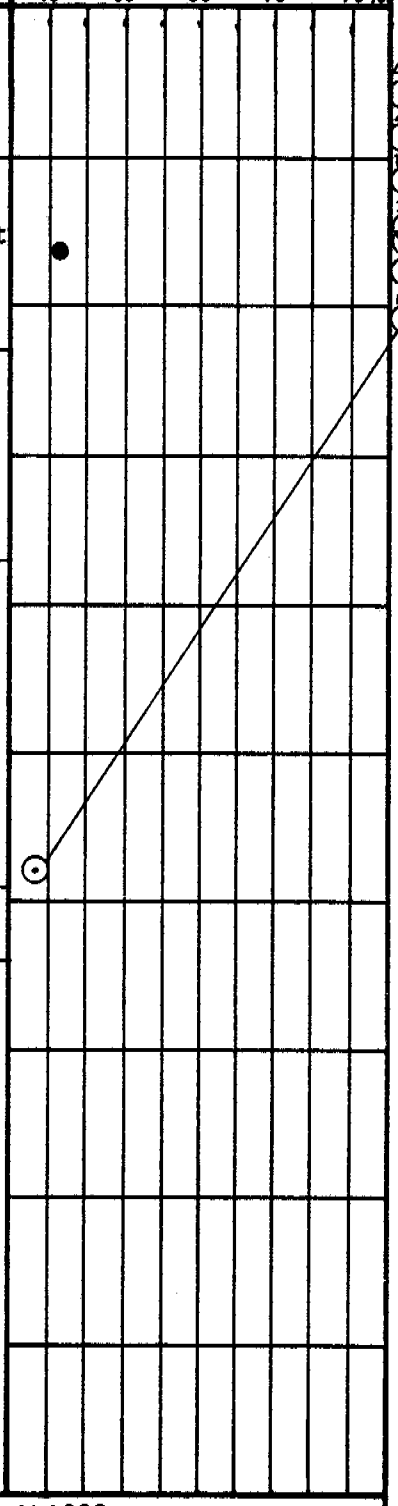
5.9m
SHALE BEDROCK

6.40m
END OF HOLE

NOTES:
1. Test hole located in a flat area with poor drainage.
2. The site is hummocky with peat tussocks.
3. Vegetation consists of shrubs to 3-4m and white and black spruce to 5-20m.
4. Test hole augered to 0.4m, then cored to 2.2m and then drilled to 6.4m with air circulation.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

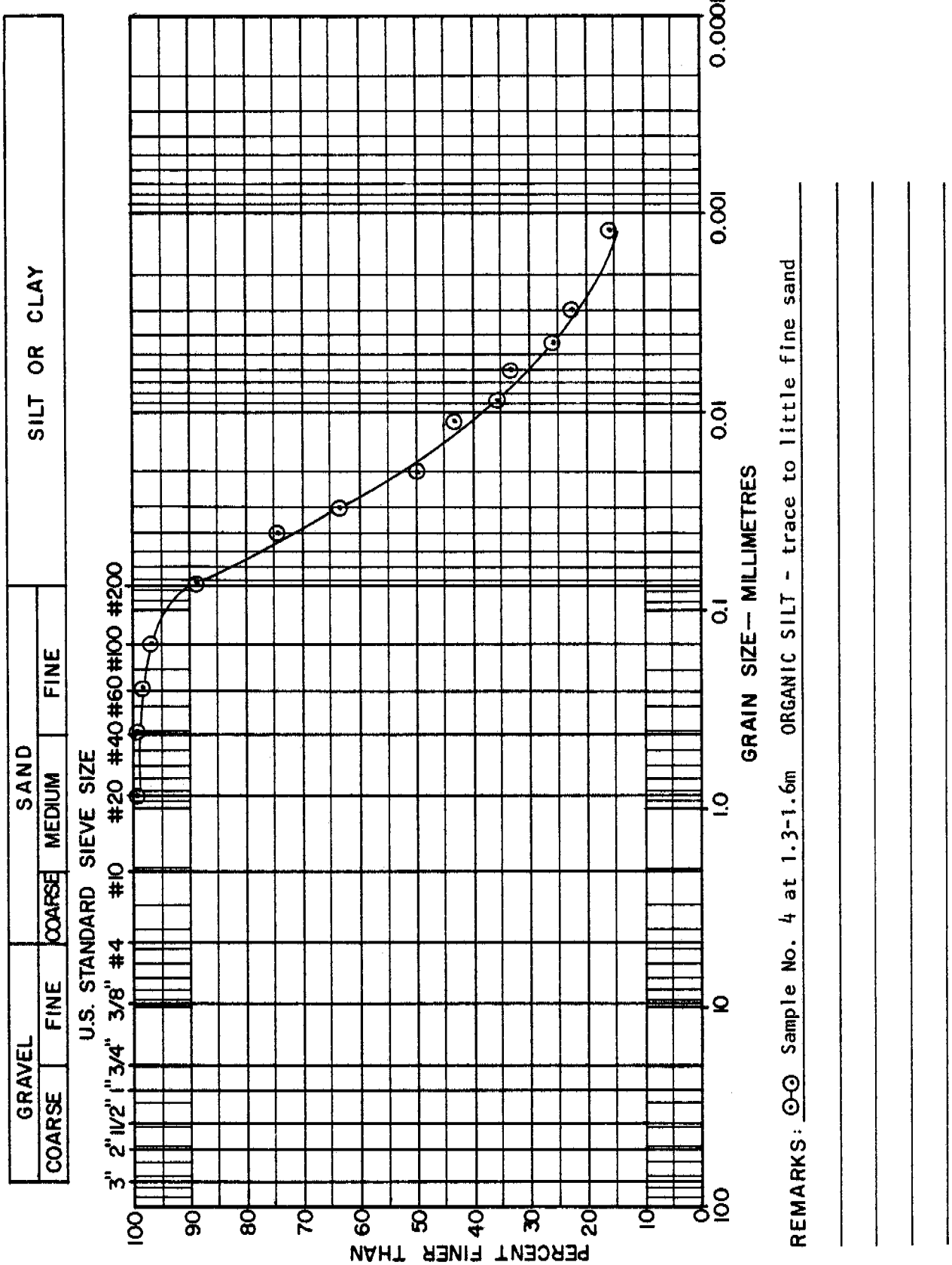


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-144
DATE	July 24/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙-⊙ Sample No. 4 at 1.3-1.6m ORGANIC SILT - trace to little fine sand

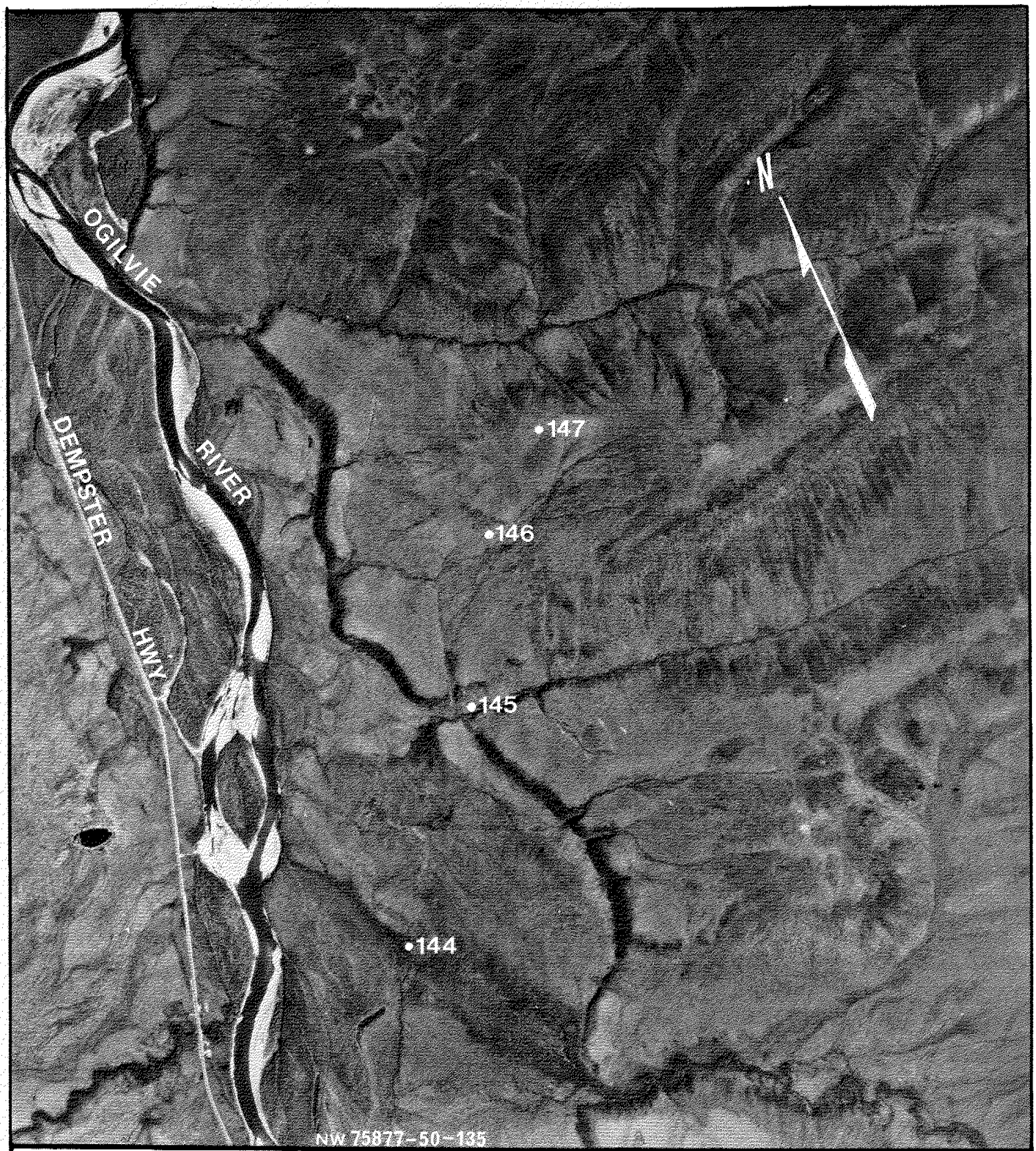
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-144	DEPTH
DATE Sept. 7/78	281

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 144

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.7 - 1.0	1237.1	77.2
3	1.0 - 1.30	1010.2	63.1
5	1.6 - 1.90	1222.6	76.3



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-145

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		
	B		1
	C		2
	C		3
	C		4
	C		5
2			
	C		6
3			
4	B		7
5	B		8
6	B		9
	B		10
7			
8			
	B		11
	B		12
9			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vs Vx Vr	
Nbn Vs	
N	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.30m
PEAT
- amorphous granular
- brown

ORGANIC SILT
- trace fine sand
- peat inclusions and layers
- brown and grey

ice lenses 5-20mm @ 5-50mm

1.60m
ice lenses 1/2-5mm@2-15mm

GRAVEL
- coarse to fine
- some sand
- little to some organic silt
- organics, roots and pieces of wood
- brown

5.3m

BEDROCK
- chip samples obtained in air return indicate shaly siltstone
- dark brown

8.5m
8.70m LIMESTONE
END OF HOLE

(Cont'd)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

28.4%
21.8%
16.4%
18.7%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-145
DATE	July 25/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

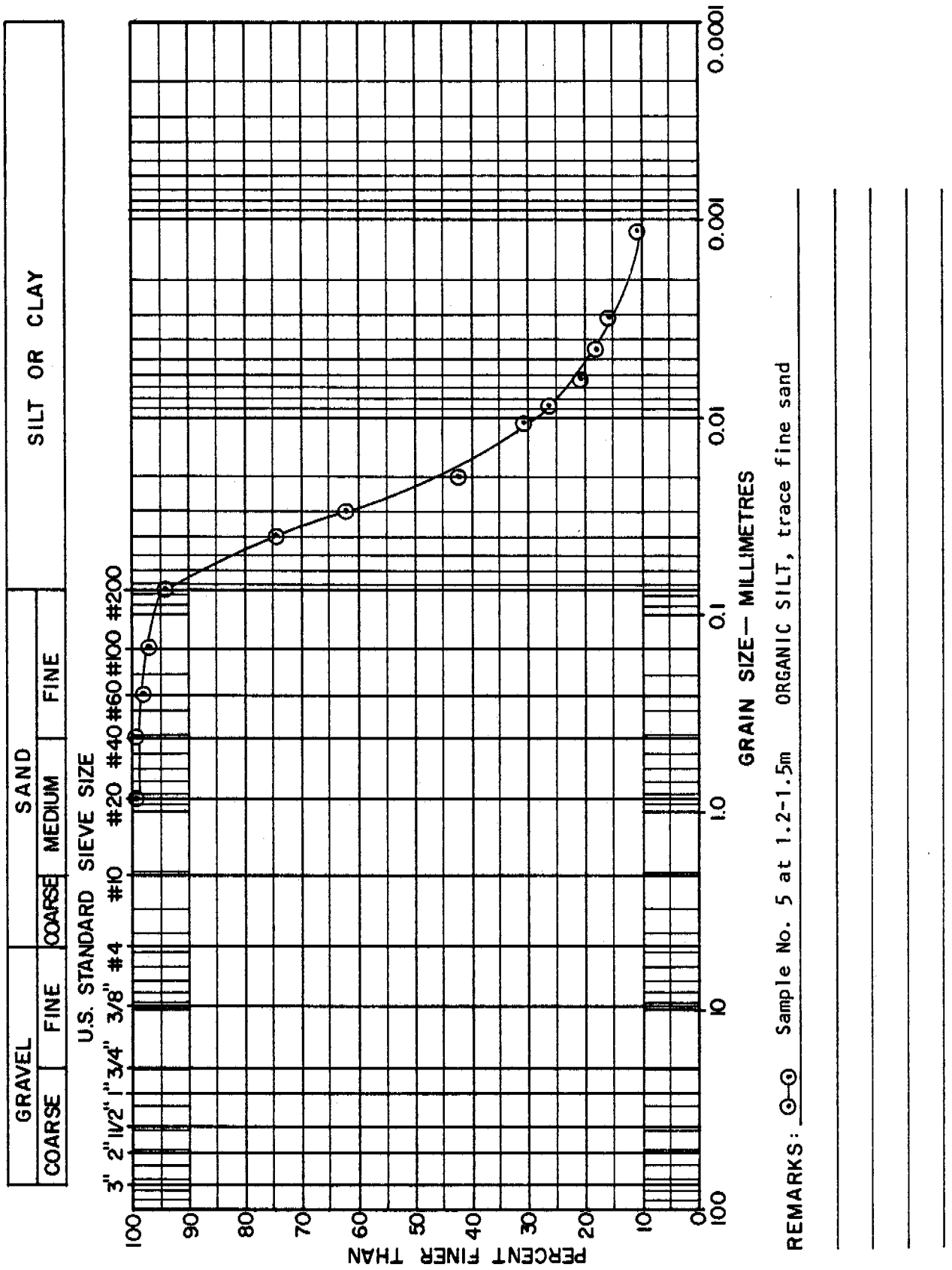
NOTES:
1. Test hole located on a hillside sloping down to the south at 5-10%
2. The site is hummocky with moss and grass.
3. Vegetation consists of moderate to dense white and black spruce to 4-20m
4. Test hole augered to 0.4m, then cored to 2.25m and then drilled to 8.7m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-145
DATE July 25/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



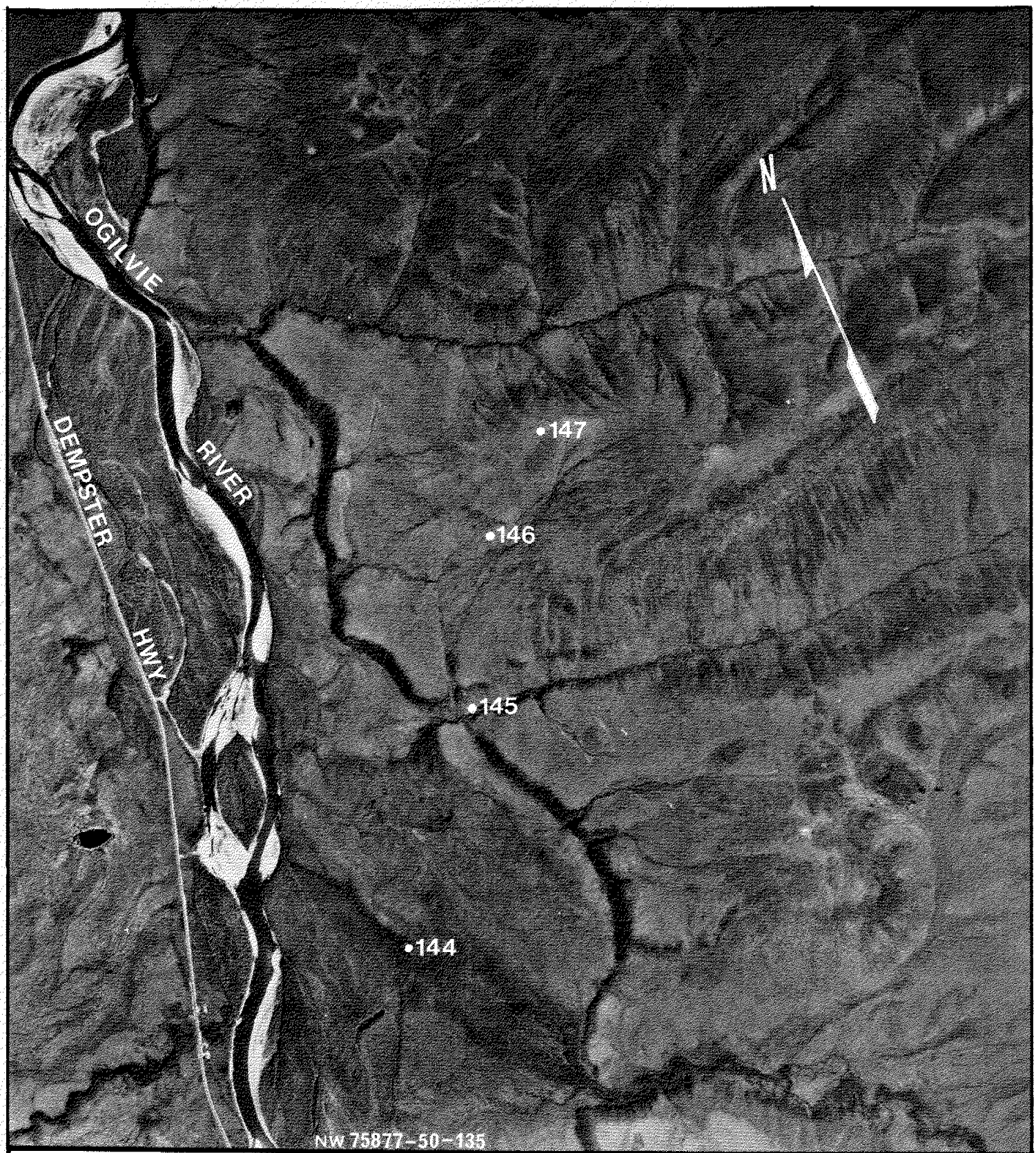
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-145	DEPTH
DATE Sept. 7/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 145

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	0.6 - 0.85	1031.0	64.4



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-146

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.25m
	C		1		Vs Vr		PEAT - amorphous granular - trace gravel - brown - ice lenses 1/2mm-7mm spaced @ 3mm-15mm
1							0.75m
2					ICE		ICE
							2.40m
3	C		2		Vr Nbe		ORGANIC SILT - little fine sand - sand pockets and laminations - grey - longitudinal ice lenses 1mm-5mm spaced at 1mm-5mm
	C		3				
	C		4				
4	C		5				3.60m
					Vs		SILT - little fine sand - trace fine gravel to 6.5m, some coarse to fine gravel below. - organic inclusions - stratified - grey - ice lenses 1/4mm-1mm spaced @ 1mm-12mm
5	C		6		Nbe		
	C		7				
6	C		8		Nbe		
7							
8							
	B		9				
9							8.70m
10					ICE+		ICE AND SILT (Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

278%
161%
104%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-146
DATE July 25/78	PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
11			
12			
13	B		10
14			
15			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
ICE+	

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT X — — — — — 0 — — — — — X WATER CONTENT LIQUID LIMIT
10 30 50 70 90%

DESCRIPTION OF MATERIAL

As Above

12.50m

BEDROCK
- hard drilling at 14.2m
- chip samples obtained in air return indicates shaly siltstone

14.20m

END OF HOLE

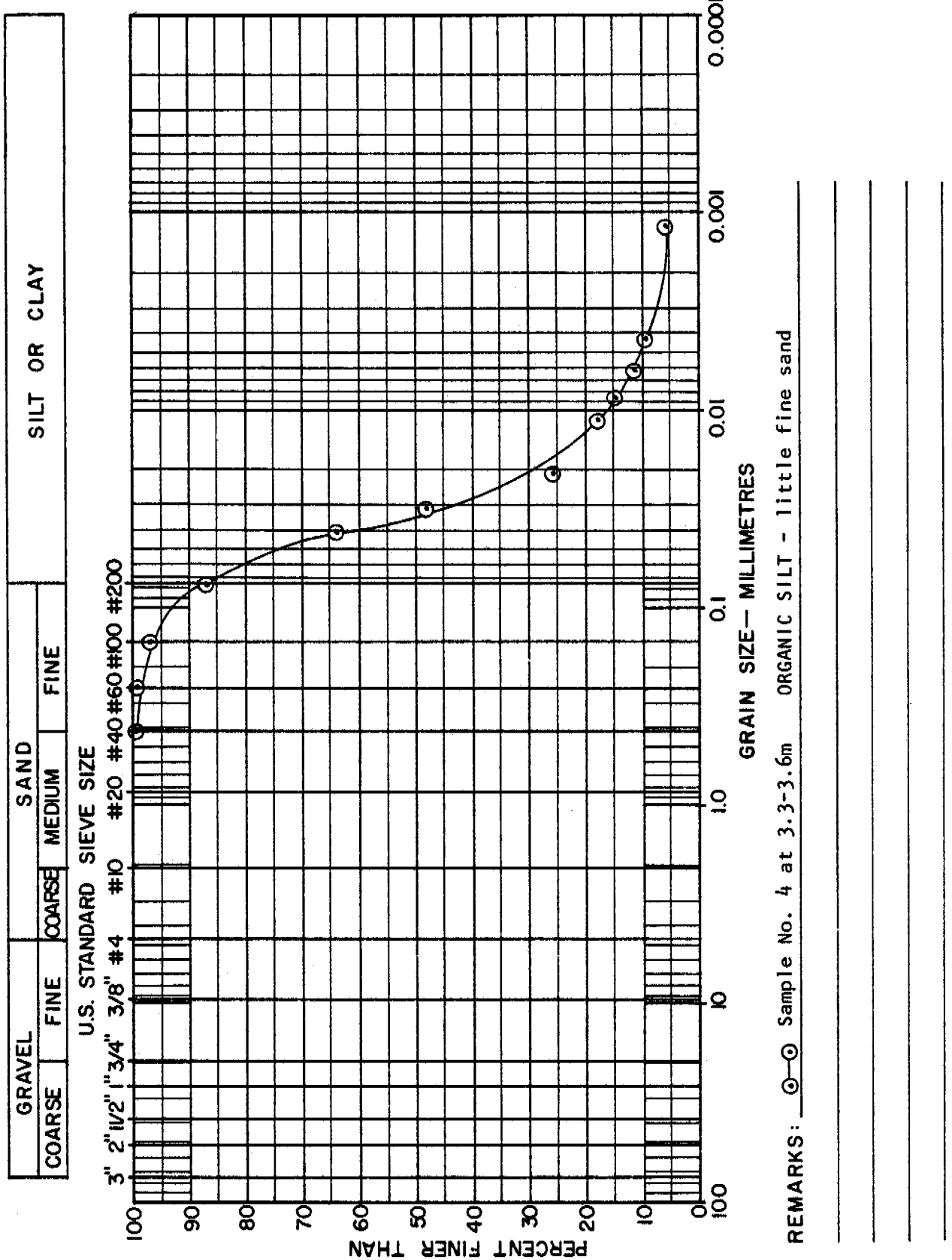
NOTES:
1. Test hole located on a hillside sloping down to the southwest at 3-5%.
2. The site is hummocky with moss and grass.
3. Drainage is fair.
4. Vegetation consists of moderate black spruce to 3-7m.
5. Test hole augered to 0.35m, then cored to 6.1m and then drilled to 14.2m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-146
DATE July 25/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



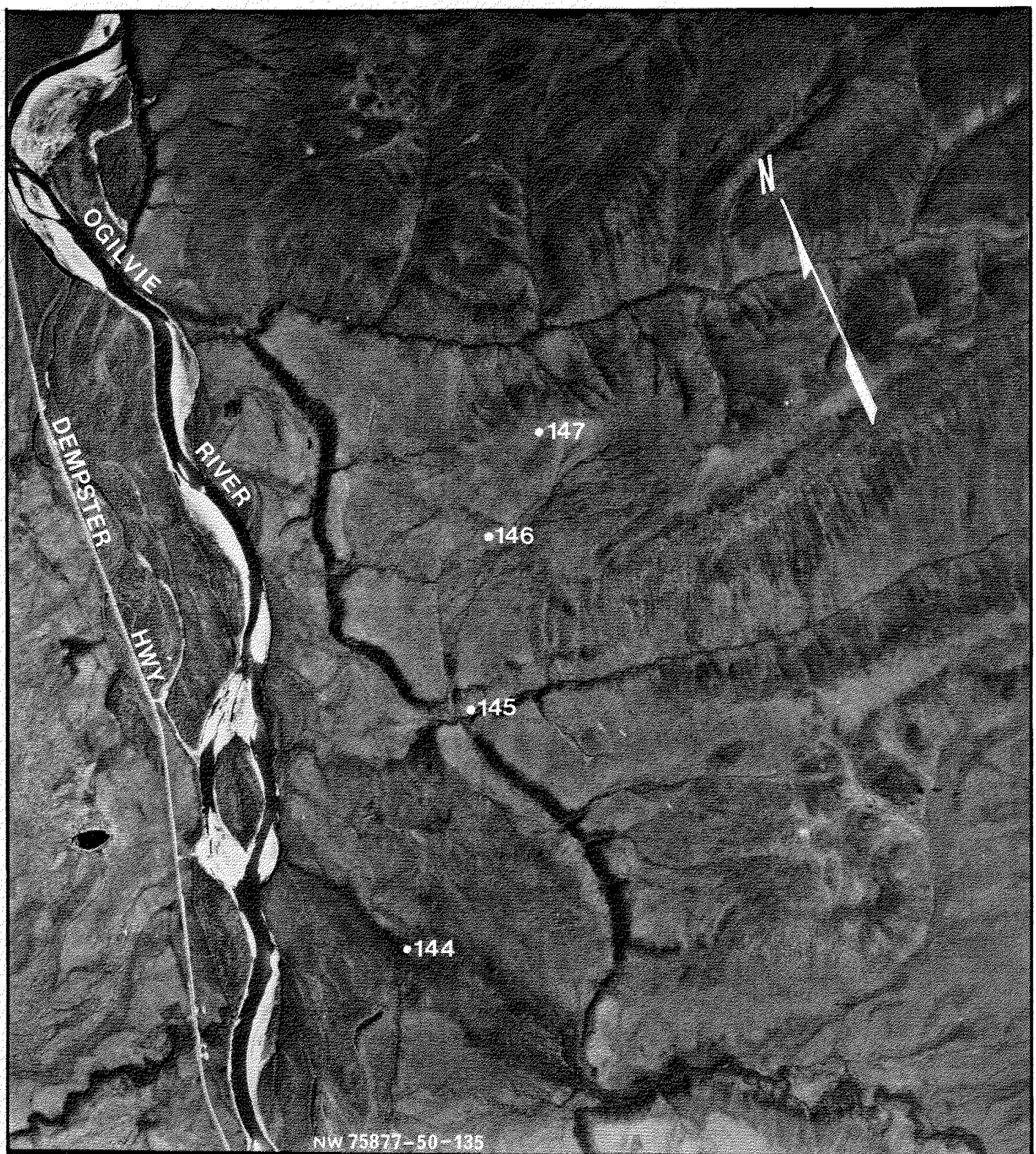
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-146 DEPTH
DATE	Sept. 5/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 146

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.35 - 0.75	1197.0	74.7
3	3.0 - 3.30	1482.1	92.5
6	4.5 - 4.85	1764.2	110.1



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-147

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION / ELEVATION	COHESION - Kg./Sq.cm. (0.2 0.6 1.0 1.4 1.8) ● FIELD VANE △ LAB VANE ■ UNCONF.
DEPTH	TYPE	BLOW/15cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (X — — — 0 — — — X; 10 30 50 70 90%)
						NF.		
							0.45m PEAT - amorphous granular - brown	
1	C		1		Vs Vr Vx		ORGANIC SILT AND PEAT - trace fine sand - pockets and laminations of organic silt and sand. - grey and brown - ice lenses 1/2-10mm @ 1-5mm	225%
	C		2				1.50m	113%
2					Vs Vr			NP
	C		3				2.10m	
	C		4		Vr Vx		SILT - little fine sand - trace fine to medium gravel - non plasticity - stratified - grey	
3	C		5					
	C		6					
	C		7					
	C		8		Nbe			
4	C		9					
	C		10					X—X
							WEATHERED SILTSTONE - angular fine to coarse gravel size pieces of calcareous siltstone - trace sand - grey	
5	B		11					
	B		12				ice lenses and inclusions 1-4mm @ 3-10mm 5.70m.	
6							END OF HOLE	

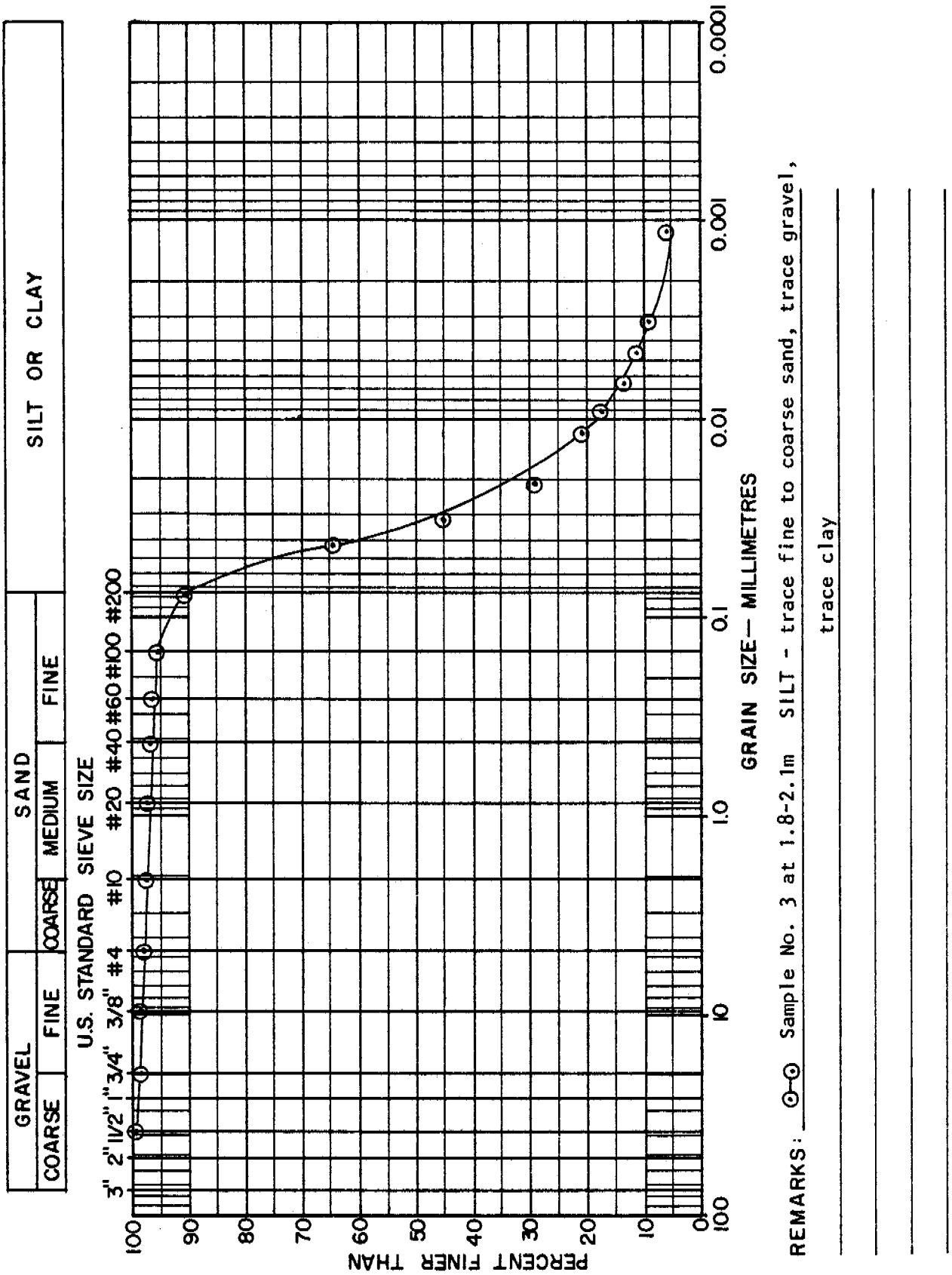
NOTES:
1. Test hole located near the crest of the hill. Ground slopes to the west at 2-3%.
2. The site is hummocky with grass and moss.
3. Drainage is fair
4. Vegetation consists of sparse black spruce to 2-3m.
5. Test hole augered to 0.4m, then cored to 4.15m and then drilled to 5.7m. with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-147
DATE	July 25/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.8-2.1m SILT - trace fine to coarse sand, trace gravel, trace clay

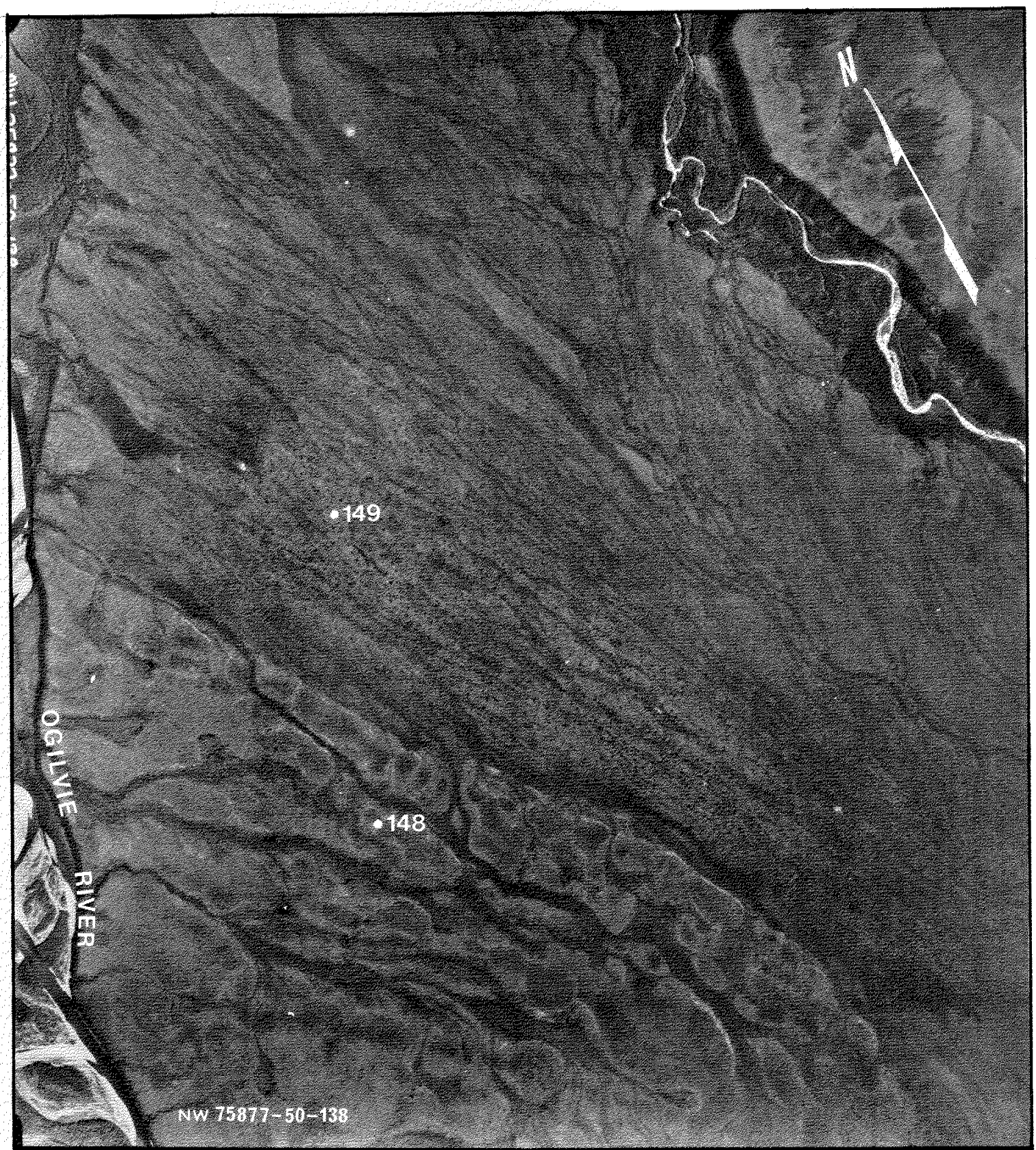
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-147 DEPTH
DATE	Sept. 7/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 147

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
4	2.20 - 2.55	1723.9	107.6
5	2.75 - 2.95	2131.2	133.1
8	3.45 - 3.65	2252.6	140.6



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-148

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.25m PEAT - amorphous granular
	C		1		Vr		0.6m
1	C		2		Vs		ORGANIC SILT - trace fine sand - peat inclusions - grey and brown
	C		3		Vx		ice lenses 1/4mm-5mm spaced @ 1mm-5mm
2	C		4				2.00m
	C		5		Vr		SILT - little gravel - fine to coarse - trace fine sand - organic inclusions - grey - ice lenses 1/4mm-2mm spaced at 1mm-10mm
	C		6				
	C		7				2.65m
	C		8		Vs		gravel, some sand
3	C		9				gravel layer
	C		10		Vs		organic silt
	C		11		Vx		SILT - trace to little fine sand - trace gravel - organic inclusions - brownish grey - ice lenses 1/2mm-6mm spaced @ 2mm-15mm spaced at 2mm - 15mm
4	C		12		Nbe		
	C		13				
5	C		14				
6	B		15				6.50m GRAVEL - coarser drilling
7							
	B		16		N		
8							
9	B		17				
							9.80m
10							END OF HOLE (Cont'd)

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

22.7%
14.8%
101.9%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-148
DATE	July 25/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

NOTES:

1. Test hole located on a fairly level area sloping down at less than 1% to the south-west.
2. The site is slightly hummocky with moss and grass cover.
3. Drainage is poor.
4. Vegetation consists of sparse black spruce to 2-3m.
5. Test hole augered to 0.4m, then cored to 5.0m and then drilled to 9.8m with air circulation.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

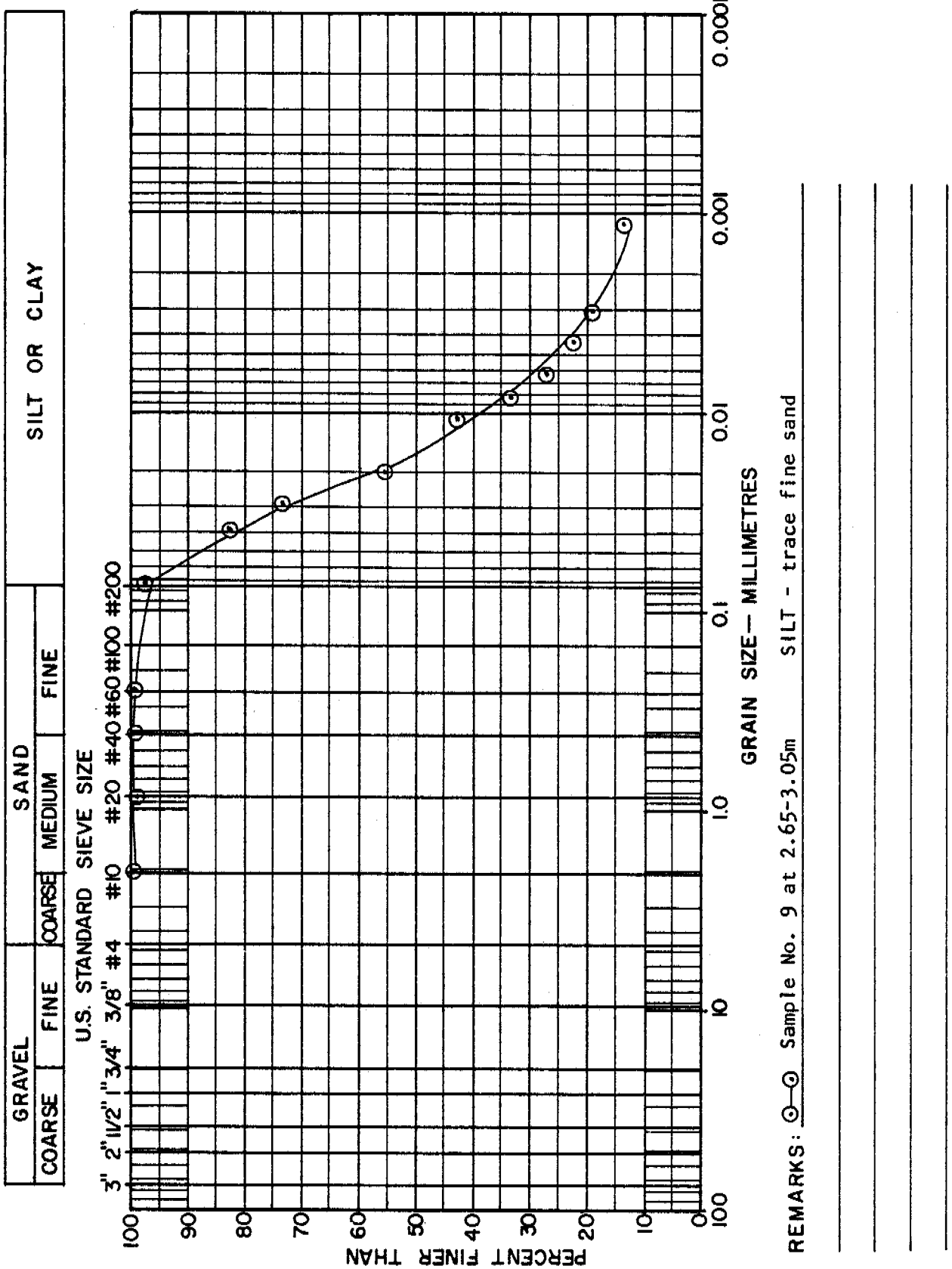
PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Hempster Lateral
LOCATION
HOLE No. 78-148
DATE July 25/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



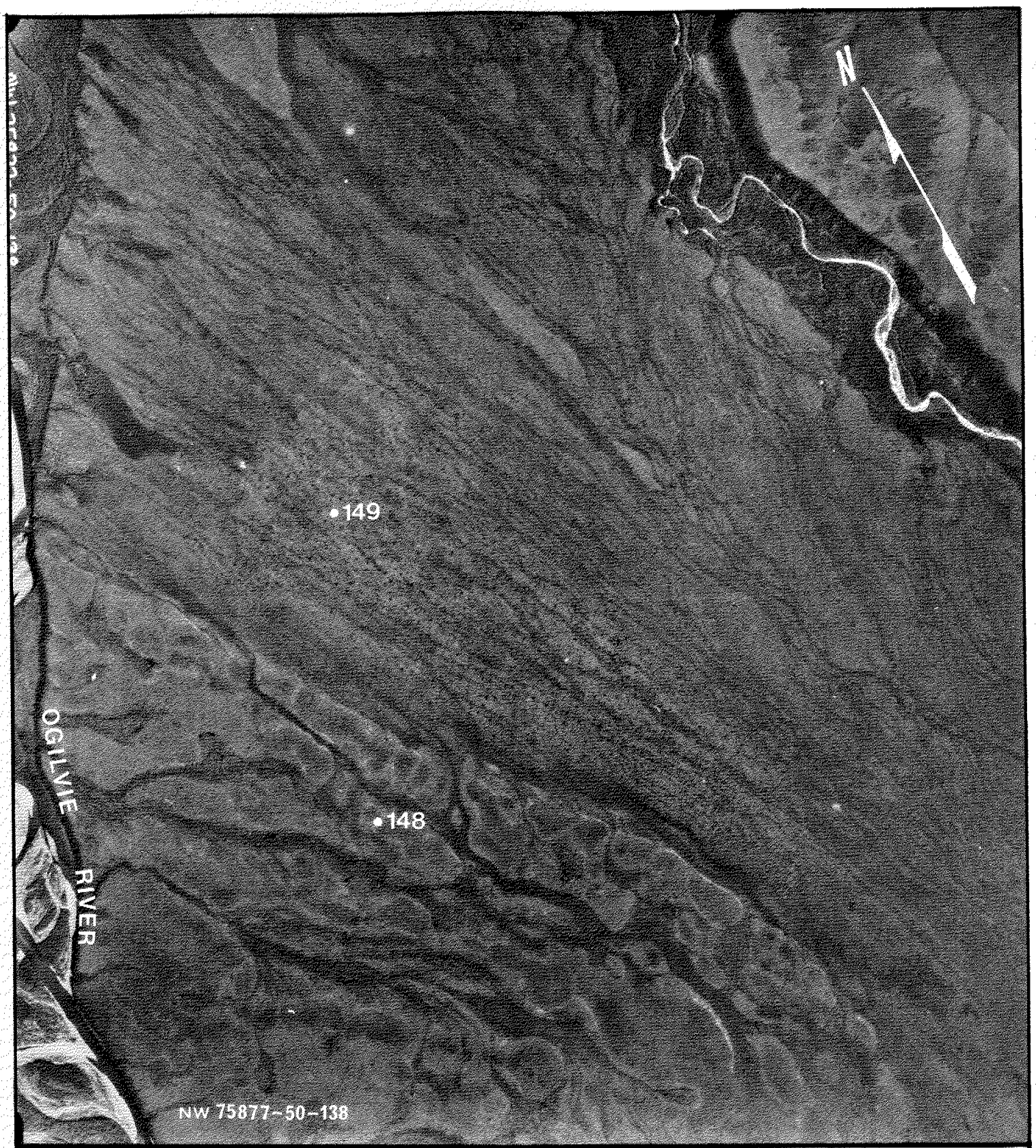
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-148	DEPTH
DATE Sept. 7/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 148

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.2 - 1.5	1218.6	76.1
9	2.65 - 3.05	1682.0	105.0
13	4.15 - 4.50	1350.5	84.3



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-149

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		
	C		1
2	B		2
3			
	B		3
4			
5	B		4
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.4 m
Vr	

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

PEAT
- amorphous granular
- brown

0.80m
ice lenses 1mm thick

GRAVEL
- coarser drilling below 2.0m

little organic silt and clay

5.70m

END OF HOLE

NOTES:
1. Test hole located on a flat poorly drained area that is slightly swampy.
2. The site is slightly hummocky with grass and moss cover.
3. The vegetation consists of sparse black spruce with dead trees and shrubs.
4. Test hole augered to 0.55m, then cored to 0.95m and drilled to 5.7m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-149
DATE July 25/78 PLATE

K.L.C. - METRIC

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-150

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	C		1
1	C		2
	C		3
	C		4
2	C		5
	C		6
	C		7
3	C		8
4	C		9
	C		10
5	C		11
	C		12
6			
	C		13
7			
	B		14
8			
	B		15
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vr	
Vs	
Nbe	
Vr	
Vs	

LOCATION
ELEVATION Ogilvie River

DESCRIPTION OF MATERIAL

0.30m PEAT
- amorphous granular
- roots
- brown

ORGANIC SILT
- little to some fine sand
- peat inclusions and layers
- roots
- non to slight plasticity

ice lenses 1/4mm-1mm spaced @ 1/2mm-1mm

ice lenses 1/4mm-1mm spaced @ 1/4mm-5mm

large wood chips

4.0m pockets of sand and silt

SILT
- some sand
- trace gravel
- non to slight plasticity
- organic pockets
- shell inclusions
- grey with rusty laminations

gravel layer

sand and silt pocket

6.5m

GRAVEL
- coarser drilling
- losing air below 8.3m

9.80m

END OF HOLE (Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

155%
NP
X

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-150
DATE	July 26/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.P. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
ORGANIC CONTENT % UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
10 30 50 70 90%

DESCRIPTION OF MATERIAL

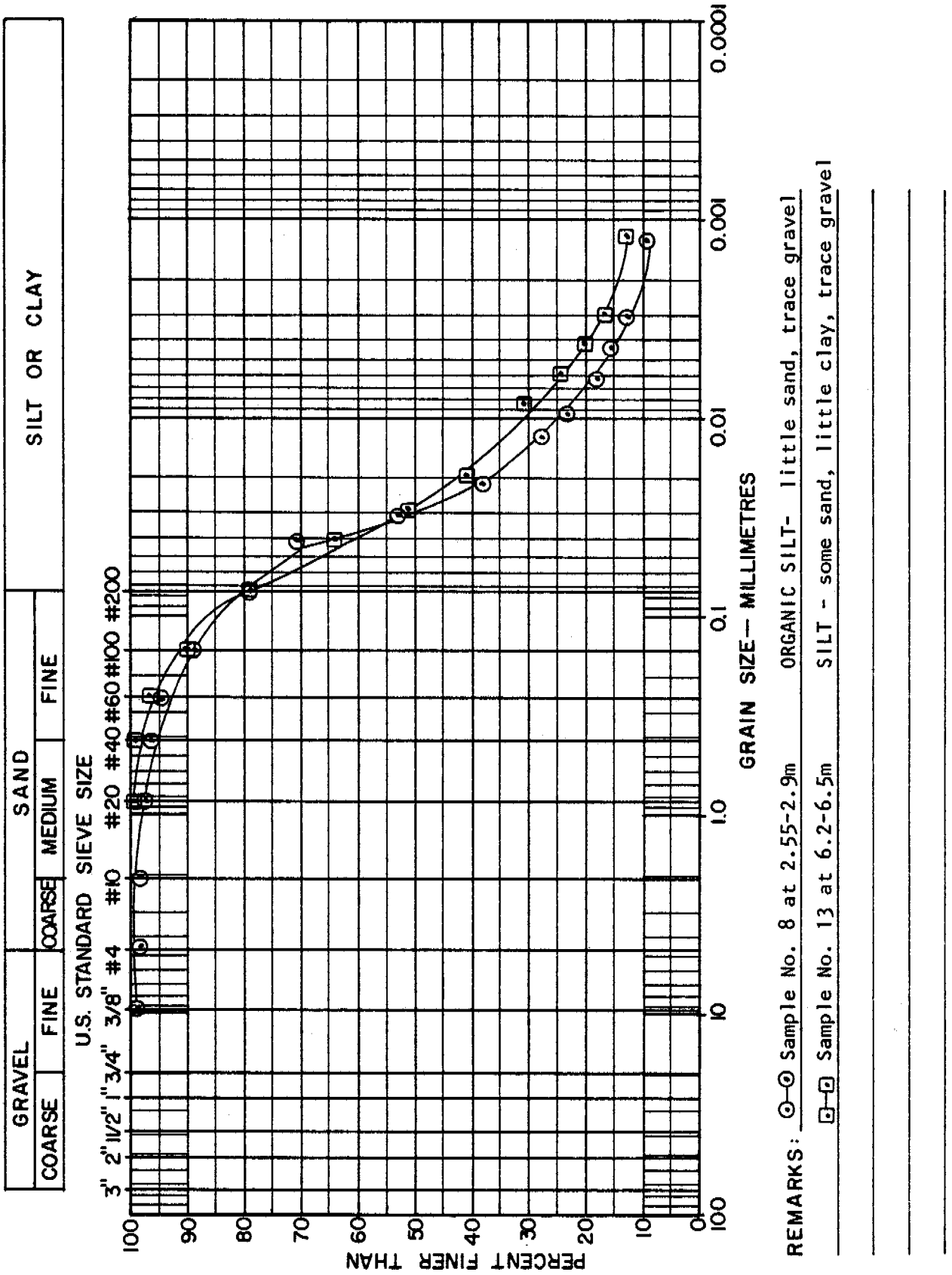
NOTES:
1. Test hole located on a flat hummocky area with poor drainage.
2. Vegetation consists of moderately dense black spruce 3-10m.
3. Test hole was augered to 0.4m, then cored to 6.5m.and then drilled to 9.8m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-150
DATE	July 26/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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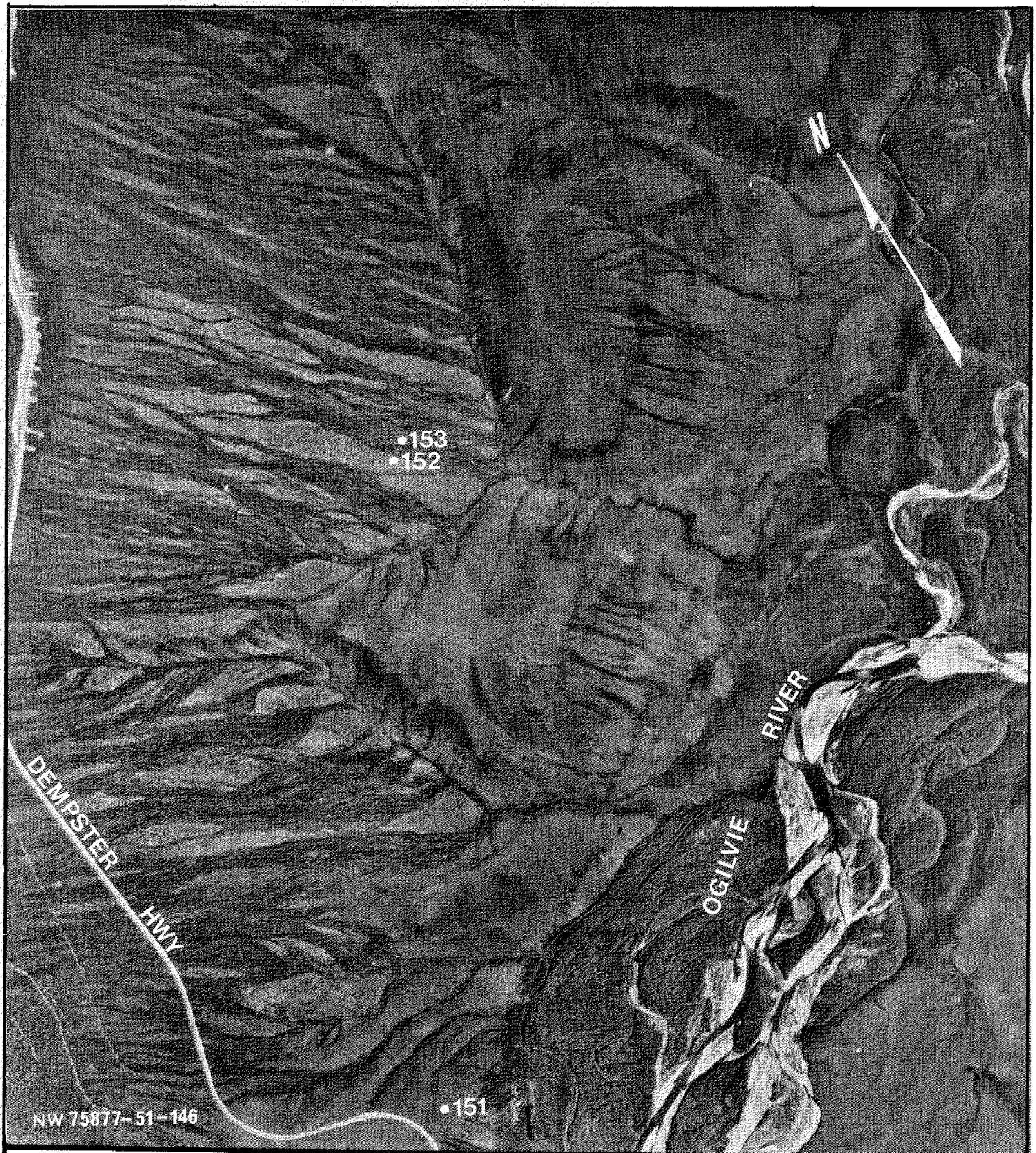
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-150 DEPTH
DATE	Sept. 11/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 150

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.7 - 1.0	1221.8	76.3
7	2.25 - 2.55	1453.8	90.8
13	6.20 - 6.50	1801.0	112.4



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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-151

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		
	B		1
1	C		2
	C		3
2	C		4
	C		5
	C		6
3	C		7
4			
	C		8
	C		9
5	B		10
	B		11
6			
	B		12
7	SPT	170 for 15 cm	13
8	B		14
9	SPT	130 for 10	15
	B		16
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.6
Vs, Vr	
Vx	

LOCATION Ogilvie River
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER - moss

SILT AND CLAY
- trace fine sand
- trace to little gravel below 0.6m.
- organic inclusions
- brown

1.2m

CLAY AND SILT
- trace to little sand
- fine to med.
- trace gravel
- medium plasticity
- grey

ice lenses 1mm-5mm spaced @ 1mm-5mm

5.5m

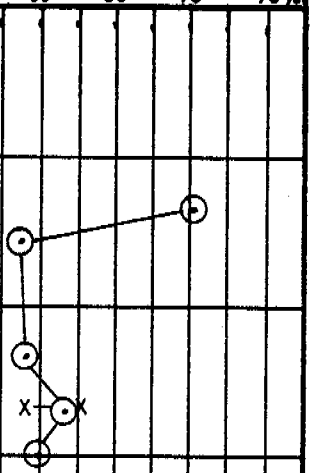
WEATHERED SHALE
- hard drilling at 4.4m
- sample obtained in air return indicate siltstone fragments

9.80m

END OF HOLE (cont'd)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-151
DATE July 26/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

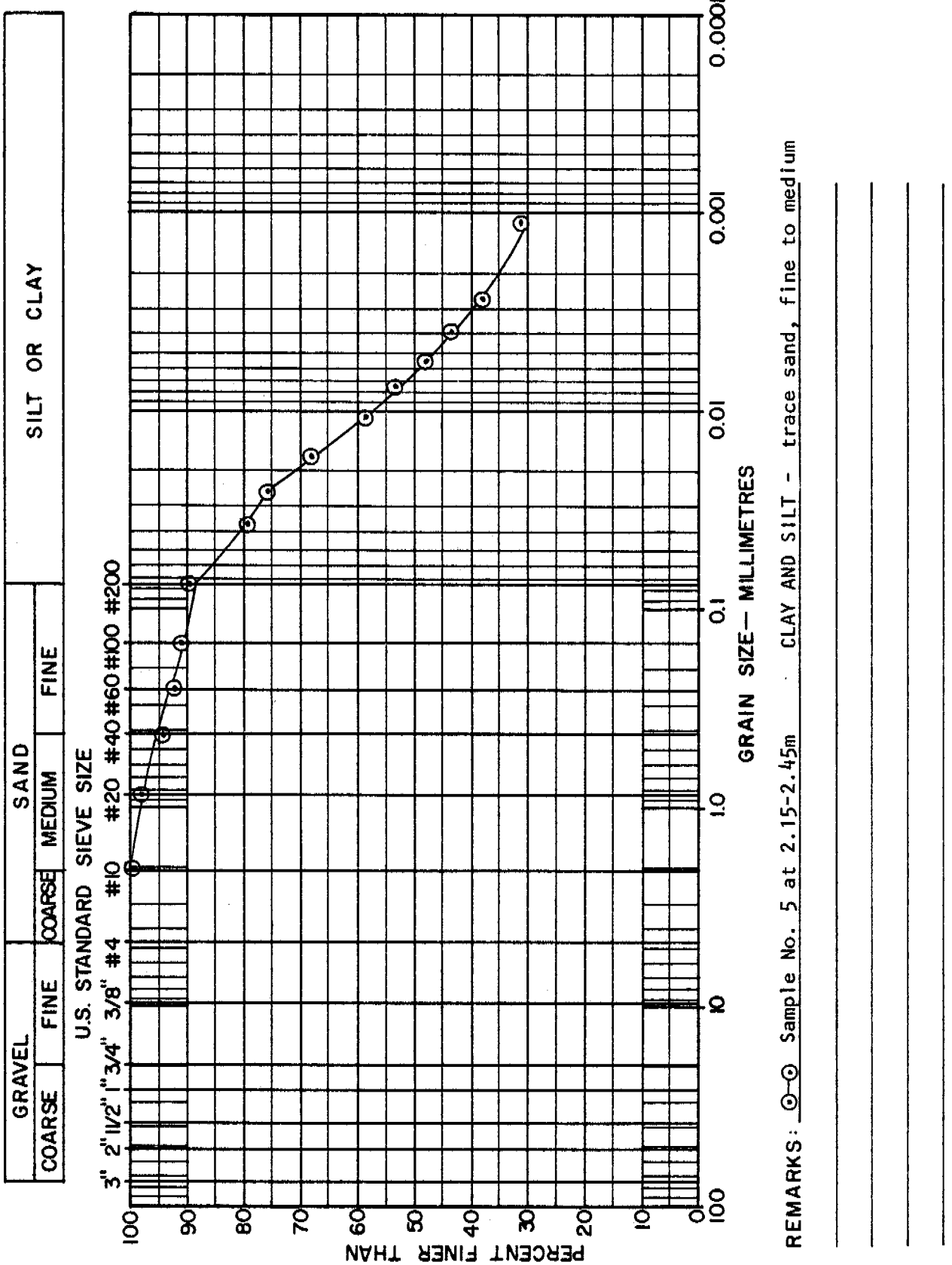
NOTES:
1. Test hole located on a hillside ascending west at 1% and descending east at 5-8%.
2. The site is slightly hummocky with a grass cover.
3. The site is a former burnt area with burnt black spurs 3-5m
4. Test hole augered to 0.7m, then cored to 4.4m and then drilled to 9.8m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-151
DATE	July 26/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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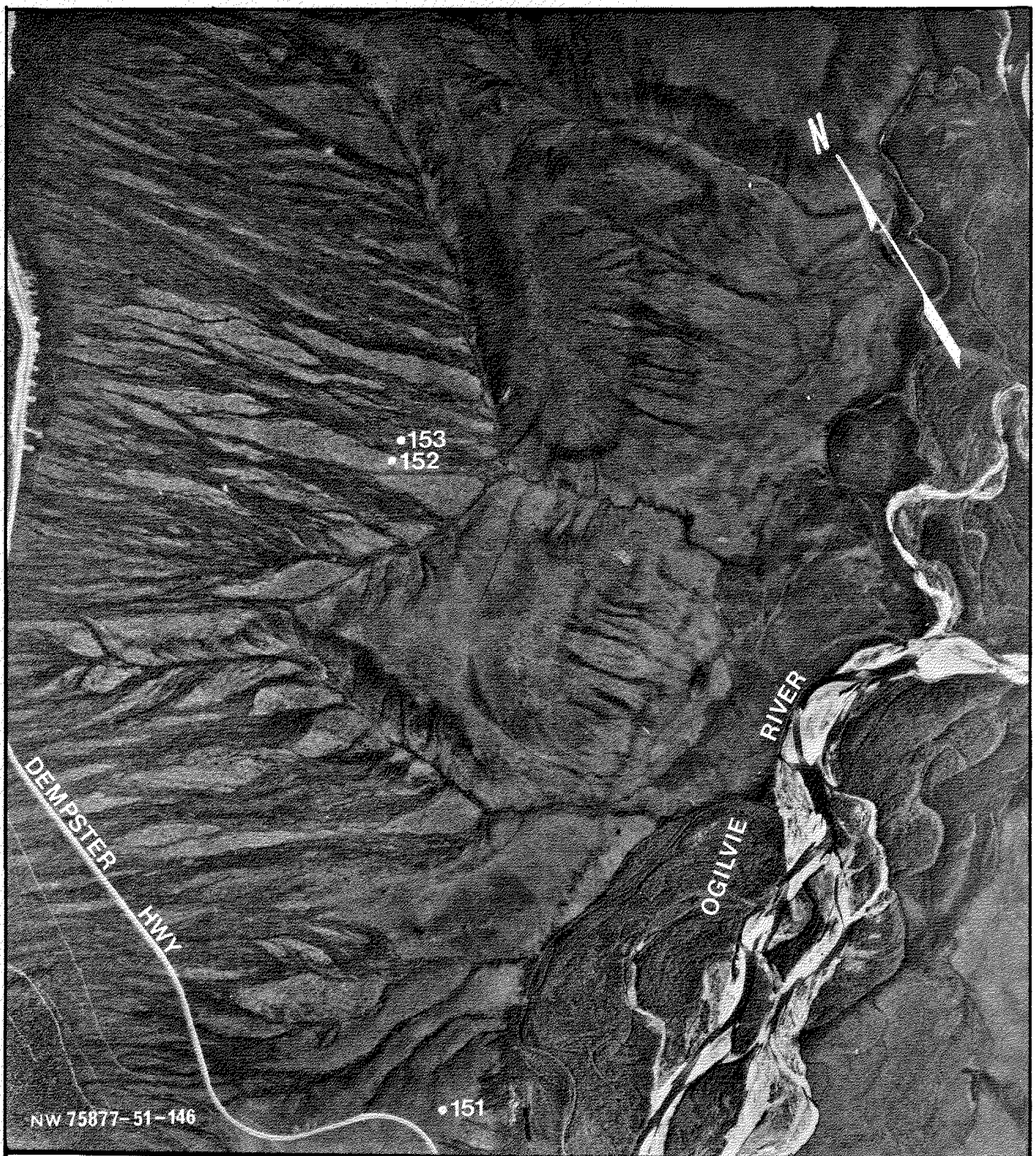
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-151	DEPTH
DATE Sept 11/78	312

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 151

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.20 - 1.55	1675.6	104.6



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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-152

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	C		1
1	C		2
	C		3
2	C		4
	C		5
3	C		6
4	C		7
	C		8
5			
	B		9
6			
	B		10
7			
8			
9	SPT	95	11
10	SPT	135	12

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
Nbe	ICE+
Nbe Vs Vr	
N	
Vx Vr Vs	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER
0.3m
0.60m
0.70m

PEAT AND ORGANIC SILT
- pockets and lenses
- brown and grey

ICE & ORGANIC SILT

SILT AND CLAY
- little sand
- trace gravel
- slight to low plasticity
- peat inclusions
- brownish grey

ice lenses 1mm-15mm spaced at 3mm-20mm

some gravel

4.50m

SAND - coarse to fine
- some silt and clay
- little gravel
- brown

7.5m

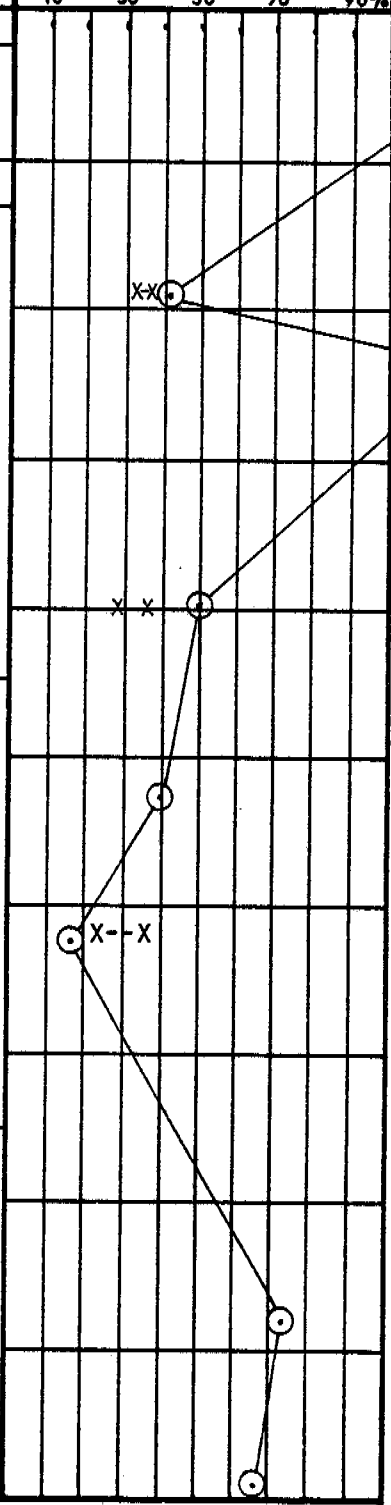
CLAY AND SILT
- trace fine gravel
- medium plasticity
- organic pockets
- brownish grey
- ice lenses 1mm-2mm spaced at 1mm-2mm

(Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - 0 - - - - - X
10 30 50 70 90%

201%
257%
133%
130%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-152
DATE	July 26/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

11

10.30m As Above

END OF HOLE

NOTES:

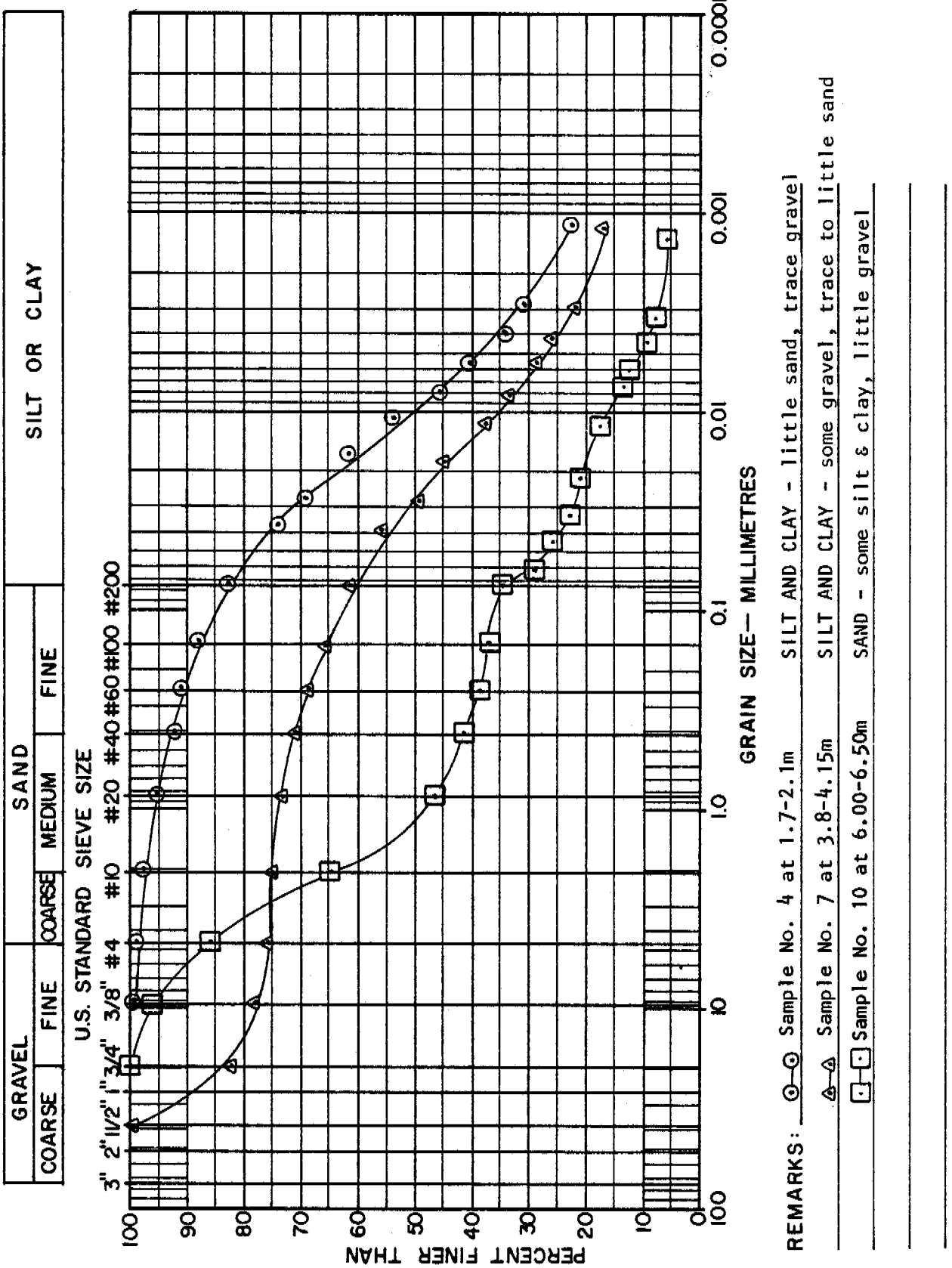
1. Test hole located on a hillside sloping down to the east at approximately 2%.
2. A small watercourse is located slightly north of the test hole.
3. The site is hummocky with a moss cover
4. Vegetation consists of black spruce 3-10m tall.
5. Test hole was augered to 0.4m, then cored to 4.5m. and then drilled to 10.3m with air circulation.
6. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0 and 7.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-152
DATE July 26/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



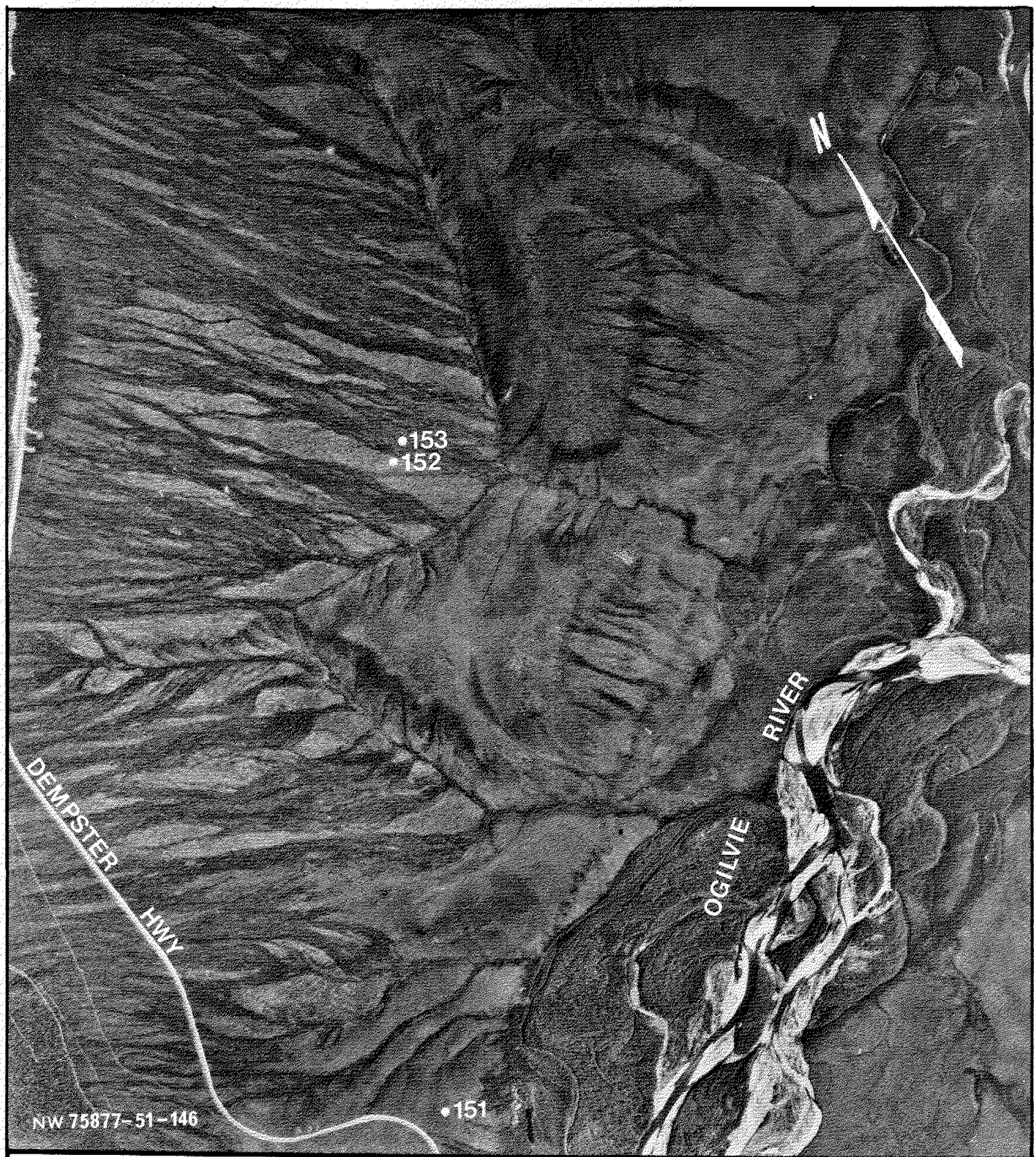
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-152	DEPTH
DATE Sept. 11/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 152

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
6	2.5 - 2.90	1228.8	76.7



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-153

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF 0.3m	0.15m ORGANIC COVER -moss
	C		1		Vr		ORGANIC SILT - trace fine sand - peat inclusions - greyish brown - ice lenses 1/4mm-5mm spaced @ 1mm-15mm
1	C		2		Vs		
	C		3				
	C		4				1.45m silt pockets
2	C		5		Nbe		SAND - and silt - trace gravel - sand and silt layers - organic inclusions - brownish grey
	C		6				2.2m
3	C		7				
	B		8				SAND AND SILT & CLAY - some gravel - organic pockets - brownish grey
4					N		
5	B		9				
6							
	B		10				
7							7.0m
8					Vx Vr		CLAY AND SILT - some sand - fine to coarse - little gravel - low to medium plasticity - organic pockets - sand and silt lenses - brownish grey
	B		11				
9							
	B		12				sand, some silt
10							(Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

115%
164%
131%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-153
DATE July 27/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
11	B		13
12	SPT	100	14
13			
14	B		15
15	B		16

SYMBOL | PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

AS ABOVE

11.0m

BEDROCK
- weathered shale from 11.0m to 13.5m
- chip samples obtained in air return indicate shaly siltstone below 13.5m.

15.00m

END OF HOLE

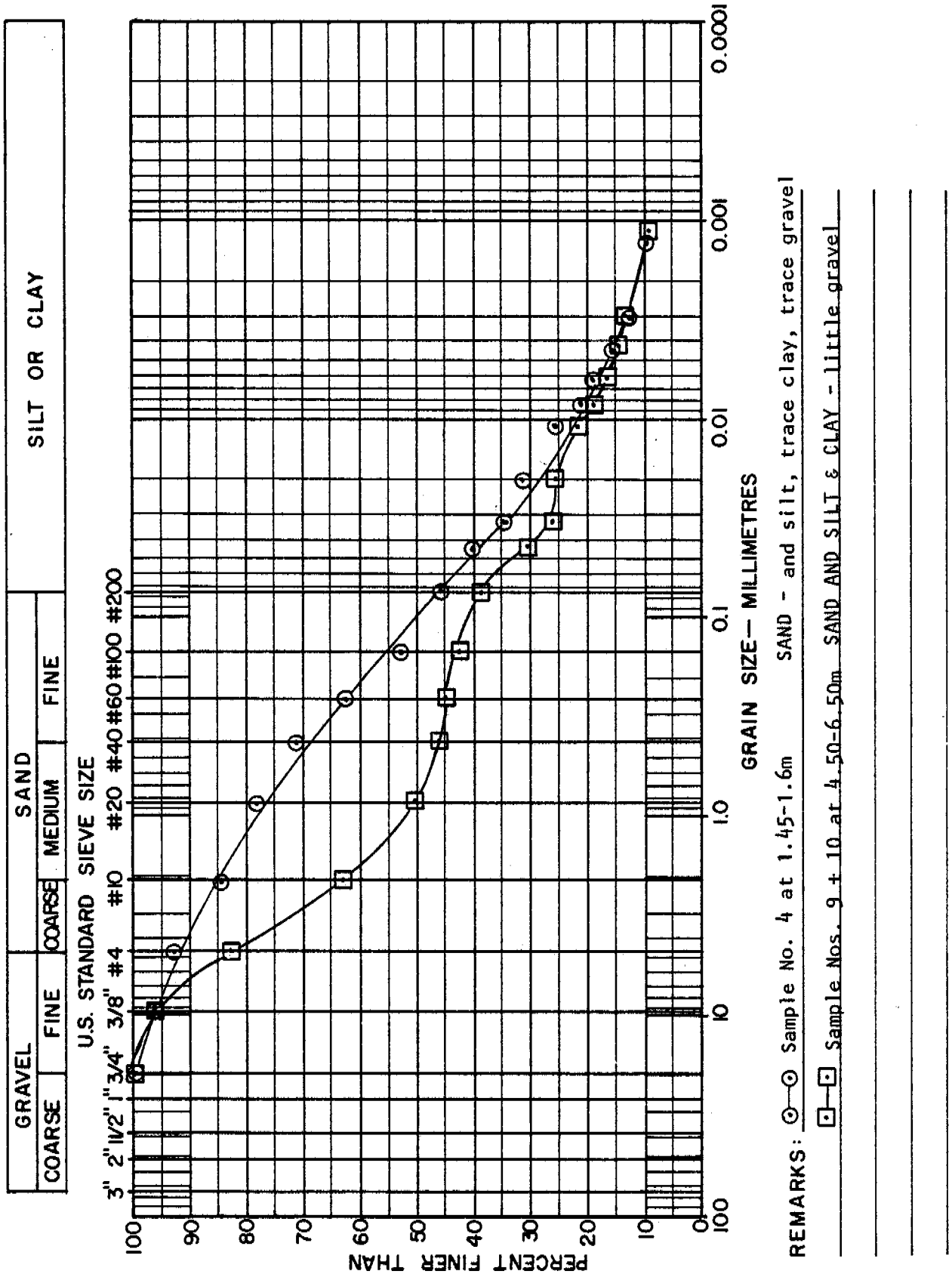
NOTES:
1. Test hole located on a hillside ascending west at 2% and descending east at 4%.
2. Small watercourses are located both north and south of the hole.
3. Site is hummocky with a moss cover.
4. Vegetation consists of moderate to dense black spruce 3-10m. tall.
5. Test hole was augered to 0.35m then cored to 2.4m and then drilled to 15.0m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-153
DATE July 27/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



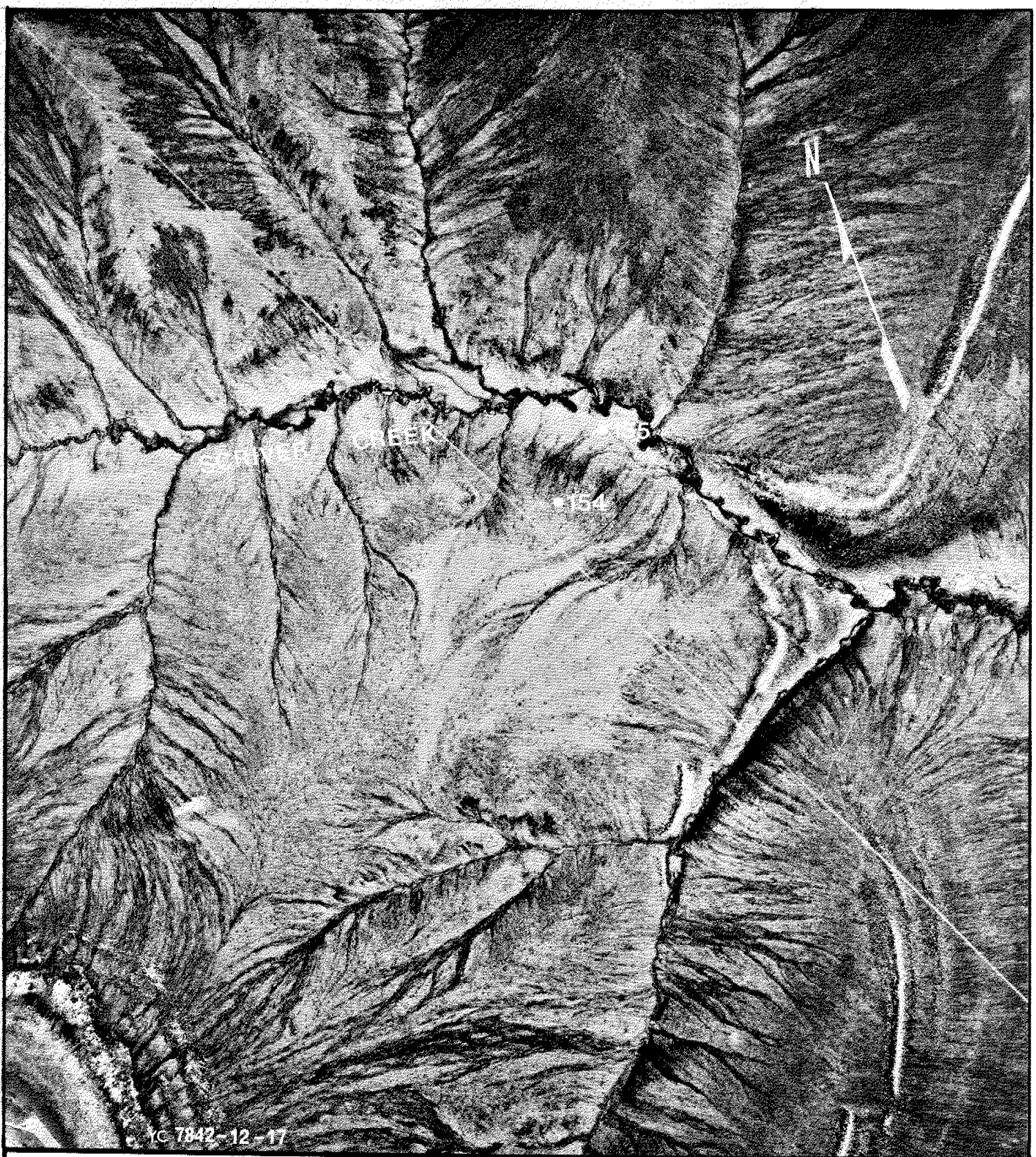
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-153	DEPTH
DATE Sept/ 14/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-153

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.35 - 0.7	1386.3	86.5



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-154

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		
	C		1
1	C		2
	C		3
	C		4
2	C		5
	C		6
	C		7
3	C		8
	C		9
4	C		10
	C		11
	C		12
	C		13
	C		14
5	C		15
	C		16
	C		17
6			
	B		18
7			
8			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
Vr Vs	
Nbn Nbe	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.15 ORGANIC COVER
0.30m

ORGANIC SILT
- trace fine sand
- greyish brown
- ice lenses 1/4mm-7mm spaced at 1mm-8mm

0.95m

SILT AND CLAY
- trace sand
- trace gravel
- slight to low plasticity
- organic inclusions
- grey with white specks

gravel and sand

coal layer

gravel and sand
- trace siltstone

4.25m

BEDROCK
- shale
- weathered in upper 2.0m

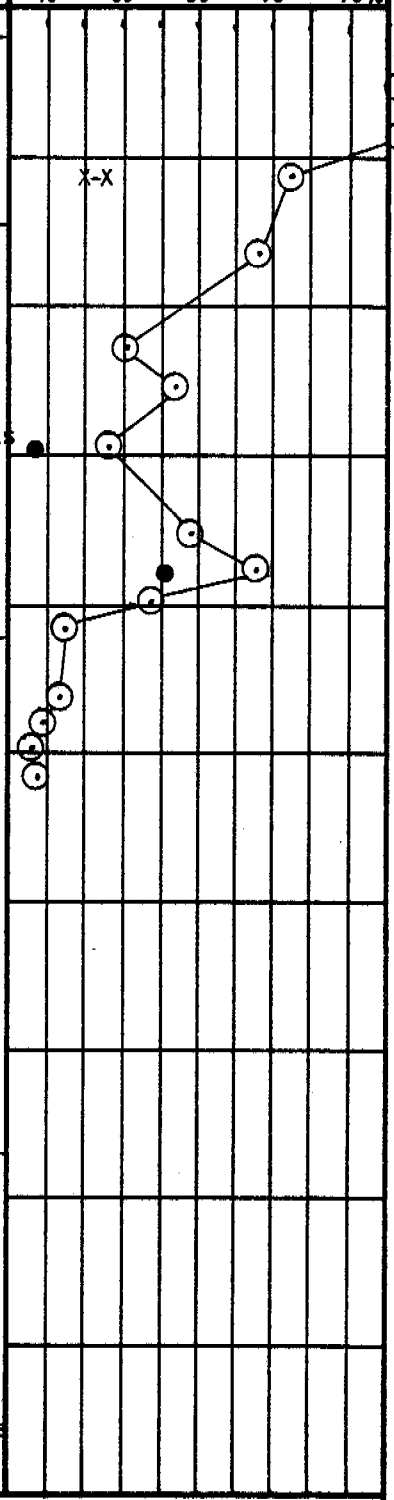
7.70m

END OF HOLE

NOTES:
1. Test hole located on a hill-side sloping down to the north west at 6-8%.
2. The site is slightly hummocky with a moss and grass cover and fair drainage.
3. Vegetation consists of moderate black spruce to 3-5m. (Cont'd)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-154
DATE	July 27/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
DESCRIPTION OF MATERIAL
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

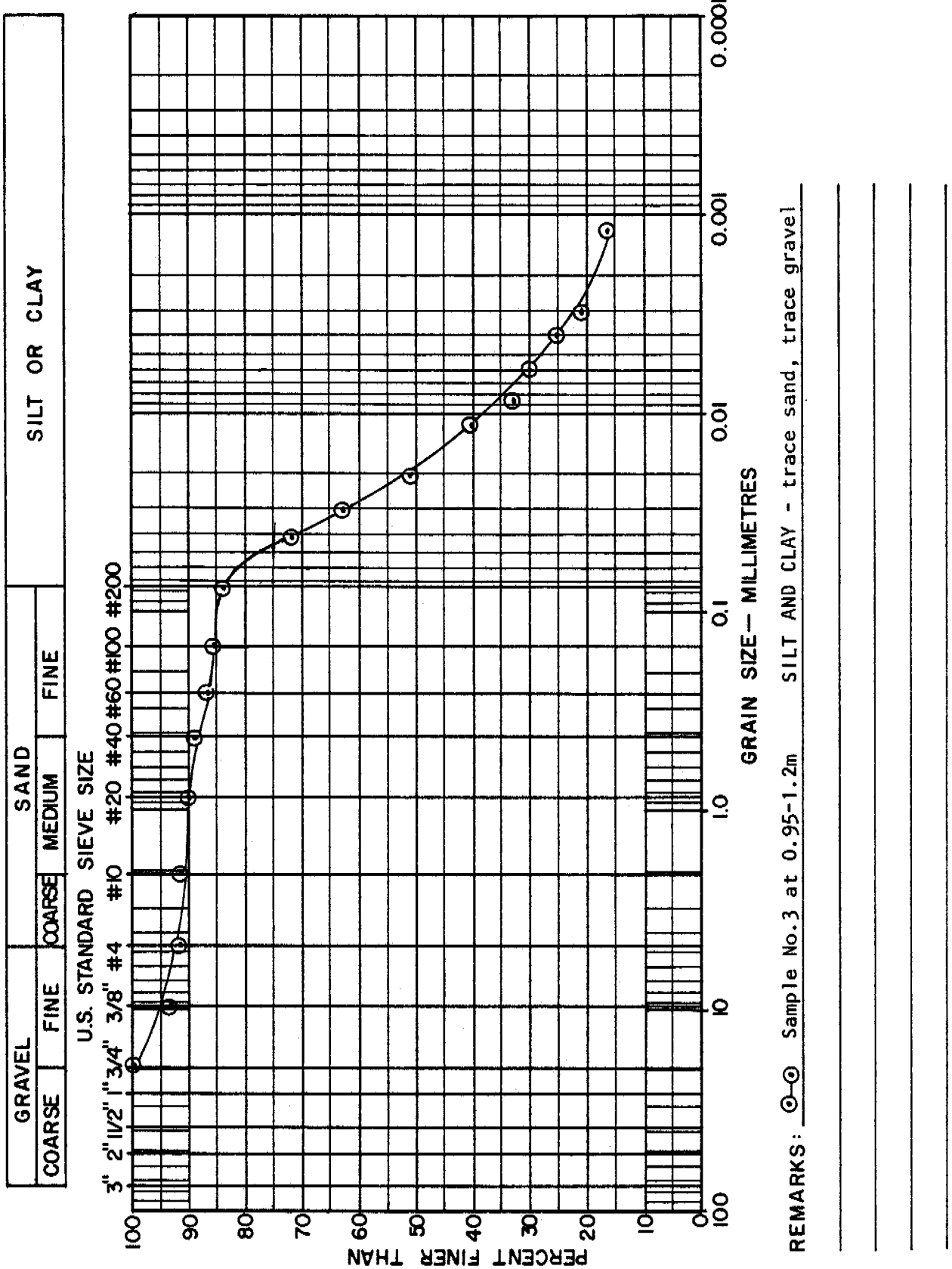
NOTES:
4. Test hole was augered to 0.35m, then cored to 5.5m and then drilled to 7.7m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-154
DATE July 27/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No.3 at 0.95-1.2m SILT AND CLAY - trace sand, trace gravel

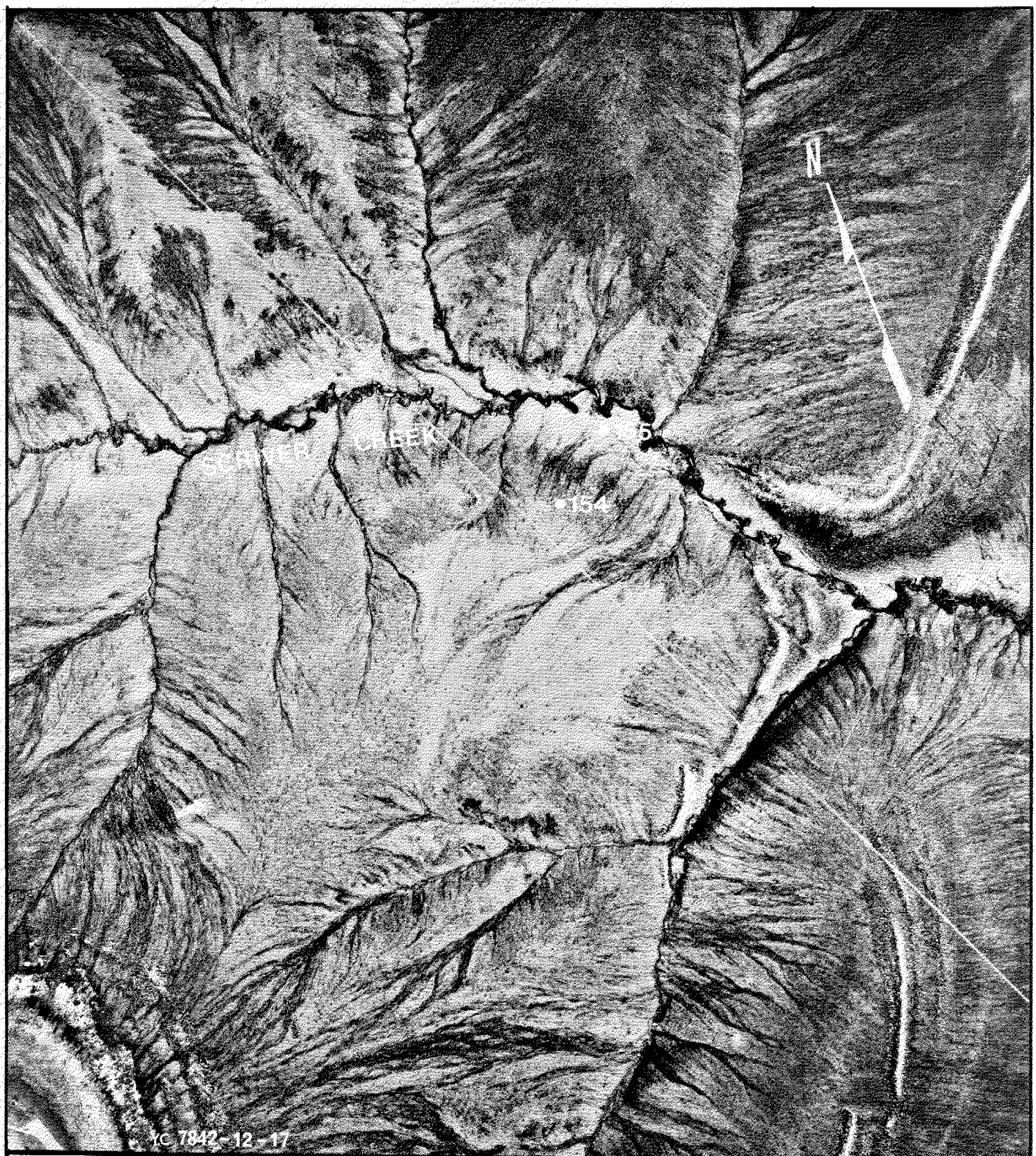
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-154 DEPTH
DATE	Sept. 6/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-154

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.7 - 0.95	1173.7	73.2
6	2.1 - 2.35	1651.1	103.0



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-155

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		
	C		1
	C		2
2	C		3
	C		4
3	C		5
	C		6
4	C		7
	C		8
5	C		9
	B		10
6			
7			
	B		11
8			
	B		12
9			
	B		13
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF.
Vr Vs	
Nbe Nbn	
N	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER-moss and grass

0.3m

ORGANIC SILT AND PEAT
- trace fine sand
- silt and peat lenses
- brownish grey
- ice lenses 1/2mm-5mm spaced at 1mm-8mm

trace gravel

4.15m

GRAVEL
- some sand
- coarse to fine
- little organic silt
- brownish grey

5.0m

6.3m

- sample obtained in air return indicates siltstone and sandstone fragments

SHALE
- soft and hard layers
- dark brown

9.80m

END OF HOLE (Cont'd)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

153%
173%
131%
239%
NP
133%
162%
NP
NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-155
DATE	July 27/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
●FIELD VANE △LAB VANE ■UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

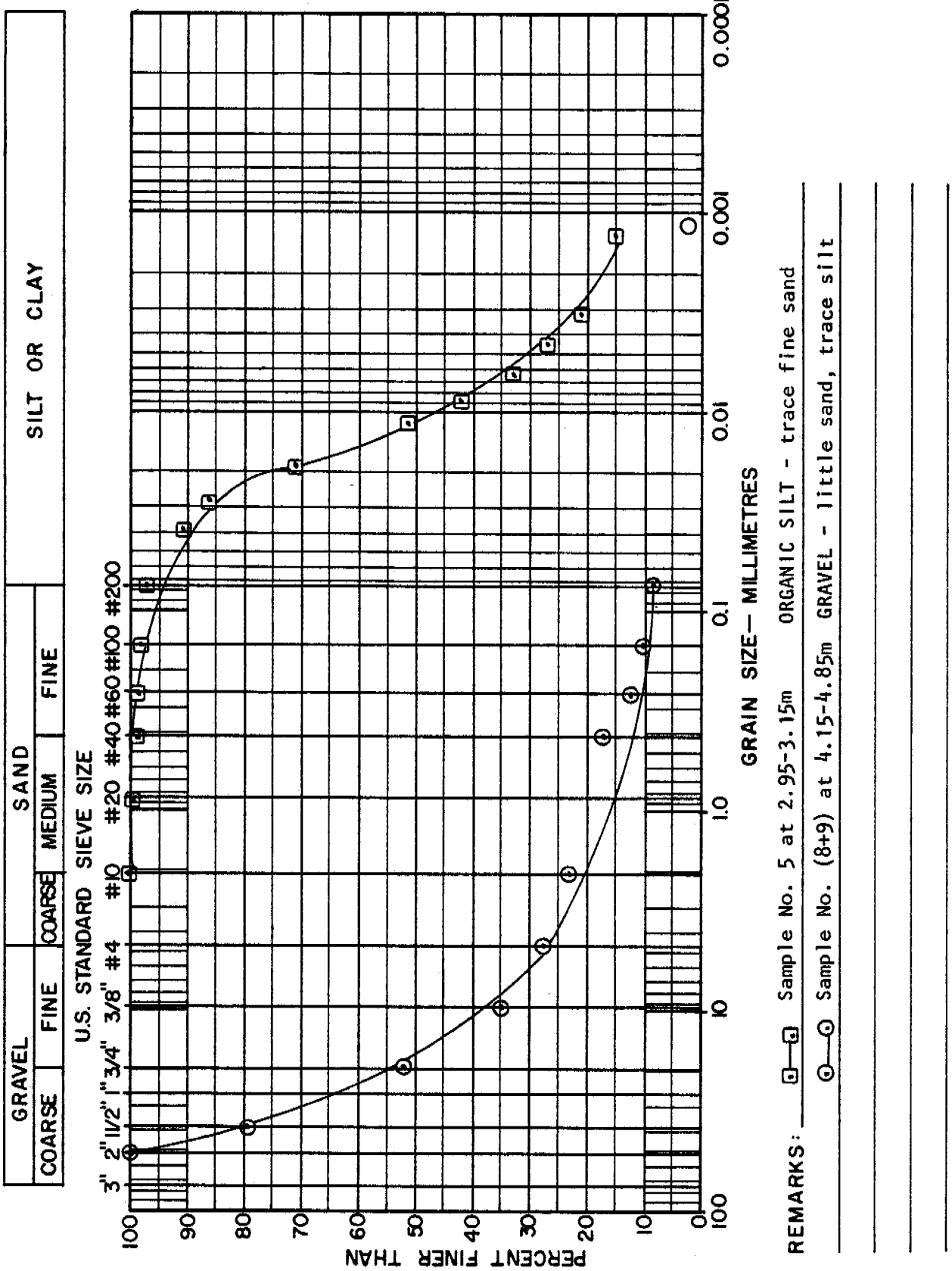
NOTES:
1. Test hole located in an east-west valley. Bottom sloping down to the north at less than 10%.
2. The site is covered with grass and moss and peat tussocks.
3. Vegetation consists of sparse to moderate black spruce to 2-5m.
4. Test hole was augered to 0.45m, then cored to 4.87m and then drilled to 9.8m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-155
DATE July 27/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-155	DEPTH
DATE Sept. 14/78	332

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-155

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	1.2 - 1.55	1160.6	72.4
4	2.10 - 2.40	1124.0	70.1
6	3.35 - 3.85	1114.0	69.5
8	4.15 - 4.55	1787.6	111.6

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-156

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.
	B					NF 0.3M
	C		1		Vx	
1	C		2		ICE+	
	C		3		Vr Vs	
	C		4		ICE+	
2	C		5		Vr	
	C		6		Vs	
	C		7			
3						
	C		8			
4	C		9			
	C		10			
5	C		11		Vr Vs	
	C		12			
6	C		13			
	C		14			
7	C		15			
	C		16			
	C		17		Nbn	
8	C		18		Nbe	
	C		19			
	C		20			
9						
	B		21			
10						

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.15m ORGANIC COVER-moss

ORGANIC SILT AND CLAY
- little fine to medium sand
- little gravel below 1.75m
- low plasticity
- sand pockets
- greyish brown
- ice lenses 1/2mm-10mm spaced @ 1/2mm-15mm

ice lens 70mm thick

peat layer

peat inclusions

4.65m

SILT AND CLAY
- little gravel
- trace sand
- trace siltstone fragments
- low to medium plasticity
- organic pockets
- greyish brown
- ice lenses 1/4mm-7mm spaced @ 1mm-20mm

organic lens

(WEATHERED SHALE-SILTSTONE)

7.70m

SHALE - SILTSTONE
- medium plasticity
- greyish brown with white specks

9.80m

END OF HOLE (Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — 0 — — — — X
10 30 50 70 90%

128%
386%
179%
230%
103%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-156
DATE	July 28/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

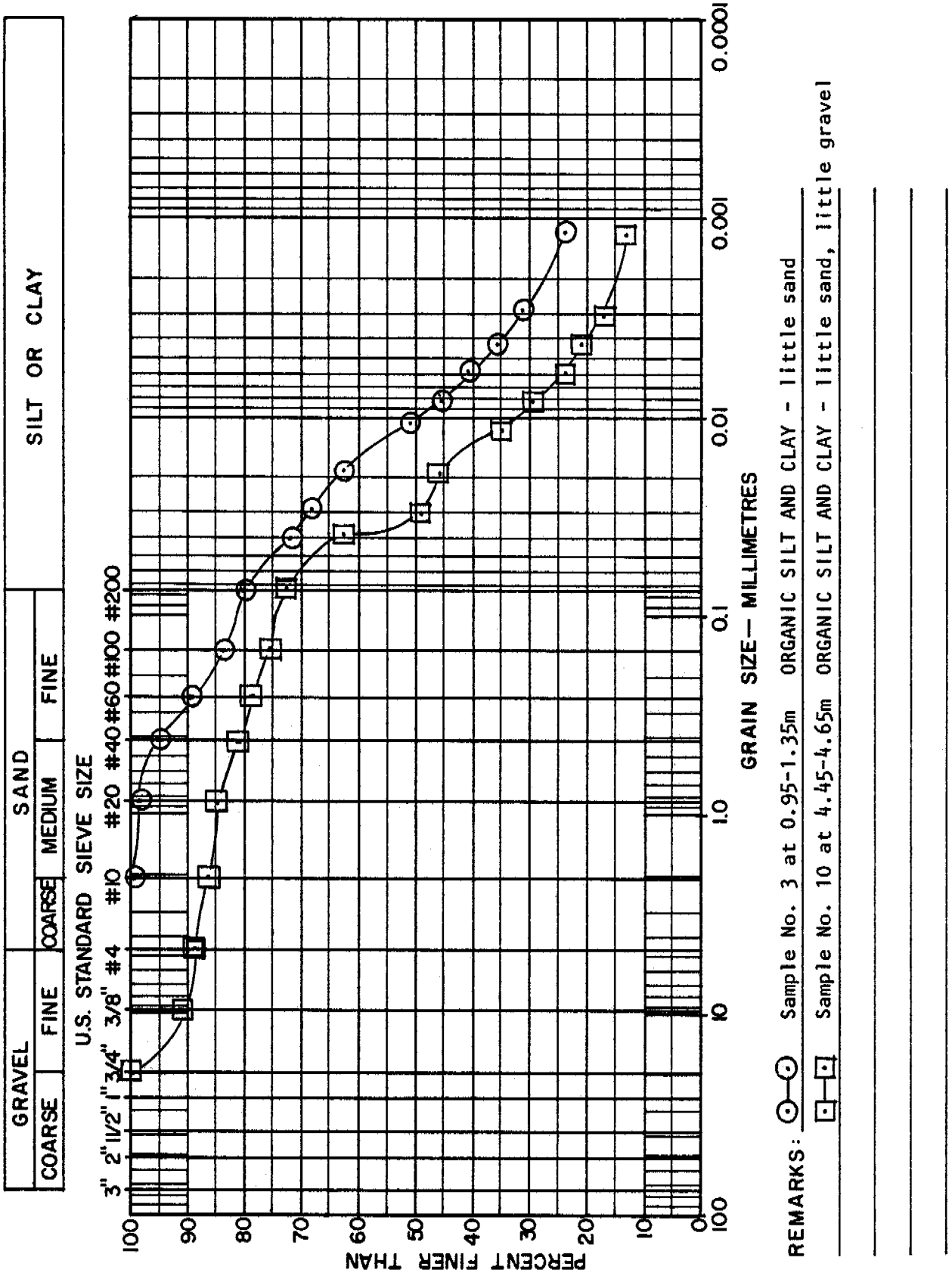
1. Test hole located on a hillside sloping 4% northeasterly towards a creek.
2. The site is slightly hummocky and moss covered.
3. Drainage is fair.
4. Vegetation consists of moderate to dense white spruce to 4-10m.
5. Test hole augered to 0.4m, then cored to 8.7m and then drilled to 9.8m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-156
DATE	July 28/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-156 DEPTH
DATE	Sept.15/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-156

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
4	1.35 - 1.75	1230.6	76.8
7	2.60 - 2.95	1385.4	86.5
9	3.90 - 4.15	1353.6	84.5
12	5.40 - 5.70	1509.2	94.2
13	5.75 - 6.05	1710.9	106.8

KLOHN LEONOFF CONSULTANTS LTD.
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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-157

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.
	B					NF
	C		1			
1	C		2		Nbe	
	C		3		Vs	
2	C		4			
	C		5			
3	C		6			
4	C		7			
5	C		8			
6	C		9			
7	C		10		Vr	
8	C		11			
	C		12			
	C		13			
	C		14			
9	C		15		Nbn	
	C		16		Vr	
10						

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.25m 0.1m ORGANIC COVER-moss

sand layer

ORGANIC SILT AND CLAY
- little fine to medium sand
- trace fine gravel
- low plasticity
- silt & clay laminations
- rusty sand laminations & layers
- peat layers
- ice lenses 1/2mm-10mm spaced @ 1mm-15mm

pieces of wood

coal specks

peat layer

144%

171%

7.00m

WEATHERED SHALE-SILTSTONE
- medium plasticity
- dark grey
- ice lenses 1/4mm-2mm spaced @ 1mm-5mm

coal layer

8.50m

SILTSTONE - SHALE
- layered
- dark grey
- ice lenses negligible below 8.65m

10.00m (Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-157
DATE	July 28/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11	B		17				As above
							11.70m
12							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Notes:

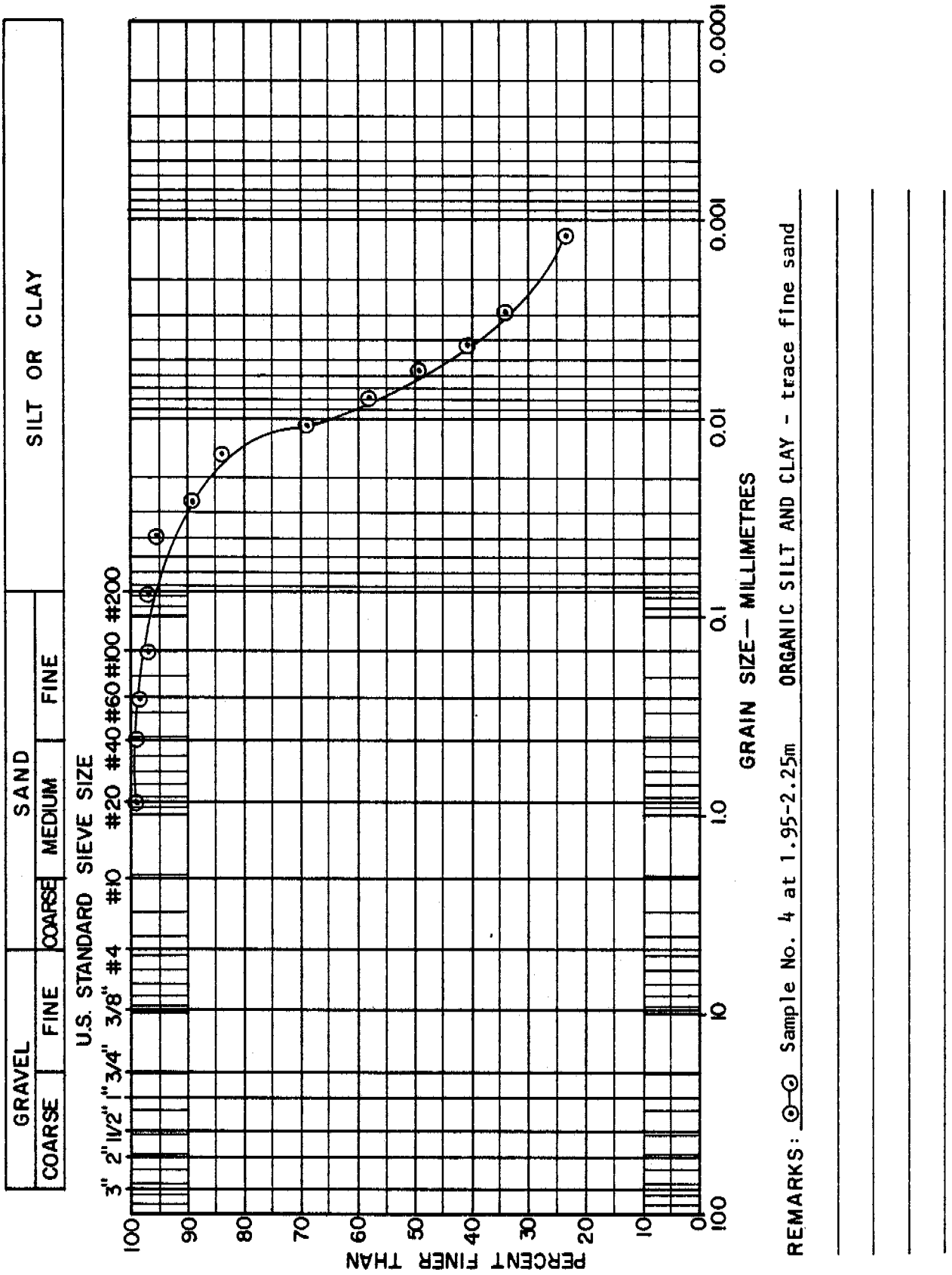
1. Test hole located at the base of hillside. The ground slopes easterly at 2-3% towards a creek.
2. The site is moss covered with fair drainage.
3. Vegetation consists of sparse black spruce to 3-5m.
4. Test hole augered to 0.25m, then cored to 9.25m and then drilled to 11.7m with air circulation.
5. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 5.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-157
DATE July 28/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

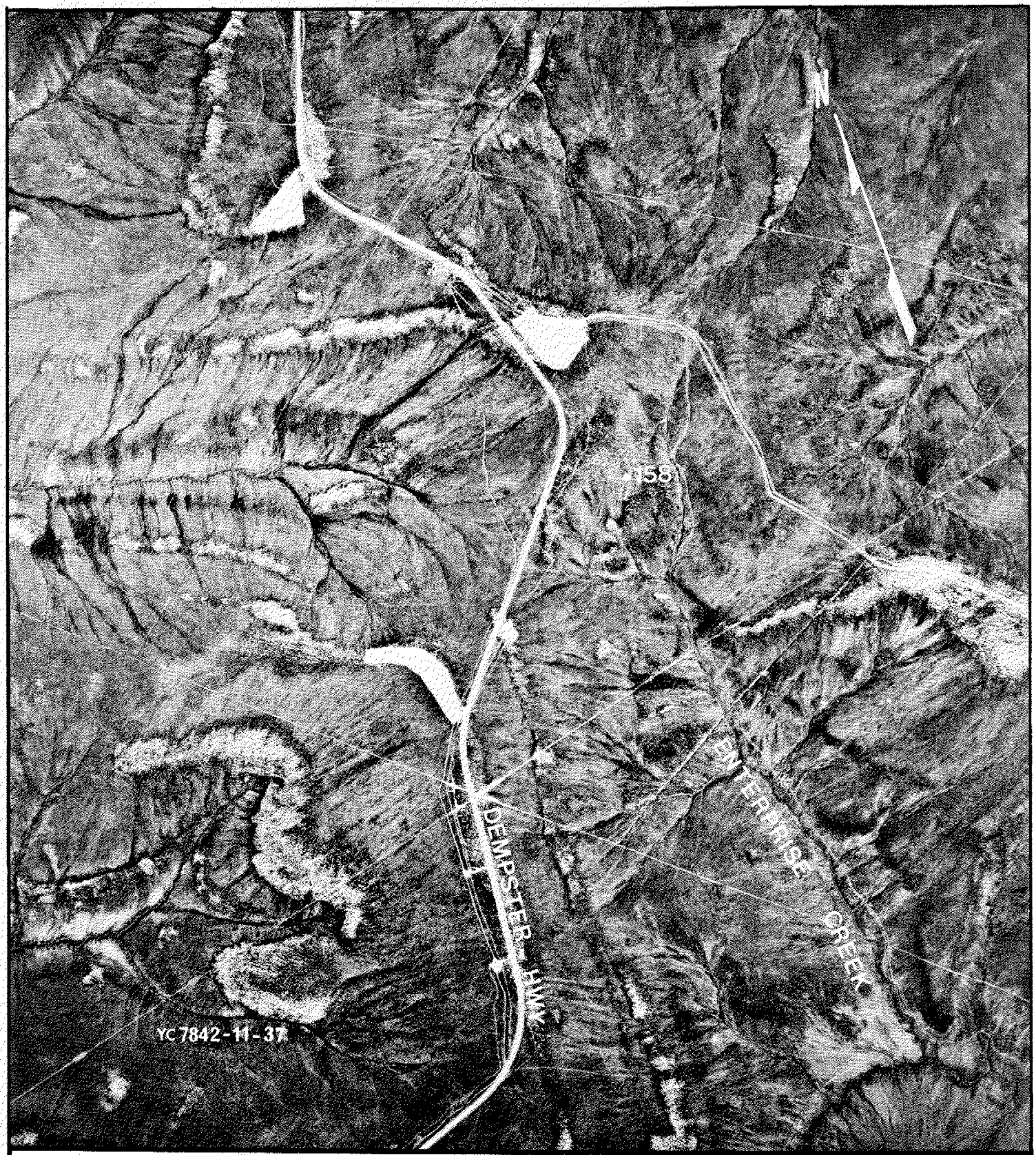
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-157 DEPTH
DATE	Sept. 15/78

342

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-157

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.30 - 1.55	1623.8	101.4
7	4.05 - 4.35	1305.9	81.5
9	5.75 - 6.10	1216.8	76.0
11	7.35 - 7.75	1650.5	103.0



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-158

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF 0.4M	0.10m ORGANIC COVER - moss
1	C		1		Vr		ORGANIC SILT - trace fine sand - brown
							0.80m
2	C		2		Nbe		WEATHERED SHALE - medium plasticity - clay & silt laminations - dark grey with rusty laminations - ice lenses 1/4mm-1mm spaced @ 3mm-8mm
3	C		3		Vr		
	C		4				
	C		5				3.40m
4	C		6		Nbn		SHALE - high plasticity - grey - ice lenses 1/4mm spaced @ 1mm-10mm
	C		7				
	C		8				
5	C		9		Vr		
	C		10				
	C		11				
6							
7	B		12				← harder - light grey
8							
	B		13				8.70m
9							END OF HOLE
10							(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — 0 — — — — X
10 30 50 70 90%

167%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-158
DATE July 29/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

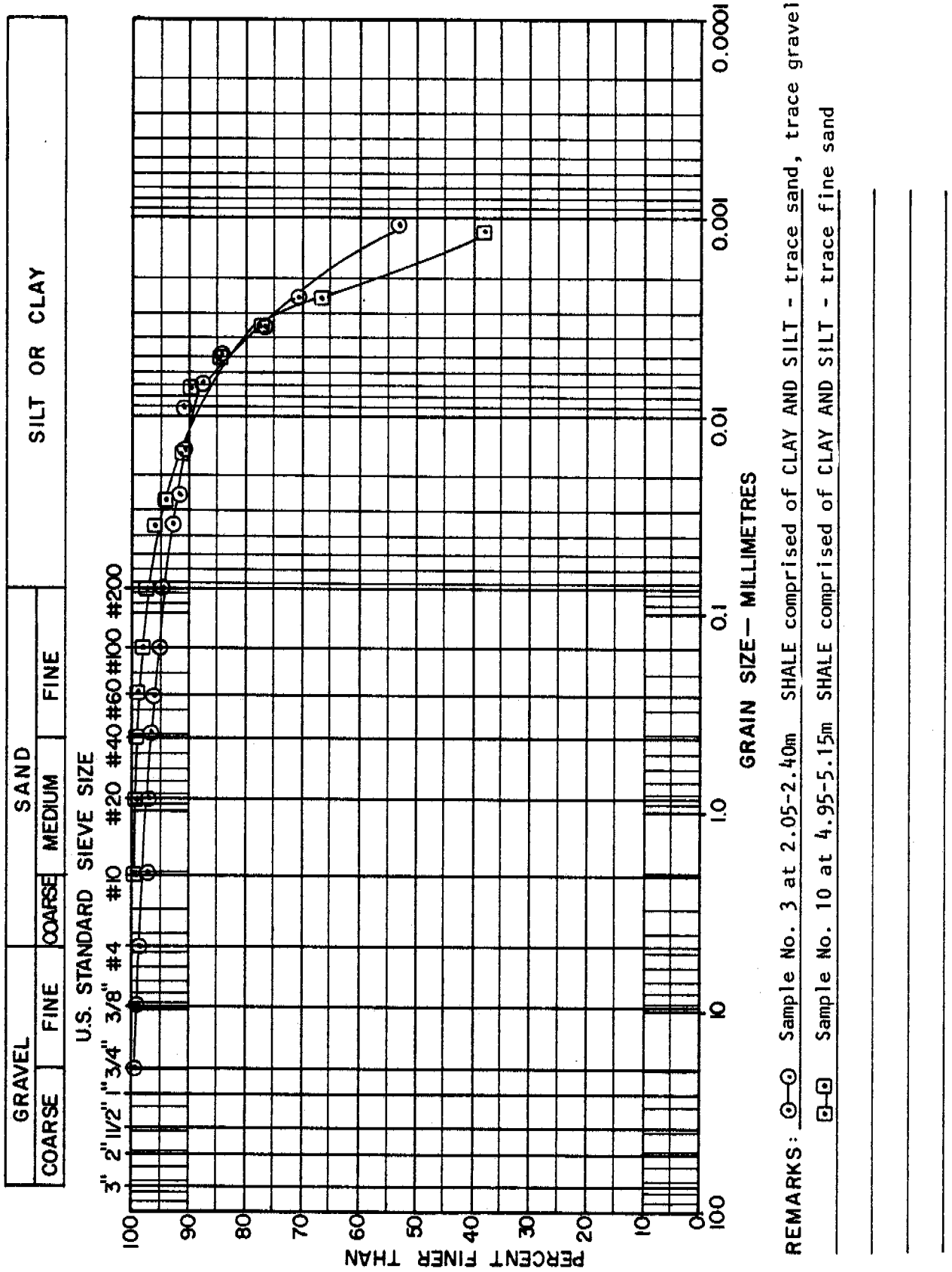
1. Test hole located east of the Dempster Highway on a gentle slope falling to the south at 1-3%.
2. The site is slightly hummocky and moss covered.
3. Vegetation consists of shrubs to 1m and sparse black spruce to 4-8m.
4. Test hole augered to 0.5m, then cored to 5.5m and then drilled to 8.7m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-158
DATE July 29/78 PLATE

K.L.G. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-158	DEPTH
DATE Sept. 15/78	347

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-158

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	2.05 - 2.40	1939.5	121.1
9	4.65 - 4.85	2034.3	127.0

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-159

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		
	C		1
	C		2
2	C		3
	C		4
3	C		5
	C		6
4			
5	B		7
	B		8
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vr Vs	
Nbe Vr Vx	
Nbn	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER - moss

0.3m
SILT & CLAY
- organic silt layers
- peat layer from 0.4-0.6m
- greyish brown

1.20m
SILT & CLAY
- pieces of shale-siltstone
- low to medium plasticity
- brownish grey with rusty zones
(WEATHERED SHALE)

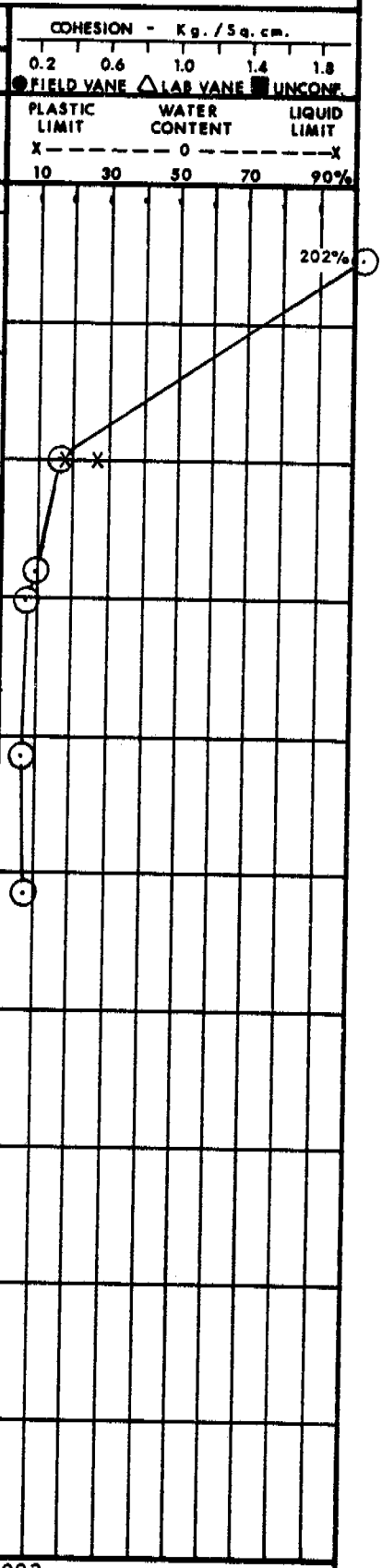
2.25m
SHALE - SILTSTONE
- sandy laminations
- fractured
- weathered in upper part
- grey

3.65m
SILTSTONE - SANDSTONE
- grey

5.60m
END OF HOLE

Notes:

1. Test hole located on a hillside sloping 3-4% to the north.
2. Drainage is fair.
3. The ground at the site is slightly hummocky and moss covered.
4. Vegetation consists of sparse to moderate white spruce 5-15m.
5. Test hole augered to 0.4m, then cored to 3.15m and then drilled to 5.6m with air circulation.

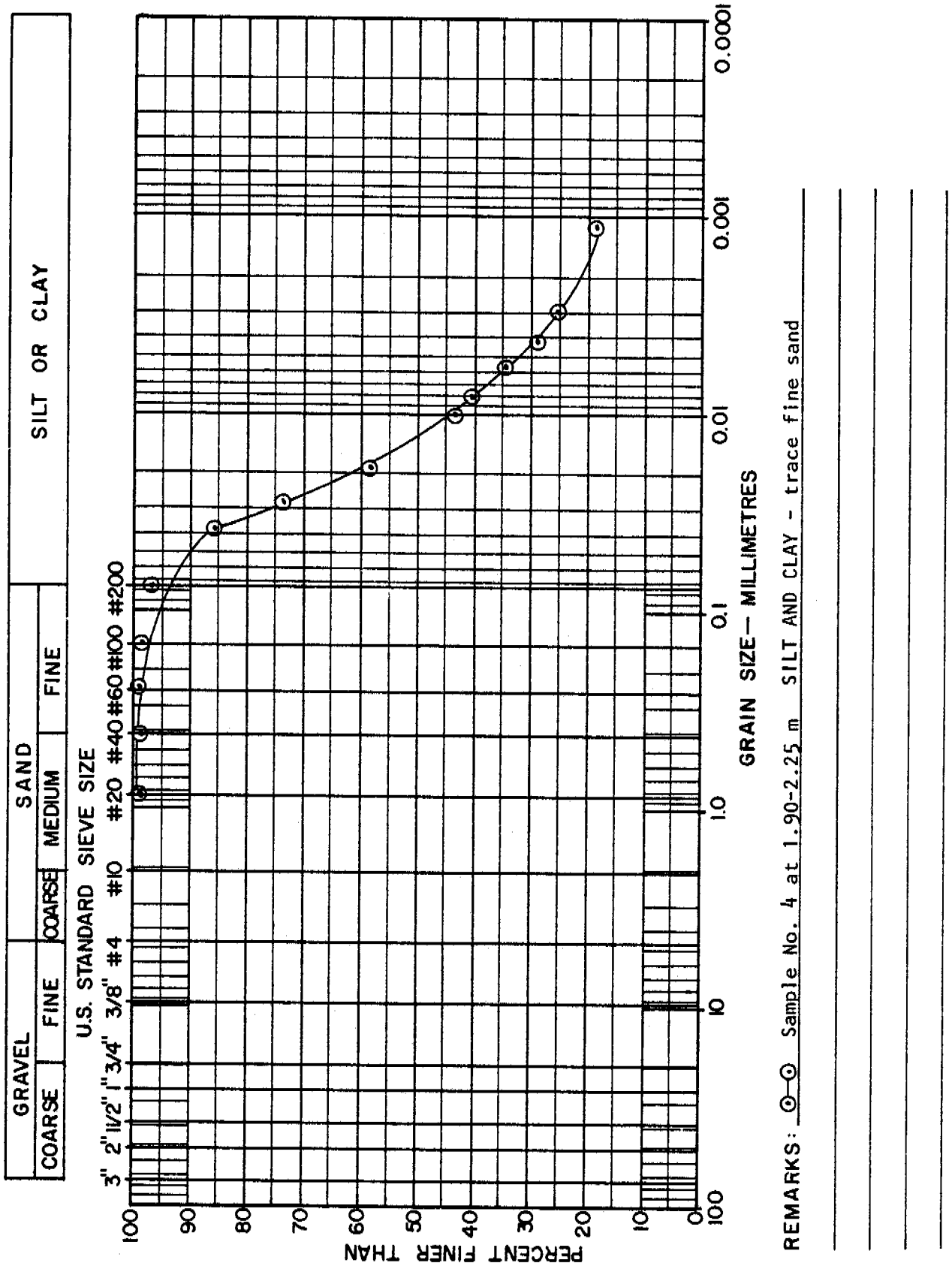


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-159
DATE	July 29/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



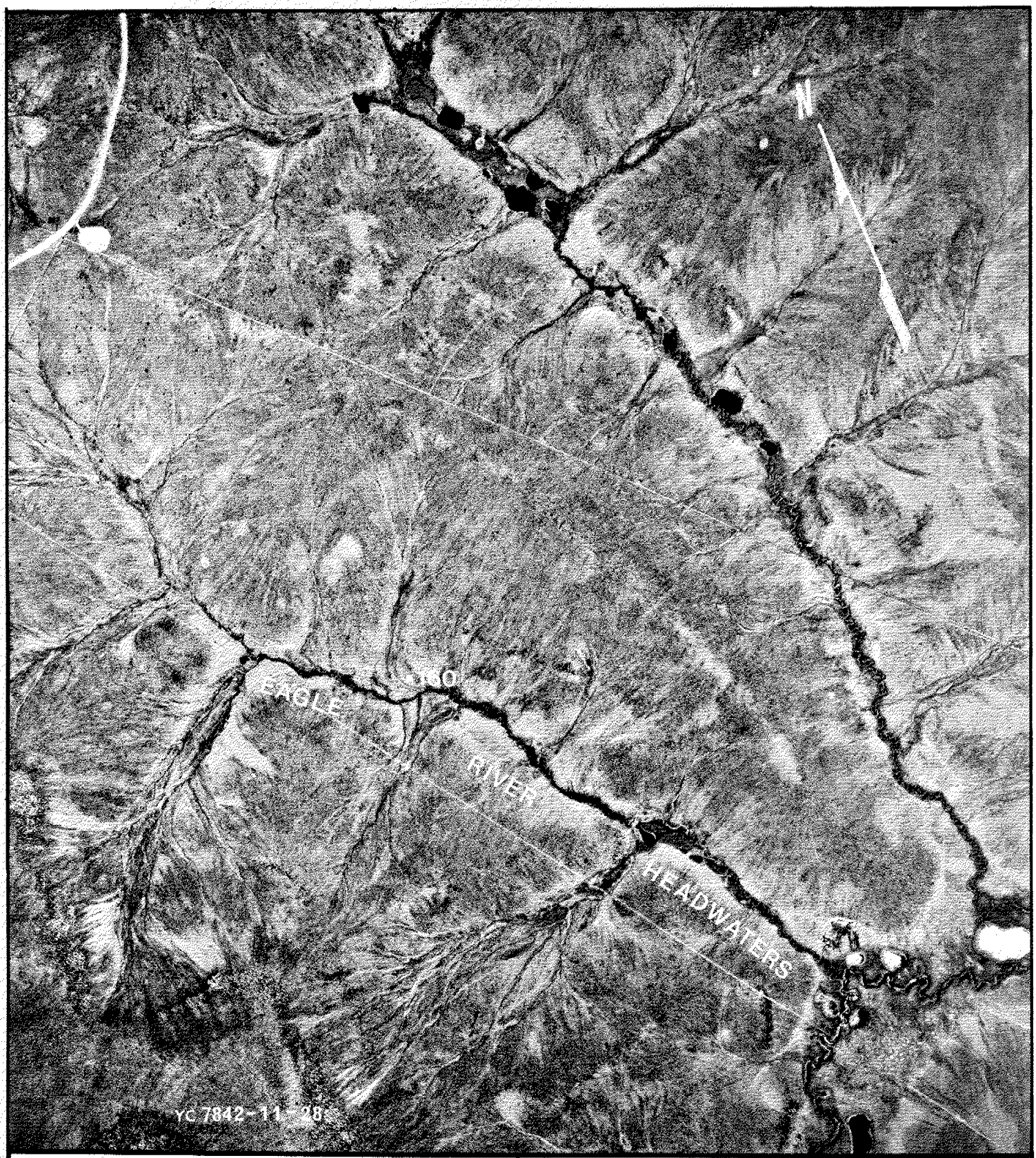
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-159	DEPTH
DATE Sept. 15/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-159

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
4	1.90 - 2.25	2022.5	126.3



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-160

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.25m ORGANIC COVER
					Vx		0.30m
1	C		1		Vs		ORGANIC SILT & CLAY - trace fine sand - slight to low plasticity - brownish grey - ice lenses 1mm-12mm spaced @ 1mm-10mm
2	C		2				
	C		3		ICE+		
3					Vs		2.90m
4	C		4		ICE+		SILT & CLAY - trace fine sand - slight to low plasticity - organic inclusions - brown - ice lenses 1/2mm-5mm spaced @ 1/2mm-5mm
					Vs		
5	C		5				5.00m
	C		6		Nbn		SILT & CLAY - little gravel - fine to coarse - little sand - slight to low plasticity - brownish grey
	C		7				5.50m
6	C		8		Nbe		
					Nbn		
7	C		9				SANDSTONE - poorly cemented - soft rock hardness classification
8							
	B		10				8.70m
9							END OF HOLE
10							(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

156%
117%
105%
18.0%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-160
DATE	July 29/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
DESCRIPTION OF MATERIAL
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
ORGANIC CONTENT % UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

Notes:

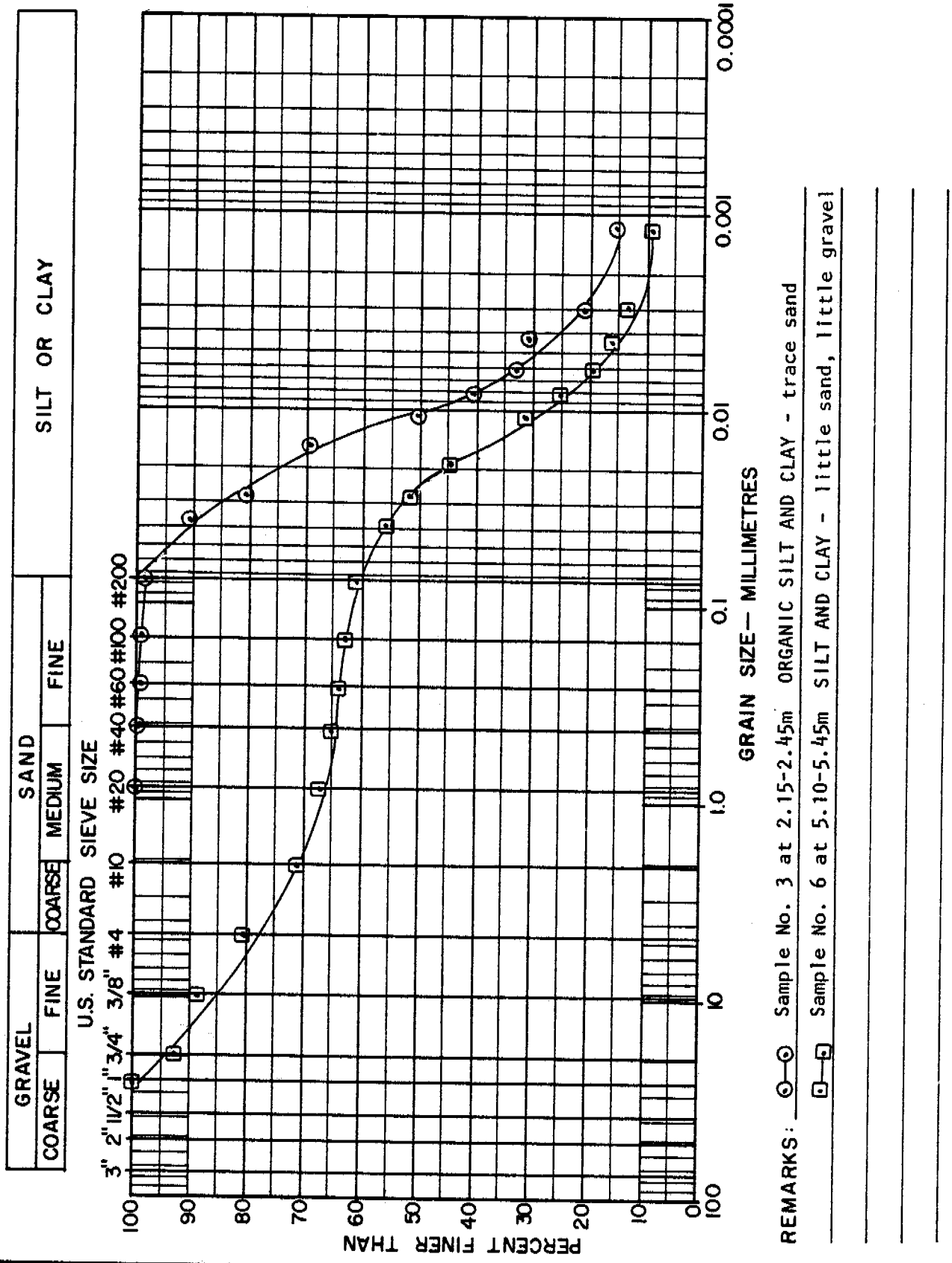
1. Test hole located north of a creek in the valley bottom.
2. The ground surface at the site is flat with poor drainage.
3. The site is slightly hummocky and moss and grass covered.
4. Vegetation consists of sparse spruce 3-6m tall.
5. Test hole was augered to 0.7m then cored to 5.9m and then drilled to 8.7m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-160
DATE July 29/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-160 DEPTH
DATE	Sept. 14/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-160

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	1.40 - 1.75	1337.9	83.5
4	3.55 - 3.75	1220.0	76.1
6	5.10 - 5.45	2105.0	131.4

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-161

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	

APPROVED: A. L. EDGEWORTH

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		
	B		1
1			
	C		2
2			
	C		3
	C		4
3	C		5
	C		6
	C		7
4			
	C		8
5	C		9
6	C		10
	C		11
7			
8			
	B		12
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.6M
Vr Vs	
Nbe	
Nbn Vr Vs Vx	
N	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

ORGANIC SILT
- little to some sand - fine to coarse
- trace fine gravel
- slight plasticity
- grey
- ice lenses 1/2mm-5mm spaced @ 2mm-12mm

2.55m

SILT AND CLAY
- little sand
- trace gravel
- low plasticity
- rusty laminations
- grey

3.00m

WEATHERED SHALE-SILTSTONE
- clay & silt laminations
- high plasticity
- very low excess ice content; ice occurs as thin lenses & inclusions 1/4mm-5mm spaced @ 2mm-20mm

6.65m

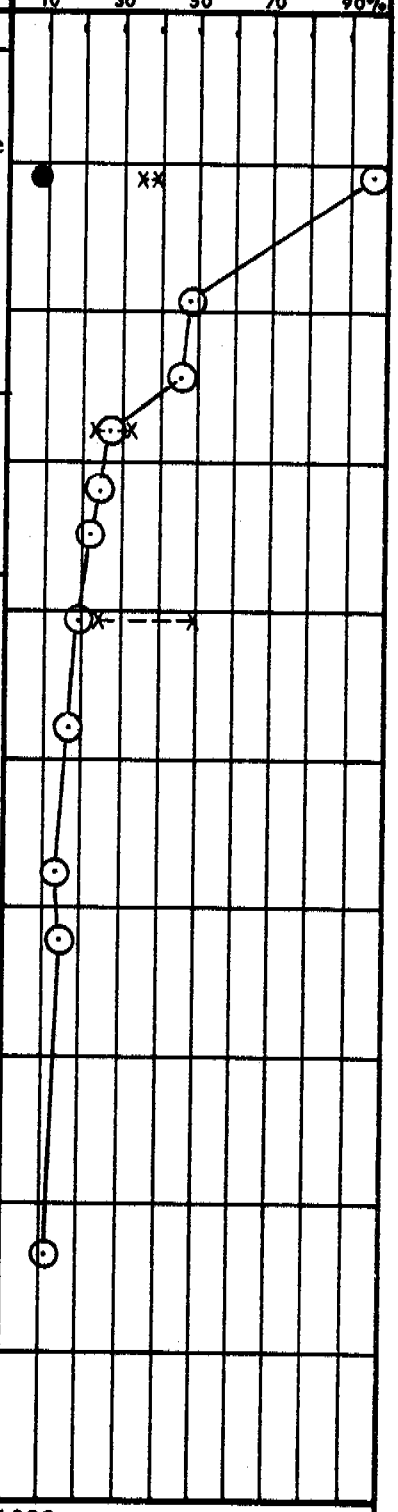
SHALE-SILTSTONE
- medium to high plasticity
- grey

8.50m

END OF HOLE

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — 0 — — — — X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-161
DATE	July 29/30/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
ORGANIC CONTENT % UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

1. Test hole located north of a small creek on a flat poorly drained area.
2. The ground surface at the site is moss and grass covered.
3. Vegetation consists of sparse to moderate black spruce.
4. Test hole augered to 1.0m, then cored to 6.65m and then drilled to 8.5m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

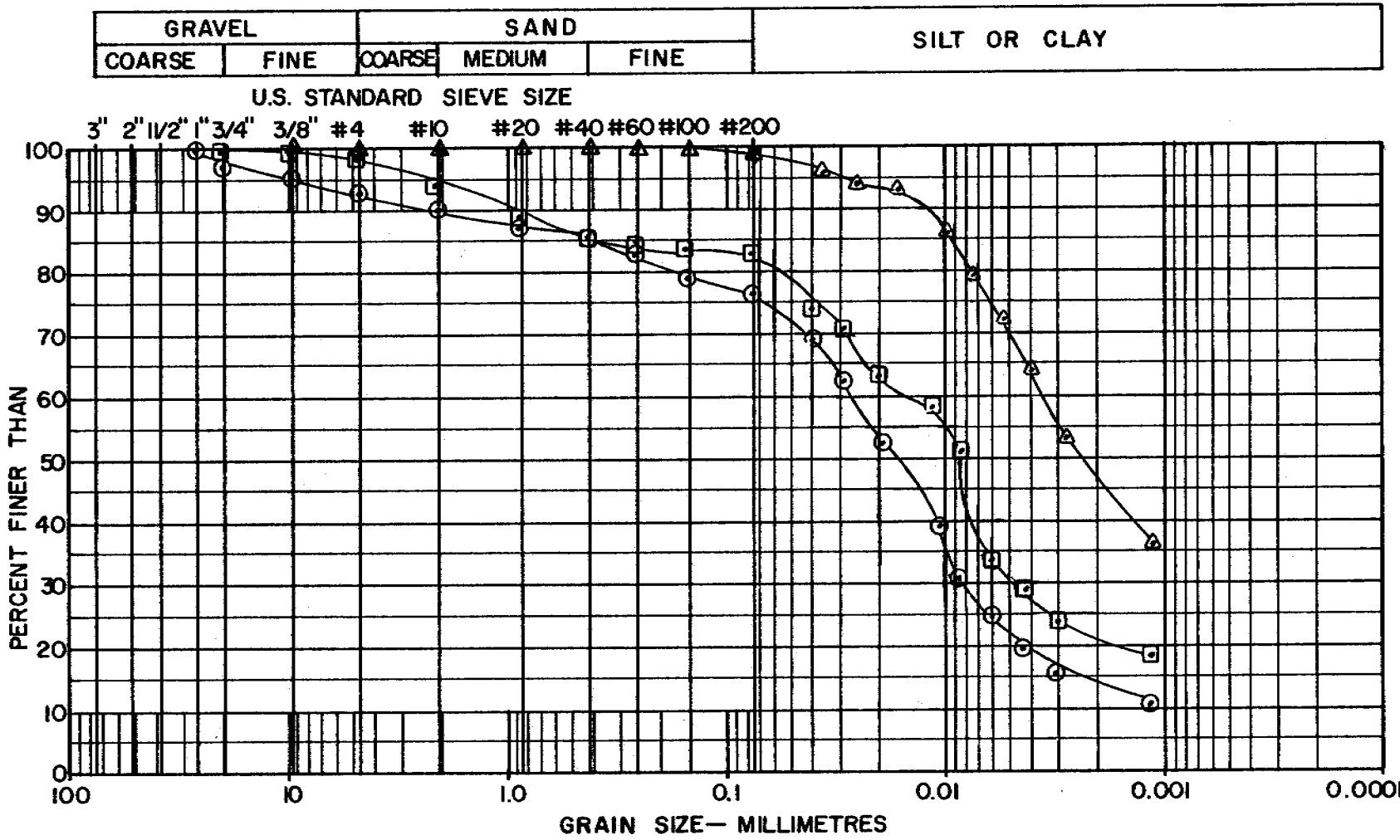
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-161
DATE	July 29/30/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-161	DEPTH
DATE Sept. 15/78	

GRAIN SIZE CURVE



REMARKS:

- Sample No. 2 at 1.0-1.15m ORGANIC SILT - little sand, trace gravel
- Sample No. 5 at 2.55-2.90m SILT AND CLAY - little sand, trace gravel
- Sample No. 8 at 3.95-4.25m SHALE comprised of CLAY AND SILT - trace fine sand

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-161

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.80 - 2.10	1552.5	96.9
6	3.00 - 3.30	1944.7	121.4

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-162

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.2m ORGANIC COVER
	C		1		Vs		ORGANIC SILT - trace fine sand - trace fine gravel - slight plasticity - rusty-greyish brown
1					ICE +		
					Vs		
					ICE +		1.65m
2	C		2				SILT AND CLAY - little medium to fine gravel - trace fine sand - low plasticity - sand and silt pockets - rusty gravel - brownish grey
	C		3		Vr		2.45m
3	C		4		Nbn		
	C		5		Vr		3.00m
	C		6				SANDSTONE - poorly cemented
	C		7		Vr		
4	C		8		Nbe		
					Vx		CLAY AND SILT - laminated - medium plasticity (WEATHERED SHALE)
5	C		9				← more durable with depth
							5.80m
6	C		10		Vr		SHALE - grey - siltstone layer @ 8.4m
					Vs		
7							
8							
	B		11				8.70m
9							END OF HOLE
10							(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

115%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-162
DATE	July 30/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
DESCRIPTION OF MATERIAL
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

Notes:

1. Test hole located east of the Dempster highway on terrain sloping gently 1% to the south.
2. The site is slightly hummocky with moss and grass ground cover.
3. Drainage is fair.
4. Vegetation consists of moderate black spruce to 1-5m.
5. Test hole was augered to 0.35m then cored to 6.5m and then drilled to 8.7m with air circulation.
6. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0 and 4.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

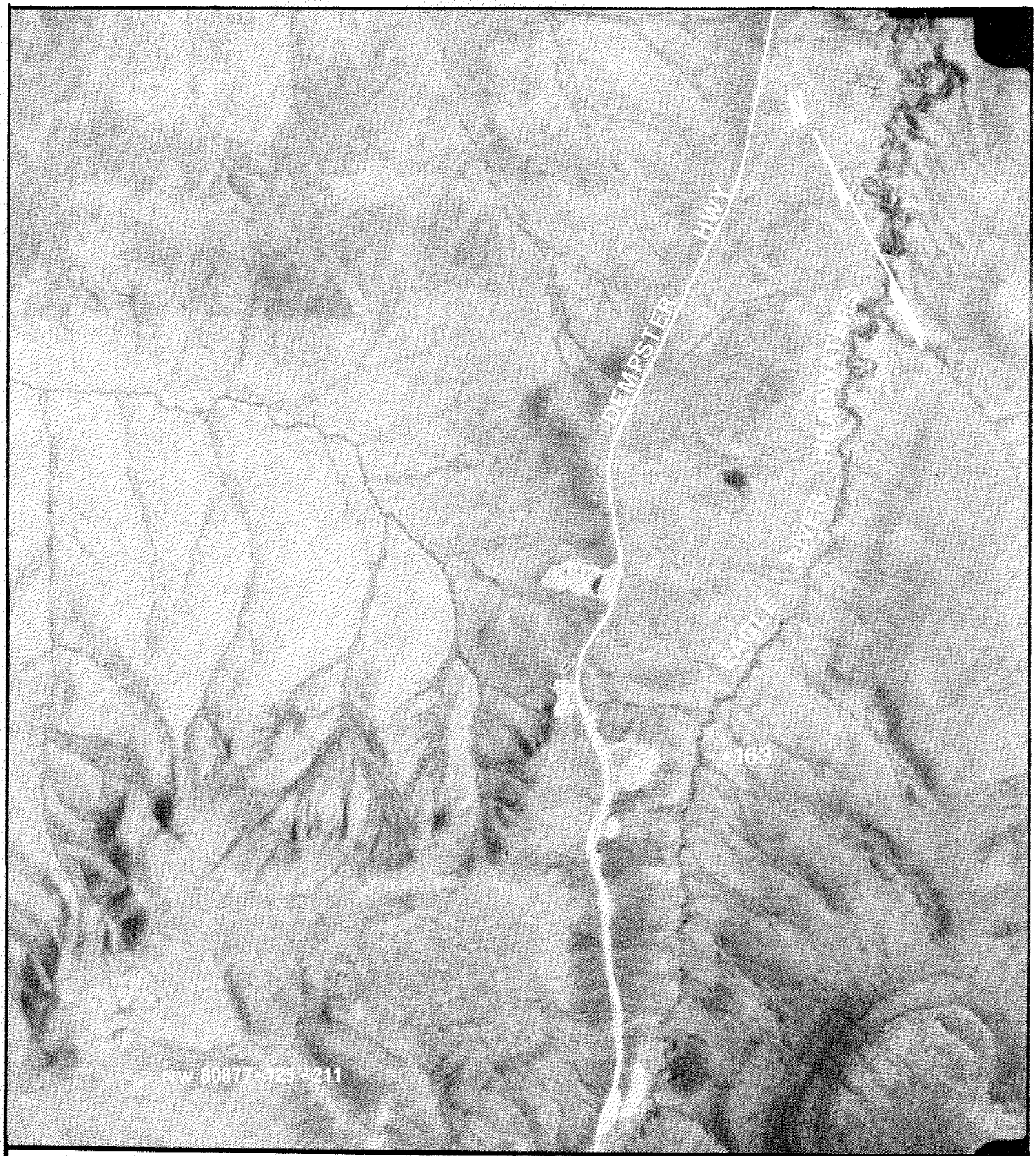
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-162
DATE July 30/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-162

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.35 - 0.70	1240.6	77.4
4	2.45 - 2.80	2104.5	131.3
7	3.30 - 3.65	1889.1	117.9
9	4.65 - 5.00	2045.9	127.7



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-163

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	B		1
	C		2
1			
2	C		3
3			
4			
5			
	C		4
6			
7			
		57	
8	SPT	85	5
9			
	SPT	65	6
10	SPT	75	7

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.4M
Vr	
Vs	
ICE	
Nbe	
Vx	
Vr	
Nbn	
Vr	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.15m ORGANIC COVER

ORGANIC SILT
- little sand
- trace gravel
- slight plasticity
- grey
- ice lenses 1mm-8mm spaced @ 1mm-10mm

2.15m

ICE

5.20m

GRAVEL
- some sand
- little silt and clay
- brown

7.00m

SILT AND CLAY
- trace fine sand
- trace gravel
- low to medium plasticity
- dark grey with white specks

(WEATHERED SHALE)

8.50m

SHALE
- low plasticity
- hard below 9.6m
- thin rusty sandstone layer @ 9.6m
- greenish grey

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

128%
124%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-163
DATE	July 30/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
11					Nbn		As above
12	SPT	107	8		Vr		12.05m
13							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

Notes:

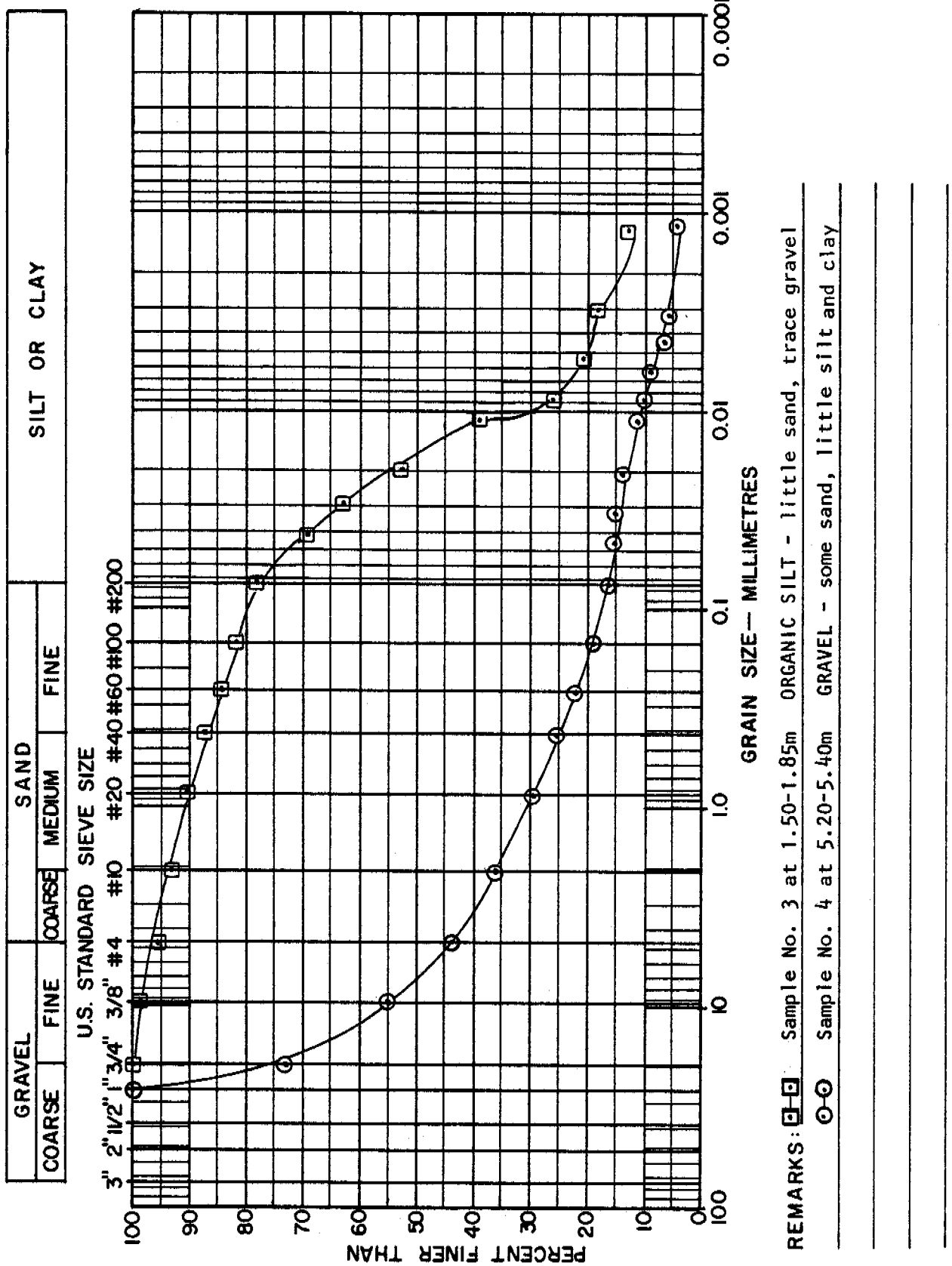
1. Test hole located east of the Dempster Highway in a wide river valley.
2. The site is flat with poor drainage.
3. The ground surface is slightly hummocky with grass and moss.
4. Vegetation consists of sparse black spruce to 1-3m.
5. Test hole augered to 0.4m, then cored to 5.4m and then drilled to 12.05m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-163
DATE July 30/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

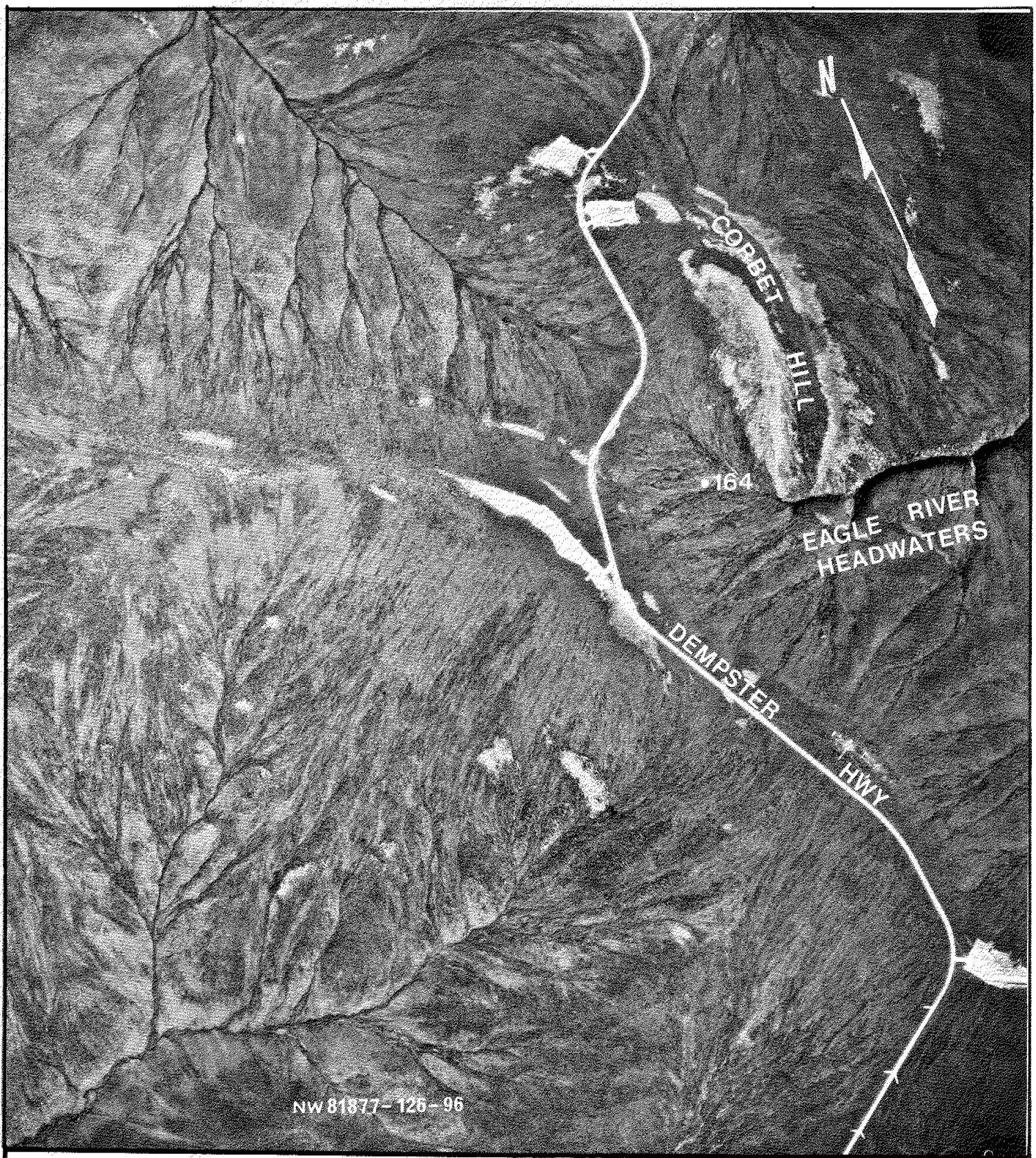
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-163 DEPTH
DATE	Sept. 15/78

370

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-163

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.50 - 1.85	1277.0	79.7



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-164

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		
	C		1
	C		2
2	C		3
	C		4
	C		5
3	C		6
	C		7
4	B		8
5	B		9
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vs	
Nbn	
Nbe	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER
0.3M

SILT AND CLAY
- little sand
- trace gravel
- slight to low plasticity
- brown
- ice lenses 1/2mm-2mm spaced @ 2mm-12mm

1.30m

WEATHERED SHALE
- clay and silt laminations
- medium plasticity
- rusty brown

2.30m

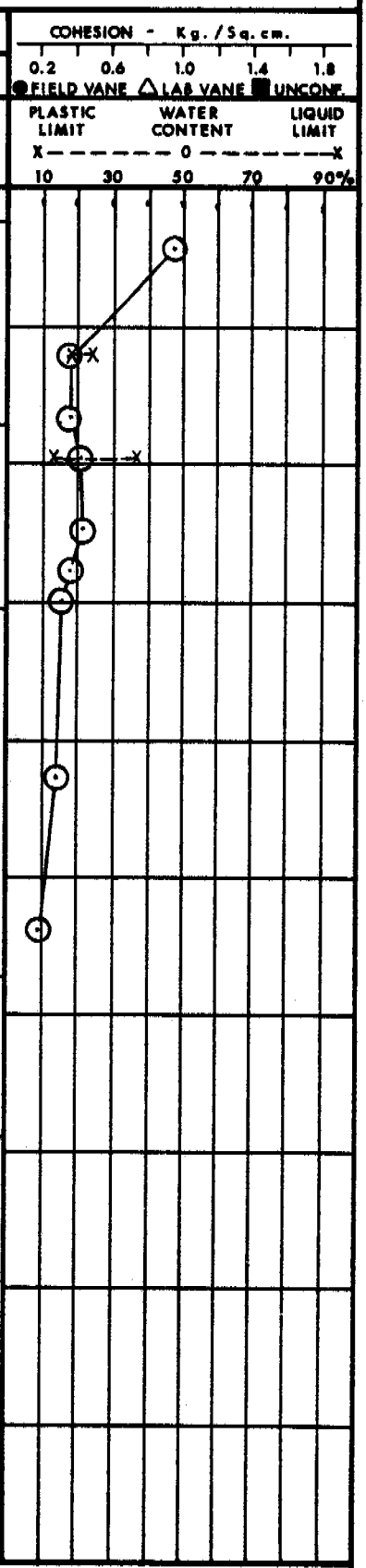
SHALE
- high plasticity
- grey

5.70m

END OF HOLE

Notes:

1. Test hole located on a hillside sloping 1-2% to the northeast.
2. The site is hummocky with a moss ground cover.
3. Drainage is poor to fair.
4. Vegetation consists of moderately dense white spruce to 2-10m and low shrubs.
5. Test hole augered to 0.3m, then cored to 3.2m and then drilled to 5.7m with air circulation.

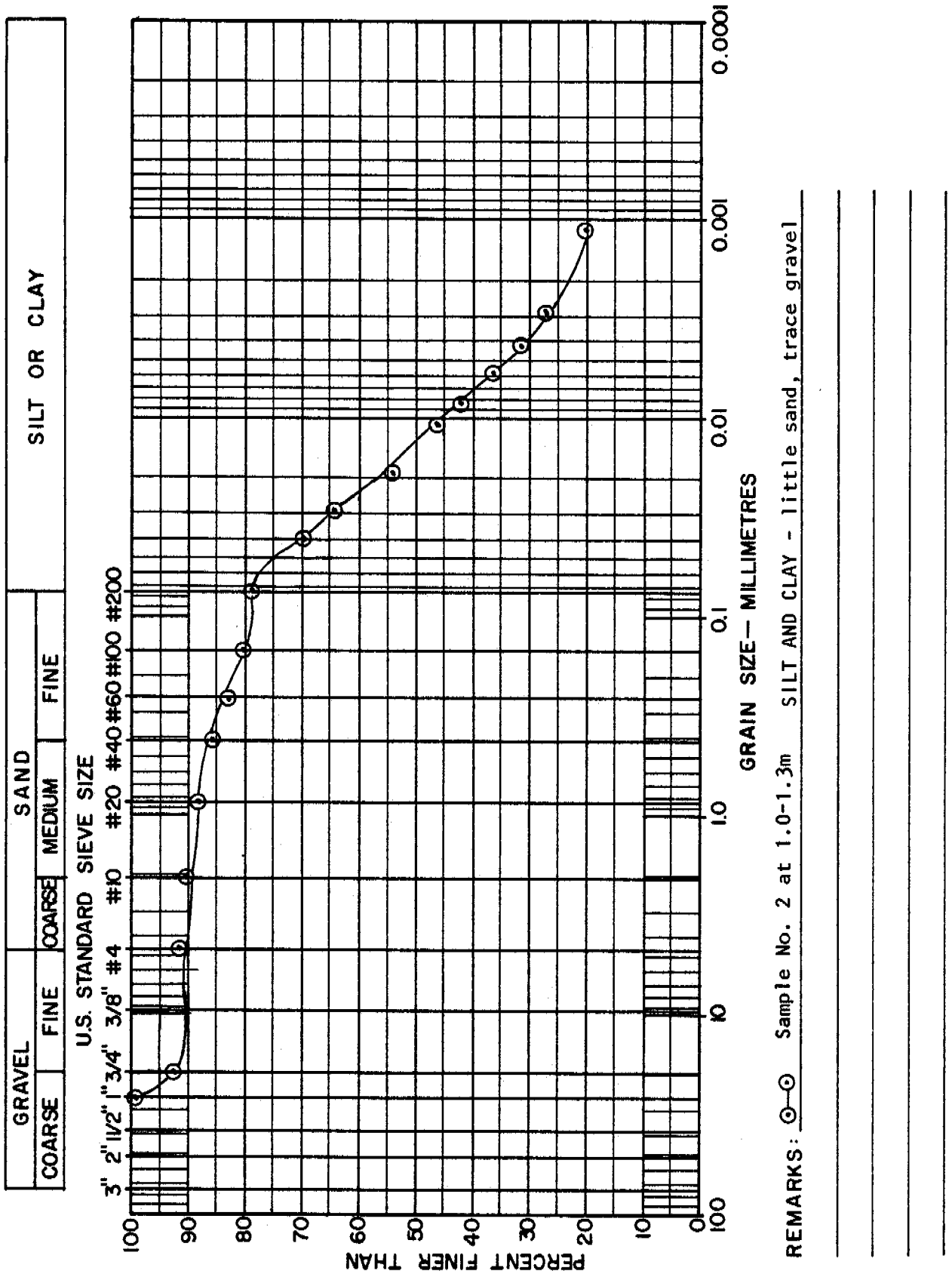


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-164
DATE	July 31/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-164	DEPTH
DATE Sept. 15/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-164

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	1.00 - 1.30	1838.5	114.7

KLOHN LEONOFF CONSULTANTS LTD. CIVIL • GEOTECHNICAL • HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-165			
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.	DATE OF ISSUE: OCTOBER 1978 APPROVED: A. L. EDGEWORTH	PROJECT No.: AL1023	AIRPHOTO SCALE: 1" = 2000' (approx)	REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
1	B		
	C		1
2			
	C		2
3	C		3
4	C		4
5	C		5
6			
7	C		6
8			
9	C		7
10	C		8
	C		9

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.6M
Vs	
ICE	
Vr	
Vs	
Nbe	
ICE+	
Vs	

LOCATION Eagle River
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER
ORGANIC SILT
- trace fine sand
- roots
- brown

1.10m

1.65m ICE

ORGANIC SILT
- trace fine sand
- slight plasticity
- laminated
- peat layers
- brown
- extensive ice lenses generally 1/4mm-2mm spaced @ 1/4mm-5mm

ice lenses 4mm-7mm spaced @ 3mm-10mm

9.70m (Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
10 30 50 70 90%

114%
121%
148%
185%
110%
176%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-165
DATE	July 31/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
11	C		10
12	C		11
	C		12
	C		13
13	C		14
14	C		15
15	C		16
16			
17			
18	SPT	125 for 10cm	17
19			
20			

SYMBOL

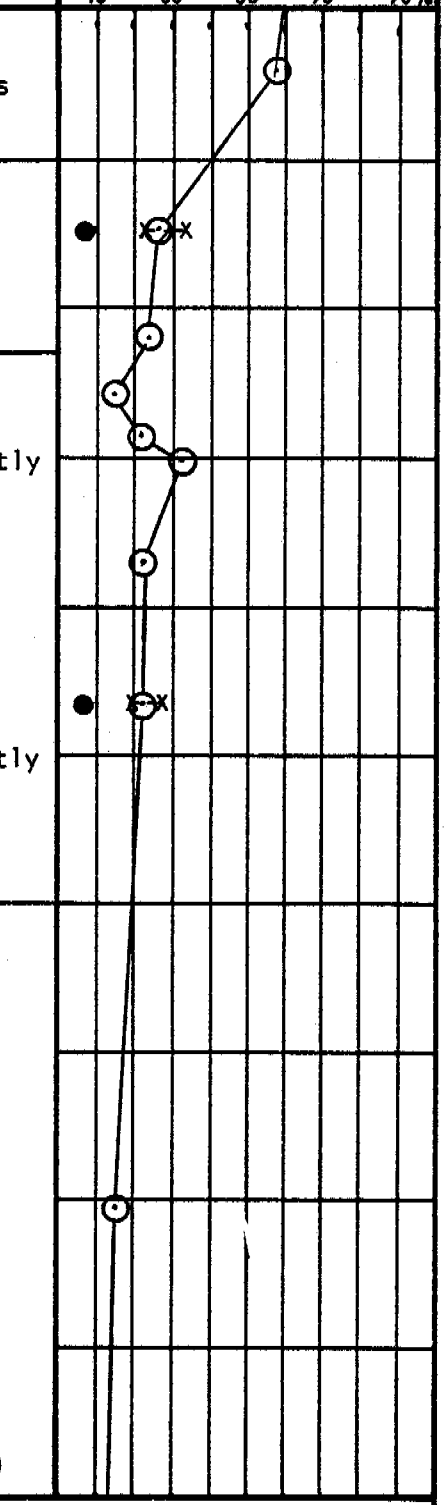
PERMAFROST

LOCATION
ELEVATION

N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
Nbe Vr Vs		SILT - trace fine sand - organic laminations - peat inclusions - greyish brown
		11.00m
		SILT AND CLAY - trace fine sand - low plasticity - organic inclusions - grey
		shale pieces
		12.30m
Nbn Vr		SILT AND CLAY - some sand - little gravel, mostly pieces of shale & sandstone - slight to low plasticity - layered - black organic inclusions - grey
		gravel layers comprised mostly of shale and sandstone
		16.00m
		SHALE - high plasticity - laminated - grey
		(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-165
DATE July 31/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION / ELEVATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● ORGANIC CONTENT % ■ UNCONF.
DEPTH	TYPE	BLOW 15cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT X — — — — — 0 — — — — — X 10 30 50 70 90%
21	B		20		Nbn		As above 21.00m	
							END OF HOLE	

Notes:

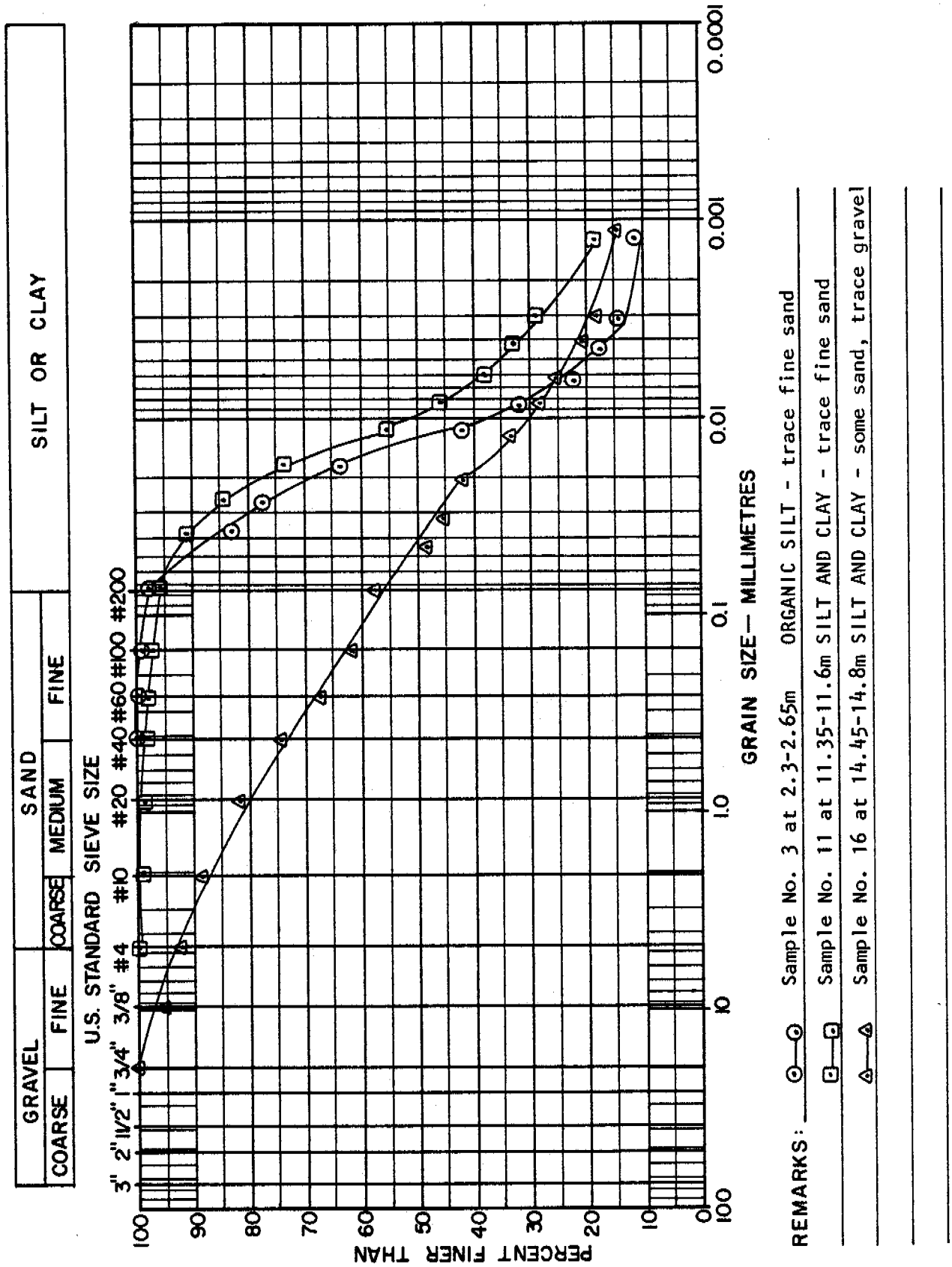
1. Test hole located near the crest of the bank along the Eagle River valley.
2. The site is hummocky and slopes to the northwest at 5% before descending steeply about 5-20m from the hole.
3. Drainage is good.
4. Vegetation consists of a moss & grass ground cover with a sparse to moderate black spruce to 3-8m.
5. Test hole augered to 0.65m, then cored to 15.0m and then drilled to 21.0m with air circulation.
6. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 6.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-165
DATE	July 31/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-165 DEPTH
DATE	Sept. 14/78 380

165

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-165

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.65 - 1.00	1436.6	89.7
3	2.30 - 2.65	1387.9	86.6
5	4.20 - 4.50	1159.0	72.3
8	9.15 - 9.35	1318.3	82.3
10	10.30 -10.60	1470.5	91.8
13	12.40 -12.75	1965.6	122.7

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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-166

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
	B		
	B		1
1			
	C		2
2	C		3
3	C		4
4			
	C		5
5	C		6
	C		7
6			
7	C		8
8			
	C		9
9			
	C		10
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.6M
Vs	
Nbe	
Nbe	

LOCATION Eagle River
ELEVATION

DESCRIPTION OF MATERIAL

0.07m ORGANIC COVER

ORGANIC SILT
- little fine sand
- trace fine gravel
- slight plasticity
- sand and silt laminations
- greyish brown

ice lenses 1/4mm-2mm spaced @ 1mm-8mm

sandier with depth
-organic laminations

6.80m

SAND AND GRAVEL
- sand fine to coarse
- stratified
- layer of silt spaced @ 0.3m-0.5m

gravel mostly comprised of siltstone

9.50m

CLAY AND SILT (Cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

109 %

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-166
DATE	Aug. 1/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
11	B		11
12	B		12
13			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

- some gravel
- trace to little sand
- medium plasticity
- organic inclusions
- rusty specks
- grey

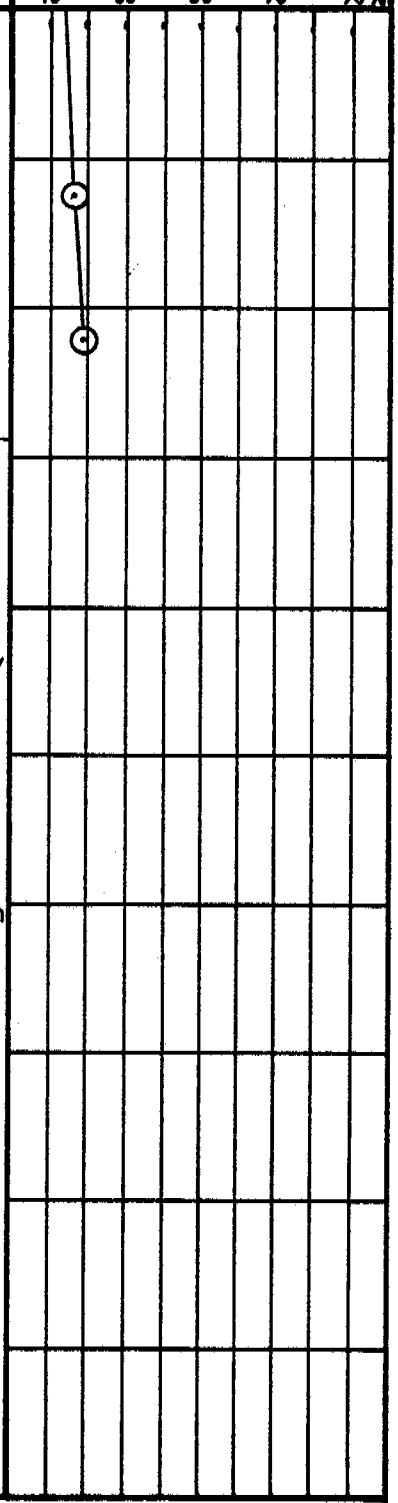
12.90m

END OF HOLE

Notes:

1. Test hole located at the base of the north bank of the Eagle River valley.
2. The ground is slightly hummocky and ascends 2-3% to the north-west in the vicinity of the hole; then steepens to more than 100% on the valley wall.
3. A lake is located 50m south of the hole.
4. Vegetation consists of a moss ground cover with a dense birch and white spruce to 15-20m.
5. Test hole augered to 0.6m, then cored to 6.9m and then drilled to 12.9m with air circulation.

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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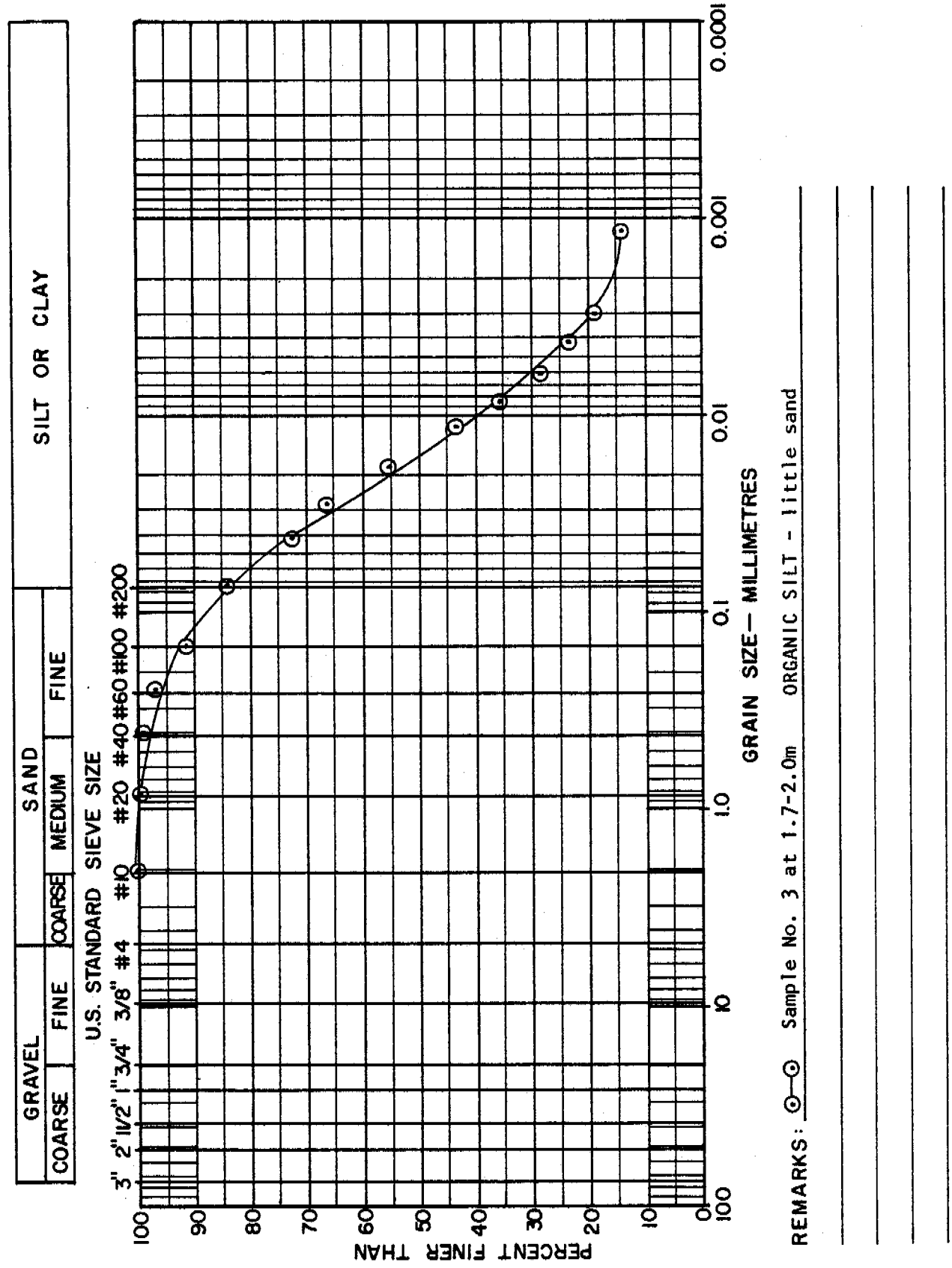
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-166
DATE	Aug. 1/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

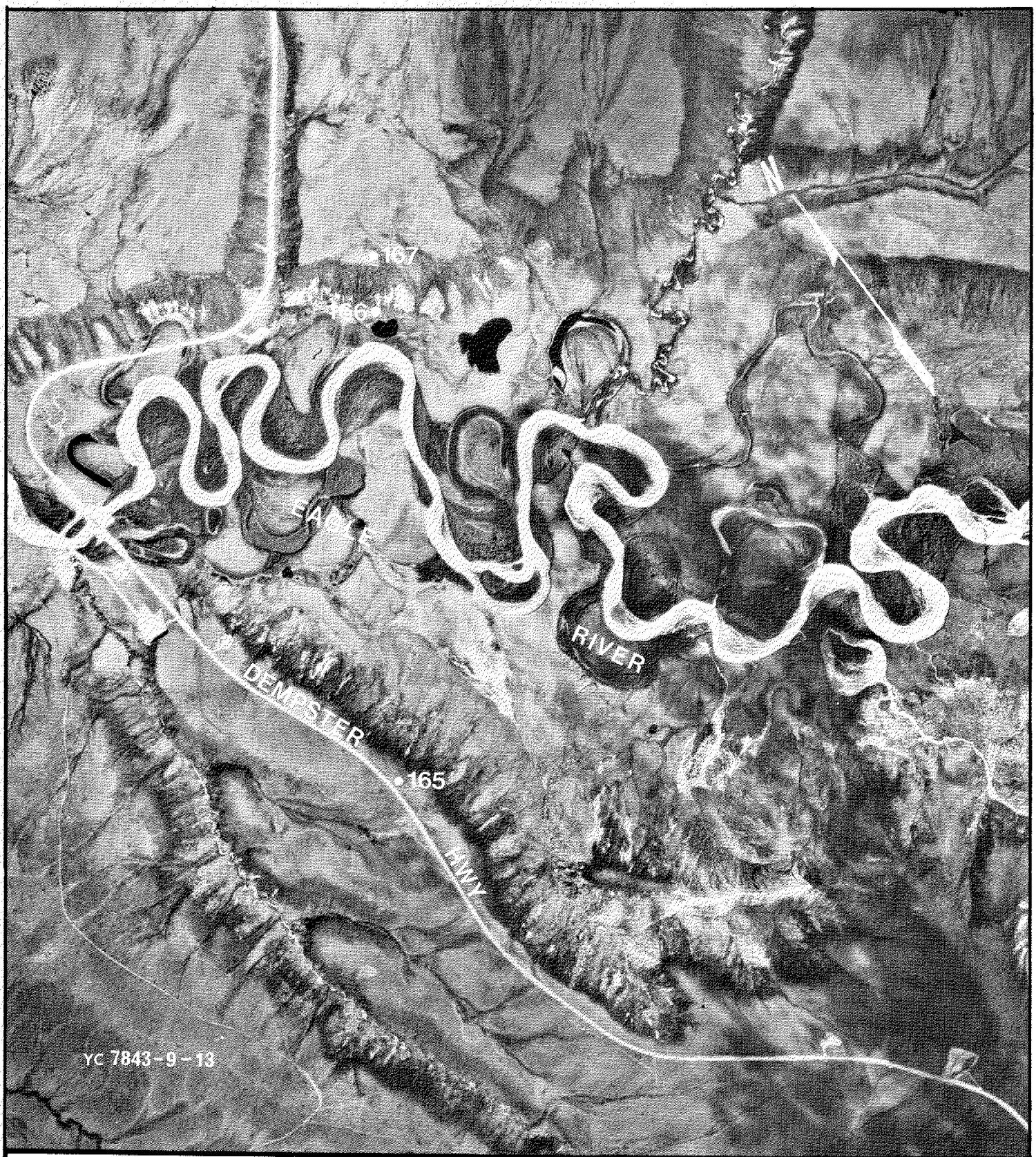
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-166 DEPTH
DATE	Sept. 14/78

385

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-166

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.70 - 2.00	1323.0	82.6



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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-167

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	A1.1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION Eagle River	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
DEPTH	TYPE	BLOW/15cm.	No.		N.R.C. CLASS	N.F. or F.	ELEVATION	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X——0——X 10 30 50 70 90%
							DESCRIPTION OF MATERIAL	
	B					NF	0.15m ORGANIC COVER	
	C		1		Vr		0.30m	
1					Vs		GRAVEL AND ORGANIC SILT - trace sand - cobbles of sandstone - slight plasticity - dark brown	
	B		2				1.00m	
2								
	B		3		Vx			
	B		4		Vr			
3					Vc			
4							GRAVEL - trace to little sand - trace silt & clay - gravel mostly subangular comprised of siltstone, sandstone and limestone - brownish grey	
	B		5					
5								
6							5.70m	
	SPT	136 for 10cm	6		Vr		CLAY & SILT - little gravel - trace sand - medium plasticity - grey	
7							6.80m	
	B		7		Nbn		SHALE - medium plasticity - grey to 8.6m, brown to 9.0m, greyish black below	
8								
	B		8					
9								
	B		9					
10							10.00m (Cont'd.)	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-167
DATE	Aug. 1/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
11			
	B		10
12			
13	B		11
14			

SYMBOL | PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

SHALE
- as above

13.00m

END OF HOLE

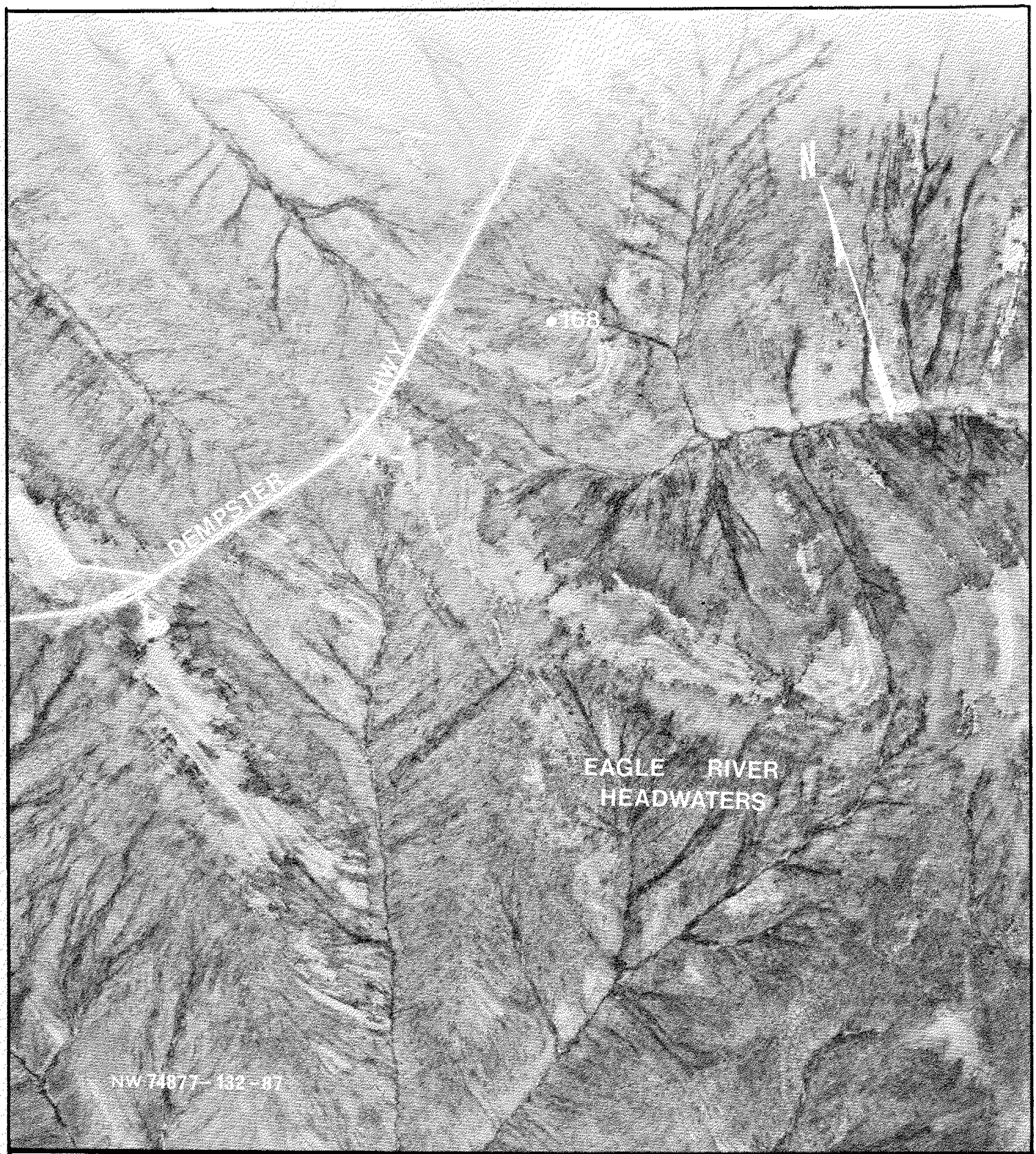
Notes:

1. Test hole located on the north valley bank of the Eagle River.
2. Drainage is fair.
3. The site is flat with a moss cover.
4. Vegetation consists of moderately dense white spruce and shrubs.
5. Test hole augered to 0.3m, then cored to 0.5m and then drilled to 13.0m with air circulation.
6. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 3.0 and 4.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-167
DATE	Aug.1/78 PLATE

K.L.C. - METRIC



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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-168

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.1m ORGANIC COVER
							0.30m
1	C		1		Vs Vr Vx		ORGANIC SILT - trace fine sand - slight plasticity - brownish grey - ice lenses 1/2mm-6mm spaced @ 1mm-12mm
	C		2				1.75m ice lens 10mm spaced @ 35mm
2							
	C		3		Nbn Vr		SILT AND CLAY - some gravel - some sand-coarse to fine - low plasticity - rusty laminations - greyish brown - ice lenses 1/4mm-3/4mm spaced @ 8mm-15mm
3	C		4				3.20m
	C		5		Nbe Vs Vx		SHALE - SILTSTONE - medium plasticity - grey with rusty zones - weathered - ice lenses 1/4mm-1mm spaced @ 1mm-10mm - ice crystal 5mm-20mm spaced @ 5mm-20mm
4	C		6				
	C		7				4.85m
5	C		8				
6	B		9		Nbn		SHALE - SILTSTONE - low plasticity - light greenish grey
7							
8							
	B		10				8.70m
9							END OF HOLE
10							(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

164%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-168
DATE	Aug. 1/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

DESCRIPTION OF MATERIAL

PLASTIC LIMIT X — WATER CONTENT 0 — LIQUID LIMIT X
10 30 50 70 90%

Notes:

1. Test hole located on a hill-side. Ground sloping north-easterly 1-2%.
2. Drainage is fair.
3. Vegetation consists of grass and moss with the occasional spruces 1-2m.
4. Test hole augered to 0.3m then cored to 5.05m and then drilled to 8.7m with air circulation.

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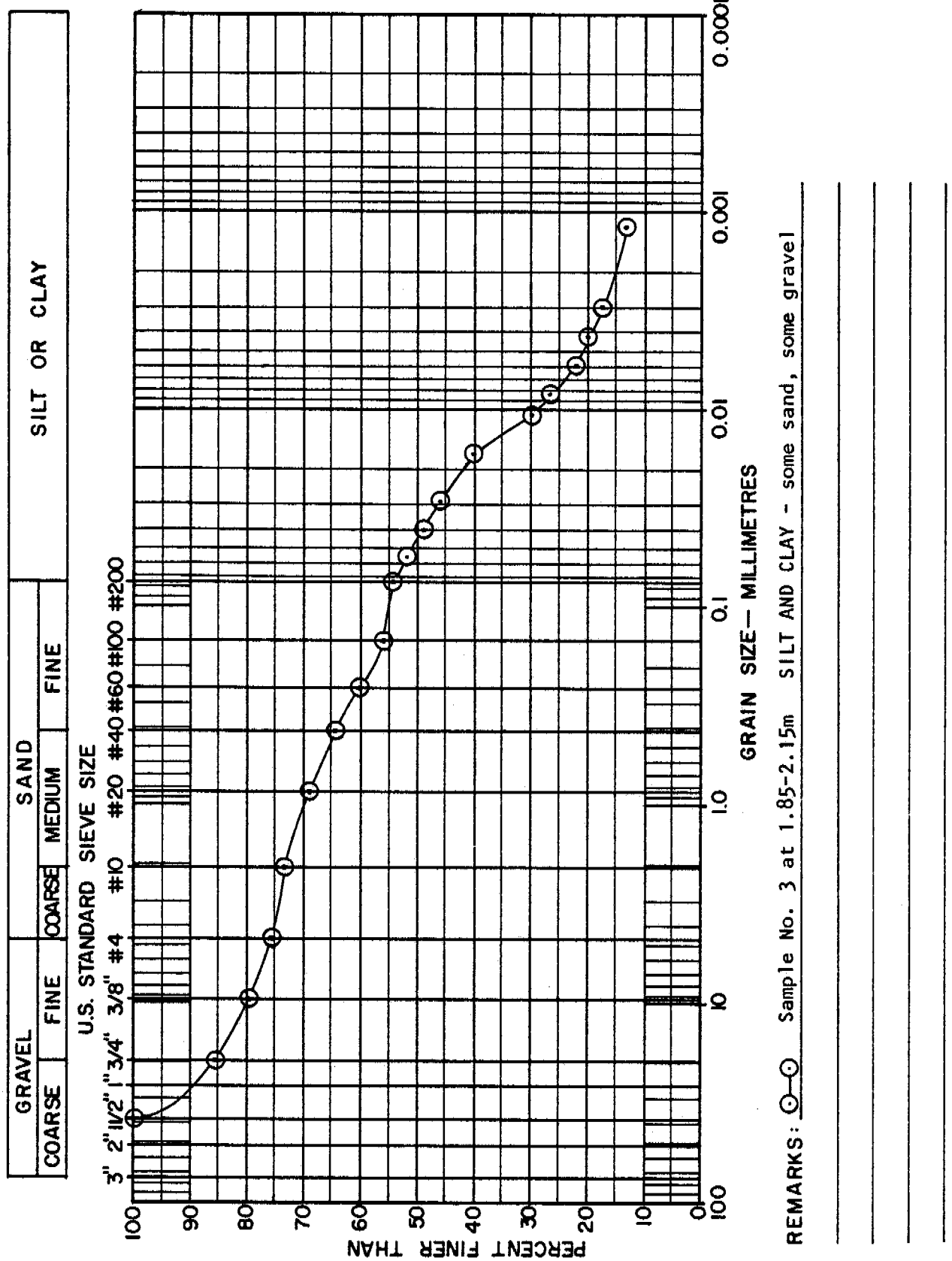
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-168
DATE Aug.1/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-168	DEPTH
DATE Oct.3/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-168

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.60 - 0.95	1226.8	76.6
4	2.15 - 2.45	2083.2	130.0

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-169

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	B		1
1			
	C		2
	C		3
2			
	C		4
	C		5
3	C		6
4	C		7
	C		8
5			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.6M
Nbn	
Nbe	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

CLAY AND SILT
- trace sand-fine to medium
- low to medium plasticity
- grey and brown clay and silt pockets
- organic pockets
- brown

0.80m

SHALE - SILTSTONE
- medium plasticity
- weathered
- grey with rusty zones

4.50m

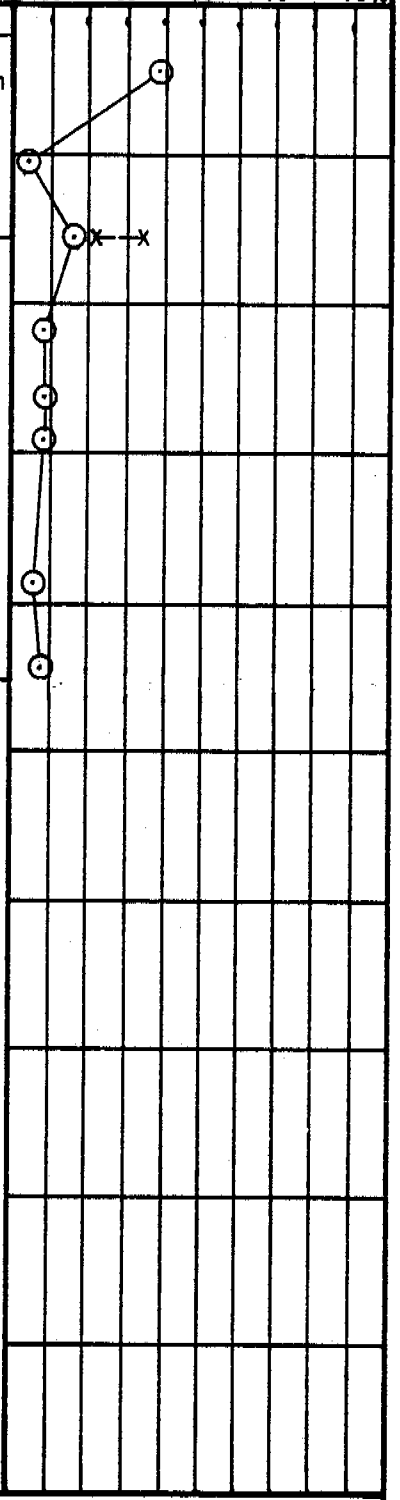
END OF HOLE

Notes:

1. Hole located on a small divide between two south draining valleys. Terrain slopes 1 to 2% south.
2. Vegetation mainly composed of stunted spruce to 3m tall and occasional bushes.
3. Peat tussocks cover the land surface.
4. The land surface has moderate to poor drainage.
5. Hole augered to 0.6m, then cored from 0.6m to 4.5m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-169
DATE	Aug. 3/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-169

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.30 - 1.80	2135.4	133.3
5	2.45 - 2.70	2255.6	140.8

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-170

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.10m ORGANIC COVER
	B						0.30m
					Nbe		ORGANIC SILT - little fine sand - fine sand laminations - organic silt pockets - brown - ice lenses 1/2mm-5mm spaced @ 1mm-15mm
1	C		2		Vs		
	C		3				1.20m
					Vr		
	C		4		Vx		
2							
	C		5				
	C		6				
3					Nbn		SILTSTONE - limestone interbeds - fractured - upper portion gravelly - greyish brown
	B		7		Nf		
4							
	B		8				
5							
	B		9				
6							6.00m
	B		10		Nbn		SHALE - medium plasticity - yellow specks - grey
7							
8							
	B		11				
9							
	B		12				9.50m
10							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — 0 — — — — X
10 30 50 70 90%

132%
162%
157%

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-170
DATE	Aug. 3/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Notes:

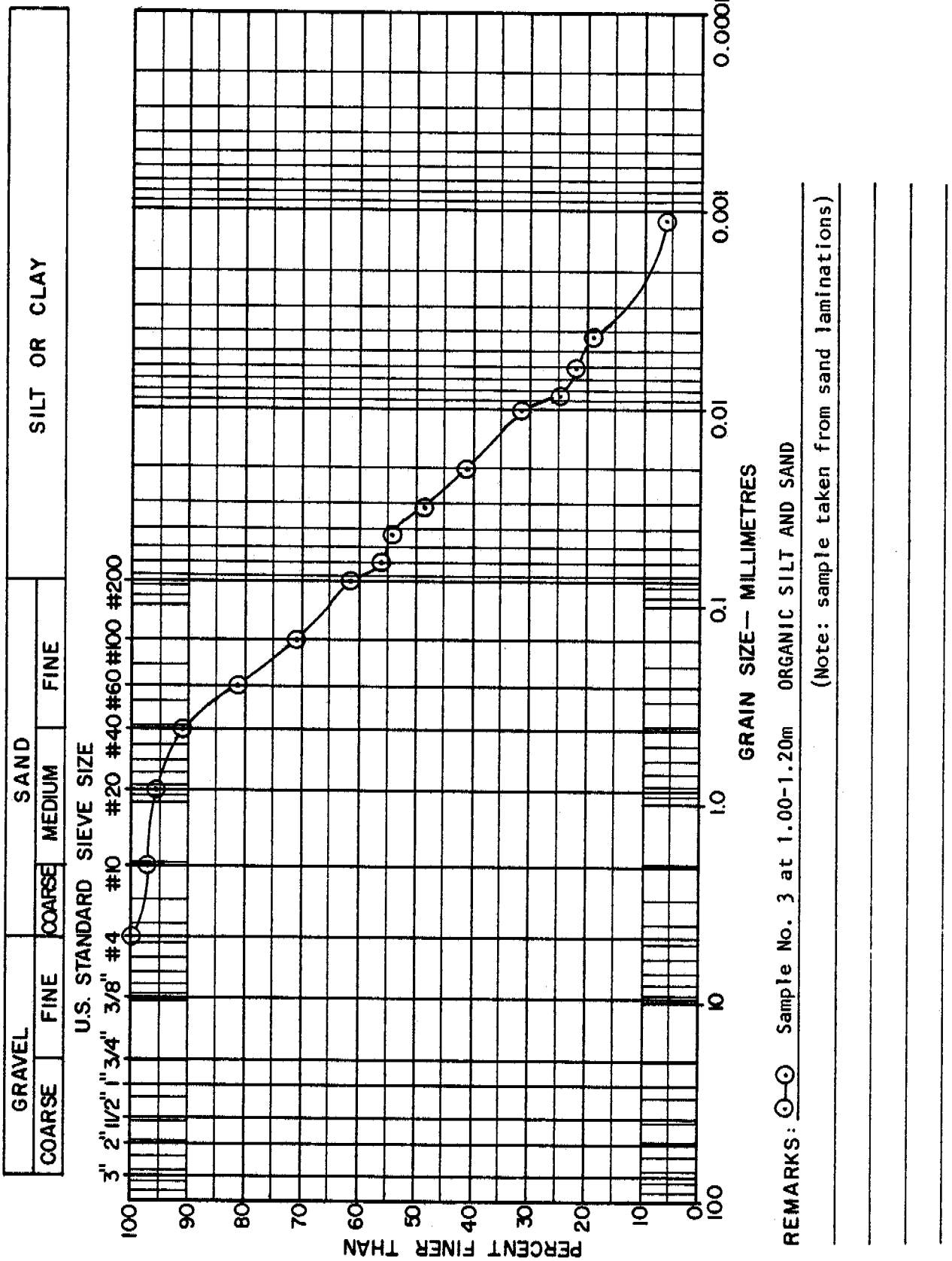
1. Hole located in a very broad flat bottomed north-south trending valley.
2. Dempster Highway located approx. 100m to the west.
3. Vegetation consists of grasses with occasional bushes and stunted conifers to 3m.
4. Drainage is generally poor.
5. Hole augered to 0.3m, then cored to 2.4m and then drilled with air to 9.5m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-170
DATE	Aug.3/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.00-1.20m ORGANIC SILT AND SAND

(Note: sample taken from sand laminations)

Klohn Leonoff Consultants Ltd.

CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-170	DEPTH
DATE Sept. 28/78	

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-171

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	ORGANIC COVER
	B						0.35m
	C		2		Nbe		ORGANIC SILT AND CLAY - trace sand & gravel - low to medium plasticity - peat inclusions - greyish brown
1					Vs		ice lenses 3mm-8mm spaced @ 10mm-15mm
	C		3		ICE +		
2					Vx		1.70m
	C		4		Vr Vx Vc		GRAVEL - little sand, coarse to fine - little silt - gravel subangular - grey
3							3.50m
4	B		5		ICE+		ICE + GRAVEL
							4.50m
5	B		6		ICE+		ICE + SILT
							5.00m
	B		7				
6							
	B		8		Nbe Vx		LIMESTONE - highly fractured - upper portion gravelly - black - hard bouncing drill action
7							
8	B		9				
9							9.00m
	B		10		Nbn		SHALE & SILTSTONE - thin limestone interbeds
10	B		11				(Cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

139%
224%
102%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-171
DATE	Aug. 4/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
11	B		12
12	B		13
13	B		14
14	B		15
15			
16			

SYMBOL | PERMAFROST | N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

Nbe

- low to medium plasticity
- dark grey
- hard bouncing drill action

14.70m

END OF HOLE

Notes:

1. Hole located on south bank of Rock River; 20m south of slope crest.
2. Vegetation is mainly grasses with occasional stunted conifers to 2m tall.
3. Site is generally flat with moderate drainage.
4. Hole augered to 0.35m, then cored to 2.4m and drilled with air to 14.7m.
5. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 5.0m.

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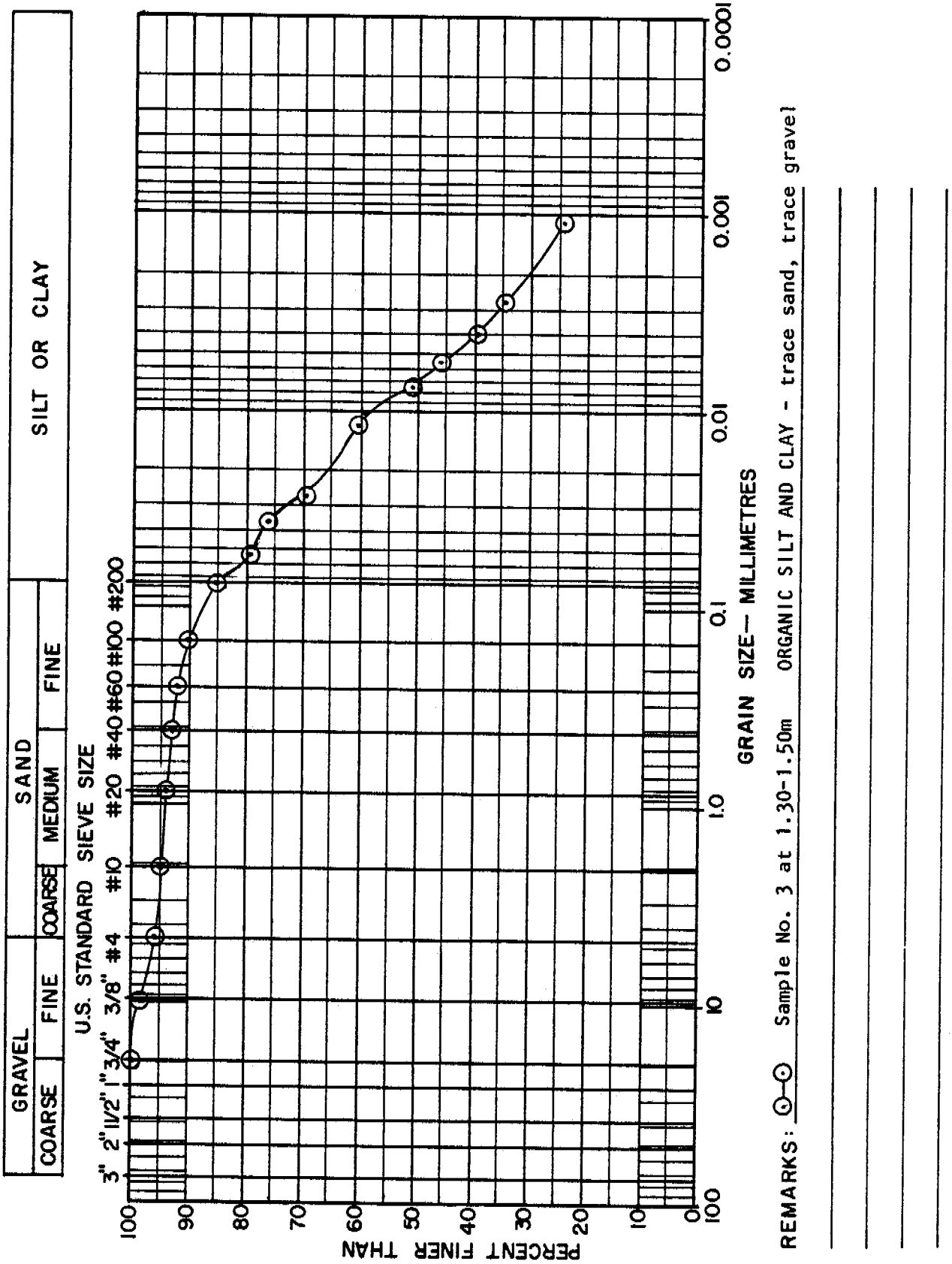
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-171
DATE	Aug. 4/78 PLATE

K.L.C. - METRIC

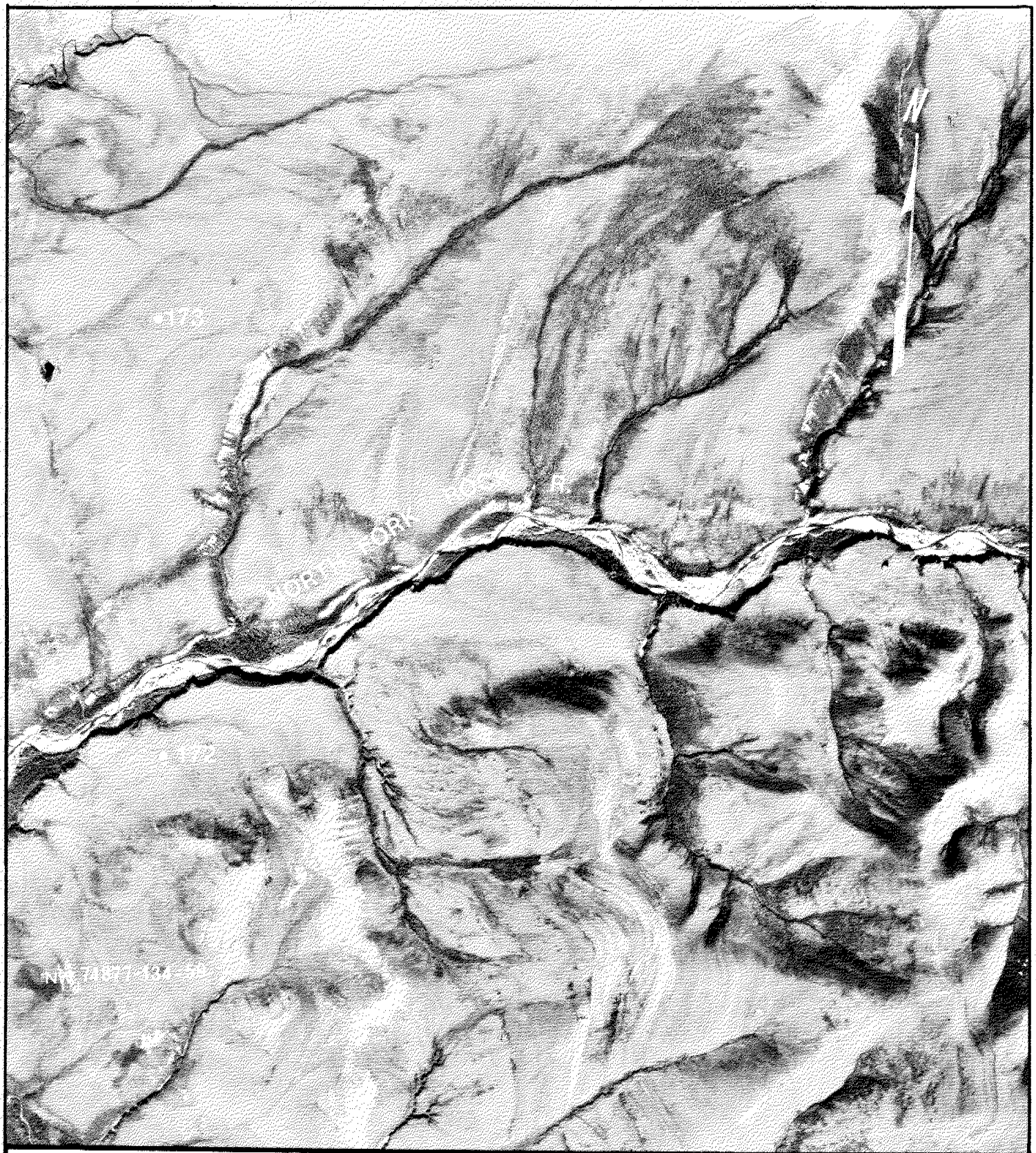
GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.30-1.50m ORGANIC SILT AND CLAY - trace sand, trace gravel

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-171	DEPTH
DATE Sept.28/78	405



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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT:
FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT
DEMPSTER LATERAL DRILLING PROGRAM

TITLE
AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-172

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.
	B					NF
	B		1			0.4M
1	C		2		Vs Vr Nbe Vx	
	C		3			
2	C		4			
	C		5		Nbe Vr	
3						
	B		6			
4						
	B		7		Nbe Nbn	
5						
	B		8			
6						
	B		9			
7						

LOCATION North Rock
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

ORGANIC SILT AND PEAT
- trace sand - fine
- trace gravel
- dark brown
- ice lenses 1/2mm-5mm spaced @ 1mm-5mm

2.00m

GRAVEL AND SAND
- sand-coarse to fine
- little silt
- gravel is subangular comprised of limestone
- grey

4.00m

SHALE
- limestone interbeds
- grey black

6.5m

END OF HOLE

Notes:

1. Hole located on a broad flat plain. A low rounded mountain rises east of the site.
2. Vegetation is exclusively grasses.
3. Land surface is flat and poorly drained.
4. Peat tussocks cover the land surface. Water was noted in depressions between tussocks.
5. Hole was augered to 0.4m, then cored to 2.6m and then drilled with air to 6.5m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

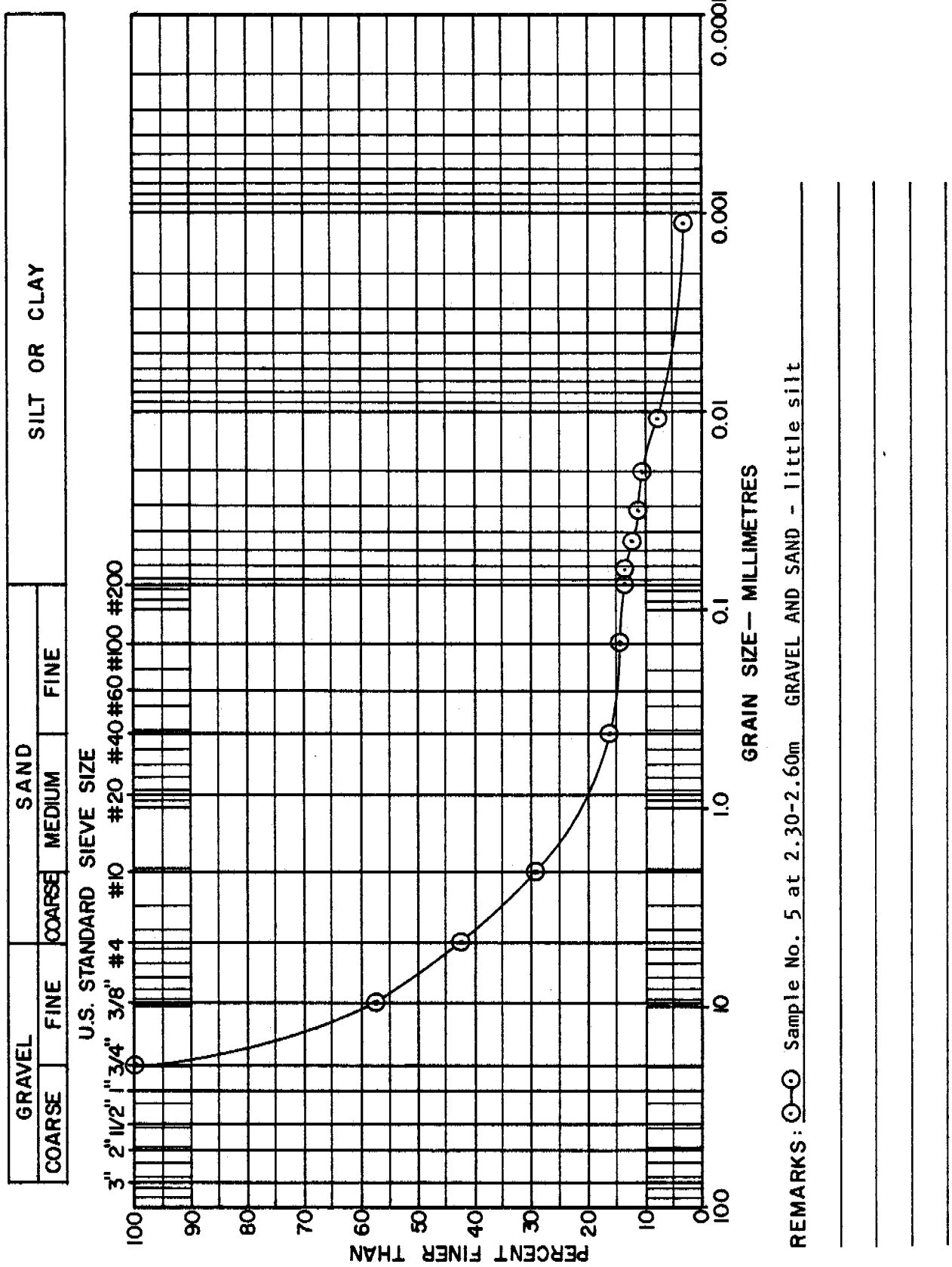
137%
214%
296%
138%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-172
DATE	Aug.4/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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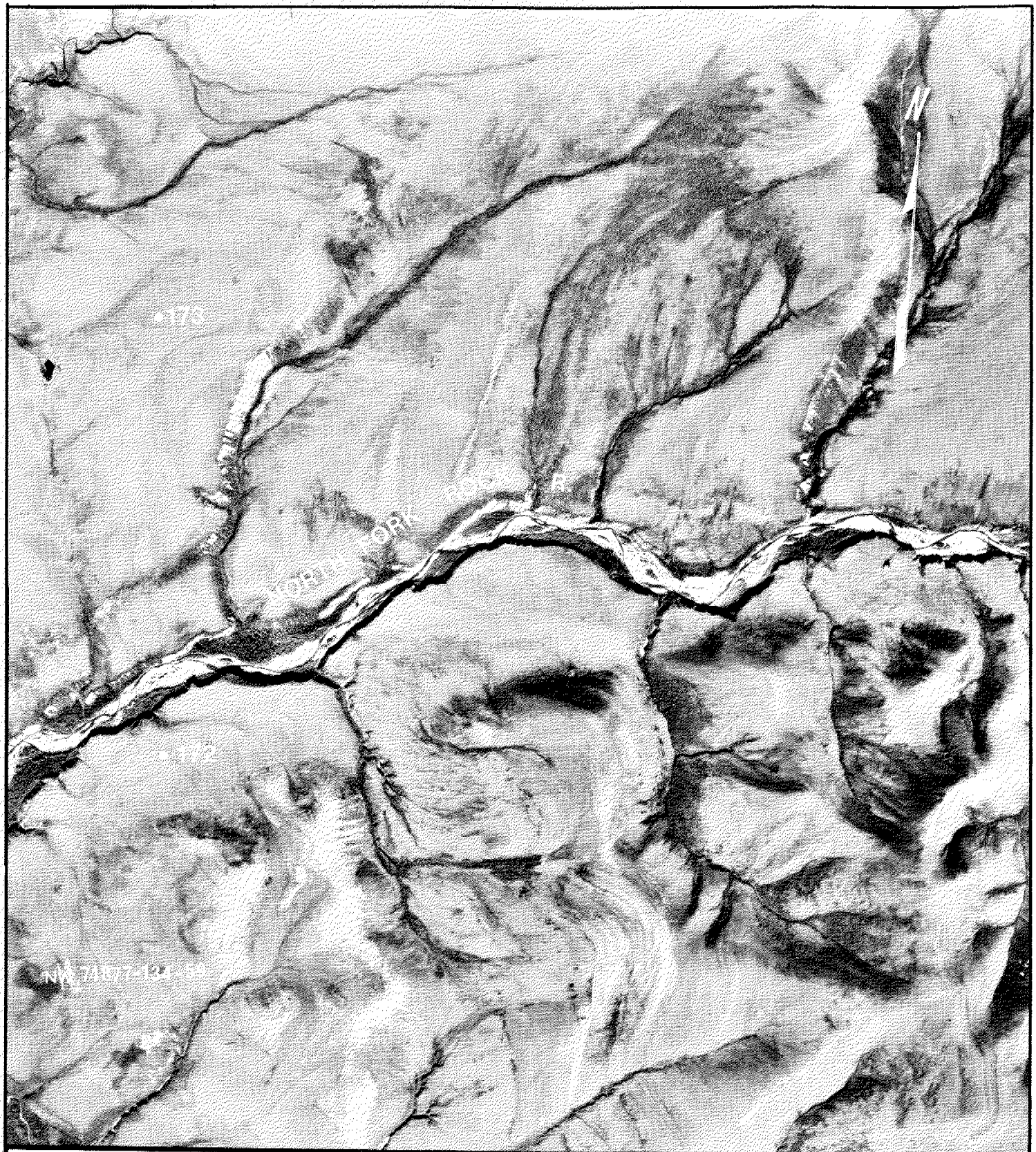
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	A 1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-172	DEPTH
DATE Oct.3/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-172

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.65 - 1.00	1005.4	62.7
4	1.80 - 2.10	1032.7	64.4



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VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-173

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.15m ORGANIC COVER
	B					0.4M	ORGANIC SILT & PEAT
	C		2		Nbe		- trace fine sand - greyish brown
1							0.70m
					Vs Vx		SAND AND SILT & CLAY - sand, fine to coarse - trace gravel - organic inclusions - grey - ice lenses 1mm-4mm spaced @ 1mm-4mm
	C		3				
2	C		4				
							2.75m
3					ICE		2.90m ICE
	C		5		ICE+ Nbe		SAND AND SILT & CLAY - trace gravel - organic inclusions - grey
							3.40m
4					ICE		ICE
							4.75m
5	C		6		Vr Vs Nbe		SILT AND CLAY - trace sand - trace gravel - low plasticity - organic inclusions - brownish grey with rusty laminations
6	C		7				← gravel layer
	C		8				6.40m
7	B		9		N		BEDROCK - chip samples obtained in air return indicated siltstone-sandstone - hard drill action
8	B		10				8.00m
9							END OF HOLE

Notes:

1. Hole located on a broad flat plain.
2. Dempster Highway located approx. 50m west of the site.

(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

222%
104%
104%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-173
DATE	Aug. 4/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

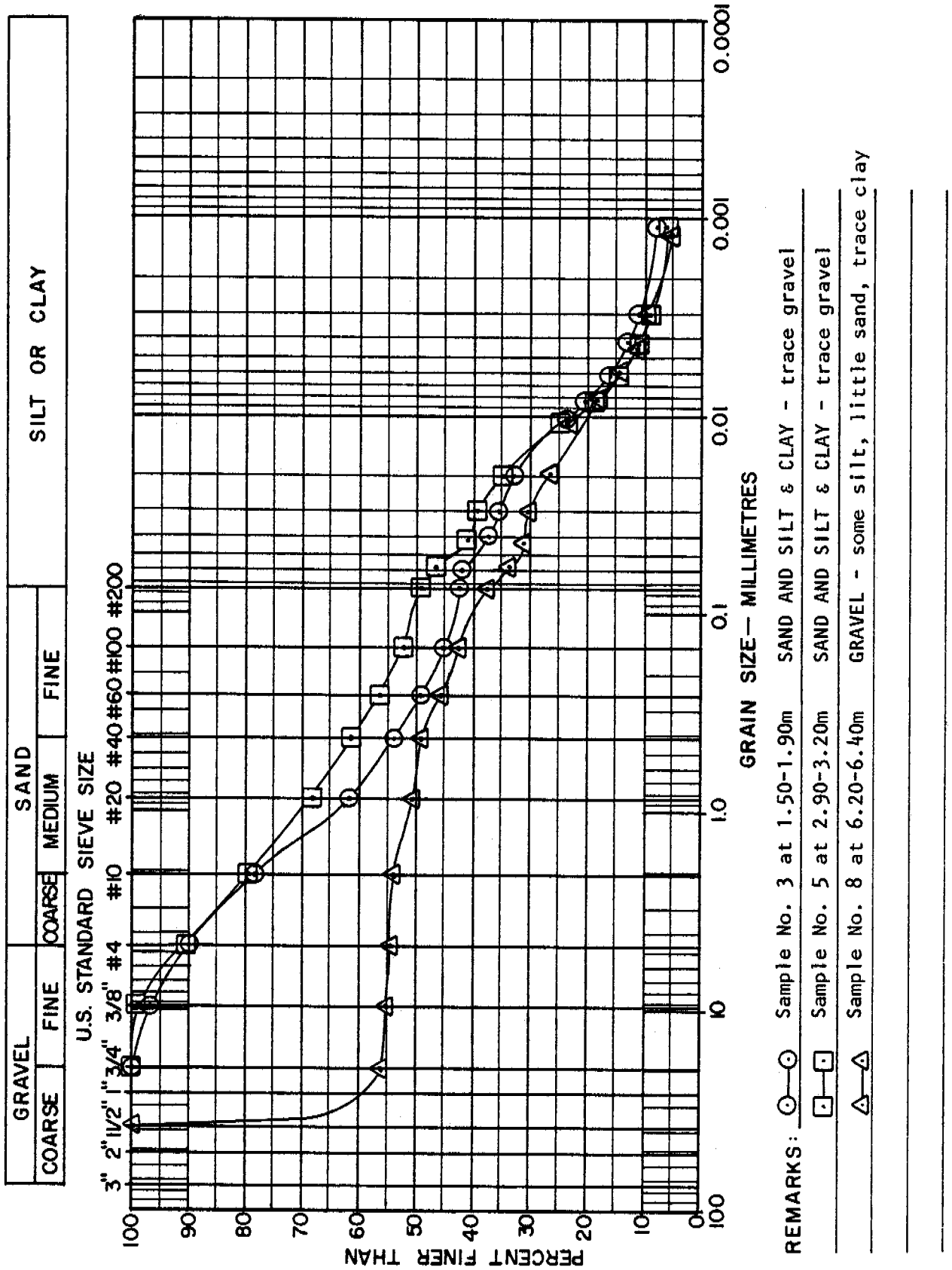
3. Vegetation is exclusively grasses.
4. Large scale polygons visible from the air.
5. Land surface is poorly drained and covered with peat tussocks.
6. Hole augered to 0.4m, then cored to 6.4m and then drilled with air to 8.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-173
DATE	Aug.4/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



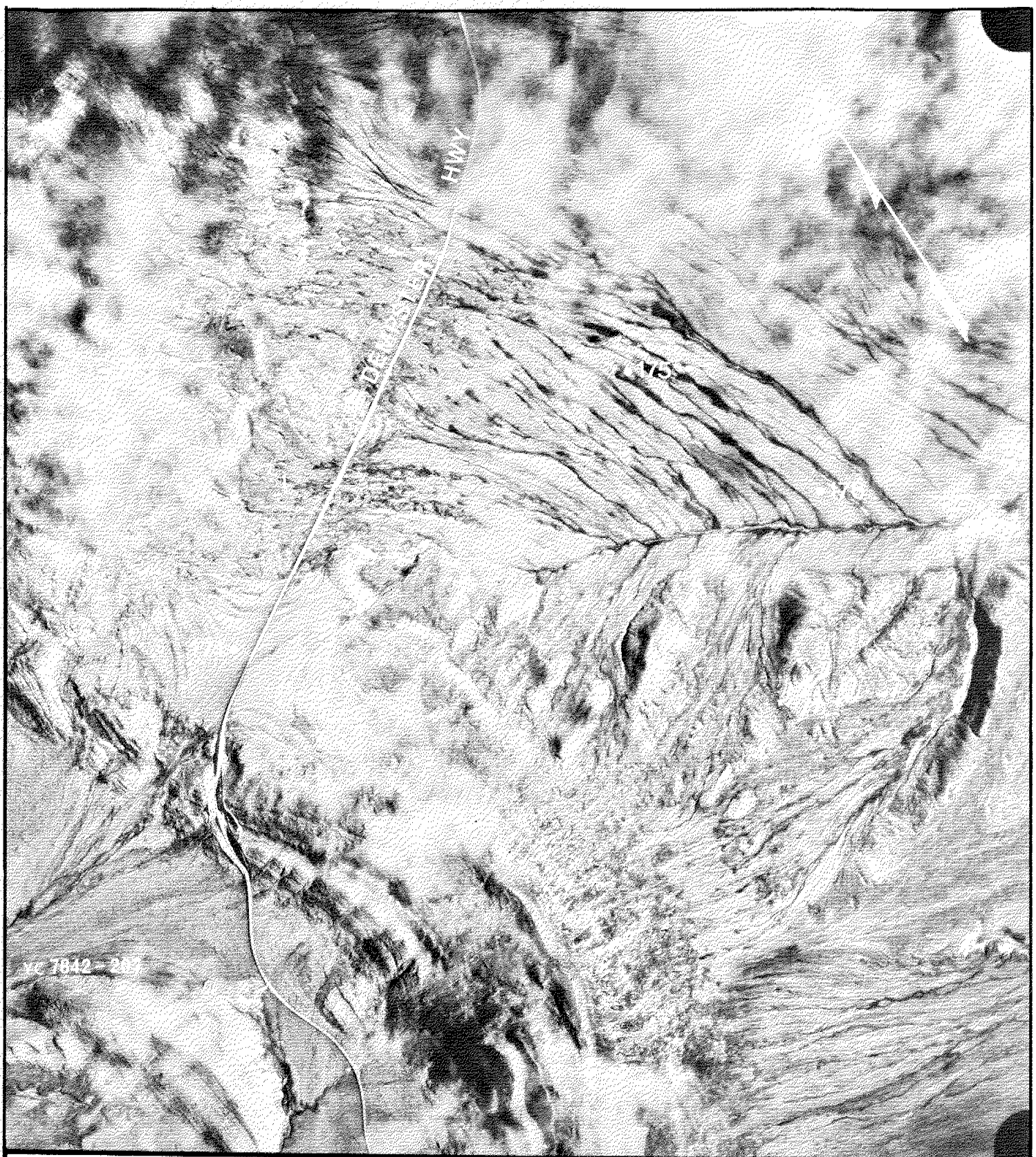
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-173 DEPTH
DATE	Oct.3/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-173

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.40 - 0.70	1018.7	63.6
4	1.80 - 2.00	1706.0	106.5
6	4.75 - 5.00	1437.4	89.7



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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-174

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.
	B					NF 0.3M
	B		1		Vs	
	C		2		ICE+	
1					Vs Nbe	
	C		3		ICE+	
	C		4		Vr ICE+	
2					Vr	
	C		5		Vs	
	B		6		Vx	
3					Vc	
	B		7			
4						
5	B		8			
6						

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

ORGANIC SILT
- trace fine sand
- trace gravel-greenish brown
- ice lenses 1mm-6mm spaced @ 3mm-8mm

1.50m some sand

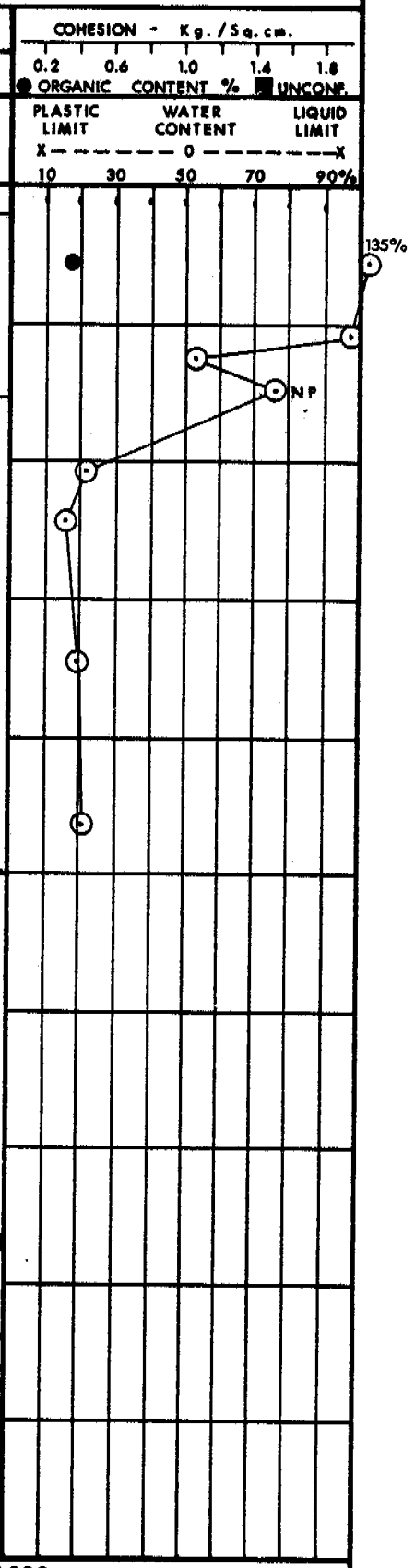
GRAVEL
- little to some sand
- sand, fine to coarse
- little silt
- gravel mostly comprised of quartzite and sandstone
- brown

5.00m

END OF HOLE

Notes:

1. Hole located on a broad rounded saddle between two mountains.
2. Dempster Highway is located approx. 100m east of the site.
3. Vegetation is exclusively grasses.
4. Land surface is moderately well drained.
5. Peat tussocks cover the surface.
6. Hole augered to 0.3m, then cored to 5.0m.
7. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, and 3.0m.

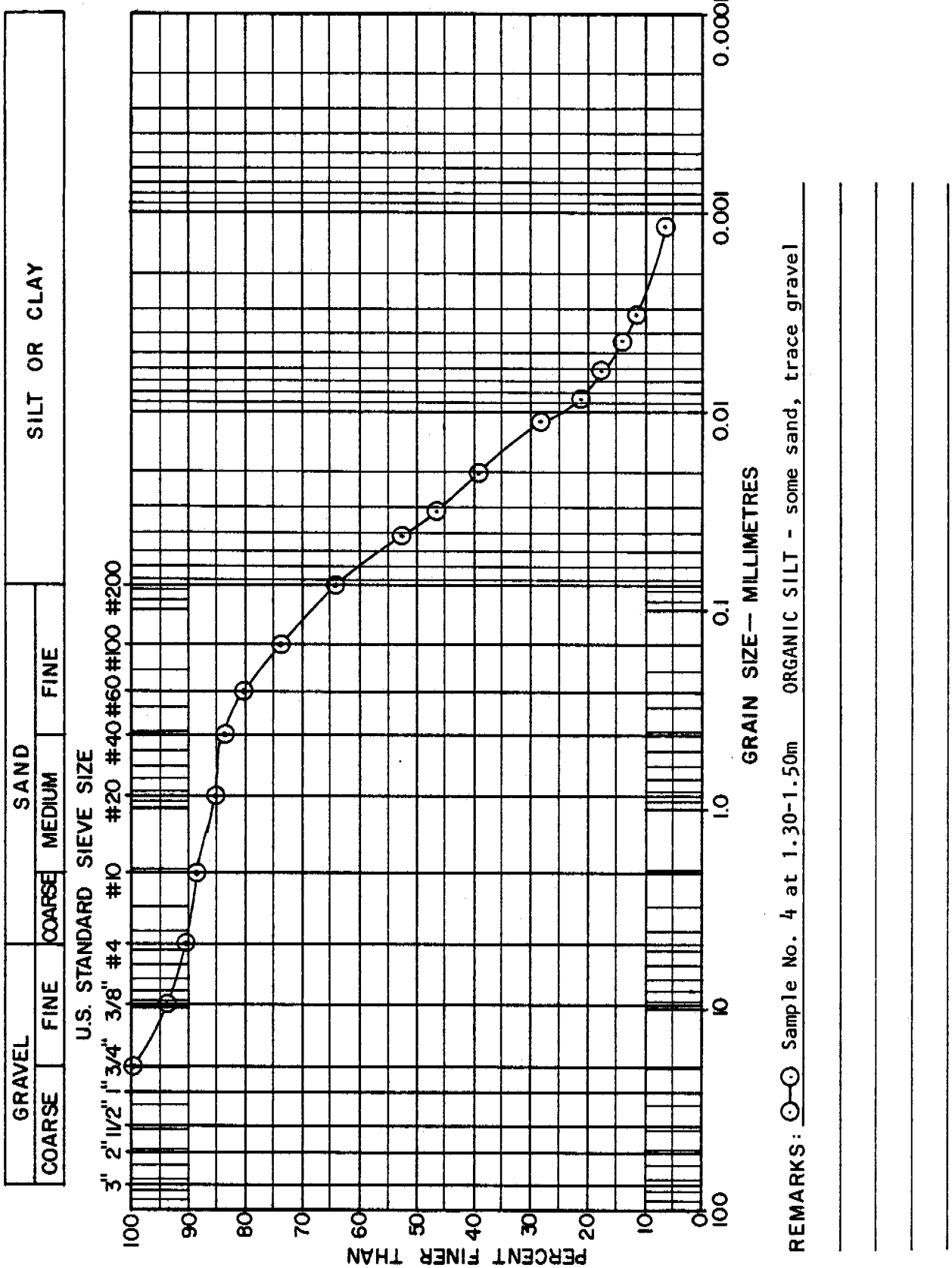


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-174
DATE Aug.9/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



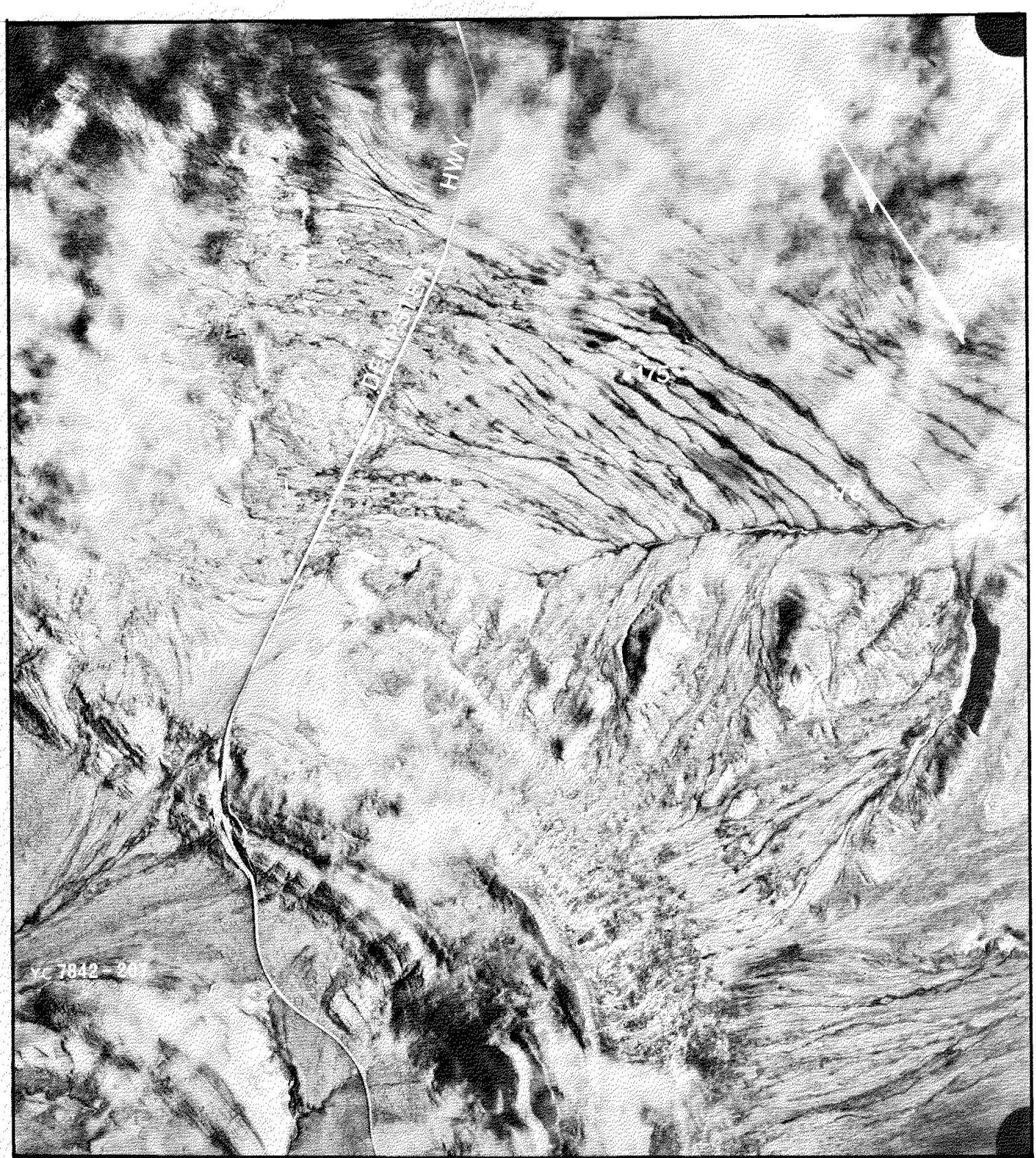
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-174 DEPTH
DATE	Oct. 4/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-174

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
4	1.30 - 1.50	2037.6	127.2



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-175

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.05m ORGANIC COVER
	B		1				SILT & CLAY
	B		2				- little sand-fine to coarse
1	C		3			0.8M	- trace gravel - fine
					Vr		- low plasticity
	C		4				- organic inclusions
							1.30m - grey silt & clay pockets
	C		5		Vs		- brown
2	C				Vx		sand layer
	C		6				2.00m GRAVEL
					Nbn		- little to some sand
	C		7				- coarse to fine
3							- little silt
	C		8				- greyish brown
							- ice lenses 1/2mm-4mm spaced @ 1mm-15mm
4	B		9		Nbn		3.10m SILTSTONE
							- slight plasticity
	B		10				- brown
5	B		11				SHALE - SILTSTONE
							- low plasticity
							- dark grey
							5.00m
6							END OF HOLE

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Notes:

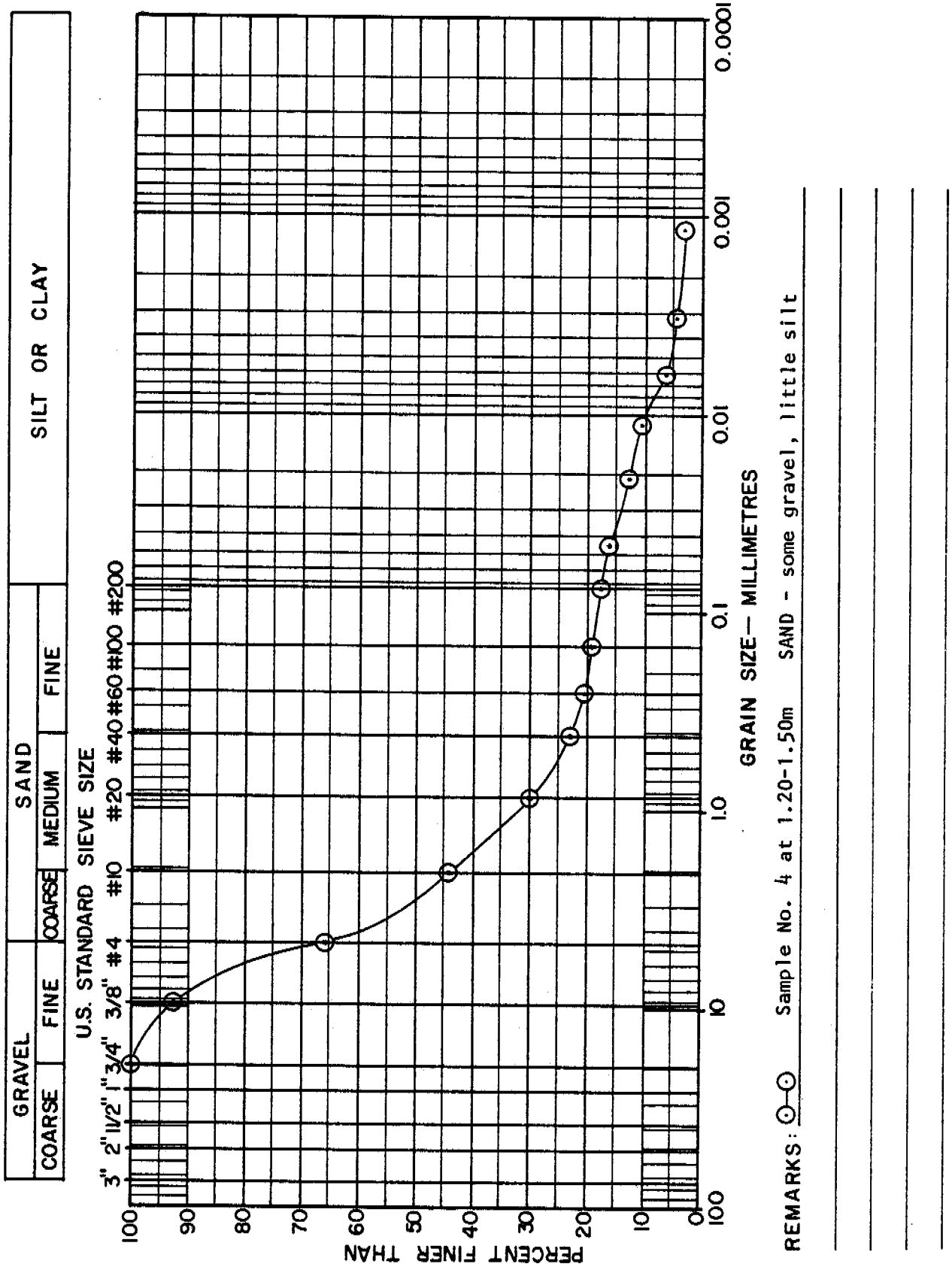
1. Hole located on a uniform ground surface sloping 3-5% easterly.
2. Dempster Highway is located approx. 500m west of site.
3. Vegetation is exclusively grasses.
4. Surface drainage is a poorly developed dentritic pattern.
5. Peat tussocks cover the surface.
6. Hole augered to 0.8m, then cored to 3.2m and then drilled with air to 5.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-175
DATE	Aug.10/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



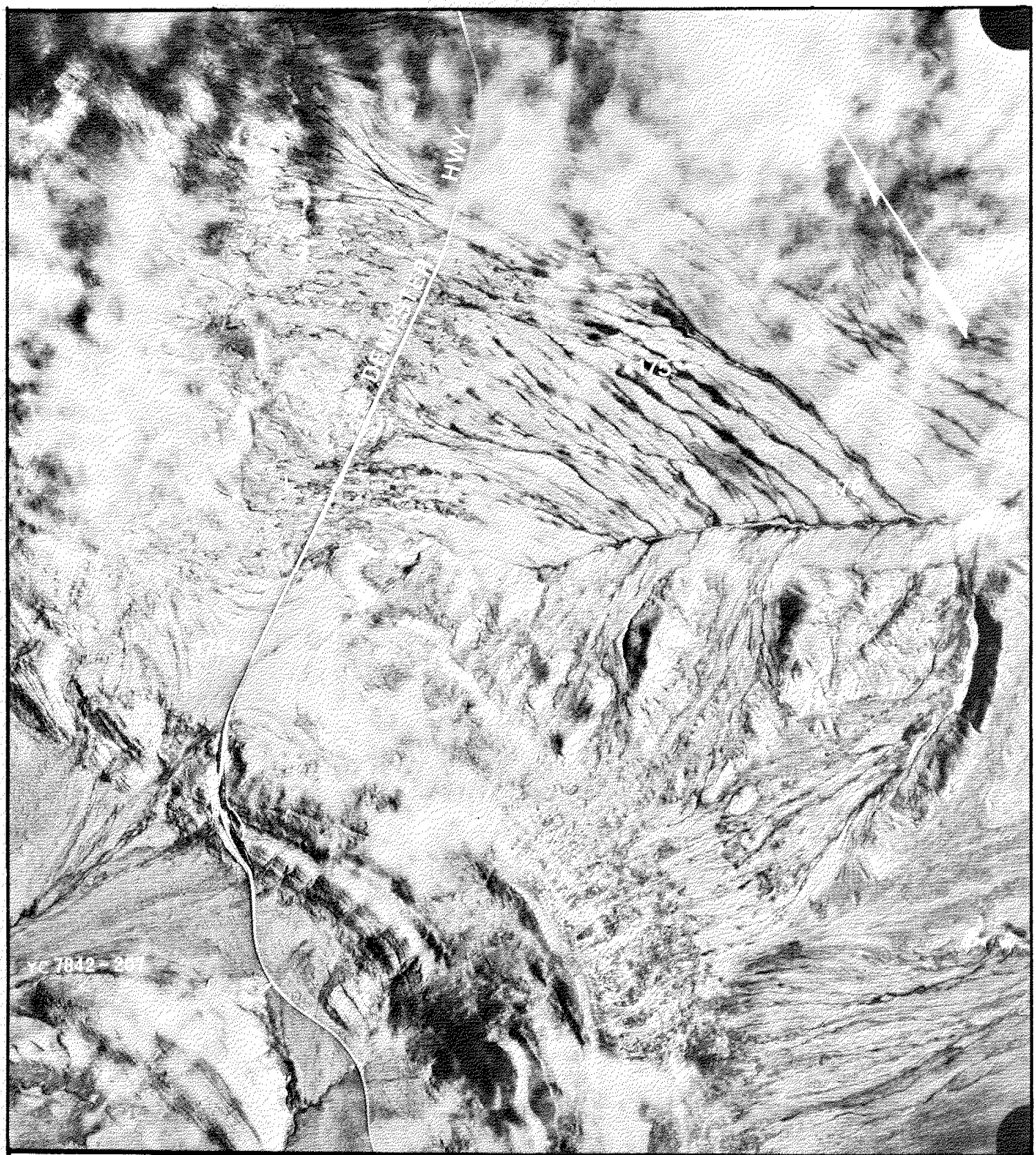
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-175	DEPTH
DATE Oct.4/78	421

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-175

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
5	1.65 - 1.90	1787.4	111.5



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-176

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.
	B					NF
	B		1			0.35M
					Vx	
1	C		2			
	C		3		Nf, Vx	
	C		4		ICE+	
2					Nbe	
					ICE+	
3	C		5		Vr	
	B		6		Vs	
4	B		7			
					Nbn	
5	B		8			
	B		9			
6						
	B		10			
7						

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.10m ORGANIC COVER

SILT AND CLAY
- little coarse to fine sand
- little gravel
- low plasticity
- organic & peat inclusions
- greyish brown with rusty laminations
- ice crystal 1/2mm-3mm spaced @ 3mm-8mm

1.15m
1.40m
1.60m

GRAVEL
- some coarse to fine sand
- little silt and clay
- brown
- gravel comprised of oxidized siltstone

2.30m
2.50m

ICE + SILT & CLAY

GRAVEL
- little sand-coarse to fine
- little silt and clay
- brown
- gravel comprised mostly of oxidized siltstone

ICE + SILT & CLAY

SHALE - SILTSTONE
- low to medium plasticity
- fractured
- grey

6.50m

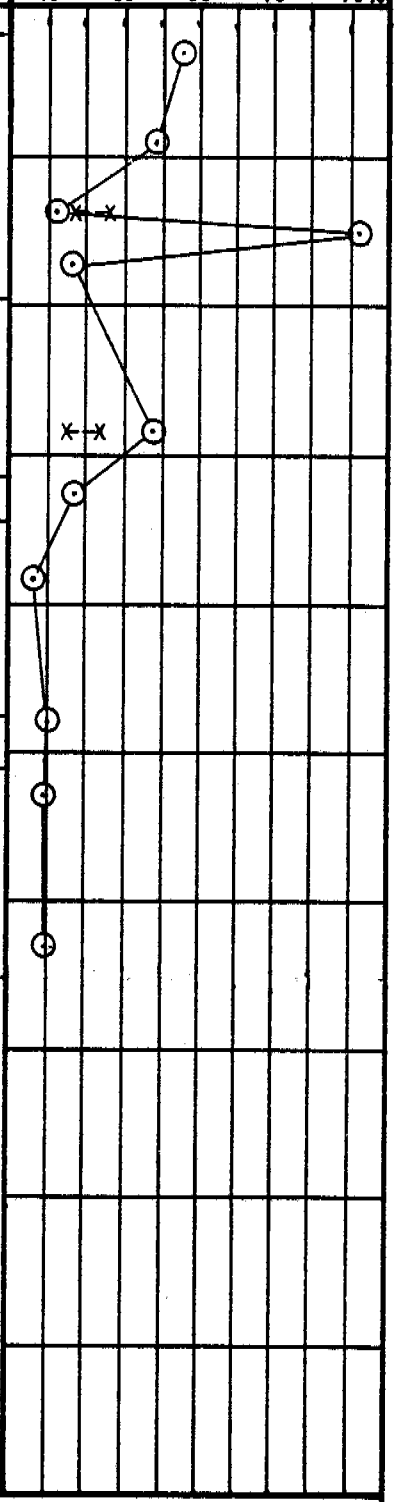
END OF HOLE

Notes:

1. Hole located on toe of a broad pediment slope. Terrain slopes 2% easterly.
2. Vegetation is exclusively grass.
3. Peat tussocks cover land surface
4. Hole augered to 0.35m, then cored to 3.3m and then drilled with air to 6.5m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

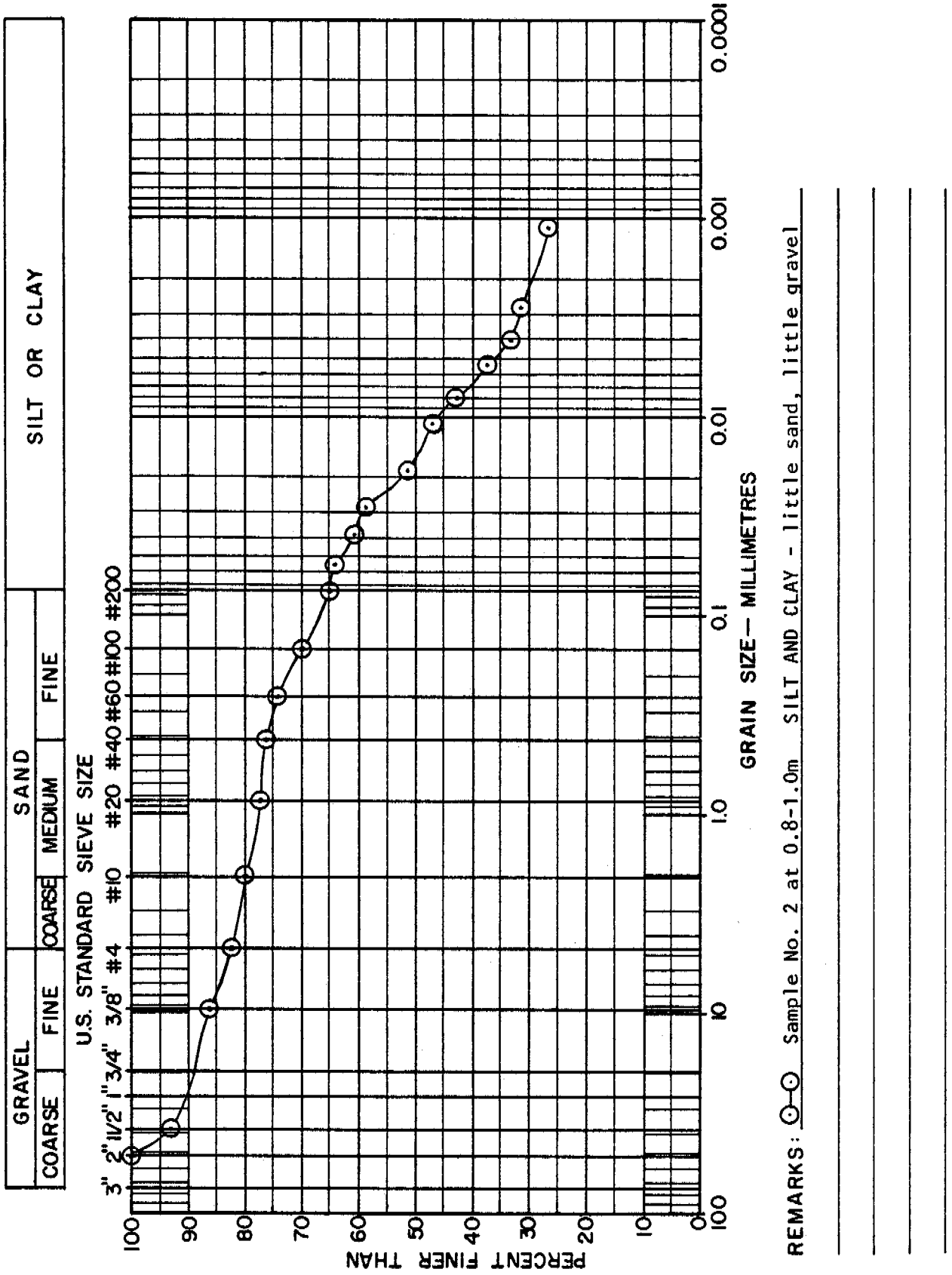


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-176
DATE Aug.10/78	PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-176 DEPTH
DATE	Oct.3/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-176

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
5	2.70 - 2.90	1876.3	117.1

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-177

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	B		1
1			
	C		2
2			
	B		3
	B		4
3			
	B		5
4			
	B		6
5			
	B		7
6			
7			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.7M
Nbe	
Vr	
Vx	
Vr	
Nbe	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.10m ORGANIC COVER

CLAY & SILT
- some sand
- little gravel
- low to medium plasticity
- dark grey

gravel, some sand
- ice lenses 1/2mm-3mm spaced @ 3mm-12mm

1.70m

SILTSTONE
- sandstone interbeds
- fractured
- brown

5.50m

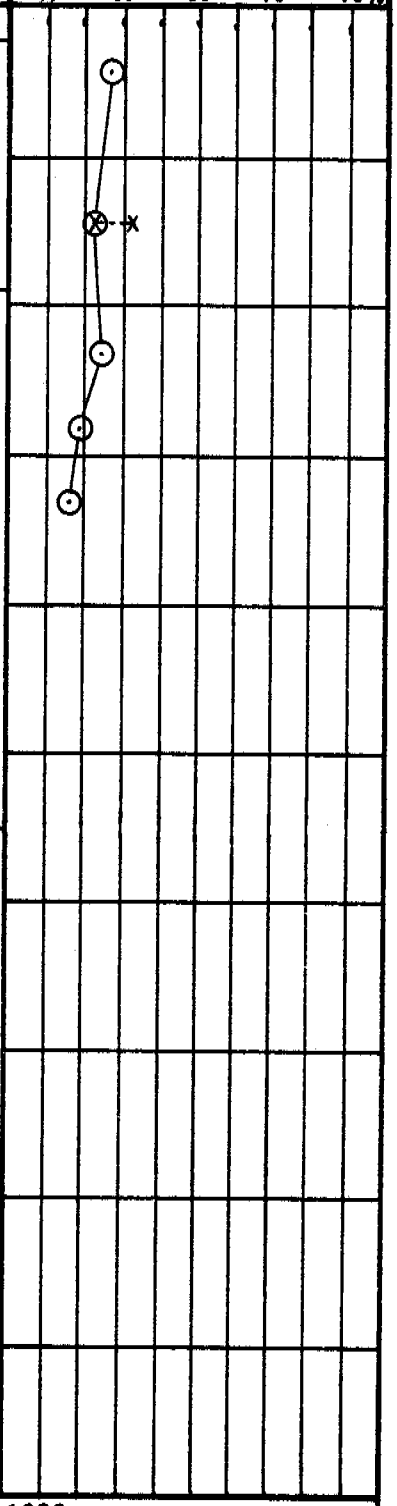
END OF HOLE

Notes:

1. Hole located on a sloping hillside. Terrain slopes 5% easterly.
2. Dempster Highway located approx. 200m east of site.
3. Vegetation consists of grasses with occasional clump of bushes.
4. Drainage is good.
5. Hole augered to 0.7m, then cored to 2.0m and then drilled with air to 5.5m.
6. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

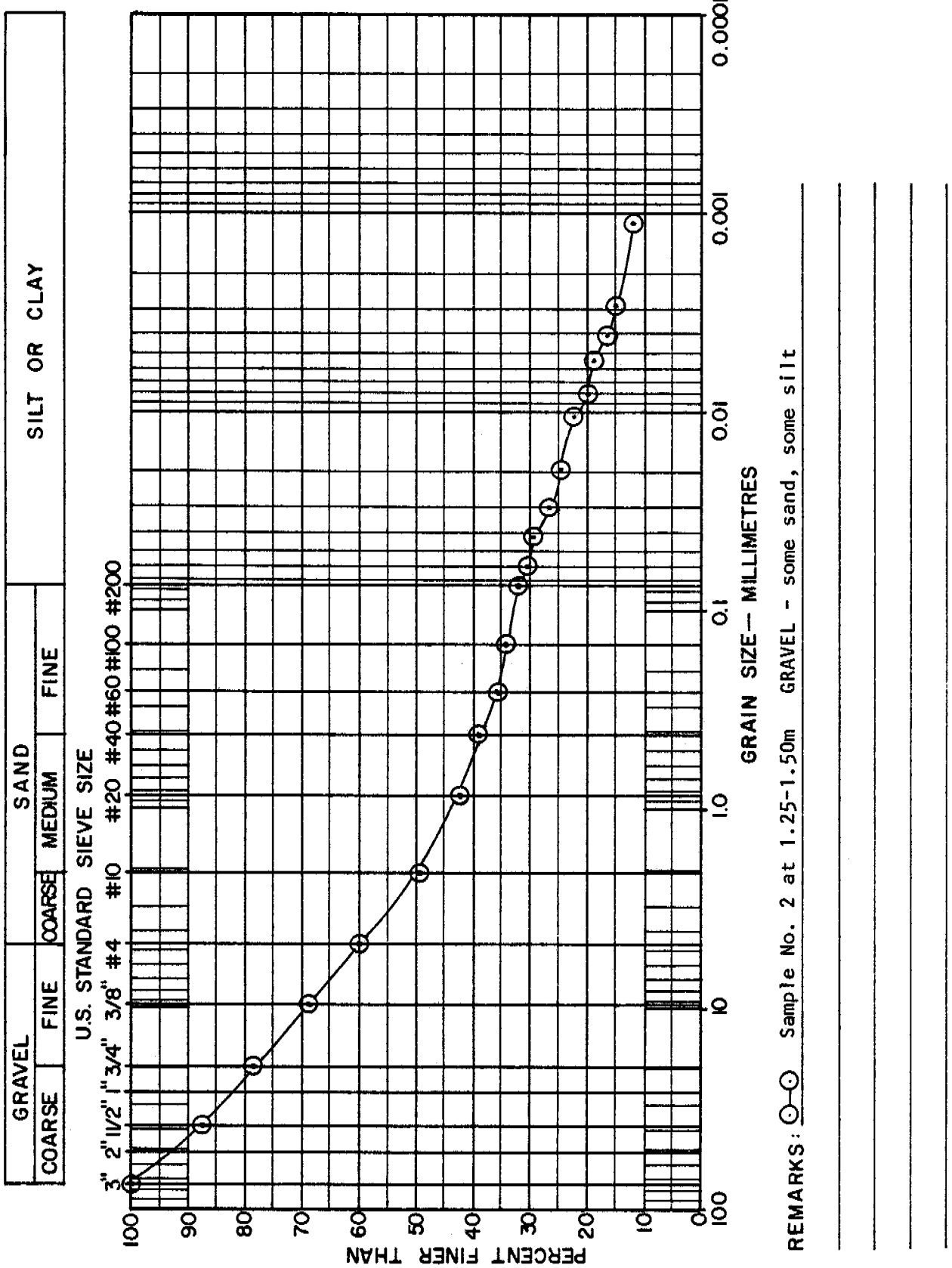


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-177
DATE	Aug.10/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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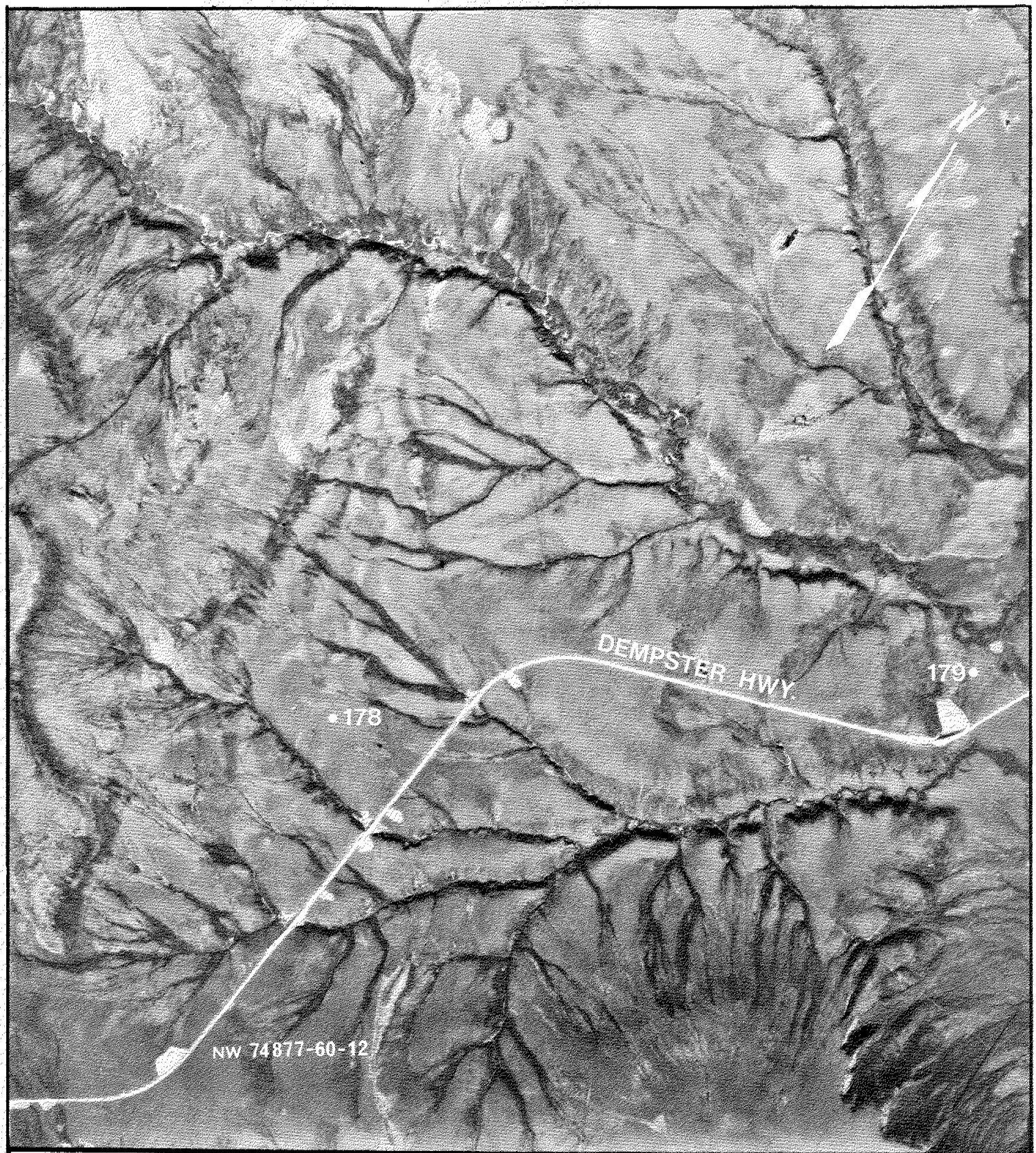
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-177 DEPTH
DATE	Oct.3/78



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-178

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	B		1
1	C		2
	C		3
2			
	C		4
	B		5
3	C		6
	B		7
4			
	B		8
5	B		9
	B		10
6			
	B		11
7			
	B		12
8			
	B		13
9			
	B		14
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vr Vs	
ICE +	
Nbe Vr	
ICE +	
Vx Vs Nbe	
ICE +	
Nbe Vx	
ICE+	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.35m PEAT - dark brown

ORGANIC SILT AND CLAY
- little to some sand
- trace gravel
- low plasticity
- peat inclusions
- greyish brown

1.70m

CLAY AND SILT
- little sand, coarse to fine
- little gravel
- medium plasticity
- organic pockets
- greyish brown
- ice crystals 1mm-3mm spaced @ 3mm-7mm

← cobbles

3.10m

ICE + SILT & CLAY
- trace cobbles below 14.0m

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

246%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-178
DATE	Aug.11/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
11	B		15
12	B		16
13	B		17
14	B		18
15	B		19
16	B		20
17			
18	B		21
19	B		22
20			

SYMBOL

PERMAFROST

N.R.C. CLASS: ICE+

N.F. or F.

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

As above

(Cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-178
DATE Aug.11/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
21	B		23		ICE+		As above
22							
23	B		24				23.00m
24	B		25		N		BEDROCK - hard drill action
25							25.00m
26							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

Notes:

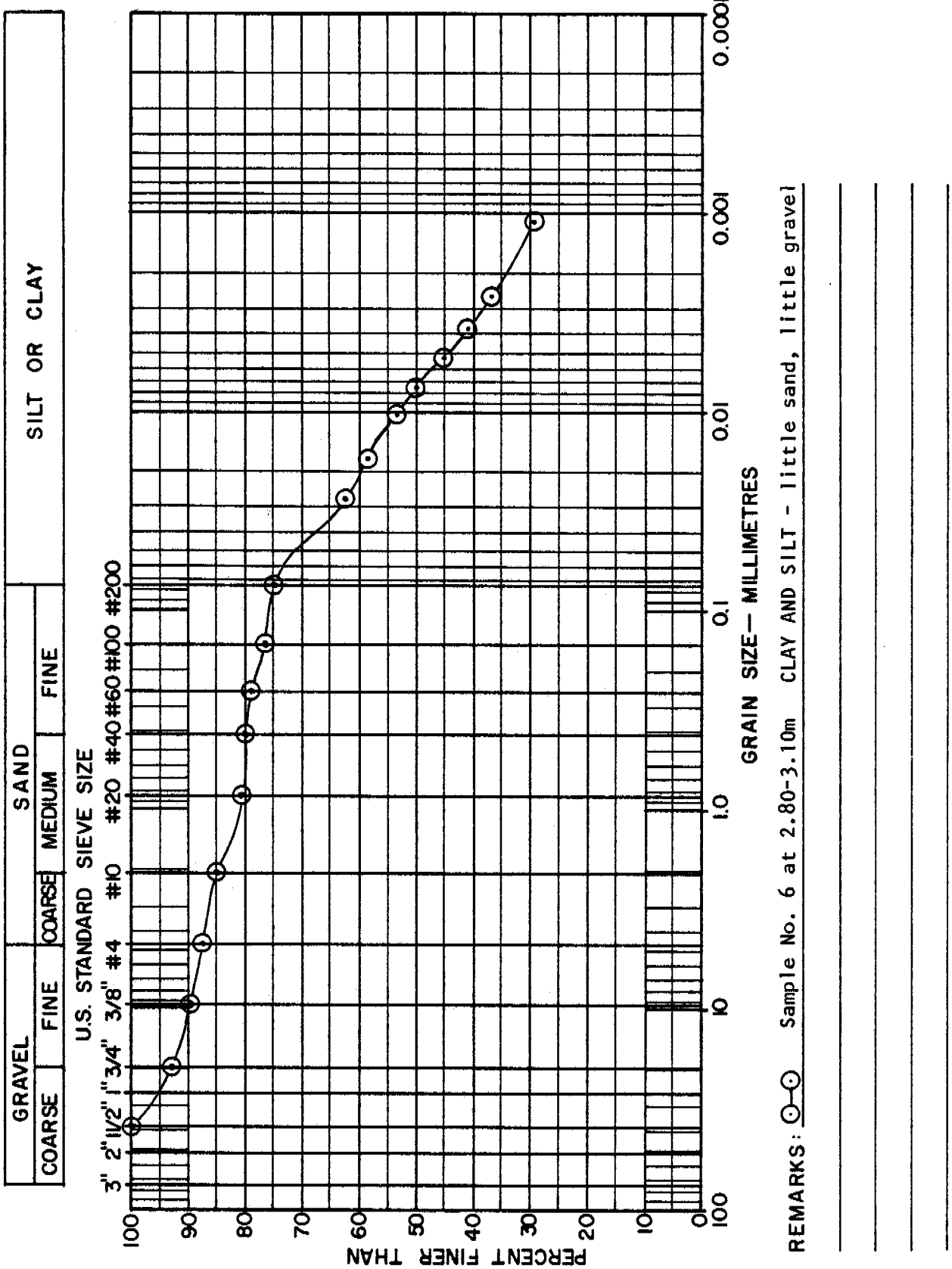
1. Hole located on a broad plain. Ground sloping (1-2%) south-easterly.
2. Vegetation is exclusively grasses.
3. Moderately well drained.
4. Peat tussocks cover land surface.
5. Hole augered to 0.4m, then cored to 3.1m and then drilled with air to 25m.
6. Sample No. 25 not recovered.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-178
DATE Aug.11/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-178	DEPTH
DATE Oct.3/78	434

FROZEN BULK DENSITY TEST RESULTS

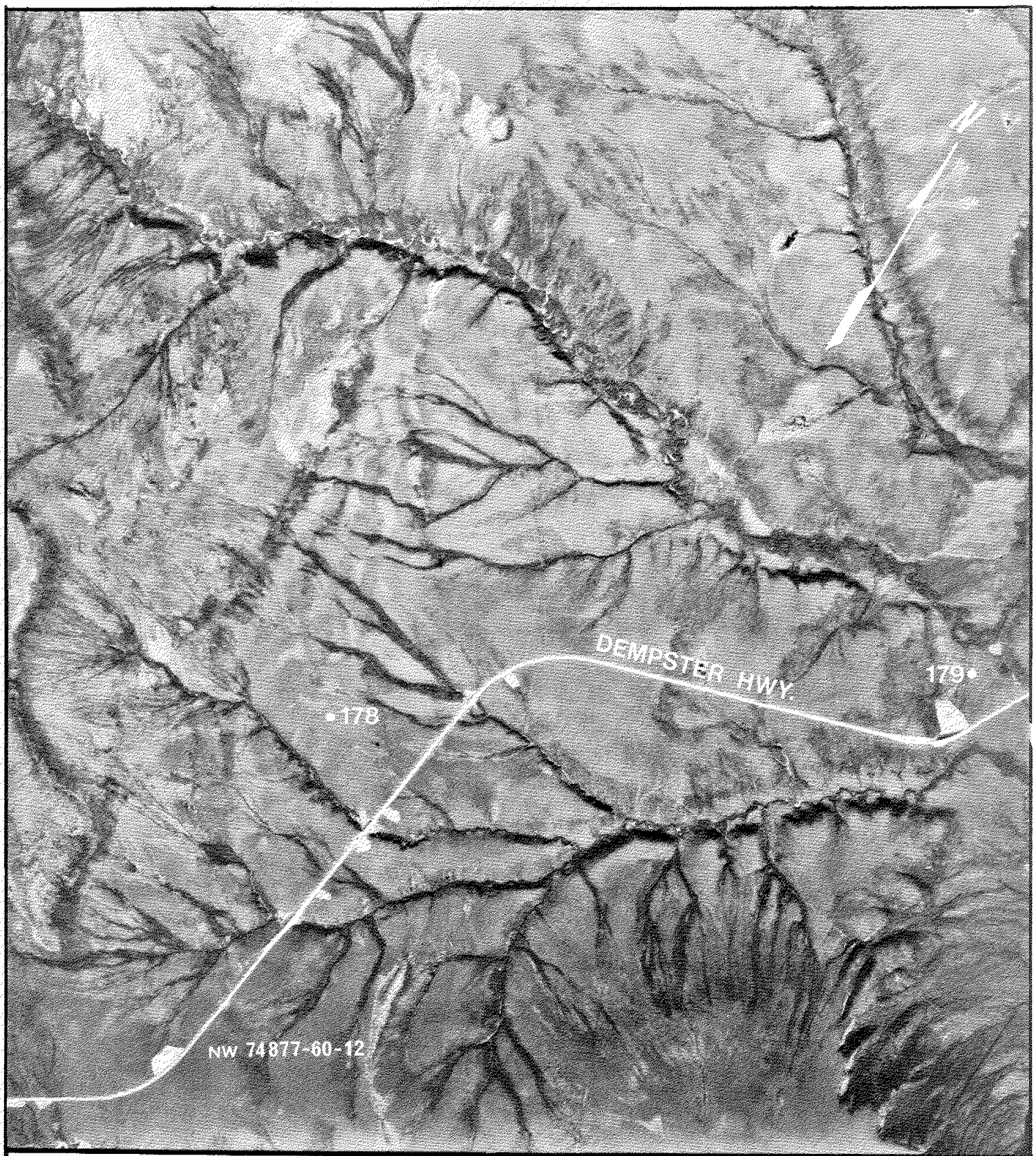
TEST HOLE NO. 78-178

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.65 - 1.00	1027.6	64.1

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-179

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	0.50 - 0.80	1166.6	72.8
6	2.70 - 3.00	1684.6	105.1
7	3.30 - 3.60	1629.4	101.7
9	4.50 - 4.75	1352.5	84.4
13	7.25 - 7.50	1156.2	72.2
16	9.50 - 9.80	1765.5	110.2



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-179

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B		1			NF	0.25m PEAT - dark brown
	B		2				
	C		3		Nbe		ORGANIC SILT AND CLAY - trace fine sand - trace fine gravel - low plasticity - peat layers - ice lenses 1/4mm-3mm spaced @ 1mm-15mm - ice crystals 2mm-8mm
	C		4		Vr		
1	C		5		Vx		
					Vs		
2	C		6				2.00m spaced @ 3mm-15mm
					Nbe		SILT - some sand - fine to medium - slight plasticity - organic & peat laminations - greyish brown - ice lenses 1/2mm-2mm spaced @ 3mm-8mm
3	C		7		Vs		
					Vr		
	C		8				3.60m
4					Nbe		4.00m GRAVEL - some sand - coarse to fine - little silt - rusty greyish brown
	C		9		Nbe		
					Vs		
	C		10				ORGANIC SILT AND PEAT & SAND - stratified - greyish brown with rusty zones - ice lenses 1/4mm-1mm spaced @ 1mm-15mm
5							5.20m
	C		11		Nbn		
6					Vs		
					Vx		SILT AND CLAY - trace fine sand - slight to low plasticity - rusty laminations - organic inclusions - grey - ice lenses 1mm-8mm spaced @ 10mm
	C		12		Vr		
7	C		13				
	C		14		Nbe		7.25m 7.50m PEAT - dark brown
8							
					Vs		SILT & CLAY - laminated - grey
	C		15		Vr		
					Nbe		
9	C		16				←ICE+ (60mm layer)
							←ICE+ (40mm layer)
	C		17				
10							10.00m (Cont'd.)

PERMAFROST
LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

464%
180%
151%
138%
303%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-179
DATE	Aug.11/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

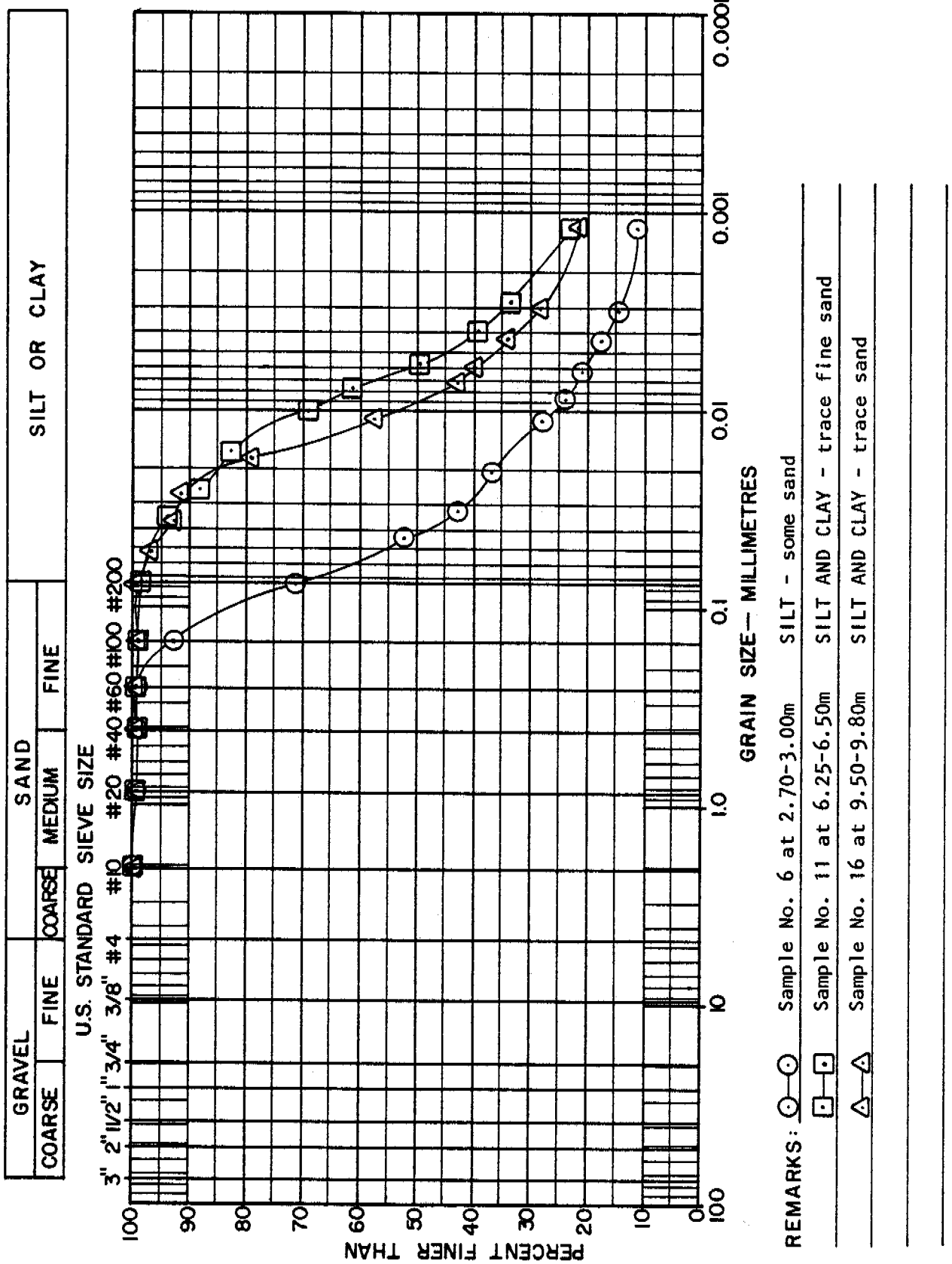
SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8
							ELEVATION	● ORGANIC CONTENT % ■ UNCONF.
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT; X — 0 — X; 10 30 50 70 90%
11	C		17		Vs Vr Nbe		SILT AND CLAY - trace to little sand - slight to low plasticity - laminated - organic inclusions - grey - ice layers 20mm-30mm spaced @ 100mm-150mm from 8.5mm-11.0m - ice layers 50mm thick from 11.0-11.3m - sample not recovered from 11.5 to 14.7m	
	C		18					
12								
	B		19					
13								
14								
		42					14.70m	
15	SPT	65 67	20		Vr Vs		SILT-organic laminations - ice lenses 1mm-3mm 15.15m	
							END OF HOLE	
16							Notes: 1. Hole located in centre of a broad east-west trending flat bottomed valley. 2. Dempster Highway located approx. 150m east of site. 3. Vegetation consists exclusively of grasses. 4. Poor surface drainage. 5. Hole augered to 0.25m, then cored to 11.5m and then drilled with air to 15.15m.	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-179
DATE	Aug.11/78 PLATE

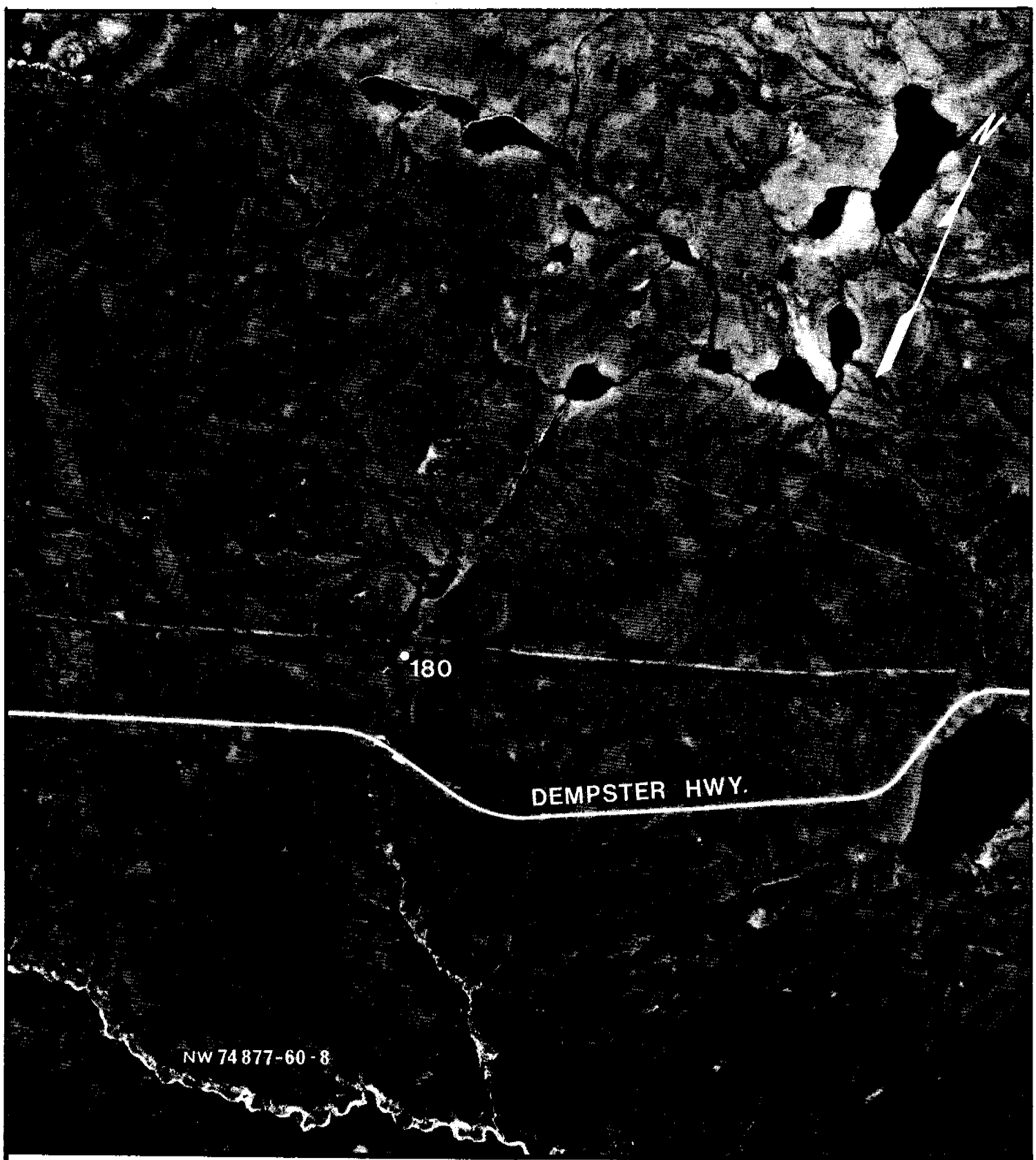
K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-179 DEPTH
DATE	Oct.6/78



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-180

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.25m ORGANIC COVER
	B		1				
	C		2		Vr Vs Vx		ORGANIC SILT - trace fine sand - slight plasticity - peat layers - brownish grey - ice lenses 1/4mm-14mm spaced @ 1mm-15mm
1					ICE +		
	C		3		Vr		
					Vs		
	C		4				
2							
	C		5				
	C		6				
3							3.00m
					Nbe		CLAY AND SILT - little gravel - little fine to coarse sand - trace cobbles & boulders - low to medium plasticity - laminated - grey with rusty zones - ice lenses 1/2mm-8mm spaced @ 3mm-20mm
	C		7		Vr		gravel layer mostly comprised of siltstone
4					Vs		
	C		8				
	C		9				peat layer
5	C		10				wood chips
	C		11				
6	C		12				
	C		13				
							6.45m
7							END OF HOLE

Notes:

1. Hole located on an undulating ground surface sloping 2% westerly.
2. Vegetation consists of grasses with occasional stunted conifer to 5m tall.
3. Surface covered with peat tussocks.
4. Moderate to poor drainage.
5. Augered to 0.3m, then cored to 6.45m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

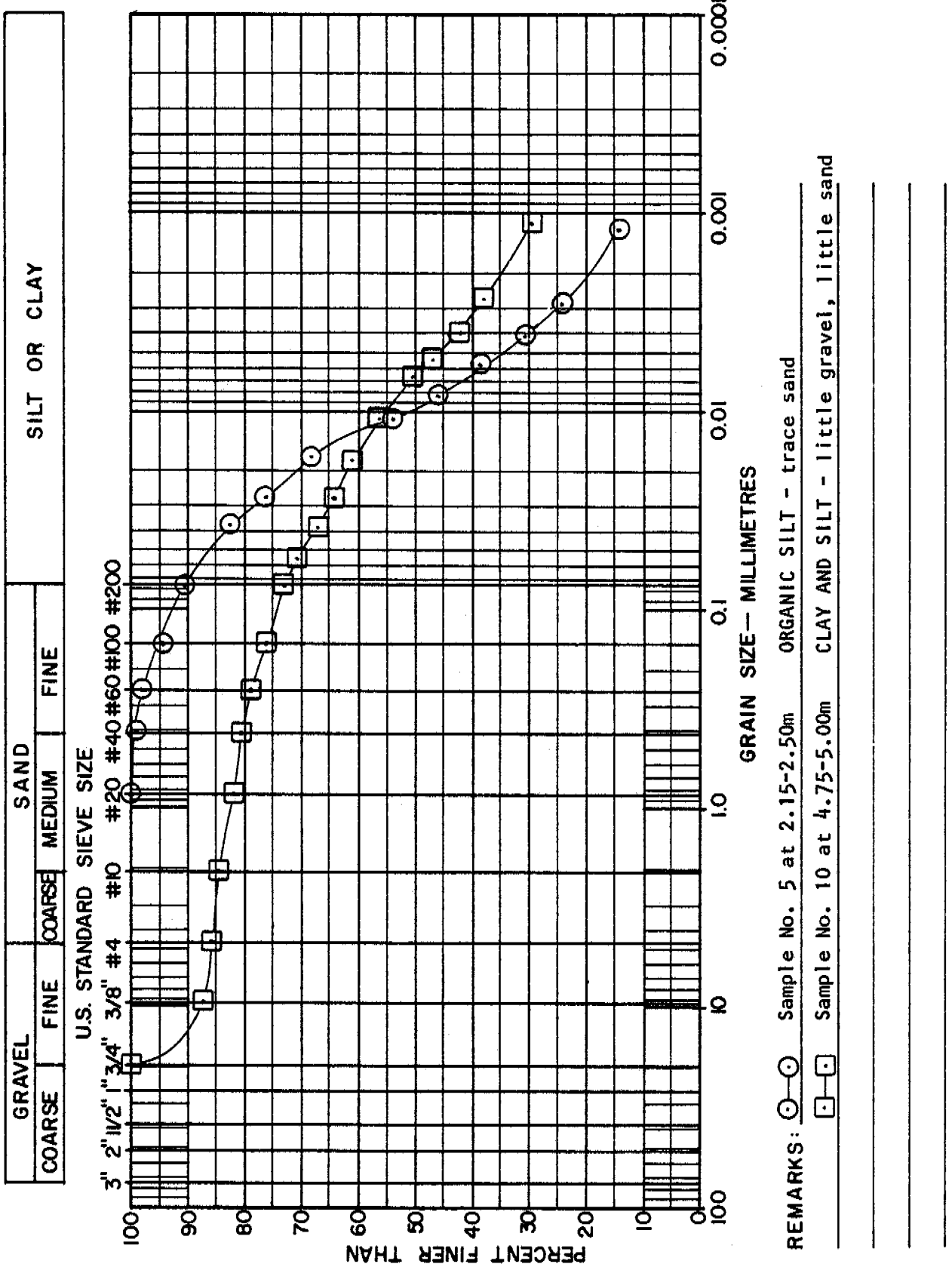
126%
166%
132%
190%
118%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-180
DATE Aug.11/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



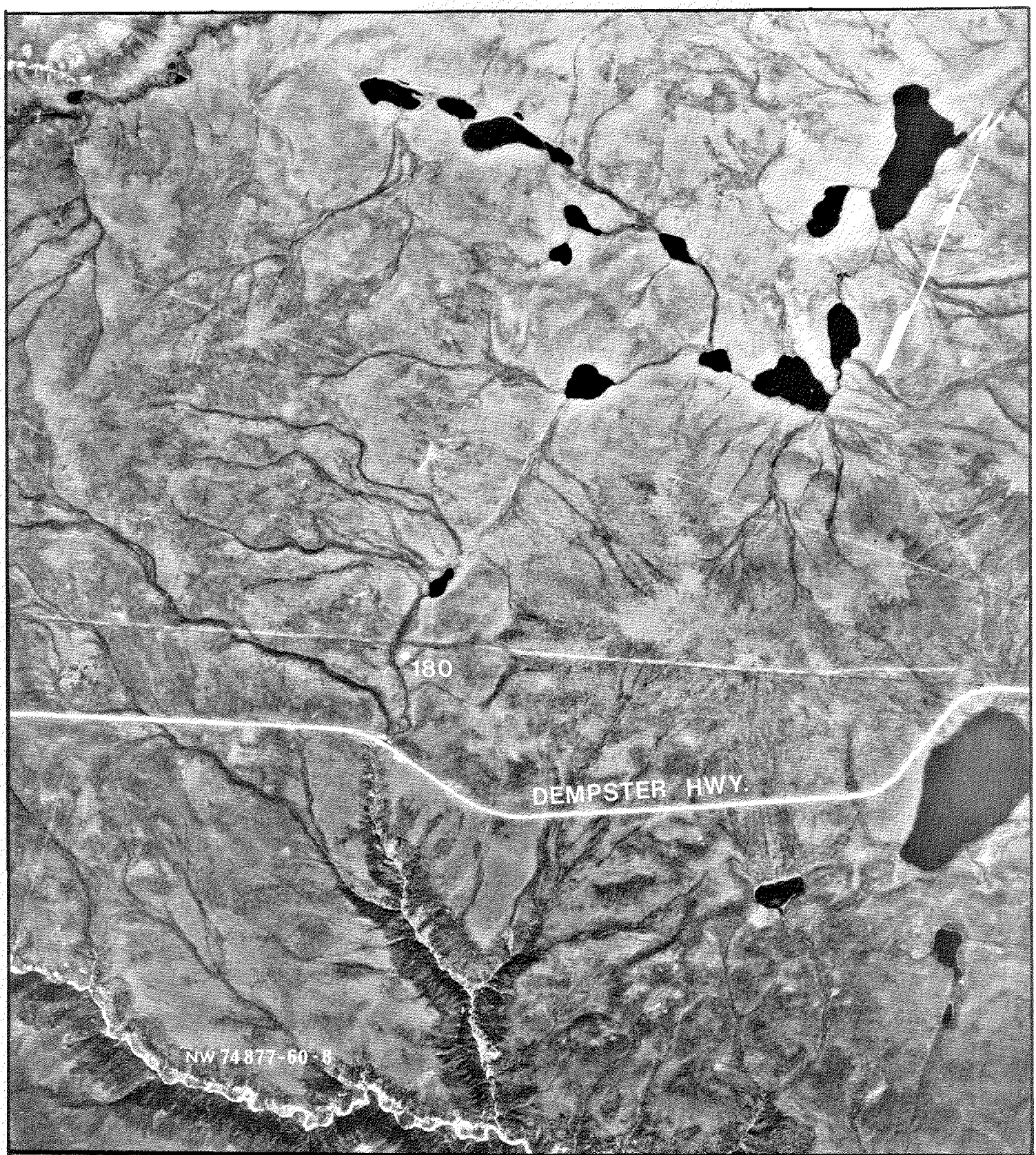
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-180 DEPTH
DATE	Oct.10/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-180

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
13	6.00 - 6.30	2061.6	128.6



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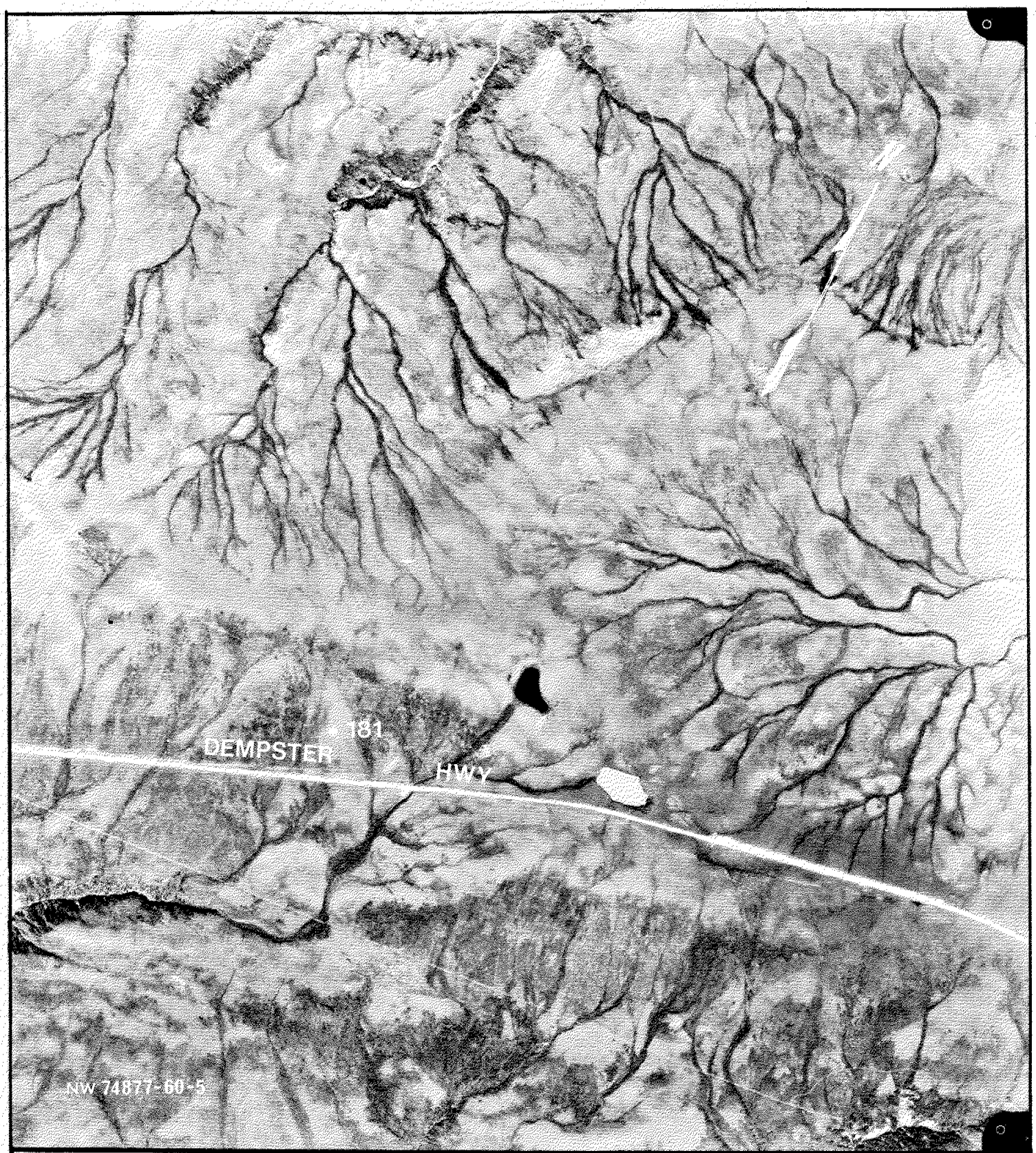
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-180

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			



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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-181

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	B		1
	B		2
1	C		3
	C		4
	C		5
2	C		6
3	C		7
	C		8
4	C		9
	C		10
5	C		11
6			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.7M
Nbe Vs Vr Vx	
ICE+ Nbe Vr Vs	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

← ICE+(40mm thick)

CLAY AND SILT
- some gravel
- little sand
- trace sand & gravel below 3.0m
- low to medium plasticity
- greyish brown with rusty zones
- ice lenses 1/4mm-2mm spaced @ 1mm-20mm
- longitudinal ice lenses 7mm-12mm thick from 3.7 to 4.7m

peat layer

← organic inclusions

← ice lens 20mm spaced @ 20mm

5.00m

END OF HOLE

Notes:

1. Hole located on a broad plain sloping 3-5% easterly.
2. Dempster Highway located approx. 250m east.
3. Vegetation mainly consists of grasses with occasional low bushes and conifers.
4. Ground surface irregular with small frost mounds to 1m high.
5. Drainage is poor.
6. Hole augered to 0.7m, then cored to 5.0m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

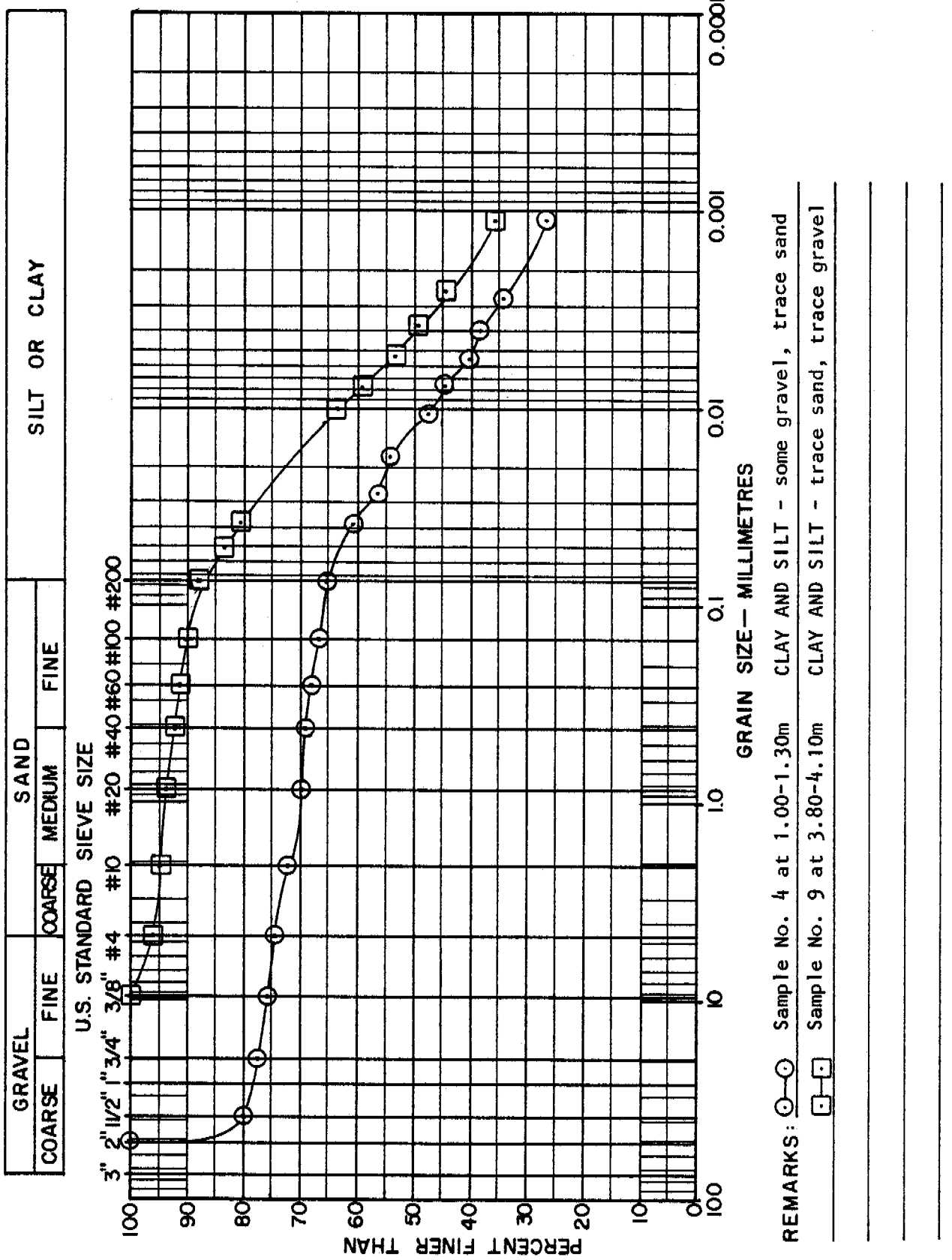
170%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-181
DATE	Aug.12/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-181	DEPTH
DATE Oct.3/78	447

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-181

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
6	1.80 - 2.00	1948.4	121.6
8	3.10 - 3.40	1940.0	121.1

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CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-182

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.20m ORGANIC COVER
	B		1			0.5M	ORGANIC SILT & CLAY - trace fine sand - slight to low plasticity - dark brown
	C		2		ICE+		0.80m
1							
	C		3		Vs		CLAY AND SILT - little to some sand - trace gravel - low to medium plasticity - brownish grey - ice lenses 1/4mm-6mm spaced @ 1mm-10mm
	C		4		Vx		
	C		5		Nbe		1.80m
2							
	C		6		ICE		2.30m ICE
	C		7		ICE+		2.80m ICE & SILT & CLAY
3							ICE+ (30mm layer)
	C		8				
	C		9		Vx		CLAY AND SILT - trace sand - fine to coarse - trace gravel - low to medium plasticity - grey - ice lenses 1mm-12mm spaced @ 1mm-15mm
	C		10		Vr		
4					Nbe		
	C		11				
5							
6	C		12				
	C		13				
7							
	C		14				
8	C		15				
9					ICE+		
	C		16		Vx Vr Nbe		
10	C		17				

(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

310%
107%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-182
DATE	Aug. 12/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	C		18				As above
					ICE+		10.75m
11	C		19		Vx		GRAVEL - some sand, coarse to fine - little silt and clay - grey
					Vr		11.50m - ice lenses 2mm-4mm spaced @ 10mm-20mm
12							ICE & SILT & CLAY
13					ICE+		
							13.80m
14	C		20		Vr		14.00m SILT AND CLAY - little sand - fine - slight to low plasticity - coal specks - grey - ice lenses 1/4mm-3mm spaced @ 3mm-15mm
15							END OF HOLE

LOCATION
ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Notes:

1. Hole located on crest of S.W. sloping hillside, at head of landslide.
2. Surface at site slopes 2% S.W. while hillside to the S.W. ascends 30%.
3. Vegetation mainly consists of grasses with low bushes and conifers to 2m tall.
4. Moderate to fair drainage.
5. Surface is undulating with local relief of 0.5m.
6. Hole augered to 0.5m, then cored to 14.0m.
7. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0 and 8.0m.

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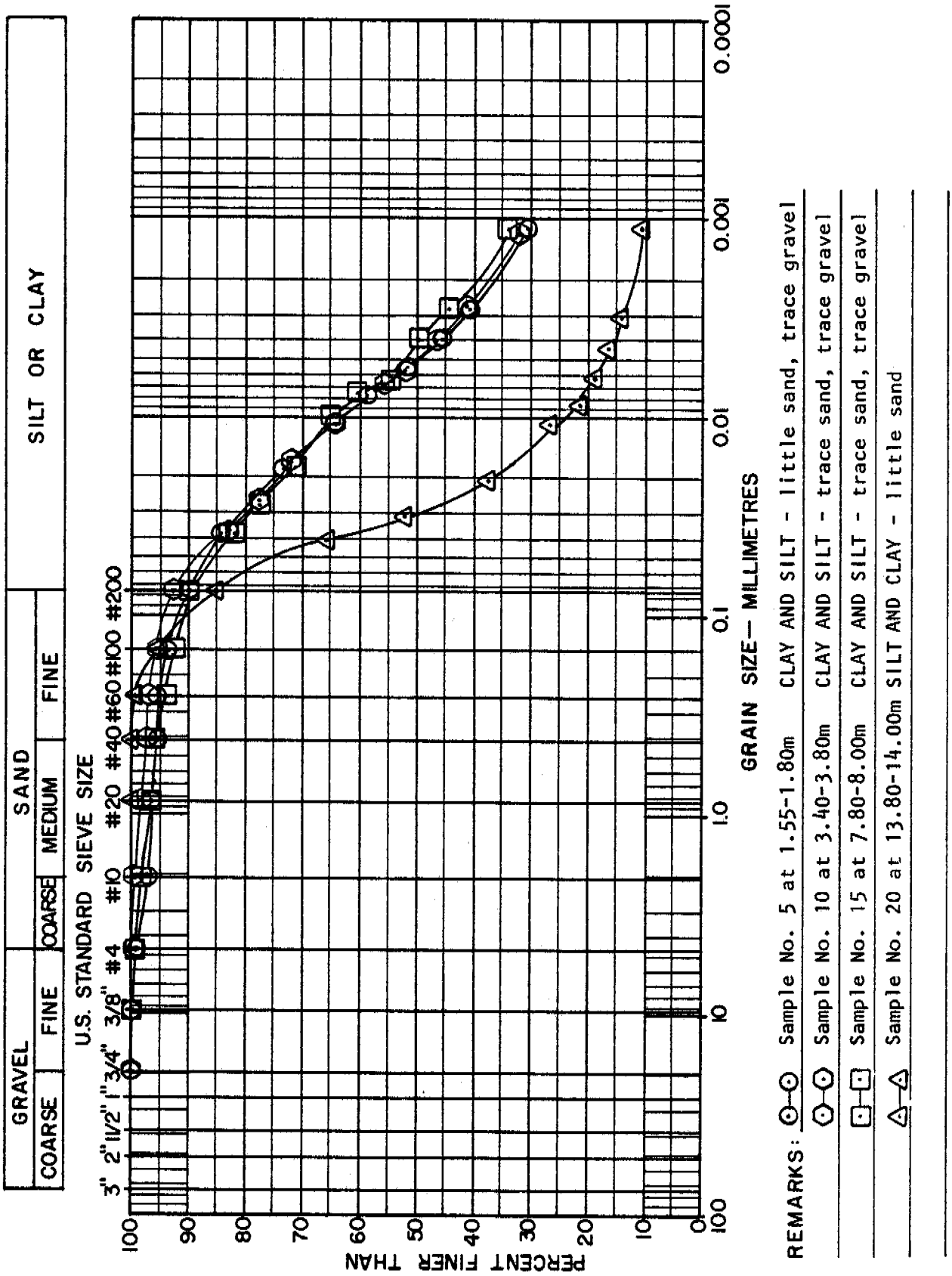
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-182
DATE	Aug. 12/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-182 DEPTH
DATE	Oct.3/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-182

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.50 - 0.80	1080.1	67.4
4	1.20 - 1.40	1744.5	110.1
7	2.30 - 2.60	1417.2	88.4
10	3.40 - 3.80	1425.1	88.9

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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-183

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.
	B		
	B		1
1	C		2
2	C		3
3	C		4
4			
5	C		5
6			
7			

SYMBOL | PERMAFROST: N.R.C. CLASS | N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
		NF	0.10m ORGANIC COVER
			0.35m PEAT - dark brown
1–3	Nbe, Vx, Vs, Vr		CLAY AND SILT - little fine to coarse sand - trace fine gravel - low to medium plasticity - organic pockets - grey with rusty zones - ice lenses 1mm-7mm spaced @ 2mm-15mm
			2.90m
4	ICE		ICE
			4.50m
5	Nbe		4.60m SAND - some gravel - little silt - brown
5	ICE+		4.80m ICE + SILT & CLAY
6	ICE		ICE
			6.00m
7			END OF HOLE

Notes:

1. Hole located on a rounded area with a north draining valley located 100m east and another valley 100m west of the site.
2. Surface slopes gently towards north, east and west from the site.
3. Vegetation consists of occasional conifer to 4m tall.
4. Good drainage.
5. Hole augered to 0.35m, then cored to 6.0m.

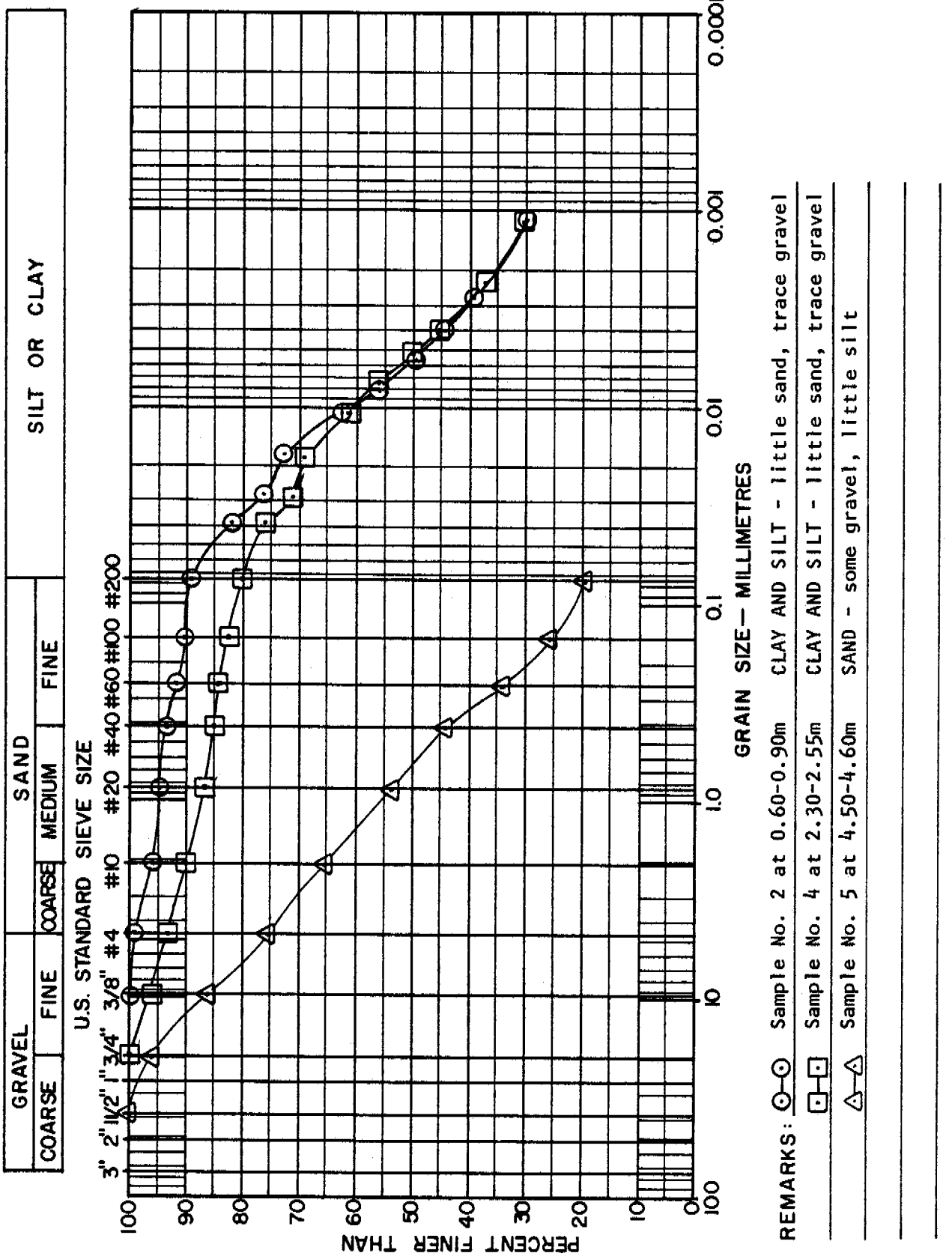
212%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-183
DATE	Aug.13/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



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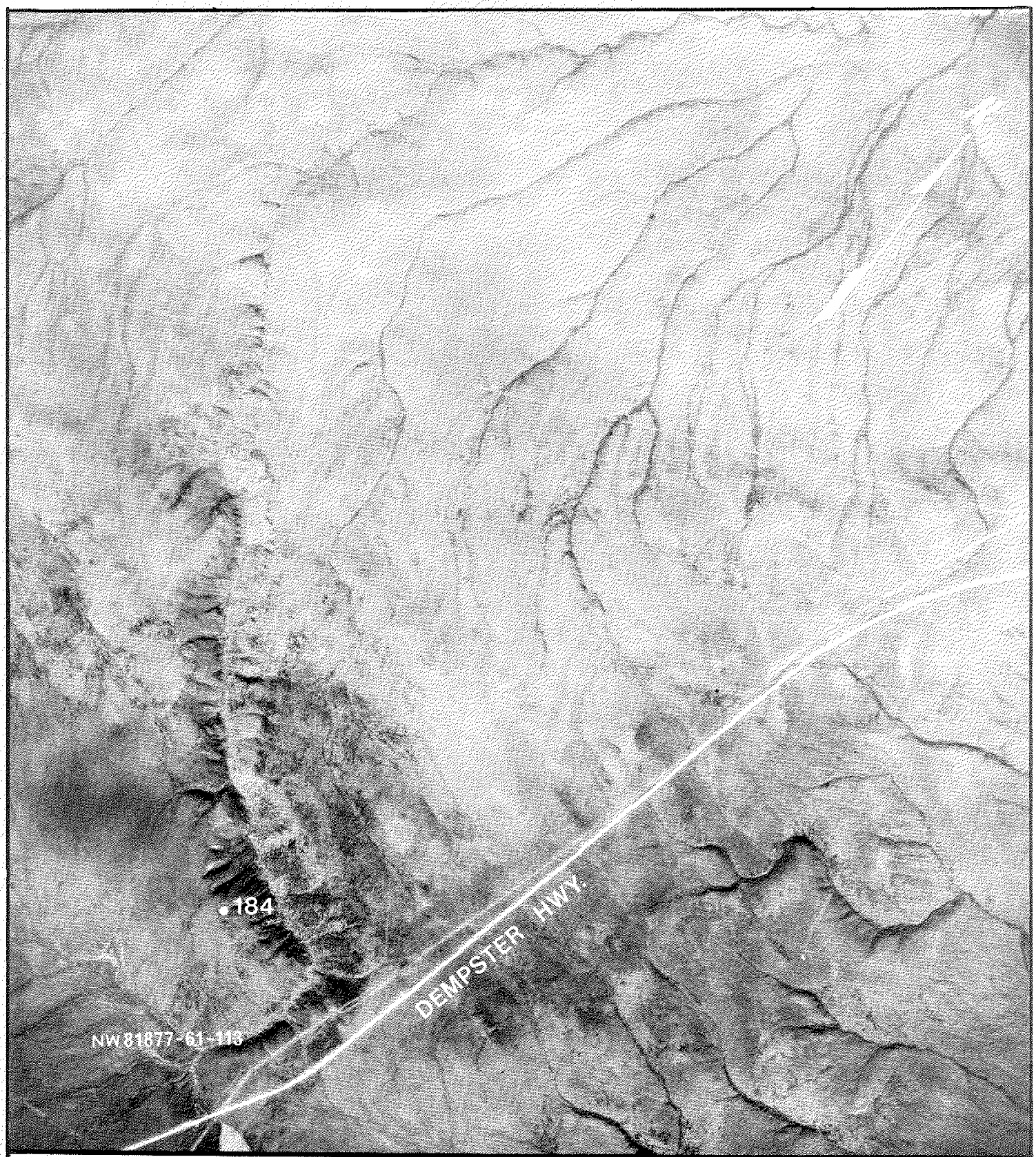
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-183	DEPTH
DATE Oct.4/78	

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-183

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.60 - 2.00	1730.2	108.0



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VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-184

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.25m PEAT - dark brown
	B				ICE		0.35m ICE
1					Vr		PEAT AND ORGANIC SILT - dark brown
							1.00m cobbles
	C		2		Nbn		ICE+ (40mm layer)
	C		3		Vs		CLAY AND SILT - some gravel - little coarse to fine sand - low to medium plasticity - organic inclusions - gravel mostly comprised of siltstone - brown with rusty specks - ice lenses 1/4mm-6mm spaced @ 3/4mm-8mm
2					Vx		2.00m
	C		4		Nbe		SHALE - SILTSTONE - low plasticity - laminated - weathered in upper 3.0m - calcareous inclusions below 5.0m - grey - ice lenses 1/2mm-8mm spaced @ 2mm-20mm
	C		5		Vr		
3	C		6		Vs		
	C		7				
4	C		8				
	C		9				
5							
	C		10				
6							
	C		11				
	C		12				6.45m
7							END OF HOLE

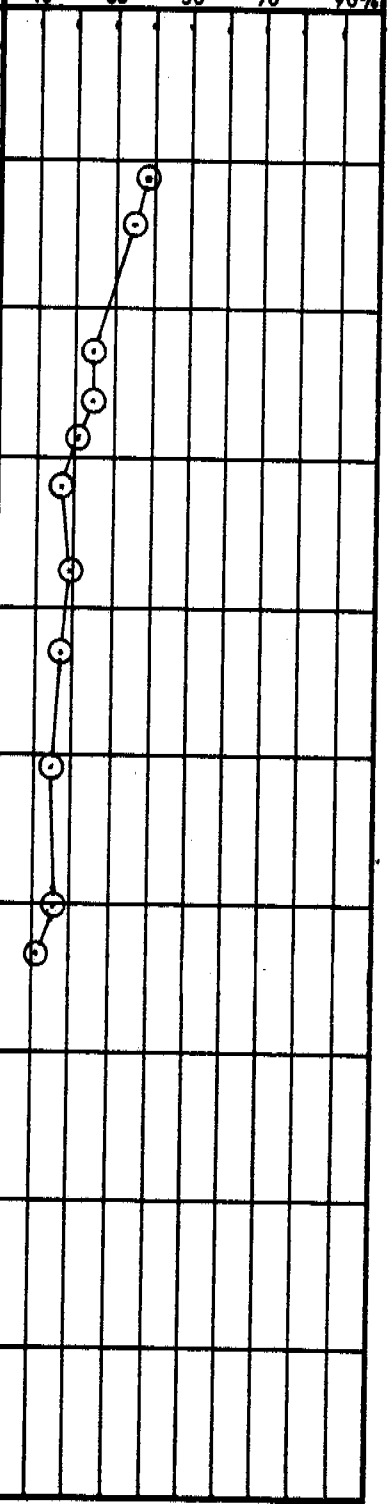
Notes:

1. Hole located on a broad plain sloping 2% easterly.
2. Vegetation mainly consists of grasses & low shrubs with occasional conifer to 4m tall.
3. Peat tussocks cover the surface.
4. Poorly drained.
5. Hole augered to 0.3m, then cored to 6.45m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

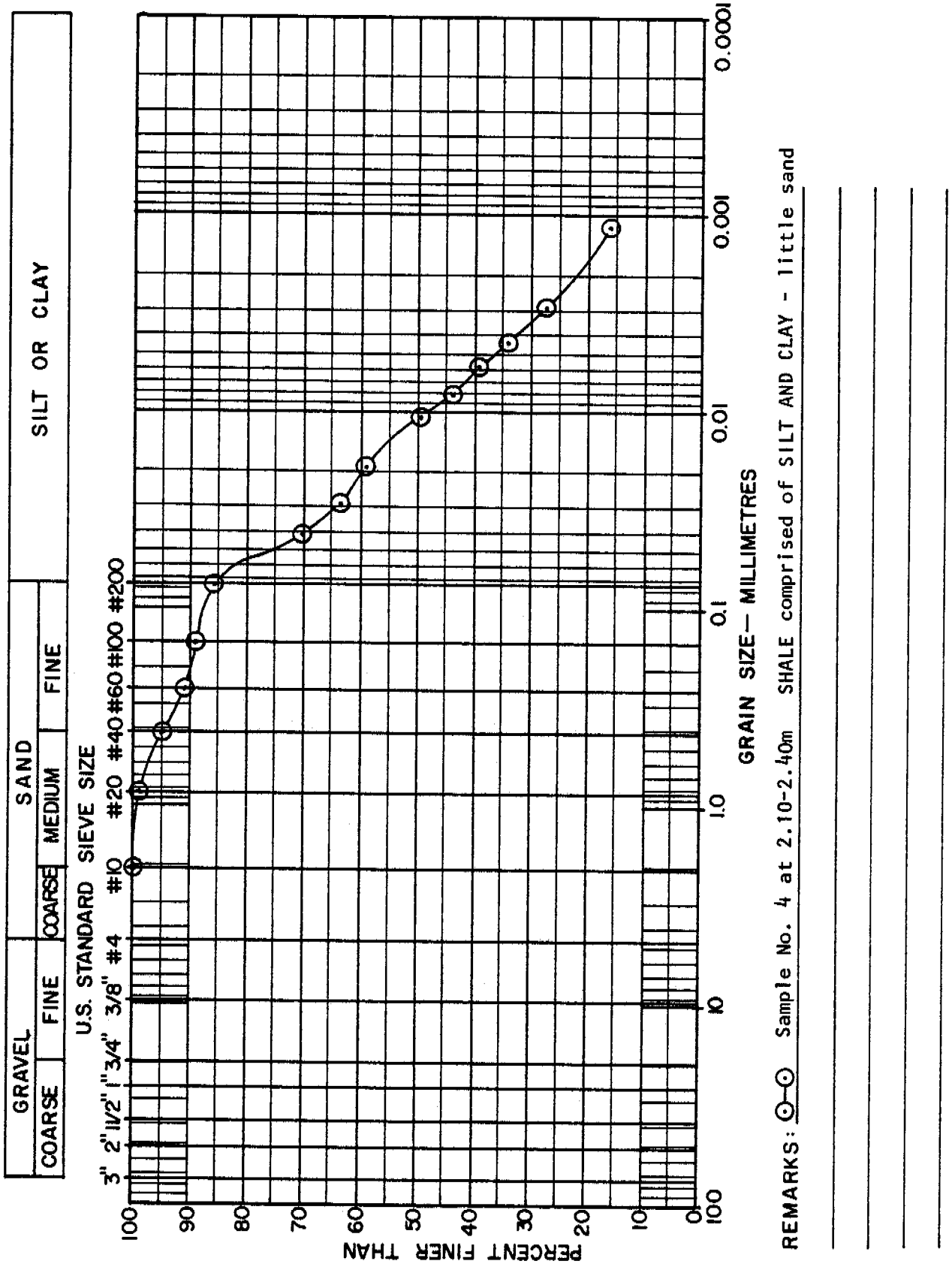


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-184
DATE	Aug.13/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-184 DEPTH
DATE	Oct. 4/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-184

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.20 - 1.55	1734.9	108.3
4	2.10 - 2.40	1914.5	119.5
6	2.70 - 2.95	2053.6	128.2
9	4.15 - 4.50	2082.1	129.9

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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-185

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		
	B		1
1	C		2
	C		3
2	C		4
	C		5
3	C		6
	C		7
	C		8
4	C		9
	C		10
5	C		11
	C		12
6	C		13
	C		14
	C		15
7	C		16
	C		17
8	C		18
	C		19
9	C		20
	C		21
10	B		22

SYMBOL

PERMAFROST

N.R.C. CLASS | N.F. or F.

LOCATION Peel River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
		NF	0.10m ORGANIC COVER
		0.5M	ORGANIC SILT AND CLAY - trace fine sand - low to medium plasticity - peat laminations - brown with rusty zones - ice lenses 1mm-7mm spaced @ 1mm-10mm
	Vx Vr Vs		
1.20m			
	Vs Vr Vx Nbe		CLAY AND SILT - trace to little gravel to 6.0m, some gravel below - little sand, fine to coarse - trace cobbles & boulders - low to medium plasticity - greyish brown with rusty zones - extensive lenses 1mm-18mm spaced @ 1mm-20mm to a depth of 5.0m - below 5.0m, ice lenses 1/4mm-10mm spaced @ 3mm-45mm (TILL)
6.55m			
	ICE+		ICE & CLAY & SILT
7.30m			
	Nbe Vr Vs		CLAY AND SILT - as above ← ICE+ (20mm layer) - ice lenses 1mm-10mm spaced @ 1mm-60mm ← cobbles

(Cont'd.)

158%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-185
DATE	Aug. 14/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

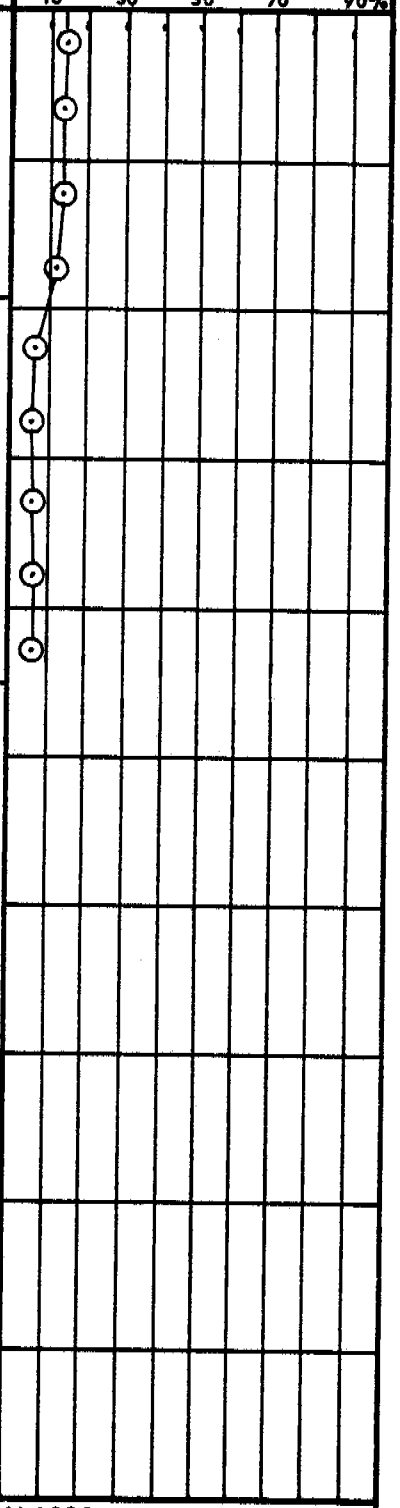
DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B		23		Vr		As above
11	B		24		Vs		
	B		25				
12	B		26				11.90m
	B		27		Nbn		SHALE - SILTSTONE - low to medium plasticity - grey
13	B		28		Vr		
	B		29		Vs		
14	B		30				
	B		31				14.5m
15							END OF HOLE

LOCATION
ELEVATION

Notes:

1. Hole located 30m south of south bank of Peel River. Terrain slopes 2% easterly.
2. Vegetation comprised of shrubs and bushes 2-3m tall and birch to 10m tall along river bank.
3. Moderate to poor drainage.
4. Hole augered to 0.5m, cored to 9.3m and then drilled with air to 14.5m.
5. Thermistors installed to a depth of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0 and 8.0m.

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



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CIVIL & GEOTECHNICAL ENGINEERS

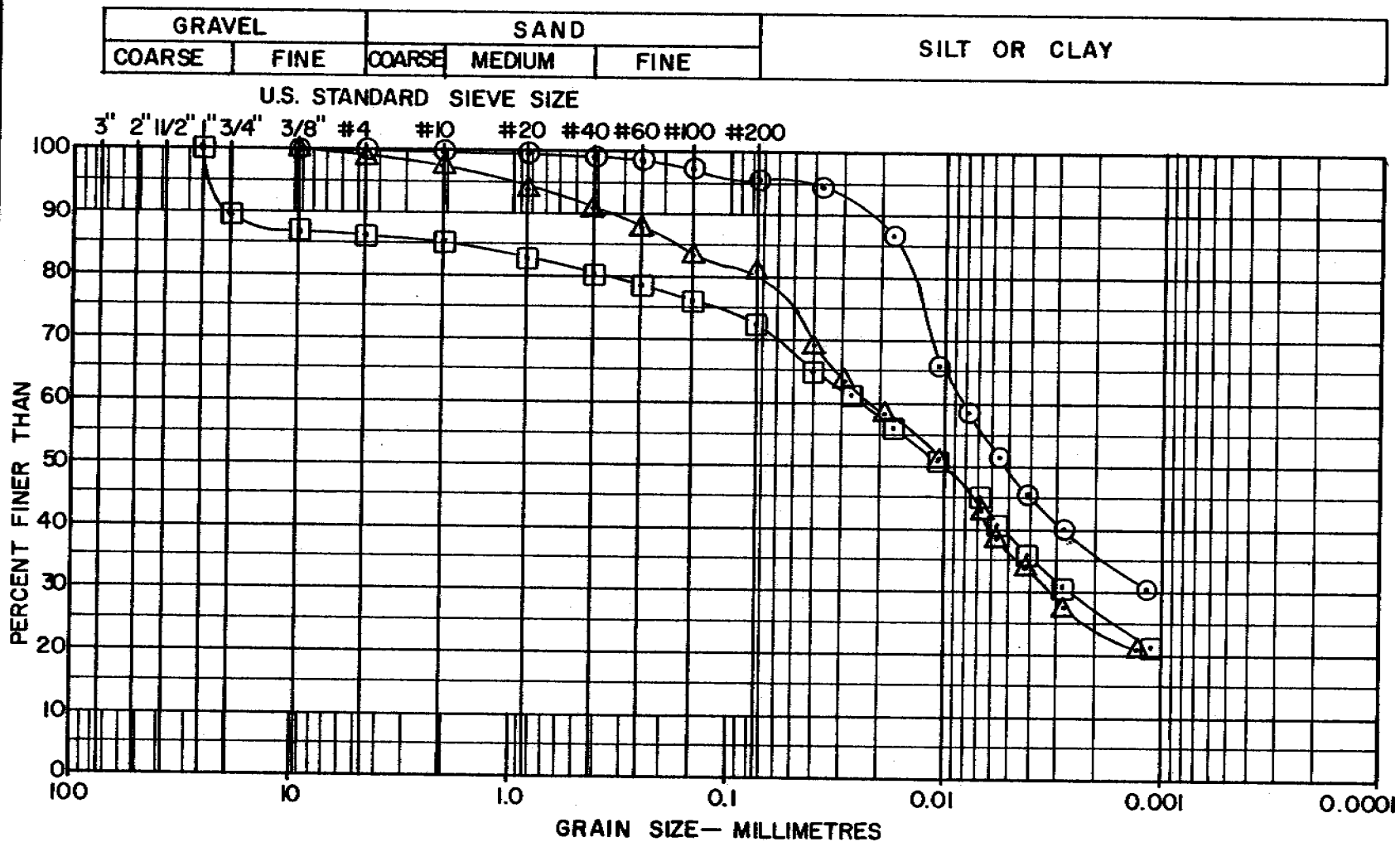
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-185
DATE	Aug. 14/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-185 DEPTH
DATE Oct. 10/78

GRAIN SIZE CURVE



REMARKS:
- Sample No. 2 at 0.50-1.00m ORGANIC SILT AND CLAY - trace sand
- Sample No. 5 at 2.15-2.35m SILT AND CLAY - little sand, little gravel
- Sample No. 13 at 5.70-6.10m SILT AND CLAY - little sand, trace gravel

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-185

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.50 - 1.00	1302.2	81.3
6	2.90 - 3.20	1872.5	116.9
9	3.60 - 3.90	1809.8	112.9
13	5.70 - 6.10	2011.6	125.5
18	7.55 - 8.05	2113.2	131.9
21	8.90 - 9.30	2235.0	139.5

KLOHN LEONOFF CONSULTANTS LTD. CIVIL • GEOTECHNICAL • HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-186			
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.	DATE OF ISSUE: OCTOBER 1978 APPROVED: A. L. EDGEWORTH	PROJECT No.: AL1023	AIRPHOTO SCALE: 1" = 2000' (approx)	REV.

TEST HOLE LOG

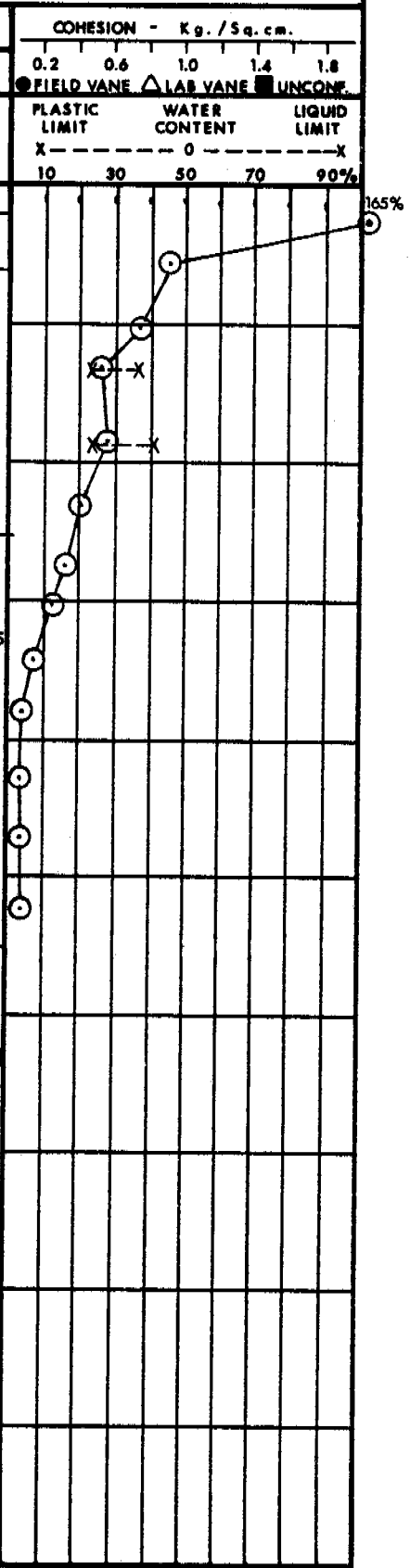
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.2m ORGANIC COVER
	B		1				0.3m ORGANIC SILT & CLAY - dark brown
	C		2		Vr		CLAY AND SILT - little to some sand - little gravel - low to medium plasticity - gravel comprised mostly of siltstone - rusty brown - ice lenses 1/4mm-5mm spaced @ 1mm-8mm
1	C		3		Vs		
	C		4		Nbe		
2	C		5				
	C		6				2.50m (TILL)
3	C		7				SHALE - concretions and interbeds of hard siltstone - low to medium plasticity - fractured - rusty brown - ice lenses 1/2mm-1mm spaced @ 5mm-10mm
	C		8				
	C		9		Vr		
4	B		10		Vs		
	B		11				
5	B		12				
	B		13				5.50m
6							END OF HOLE

LOCATION Peel River
ELEVATION

Notes:

1. Hole located on Peel River flood plain on a small peninsula surrounded by water on north, east and west.
2. Surface is flat, but irregular with frost mounds and peat tussocks.
3. Vegetation consists of shrubs and grasses with occasional conifers to 10m tall.
4. Poor drainage.
5. Hole augered to 0.3m, cored to 3.6m, then drilled with air to 5.5m.

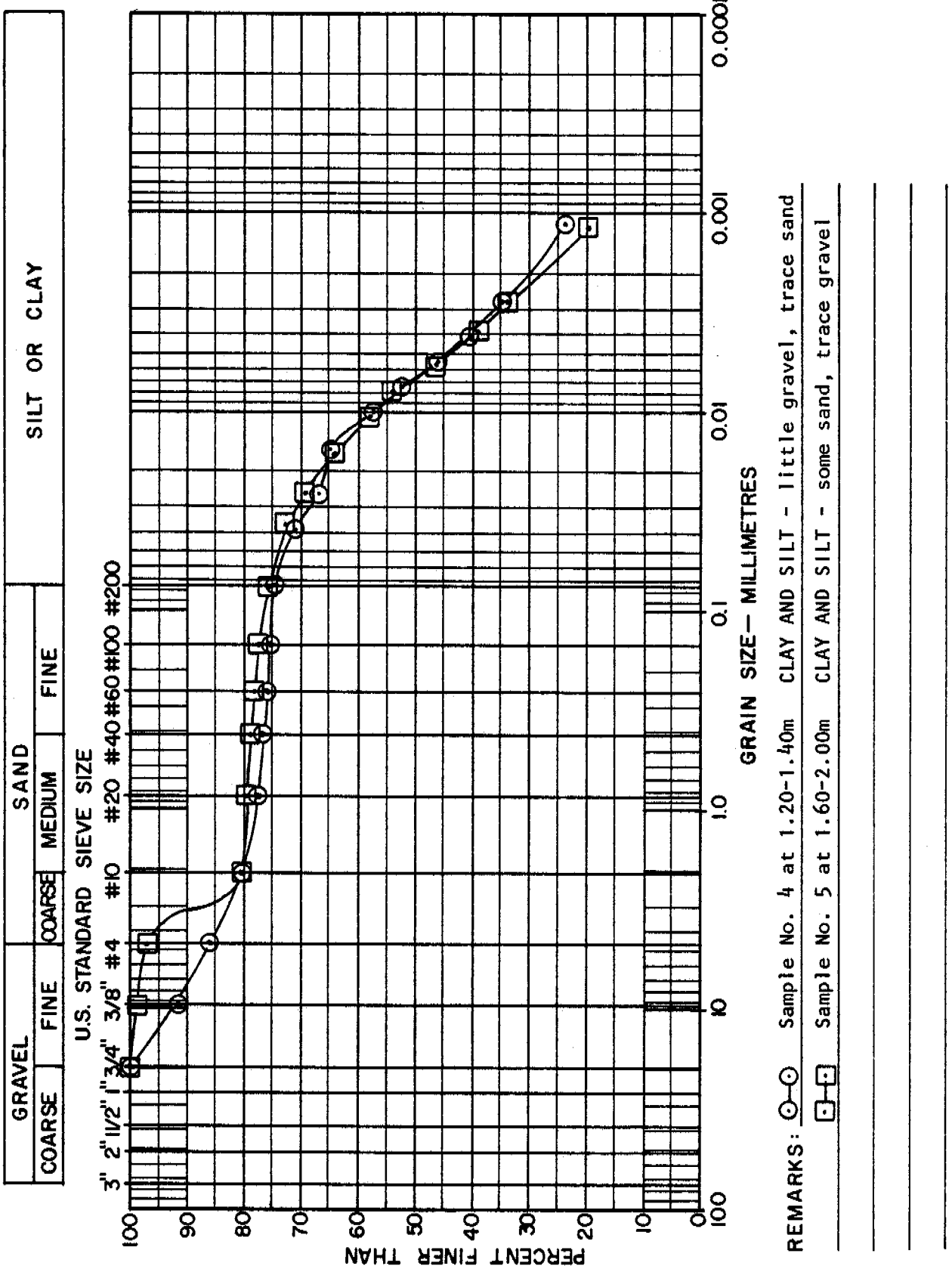


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-186
DATE Aug. 14/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-186 DEPTH
DATE	Oct.4/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-186

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	0.80 - 1.20	1669.7	104.2
5	1.60 - 2.00	1811.7	113.1
8	2.80 - 3.20	2174.5	135.7

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-187

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.1m ORGANIC COVER
	B		1				0.3m
	C		2		Vs		ORGANIC SILT AND CLAY - trace fine sand - trace gravel - low plasticity - silt laminations - peat layer - greyish brown - ice lenses 1/4mm-7mm spaced @ 1mm-12mm
1	C		3		ICE+		
					Vs		
	C		4		ICE+		
	C		5		Vr Vs		1.70m
2	C		6		Nbe		CLAY AND SILT - trace to little sand - trace gravel - medium to high plasticity - greyish brown
	C		7				
	C		8				3.30m (TILL)
3	C		9				
							SHALE - SILTSTONE - medium to high plasticity - laminated - white specks - upper 1.0m is highly weathered & fractured
	C		10				
4	C		11		Nbn		
	C		12				
	B		13				
5							
	B		14				
	B		15				
6							
	B		16				6.50m
7							END OF HOLE

Notes:
1. Hole located north of Peel River.
2. Vegetation consists of shrubs to 2m and birch and conifers to 10m in the vicinity.
3. Frost mounds and peat tussocks cover the surface.
4. Drainage is poor.
5. Hole augered to 0.3m, cored to 4.5m then drilled with air to 6.5m.

LOCATION Peel River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● ORGANIC CONTENT % ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

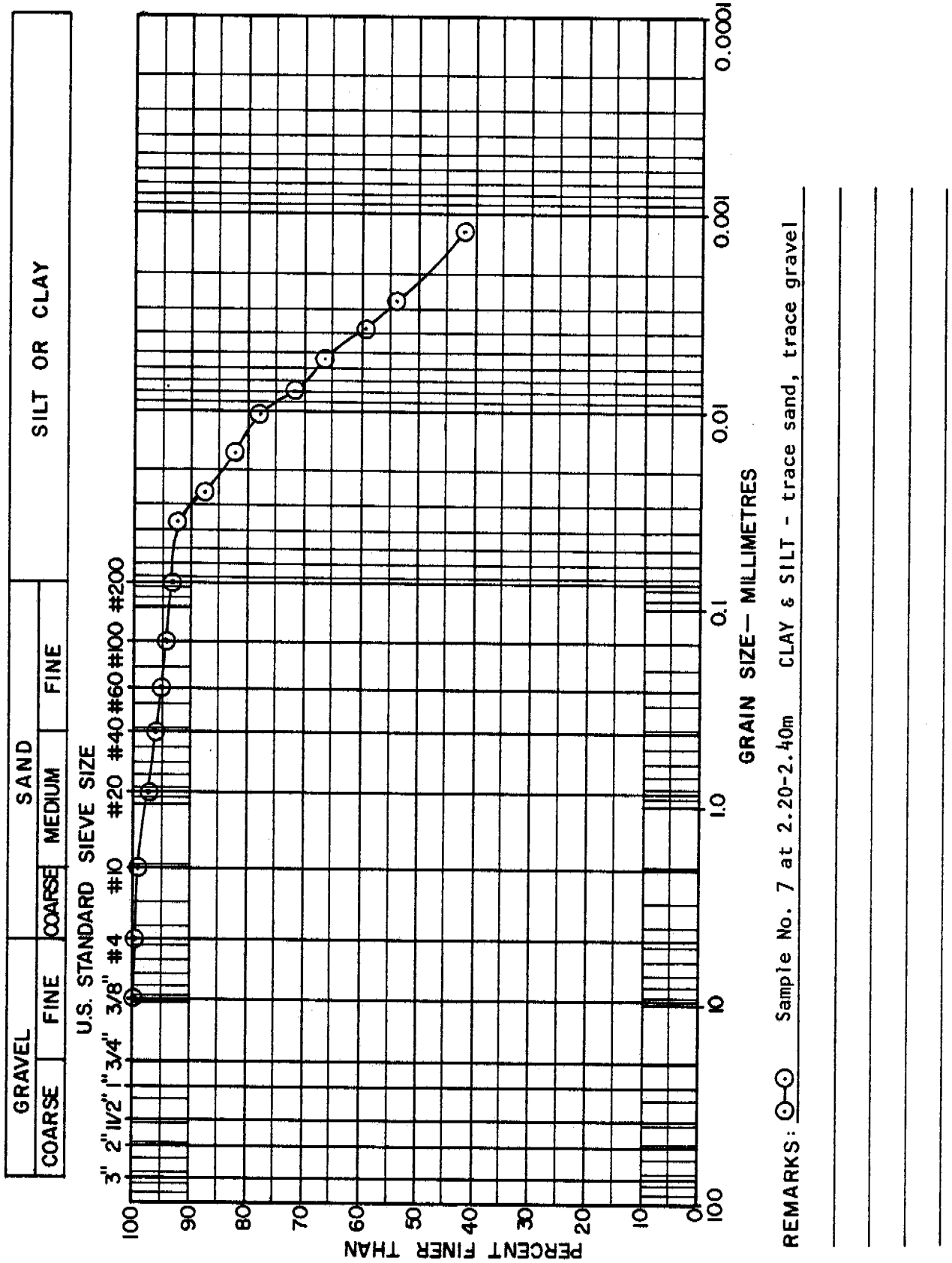
135%
199%
113%
220%
217%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-187
DATE Aug. 14/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 7 at 2.20-2.40m CLAY & SILT - trace sand, trace gravel

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-187	DEPTH
DATE Oct.6/78	473

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-187

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
6	1.80 - 2.20	1750.0	109.2
9	2.85 - 3.30	1908.0	119.1

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-188

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
PERMAFROST
LOCATION
ELEVATION
COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

SAMPLE DATA				SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT
DEPTH	TYPE	BLOW/15 cm.	No.					X — 0 — X; 10 30 50 70 90%
	B					NF	0.10m ORGANIC COVER	
	B		1			0.35M		
	C		2		Nbe		PEAT - dark brown	431%
1	C		3		Vr		1.00m	467% 181%
	C		4		Vr Vs		gravel layer 1.80m ORGANIC SILT AND CLAY - trace to little sand - low plasticity - peat pockets - greyish brown - ice lenses 1/2mm-3mm spaced @ 1mm-10mm	114%
2	C		5					
	C		6		Nbe Vs		←trace cobbles and boulders	
3	C		7		Vr Vx		CLAY AND SILT - and sand - sand, coarse to fine - little to some gravel - low to medium plasticity - rusty specks - massive structure - brown to 6.0m, grey below - ice lenses 1/4mm-3mm spaced @ 1mm-20mm	
4	C		8					
	C		9					
5								
	C		10					
6	B		11				(TILL)	
	B		12					
7	B		13					
	B		14					
8	B		15					
	B		16				8.50m	
9							END OF HOLE	

Notes:
1. Hole located on a hummocky surface sloping 1% to north.

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-188
DATE	Aug. 14/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.				SYMBOL	PERMAFROST		LOCATION	COHESION - Kg./5q.cm. 0.2 0.6 1.0 1.4 1.8 ●FIELD VANE △LAB VANE ■UNCONF.
HT. DROP 76 cm.							ELEVATION	
SAMPLE DATA					N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT X—0—X 10 30 50 70 90%
DEPTH	TYPE	BLOW/15cm.	No.					
							2. Vegetation is comprised of a thick growth of shrub and conifers to 15m tall. 3. Peat tussocks cover the surface. 4. Poorly drained. 5. Hole augered to 0.3m, cored to 5.4m and then drilled with air to 8.5m.	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-188
DATE	Aug.14/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-188

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.35 - 0.70	965.7	60.3
4	1.20 - 1.60	1556.4	97.1
6	2.00 - 2.55	1691.5	105.6

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-189

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

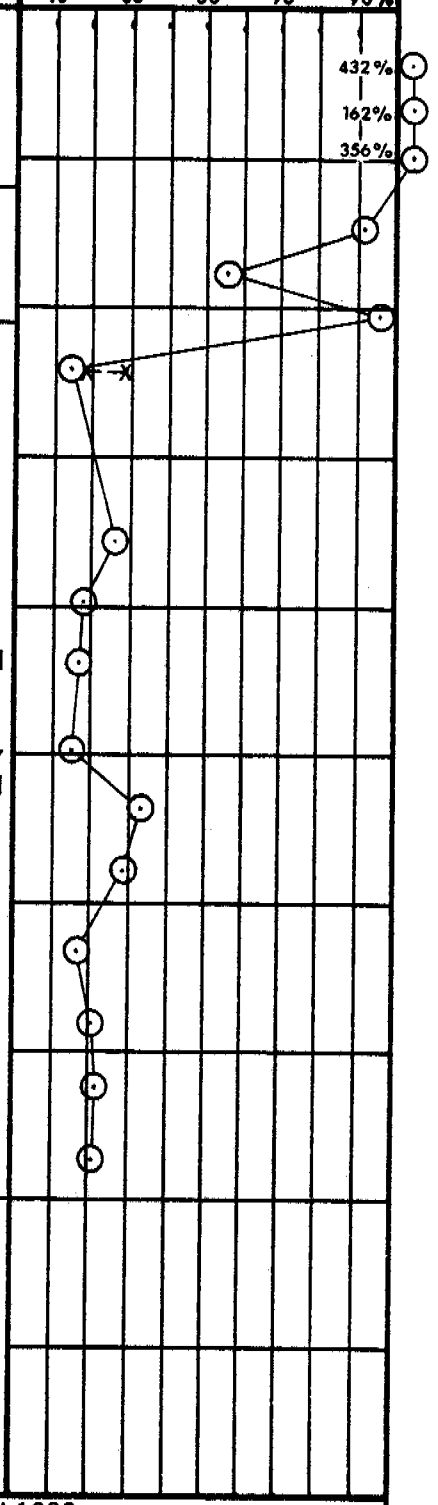
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.30m
	C		1		Nbe		PEAT AND ORGANIC SILT - trace fine sand - trace fine gravel - layered
1	C		2		Vr		
	C		3		Vs		1.20m - dark brown
	C		4		ICE+		ORGANIC SILT - little to some gravel - trace sand - slight plasticity - rusty brown
2	C				Vs		cobbles 2.10m
	C		5		Nbe		CLAY AND SILT - some coarse to fine sand - little coarse to fine gravel - low to medium plasticity - stratified and laminated - greyish brown - ice lenses 1/4mm-2mm spaced @ 3mm-30mm
3					Vr		
					Vs		
	C		6				
4	C		7				
	C		8				
5	C		9				
	B		10				
6	B		11				
	B		12				
7	B		13				
	B		14				
8	B		15				8.00m
9							END OF HOLE Notes: 1. Hole located on a broad flat plain. 2. Surface irregular with peat tussocks and frost mounds. (Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-189
DATE Aug. 15/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
DESCRIPTION OF MATERIAL
COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

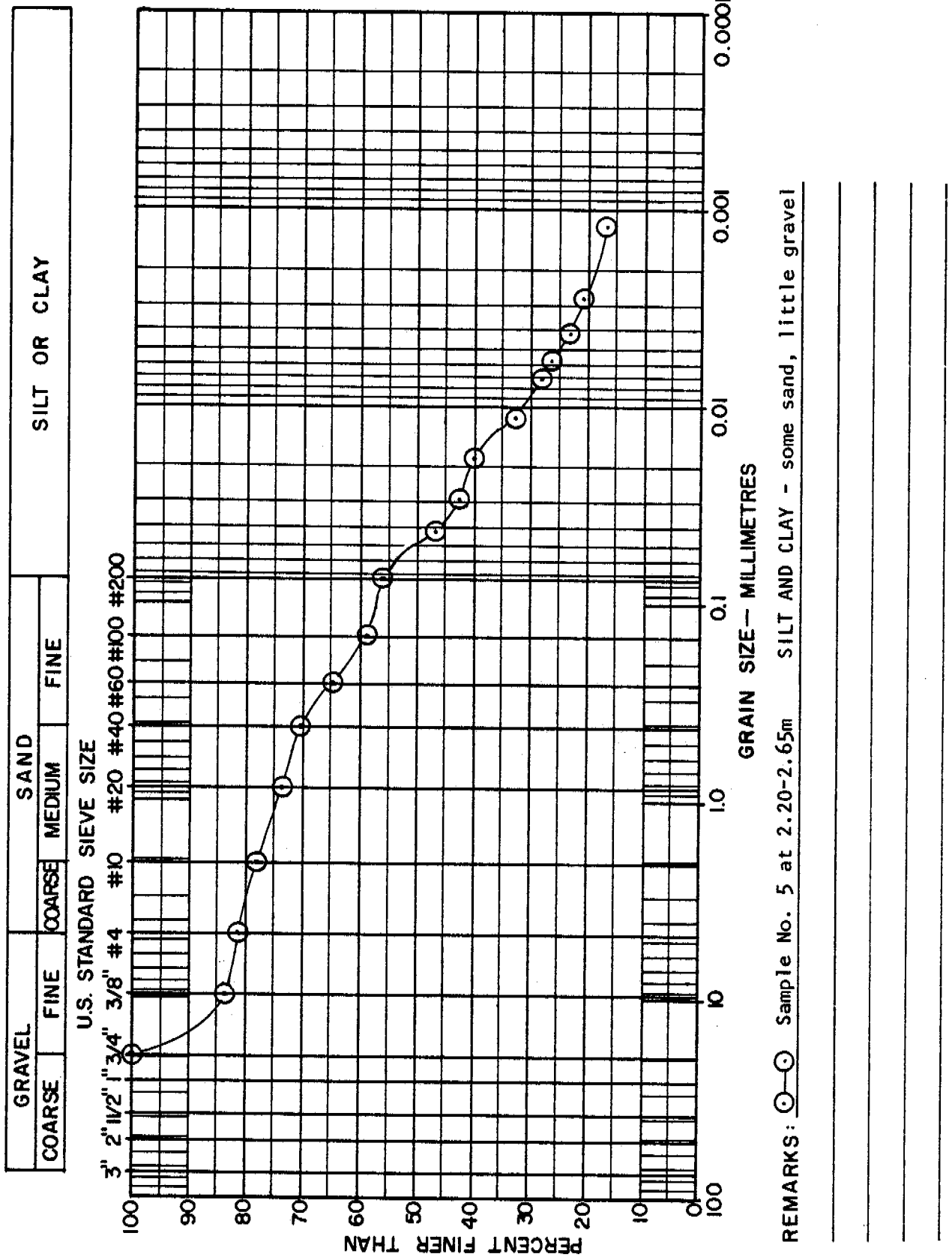
3. Vegetation mainly consists of conifers to 10m tall and occasional shrubs.
4. Poor drainage.
5. Hole augered to 0.3m, cored to 5.1m and then drilled with air to 8.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-189
DATE	Aug. 15/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 5 at 2.20-2.65m SILT AND CLAY - some sand, little gravel

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-189 DEPTH
DATE	Oct. 10/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-189

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.30 - 0.70	1046.5	65.2
6	3.45 - 3.70	2018.3	125.9
9	4.70 - 5.10	2165.7	135.2

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-190

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
	B		
	B		1
1	C		2
	C		3
2	C		4
3	C		5
	C		6
4	C		7
	C		8
	C		9
5	C		10
	B		11
6	B		12
	B		13
7	B		14
	B		15
8	B		16
	B		17
9			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.5M
Vr Vs	
ICE	
Vr	
ICE+	
Vr Vs	
Nbe Vr	
Vr	
Nbe	
Nbn	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.10m ORGANIC COVER

ORGANIC SILT AND CLAY
- trace fine sand
- low plasticity
- peat pockets
- grey
- ice lenses 1mm-3mm spaced @ 1mm-10mm

← ICE+ (70mm)

1.15m

1.30m ICE

ORGANIC SILT AND CLAY
- little medium to fine sand
- trace gravel
- low plasticity
- pieces of sandstone
- rusty greyish brown
- ice lenses 1mm-6mm spaced @ 2mm-10mm

3.00m

PEAT AND ORGANIC SILT
- dark brown
- ice lenses 1/2mm-2mm spaced @ 2mm-10mm

4.25m

GRAVEL
- little fine to coarse sand
- trace to little silt
- grey with rusty zones
- gravel mostly comprised of sandstone
- ice lenses 1/4mm-3mm spaced @ 1-15mm

5.50m

SHALE - SILTSTONE
- low to medium plasticity
- grey

8.50m

END OF HOLE

Notes:
1. Hole located on a plain, sloping gently 1-2% easterly.

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

178%
358%
296%
227%
120%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-190
DATE	Aug. 15/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA: DEPTH | TYPE | BLOW/15 cm. | No.
SYMBOL
PERMAFROST: N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT X — WATER CONTENT — 0 — LIQUID LIMIT X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

2. Small creek located 35m S.W. of site. Slope on creek bank 2:1.
3. Vegetation consists of conifers to 5m tall & to 20m near creek.
4. Ground surface is irregular with peat tussocks and frost mounds.
5. Poorly drained.
6. Hole augered to 0.5m, cored to 5.0m and then drilled with air to 8.5m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-190
DATE Aug.15/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-190

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
6	2.90 - 3.40	1035.4	64.6
9	4.20 - 4.40	1536.7	95.9

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-191

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION / ELEVATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
DEPTH	TYPE	BLOW/15cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT X——0——X 10 30 50 70 90%
	B					NF	0.10m ORGANIC COVER	
	C		1		Vr		0.30m ORGANIC SILT - trace sand - trace gravel - slight plasticity - laminated - greyish brown - ice lenses 1/4mm-5mm spaced @ 2mm-10mm	109%
1	C		2		ICE+ Vs ICE+			133%
	C		3		Vr Vs			134%
2	C		4		Vs		1.70m SILT AND CLAY - trace sand, medium to fine - trace gravel - low to medium plasticity - laminated - greyish brown - gravel mostly comprised of siltstone - ice lenses 1/4mm-5mm spaced @ 1mm-10mm	
	C		5		Nbe			
3	C		6				3.30m SHALE - SILTSTONE - low to medium plasticity - laminated - fractured - rusty grey - ice lenses 1/4mm spaced @ 1mm-3mm	
	C		7					
	C		8		Vs			
4					Nbn			
	B		9					
5	B		10					
	B		11				5.50m	
6							END OF HOLE	

Notes:

1. Hole located on a broad flat plain.
2. Vegetation consists of conifers to 10m tall.
3. Ground surface covered with peat tussocks.
4. Poor drainage.
5. Hole augered to 0.3m, cored to 3.8m and then drilled with air to 5.5m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-191
DATE	Aug.15/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-191

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.80 - 1.20	1196.6	74.7
4	1.70 - 2.20	1671.8	104.3
6	2.70 - 3.30	1988.6	124.1

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VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-192

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					N.F.	0.10m ORGANIC COVER
	C		1		ICE+		0.25m ICE + ORGANIC SILT - trace fine sand - slight to low plasticity - peat inclusions - brown
1	C		2				
	C		3		Vr		1.40m
	C		4		Vx		CLAY & SILT - some coarse to fine sand - trace gravel - low to medium plasticity - brown with rusty zones - ice lenses 1/4mm-7mm spaced @ 1mm-10mm
2	C		5		Vs		gravel layer
					Nbe		
	C		6				
3	C		7				3.30m
	C		8		Vs		SHALE - SILTSTONE - weathered - medium plasticity - grey with rusty zones - ice lenses 1/4mm spaced @ 1mm-5mm
4	C		9		Nbn		
	B		10				
5	B		11				
	B		12				5.50m
6							END OF HOLE

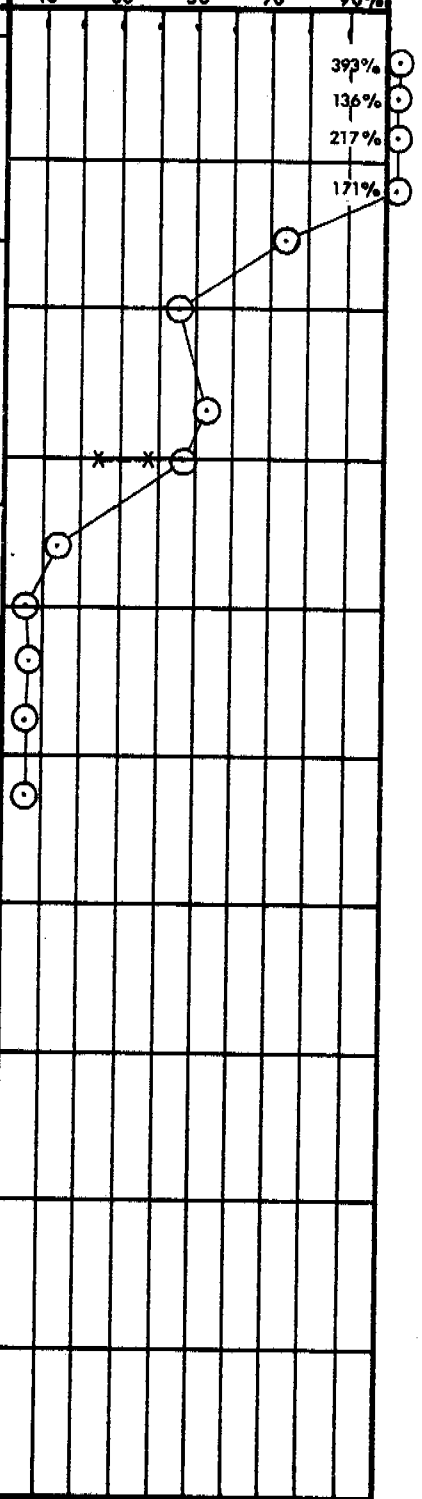
Notes:
1. Hole located on a broad flat plain approx. 1km south of Mackenzie River.
2. Vegetation consists of mainly sparse conifers to 10m tall and shrubs.
3. Peat tussocks cover land surface.
4. Poorly drained with standing water noted in depressions.
5. Hole augered to 0.25m, cored to 4.1m and then drilled with air to 5.5m.

LOCATION Mackenzie River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — 0 — — — — X
10 30 50 70 90%

393%
136%
217%
171%

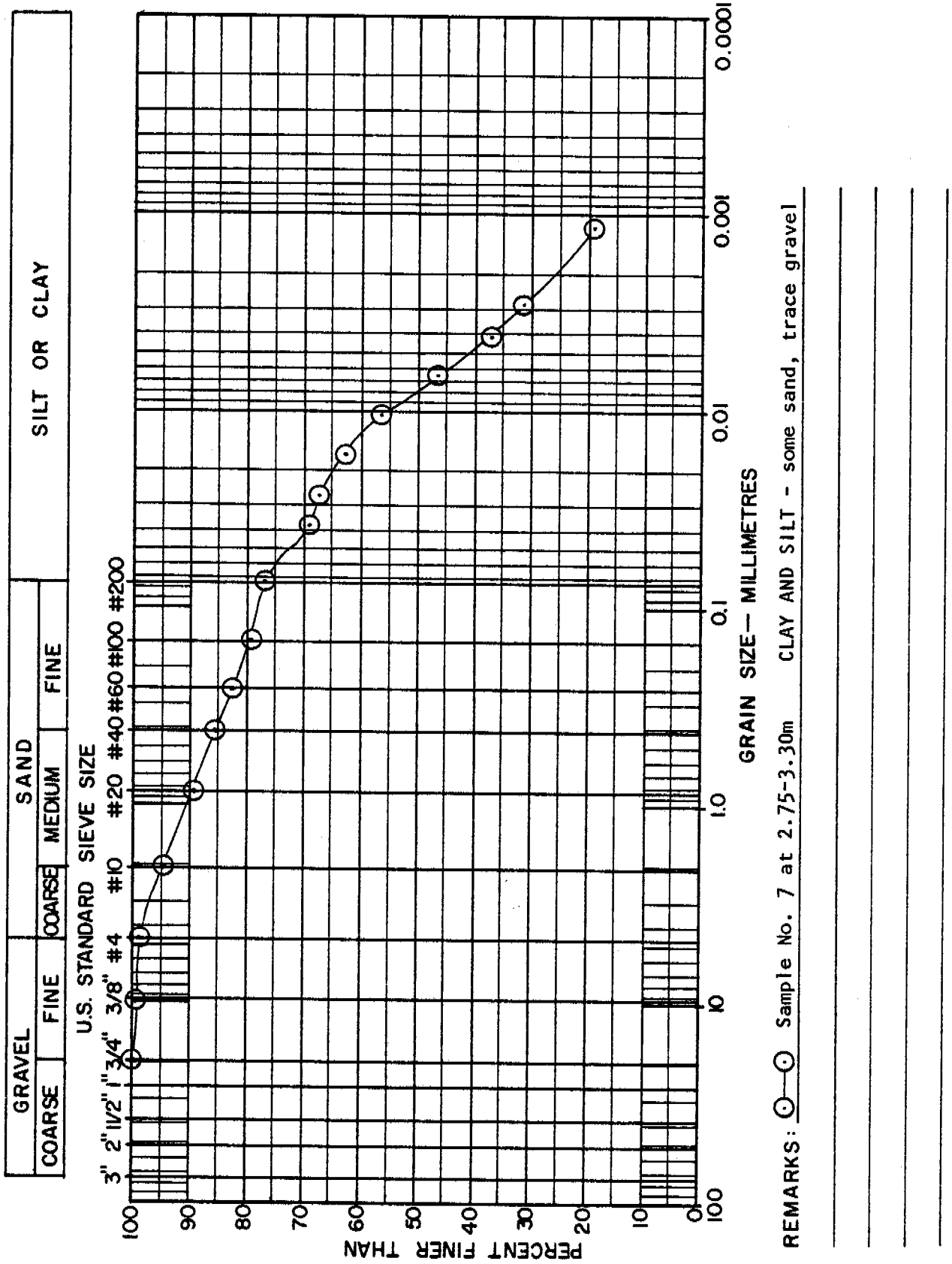


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-192
DATE	Aug. 15/78 PLATE

K.L.G. - METRIC

GRAIN SIZE CURVE



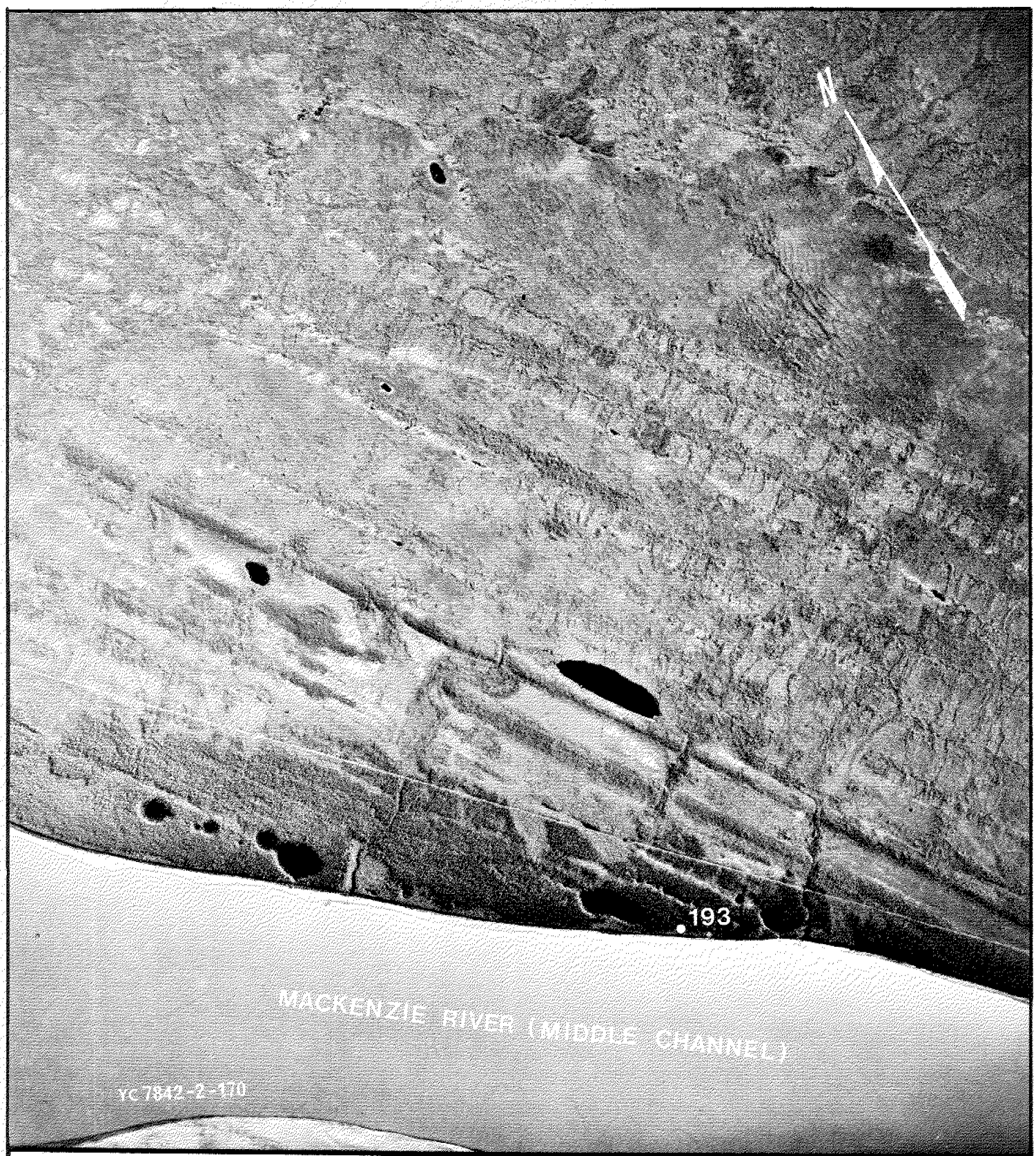
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-192	DEPTH
DATE Oct. 10/78	493

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-192

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
6	2.20 - 2.75	1577.7	98.5



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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-193

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION Mackenzie River	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	ELEVATION / DESCRIPTION OF MATERIAL	PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (X — 0 — X) 10 30 50 70 90%
	B					NF	0.05m ORGANIC COVER	
						0.35M	ORGANIC SILT - little to some fine sand - non to slight plasticity - sand laminations & layers	
	C		1		Vs			
1	C		2		Vr			115%
	C		3		Vx		peat layer - peat inclusions - brownish grey - ice lenses 1/4mm-6mm spaced @ 1mm-30mm	110%
	C		4		Nbe			163%
2	C		5				1.90m	213%
	C		6		Vs		SILT AND CLAY & SAND - trace to little gravel - low plasticity - rusty specks - organic inclusions - brown - ice lenses 1mm-10mm spaced @ 1mm-20mm	
					Vr			
3	C		7		Vx		2.80m	
					Vr			
	B		8		Vs			
4					Vx			
					Nbn		SILT AND CLAY - some to and sand - sand, coarse to fine - trace gravel - trace cobbles & boulders - low plasticity - stratified below 5.0m - brownish grey - ice lenses 1/4mm-5mm spaced @ 3mm-50mm	
	C		9					
5	C		10					
	C		11					
	C		12					
	B		13				silt layer	
6	C		14					
	C		15					
	C		16					
7	C		17					
	C		18				silt layer	
	C		19					
8	C		20					
	C		21					
							8.70m	
9					Nbe		cobbles	
	B		22		Nbn		CLAY AND SILT - some coarse to fine sand - trace to little gravel - medium plasticity - dark grey (Cont'd)	
	C		23					
10	C		24				10.00m	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-193
DATE	Aug.15/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	N.R.C. CLASS	N.P. or F.	DESCRIPTION OF MATERIAL
	C		25				SILT AND CLAY
	C		26		Vs		- some coarse to fine sand
11					Nbn		- little fine gravel
	B		27				- slight to low plasticity
	B		28				- laminated
12							- grey
	B		29				
	B		30				
13							
	B		31				
	B		32				
14							
	B		33				
							14.50m
15	B		34		Nbn		SHALE
	B		35				- low to medium plasticity
16	B		36				- grey
							16.00m
17							END OF HOLE

Notes:
1. Hole located on north bank of Mackenzie River, 10m north of crest of river bank. Terrain is flat.
2. Site roughly 10m above level of river at time of drilling.
3. Vegetation consists of thick forest cover of shrubs, alder and spruce to 20m tall.
4. Well drained.
5. Hole augered to 0.35m, cored to 10.7m and then drilled with air to 16m.
6. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0 and 8.0m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

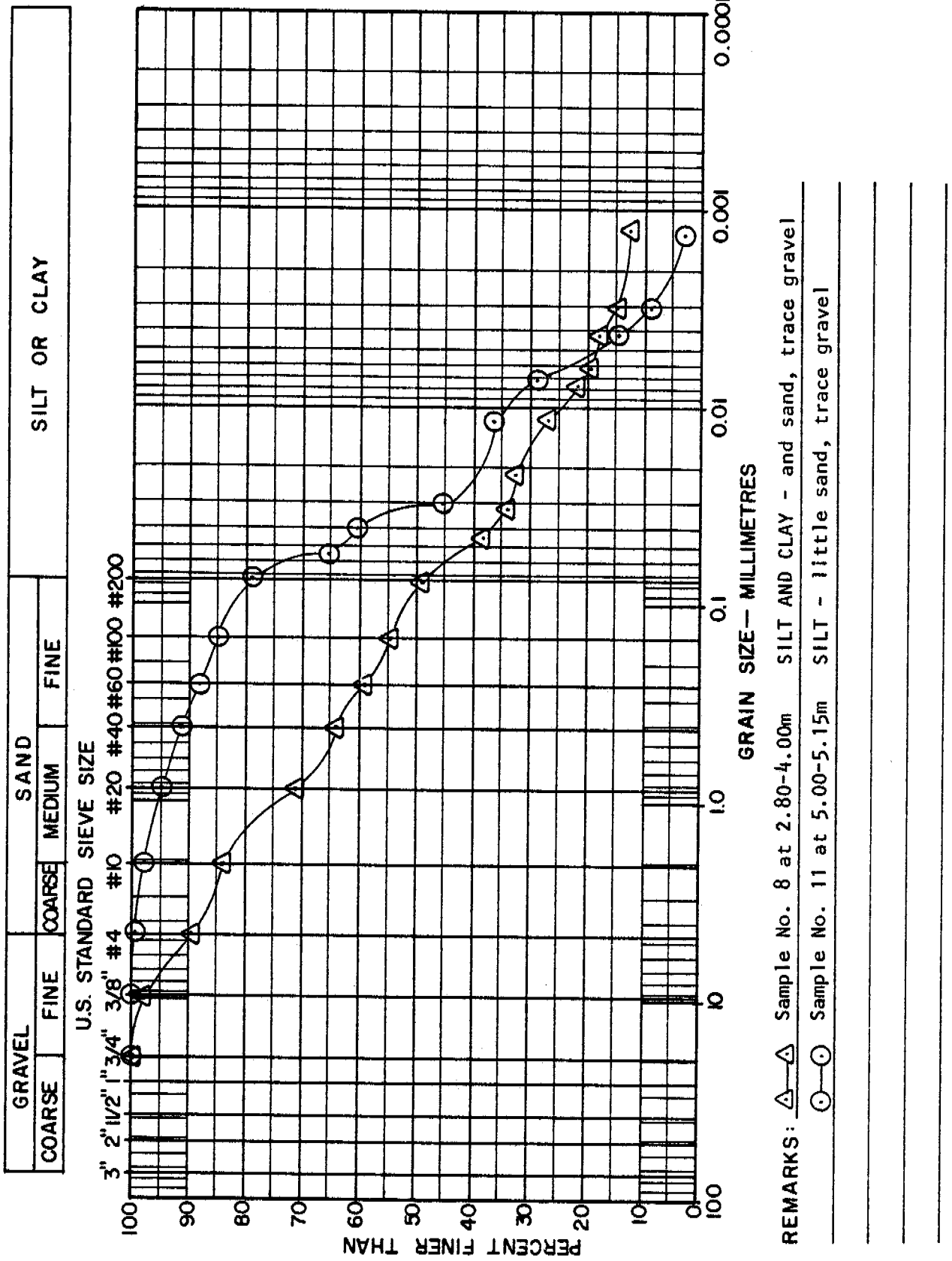
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-193
DATE Aug.15/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-193 DEPTH
DATE	Oct.11/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-193

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.20 - 0.70	1177.4	73.5
3	1.00 - 1.25	1286.0	80.3
9	4.00 - 4.30	2075.4	129.5
12	5.15 - 5.50	2270.6	141.7
21	8.30 - 8.70	2280.5	142.3

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CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-194

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.15m ORGANIC COVER
	C		1		I.F.		0.25m ICE
	C		2		Nbe Vr Vx		PEAT - organic silt pockets - dark brown - ice lenses 1/2mm-5mm spaced @ 1mm-12mm
1	C		3				
2	C		4				2.15m
	C		5		ICE+		2.50m ICE + ORGANIC SILT
	C		6				
3					Vx Nbe		SILT AND CLAY - little fine to coarse sand - trace fine gravel - low plasticity
	C		7				gravel layer 3.70m
4	C		8		Vr		CLAY AND SILT - some coarse to fine sand - little gravel - low to medium plasticity - grey - ice lenses 1/4mm-2mm spaced @ 1mm-50mm
	C		9		Vs		
5	C		10		Nbe		
	B		11				5.50m
6	B		12		N		SHALE - SILTSTONE - low to medium plasticity - weathered up to 7.0m - grey
	B		13				
7	B		14				
	B		15				
8	B		16				8.00m
9							END OF HOLE

Notes:
1. Hole located on a broad flat plain.
2. Vegetation mainly consists of buckbrush with spruce to 10m in vicinity.

(Cont'd.)

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - 0 - - - - - X
10 30 50 70 90%

668%
811%
594%
236%
173%
109%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-194
DATE	Aug.16/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

3. Poorly drained, standing water noted within depressions.
4. Hole augered to 0.15m, cored to 4.85m and then drilled with air to 8.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

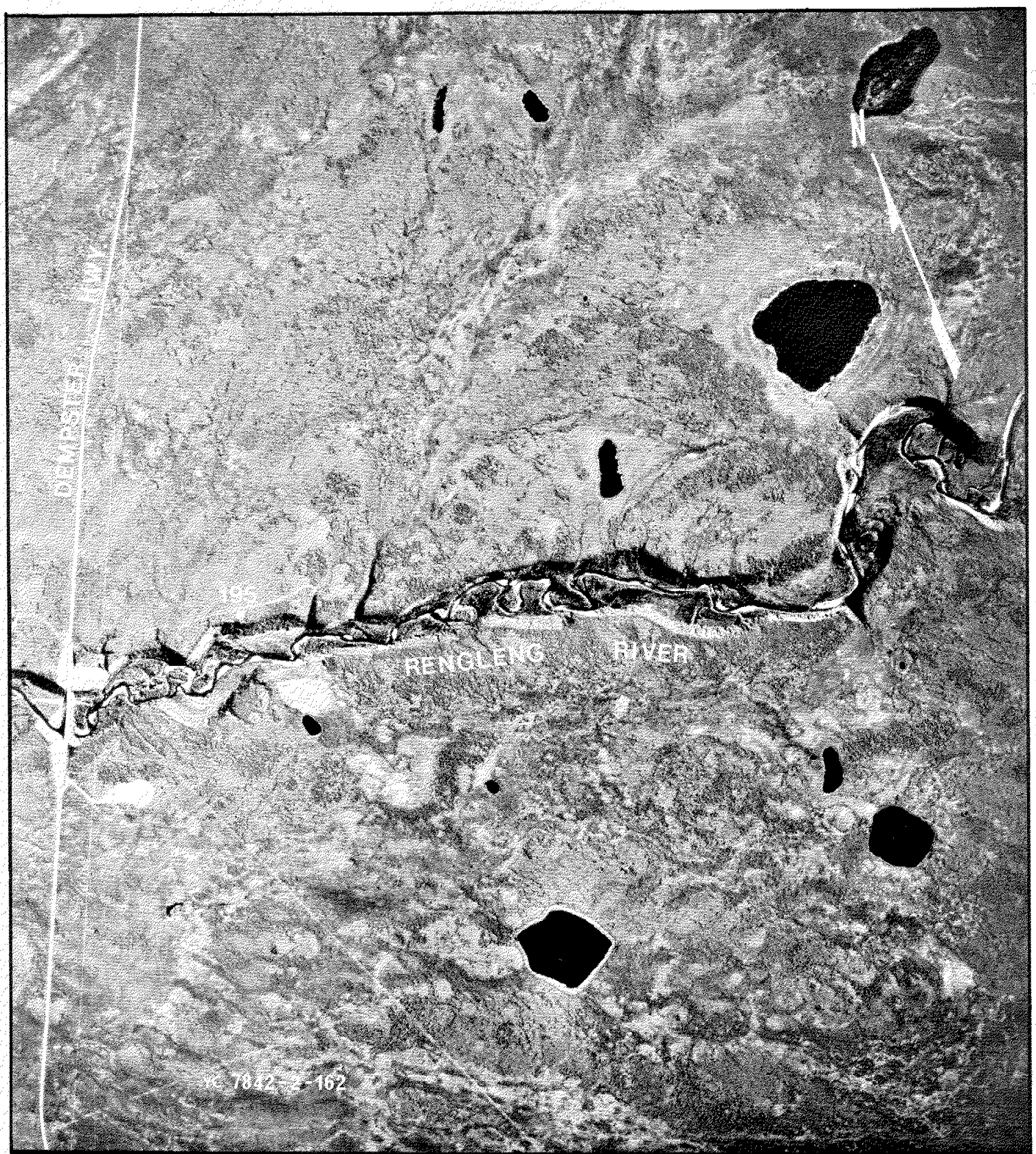
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-194
DATE	Aug. 16/78 PLATE 502

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-194

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.15 - 0.45	1019.7	63.6
8	3.70 - 4.00	1931.1	120.5



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-195

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE: OCTOBER 1978
APPROVED: A. L. EDGEWORTH

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.
	B		
1	B		1
	B		2
	B		3
2	C		4
	C		5
3	B		6
	B		7
4	B		8
	B		9
5	B		10
	B		11
6	B		12
	B		13
7	B		14
	B		15
8	B		16
	B		17
9			

SYMBOL

PERMAFROST

N.R.C. CLASS: N

N.P. or F.: NF; 1.0M

LOCATION Rengleng River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.10m ORGANIC COVER

SILT AND CLAY
- some fine to coarse sand
- little to some gravel
- slight to low plasticity
- organic pockets
- brown

1.75m

GRAVEL
- some sand
- coarse to fine
- little to some silt & clay
- grey

2.00m

2.50m

SANDSTONE
- fine-grained
- grey

SHALE - SILTSTONE
- low to medium plasticity
- grey

8.50m

END OF HOLE

Notes:
1. Hole located on north side of Rengleng River, approx. 20m north of creek valley on a broad flat plain.

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-195
DATE	Aug.16/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.

LOCATION Rengleng River
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

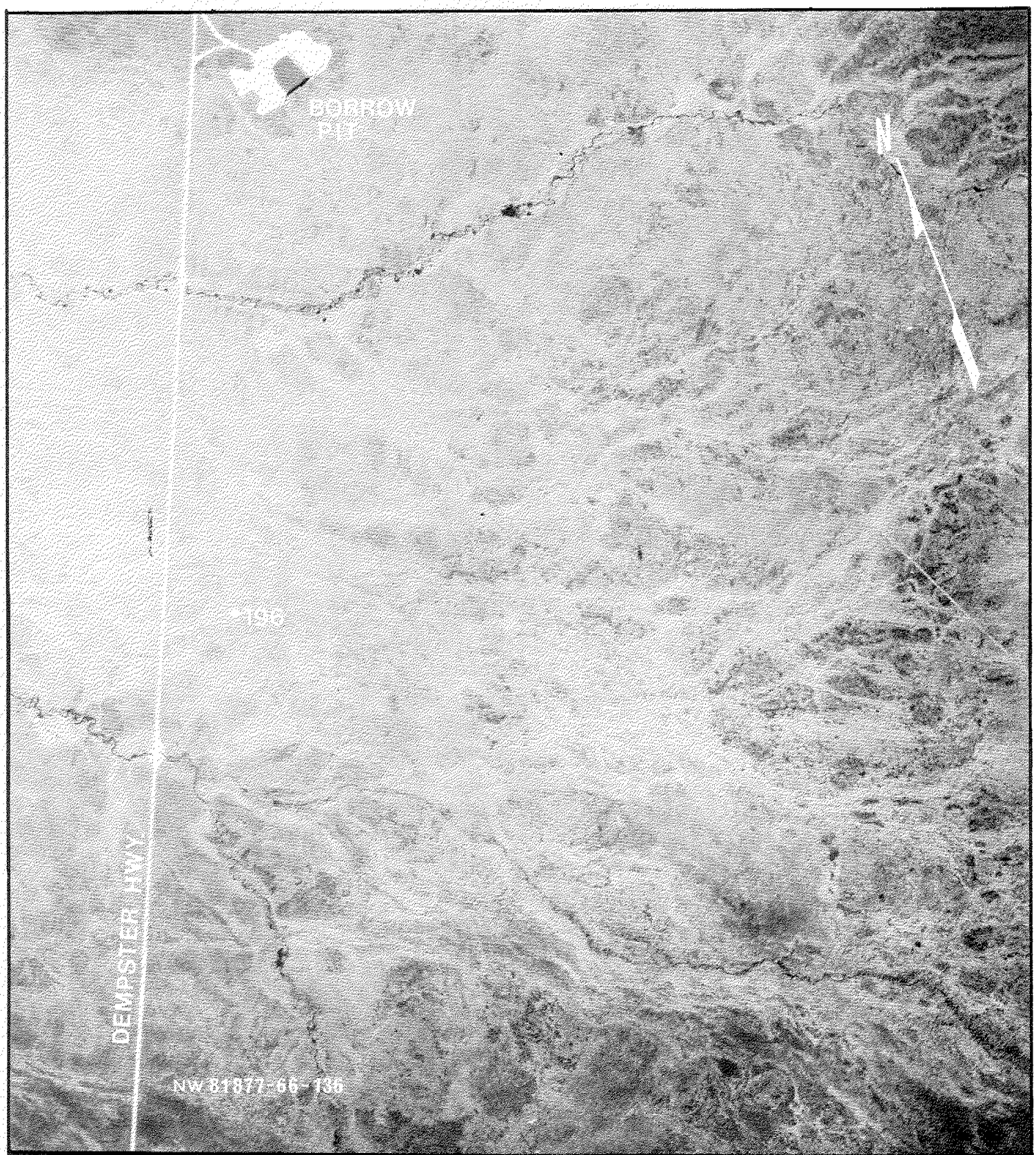
DESCRIPTION OF MATERIAL

2. Vegetation consists of mainly buckbrush with poplars to 10m.
3. Moderate to poor drainage.
4. Hole augered to 1.75m, cored to 2.1m and then drilled with air to 8.5m.
5. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 5.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-195
DATE Aug.16/78 PLATE 506

K.L.C. - METRIC



KLOHN LEONOFF CONSULTANTS LTD. CIVIL • GEOTECHNICAL • HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-196			
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.	DATE OF ISSUE: OCTOBER 1978 APPROVED: A. L. EDGEWORTH	PROJECT No.: AL1023	AIRPHOTO SCALE: 1" = 2000' (approx)	REV.

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.
	B					
	B		1			NF
1	B		2			
	B		3			1.5M
2	C		4		Vr Vs Nf	
	C		5			
	C		6			
3	C		7		Vr Vs Nbn	
	C		8			
	C		9			
4	C		10			
	C		11			
	C		12		Nbn	
5	B		13			
	B		14			
6	B		15			
	B		16			
7						

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

SILT
- little coarse to fine sand
- trace gravel
- slight to low plasticity
- rusty brown
- ice lenses 1/4mm-3mm spaced @ 1mm-20mm

2.60m

CLAY AND SILT
- little to some sand
- little gravel
- low to medium plasticity
- gravel mostly comprised of siltstone
- ice lenses 1/2mm-3mm spaced @ 1mm-20mm

silt layer

and gravel

4.25m

SHALE - SILTSTONE
- medium to high plasticity
- fractured to 5.0m
- grey

6.50m

END OF HOLE

Notes:
1. Hole located on a broad flat plain.
2. Vegetation consists of mainly buckbushes and spruces to 15m.
3. Peat tussocks cover surface.
4. Poorly drained.
5. Hole augered to 1.5m, cored to 5.6m and then drilled with air to 6.5m.

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

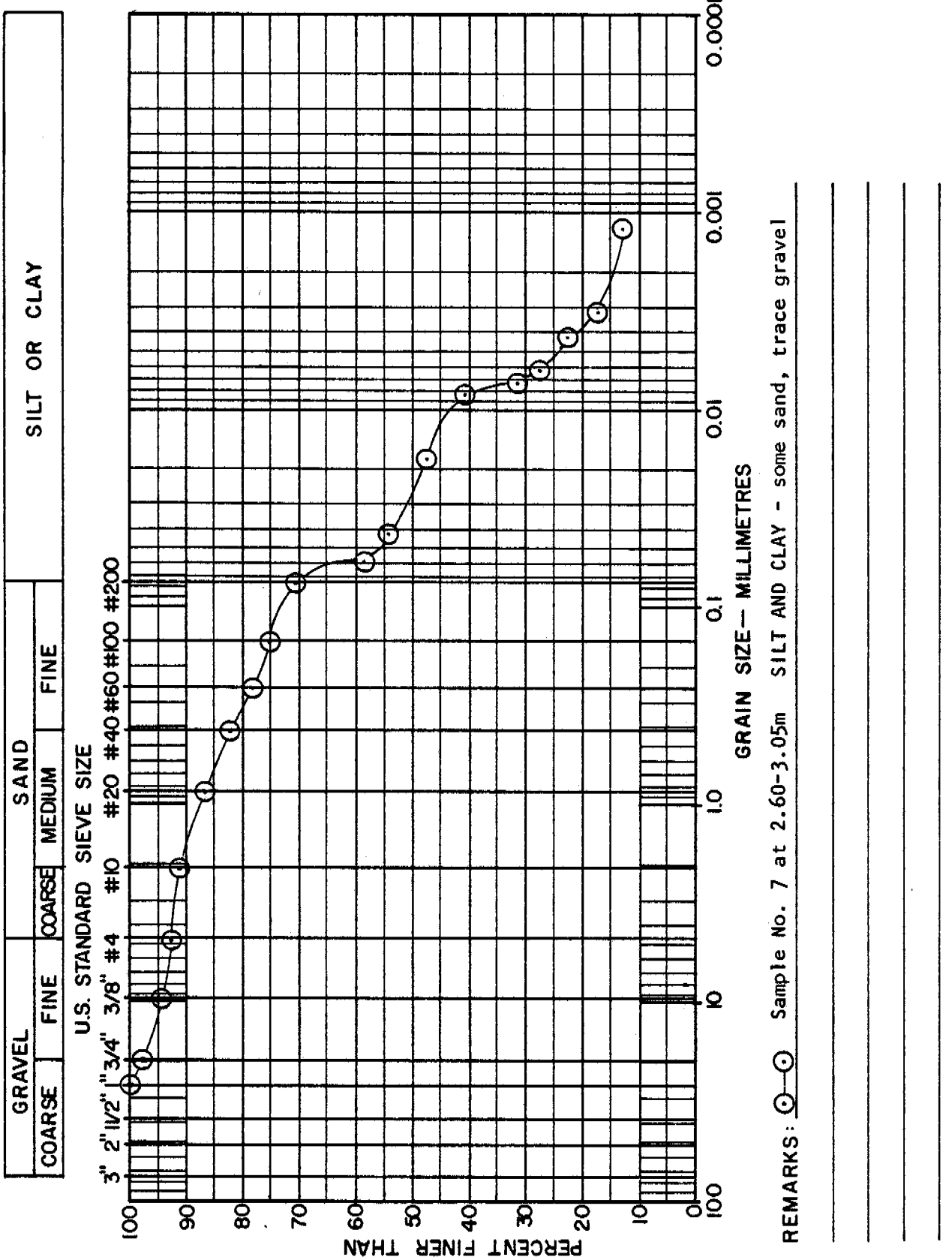
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-196
DATE	Aug. 17/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



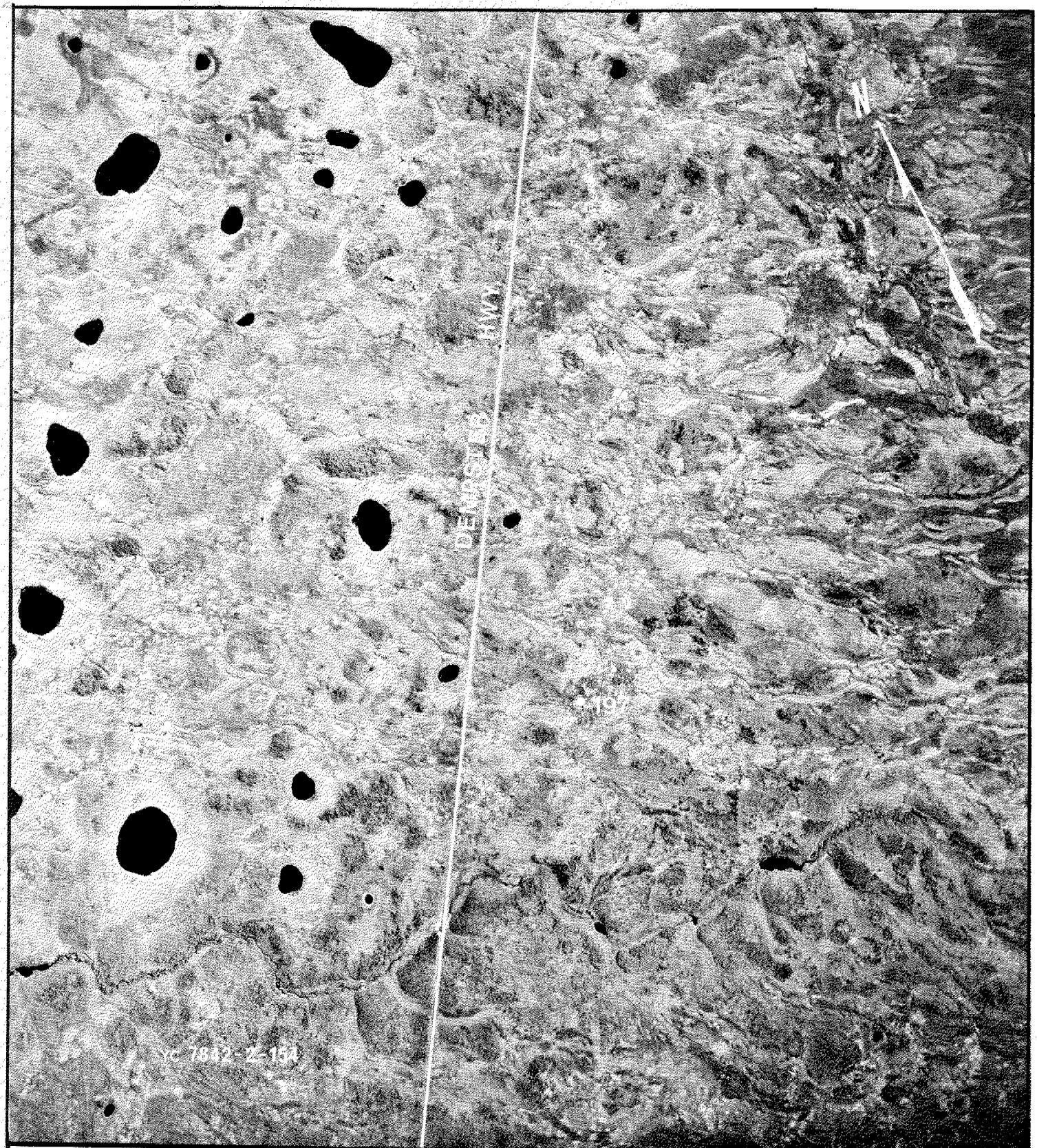
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-196	DEPTH
DATE Oct.11/78	509

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-196

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
7	2.60 - 3.05	2156.2	134.6



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-197

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.10m ORGANIC COVER
	B		1			0.5M	PEAT - dark brown
	C		2		Nbe		0.80m
1					Vs		1.00m ORGANIC SILT AND CLAY - little sand - fine to coarse - trace gravel - low plasticity
	C		3		Vr		
	C		4		Vs		
2	C		5		Vx		CLAY AND SILT - some coarse to fine sand - trace gravel - low to medium plasticity - organic inclusions - ice lenses 1/2mm-5mm spaced @ 3mm-20mm
	C		6				2.25m
	C		7		Nbn		2.85m
3	C		8				
	C		9		Nbn		GRAVEL - some silt & clay - little sand - rusty greyish brown
					Nbe		
4	C		10		Vr		
	C		11		Vs		CLAY AND SILT - some sand-coarse to fine - some gravel - low to medium plasticity - grey - ice lenses 1/4mm-2mm spaced @ 3mm-45mm
5	C		12				
	B		13				5.50m
6	B		14		Vr		
	B		15		Vs		SAND - coarse to fine - some gravel - little silt & clay - grey
7	B		16				
	B		17				
8	B		18				8.00m
9							END OF HOLE

Notes:
1. Hole located within a shallow depression on a broad flat plain.
2. Dempster Highway is located approx. 300m west.

(Cont'd.)

LOCATION
ELEVATION
PERMAFROST

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

509%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-197
DATE	Aug.17/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION
COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – – 0 – – – – – – X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

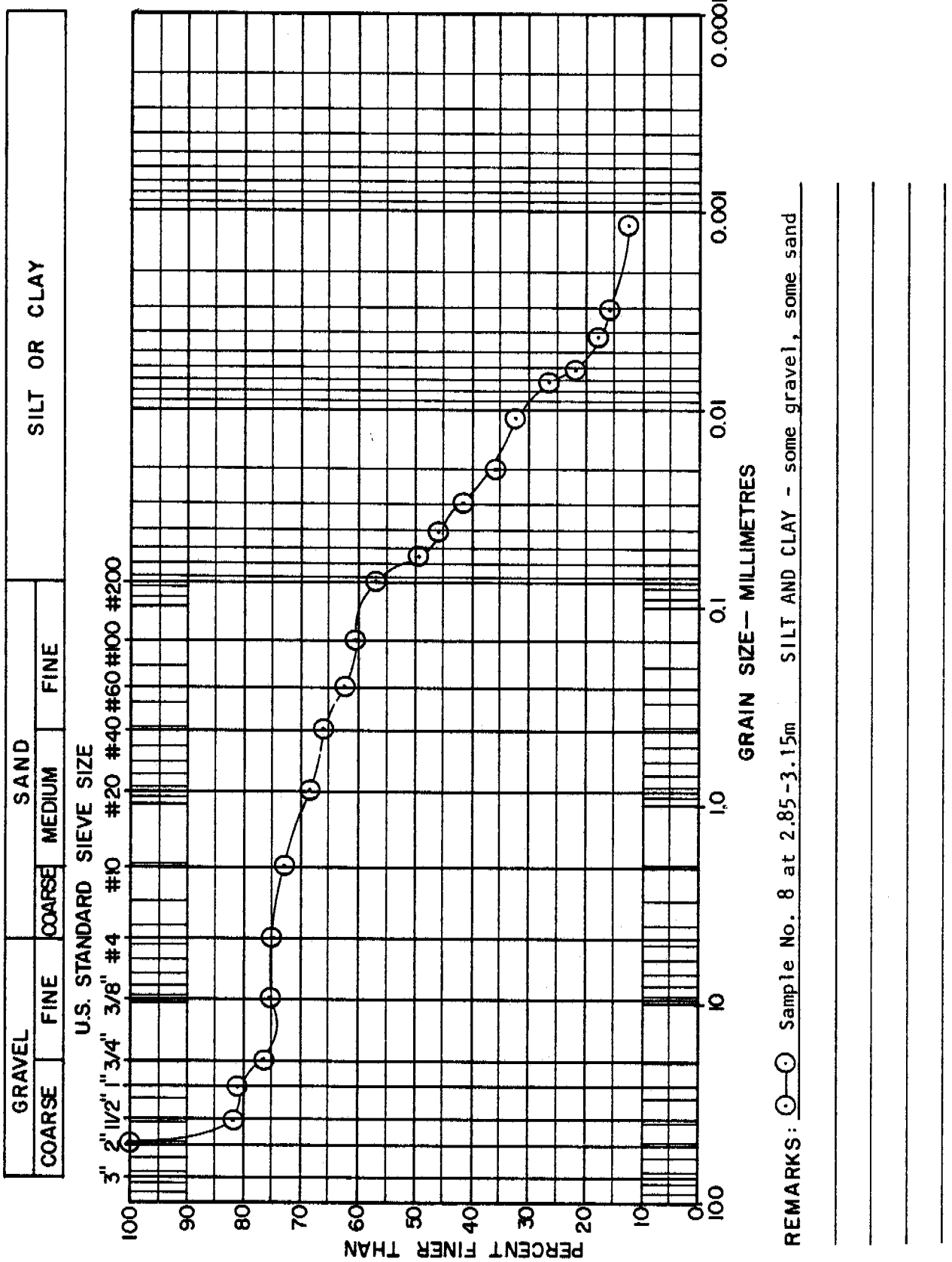
3. A small slough is present within the depression where the hole was located.
4. Tall grasses and small shrubs form the vegetation.
5. Hole augered to 0.5m, cored to 4.85m and then drilled with air to 8.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-197
DATE	Aug.17/78 PLATE 513

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-197 DEPTH
DATE	Oct.11/78

514

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-197

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.00 - 1.30	1474.0	92.0
6	1.95 - 2.55	1891.6	118.0
12	4.45 - 4.85	2168.2	135.3

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-198

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
1	B		
	B		1
	C		2
2	C		3
	C		4
3	C		5
	C		6
4	C		7
	C		8
5	C		9
	C		10
6	B		11
	B		12
7	B		13
	B		14
8	B		15
	B		16
9	B		17
	B		18
10	B		19

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.5M
ICE +	
ICE +	
Vr	
Vs	
Vr	
Nbe	
Vr	
Vx	
Nbe	
Nbn	
Vx	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

ORGANIC SILT AND CLAY
- trace fine to coarse sand
- trace gravel
- low plasticity
- laminated
- brown
- ice lenses 1/2mm-12mm spaced @ 2mm-8mm

1.00m

SILT AND CLAY
- little to some sand
- coarse to fine
- trace to little gravel
- low plasticity
- laminated & stratified
- rusty brown
- ice lenses 1/4mm-3mm spaced @ 1mm-50mm

← cobbles

4.50m

SAND - coarse to fine
- some gravel
- little silt
- stratified
- ice lenses 1/2mm-1mm spaced @ 15mm-25mm

5.00m

SHALE - SILTSTONE
- low to medium plasticity
- grey

(Cont'd.)

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-198
DATE Aug.17/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		20
11	B		21
	B		22
	B		23
12	B		24
	B		25
13	B		26
	B		27
14	B		28
	B		29
15	B		30
	B		31
16	B		32
	B		33
17	B		34
18			

SYMBOL

PERMAFROST

N.R.C. CLASS: Nbn, Vx

N.F. or F.

LOCATION

ELEVATION

DESCRIPTION OF MATERIAL

As above

17.50m

END OF HOLE

Notes:
1. Hole located on a broad flat plain.
2. Vegetation consists of mainly conifers to 7m and occasional birch to 15m.

(Cont'd.)

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-198
DATE Aug. 17/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA
DEPTH | TYPE | BLOW/15cm. | No.
SYMBOL
PERMAFROST
N.R.C. CLASS | N.F. or F.
LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X - - - - - - 0 - - - - - - X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

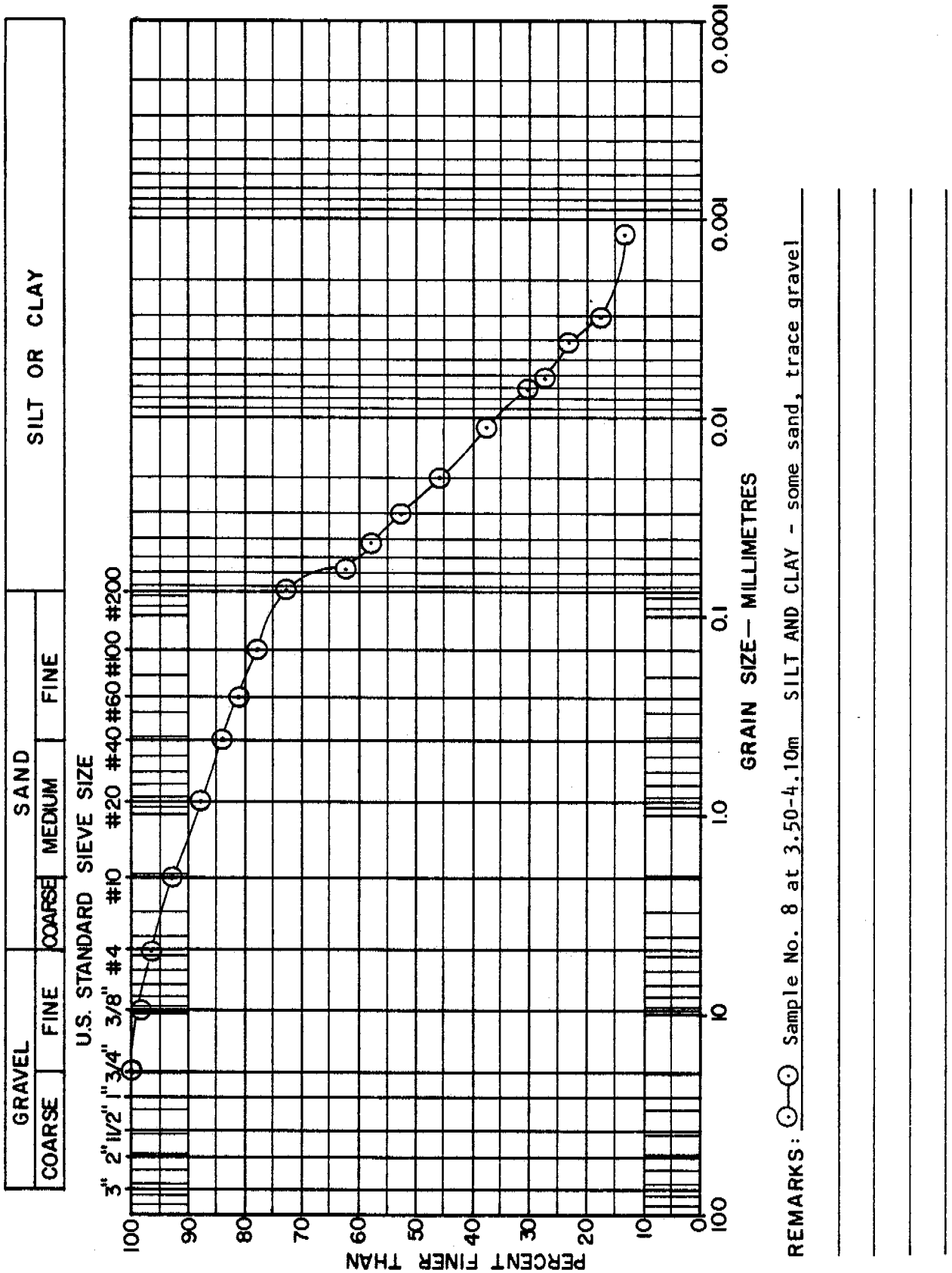
3. Frost mounds and peat tussocks cover ground surface.
4. Poorly drained.
5. Hole augered to 0.5m, cored to 5.35m and then drilled with air to 17.5m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-198
DATE Aug. 17/78 PLATE 519

K.L.C. - METRIC

GRAIN SIZE CURVE



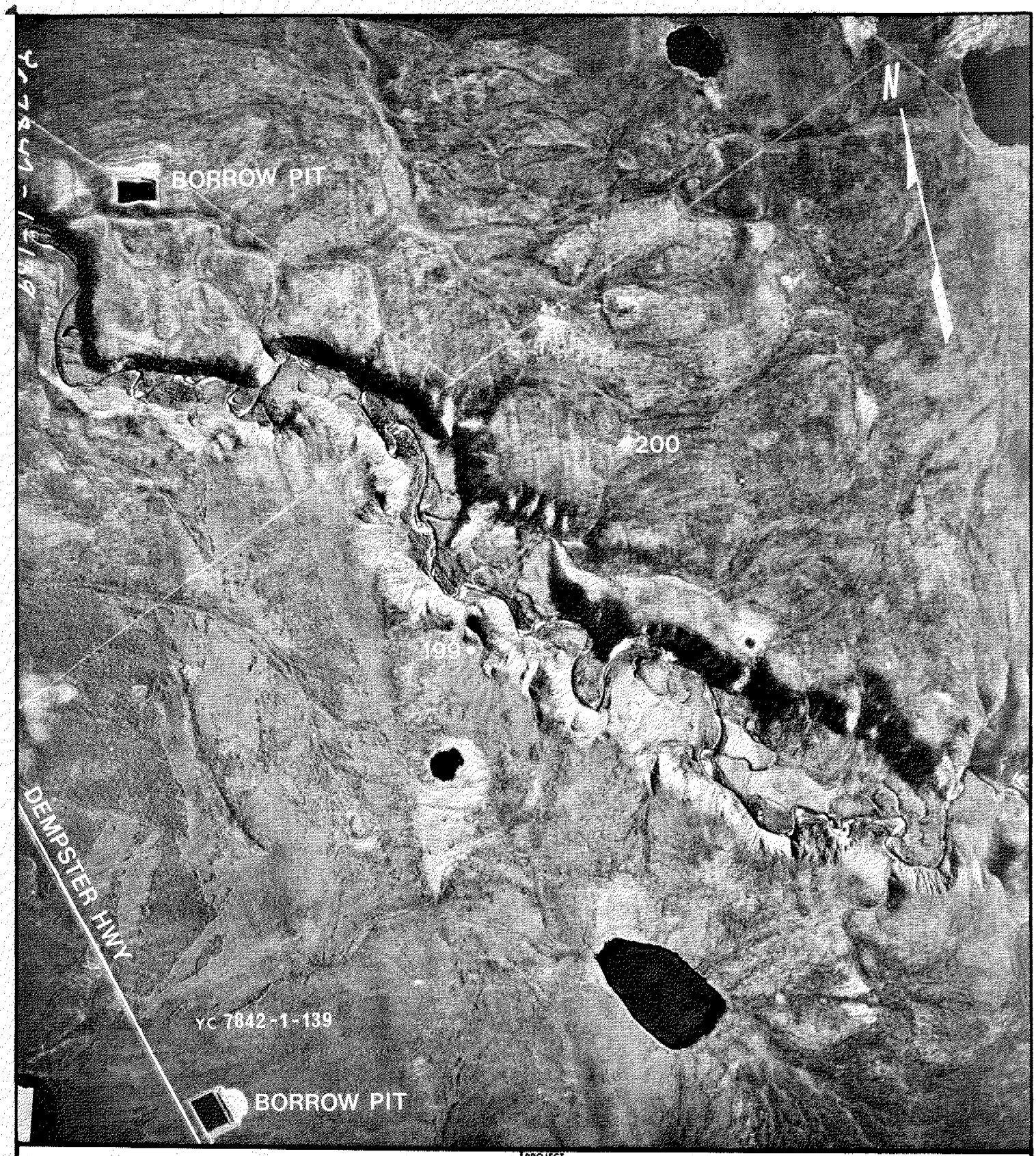
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-198 DEPTH
DATE	Oct.11/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-198

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	1.20 - 1.65	1783.6	111.3
6	2.60 - 3.10	1906.5	119.0
10	4.95 - 5.35	2250.8	140.5



KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-199

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.
	B					NF
	B		1			
	C		2		Nbe Vx	
1	C		3		ICE+	
					Vr	
					Vs	
2	C		4		ICE +	
					Vs	
3	B		5		Nbe	
					Nbn	
	B		6			
4	C		7		Vr	
	C		8		Vs	
	C		9			
5					Vr	
	C		10		Vs	
	C		11		Nbn	
6						
	C		12			
7						

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.25m — 0.05m ORGANIC COVER

0.35m — ORGANIC SILT
- trace fine sand
- dark brown

1.10m — SILT AND CLAY
- some coarse to fine sand
- little gravel
- low plasticity
- brown
- ice lenses 2mm-5mm spaced @ 2mm-8mm

3.80m — SAND
- little silt
- little gravel
- trace cobbles
- rusty brown to 3.55m, grey below
- ice lenses 1/2mm-2mm spaced @ 1mm-3mm

4.50m — SAND AND SILT
- laminated
- coal pockets
- grey
- ice lenses 2mm-3mm spaced @ 20mm-100mm

SILTSTONE
- sandstone interbeds
- light grey

6.25m — END OF HOLE

Notes:
1. Hole located on south bank of an unnamed valley, approx. 30m from crest of slope.
2. Valley sides slope approx. 2:1.
3. Vegetation consists of mainly conifers to 15m and shrubs.
4. Moderately well drained.
5. Hole augered to 0.25m, then cored to 6.25m.

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

257%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-199
DATE	Aug.17/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-199

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
4	1.50 - 2.00	1835.6	114.6
7	3.80 - 4.20	2051.0	128.0

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL ● GEOTECHNICAL ● HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-200

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

DEPTH	TYPE	BLOW/15 cm.	No.
	B		1
	B		
1	C		2
	C		3
2	C		4
	C		5
	C		6
3	C		7
	C		8
4	C		9
	C		10
	C		11
5	C		12
	C		13
	C		14
6	C		15
	C		16
7	C		17
	C		18
8	B		19
	B		20
9	B		21
	B		22
10	B		23

SYMBOL

PERMAFROST

N.R.C. CLASS: Vr, Vs, ICE +, Vs, Vr, Nbe, Vx, Vr, Vs, Nbn

N.P. or F.: NF

LOCATION

ELEVATION

COHESION - Kg./Sq. cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

DESCRIPTION OF MATERIAL

0.30m

ORGANIC SILT & CLAY
- trace fine sand & gravel
- dark brown

SILT AND CLAY
- some sand
- trace gravel
- brown
- extensive ice lenses 2.5mm spaced @ 2mm-5mm
- ice lenses 20mm spaced @ 100mm-200mm

1.25m
1.35m

ICE + SAND AND GRAVEL
- trace silt & clay

SILT AND CLAY
- some sand
- trace to little gravel
- low to medium plasticity
- grey
- ice lenses 1/4mm-6mm spaced @ 3mm-50mm

← cobbles

← cobbles of siltstone

6.00m

SHALE - SILTSTONE
- laminated
- low to medium plasticity
- grey

10.00m (Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-200
DATE	Aug. 18/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION / ELEVATION	COHESION - Kg./Sq.cm. 0.2 0.6 1.0 1.4 1.8 ● FIELD VANE △ LAB VANE ■ UNCONF.
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT X——0——X 10 30 50 70 90%
	B		24		Vr Vs Nbn		As above	
11								
	B		25					
12								
	B		26				12.50m	
13							END OF HOLE	

Notes:

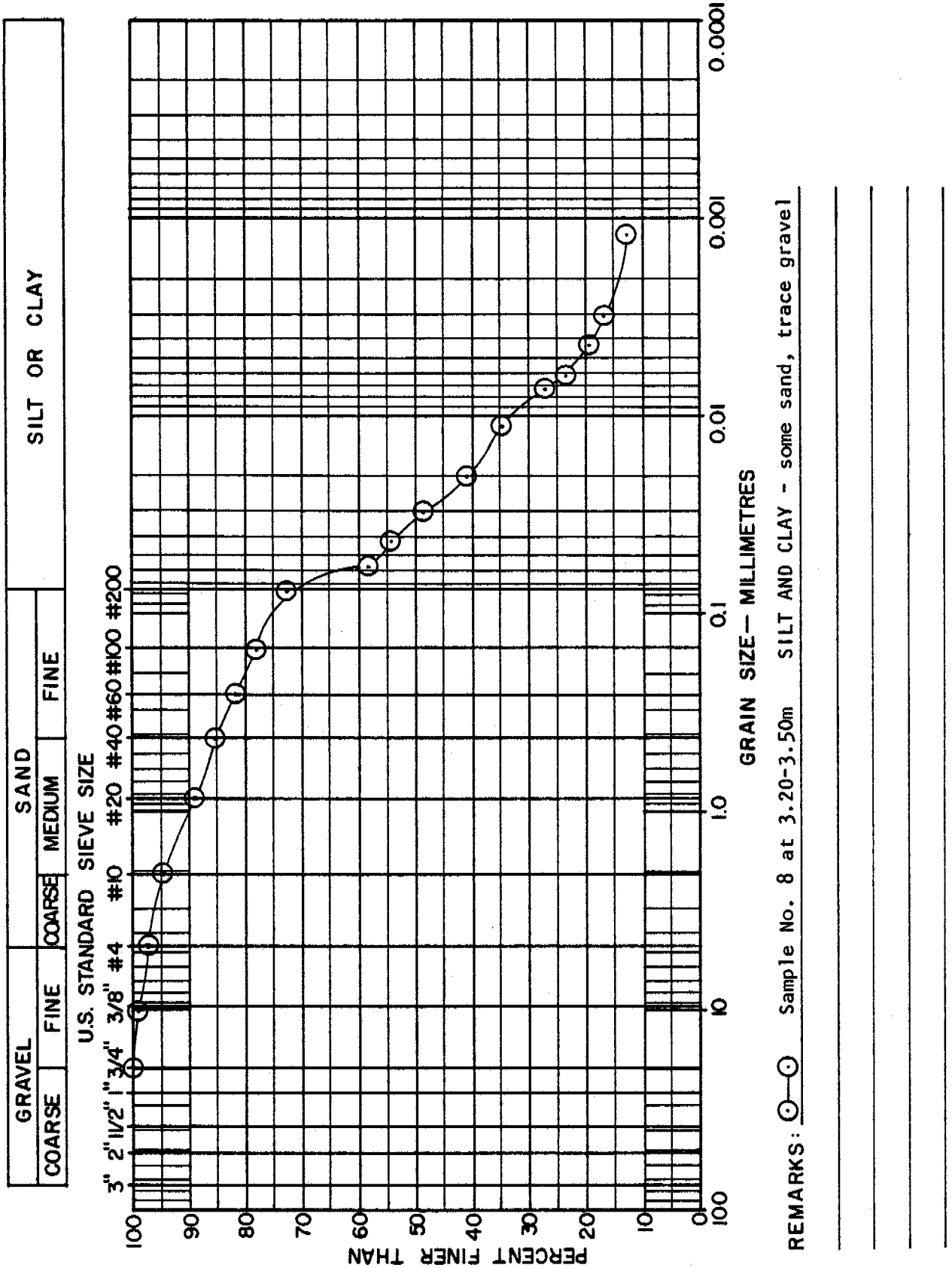
1. Hole located on north bank of an unnamed valley, 50m north of crest of valley. Terrain is flat.
2. Vegetation consists of conifers to 15m and small shrubs.
3. Frost mounds present.
4. Moderately poor drainage.
5. Hole augered to 0.3m, then cored to 7.3m and then drilled with air to 12.5m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-200
DATE	Aug. 18/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-200	DEPTH
DATE Oct. 11/78	528

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-200

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
7	2.70 - 3.20	2133.3	133.1
16	6.00 - 6.45	2138.8	133.5

KLOHN LEONOFF CONSULTANTS LTD.
CIVIL • GEOTECHNICAL • HYDRAULIC
VANCOUVER - CALGARY - WINNIPEG, CANADA

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-201

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

HAMMER WT. 63.5Kg.
HT. DROP 76 cm.
SAMPLE DATA

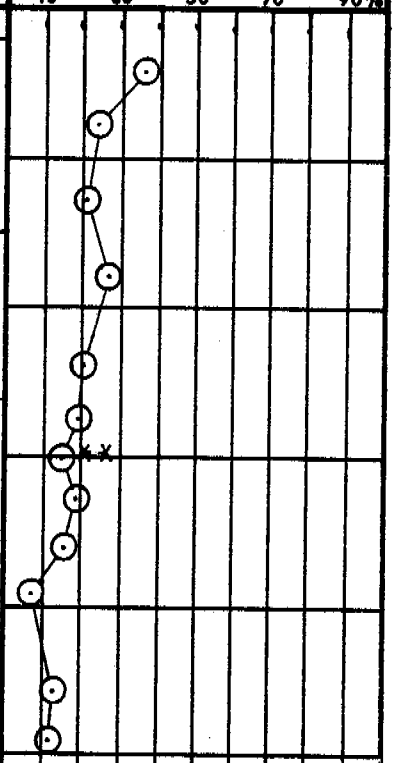
DEPTH	TYPE	BLOW/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B						0.05m ORGANIC COVER
	B		1				SILT AND CLAY - little coarse to fine sand - trace fine gravel - low plasticity - rootlets - brown
1	B		2			NF	
	B		3				1.50m
2	C		4		Vr Vs		coal layer SAND AND SILT & CLAY - trace gravel - low plasticity - grey - ice lenses 1/2mm-10mm spaced @ 1mm-10mm
	C		5		Nbn		2.40m
	C		6		Vr Vs		2.85m
3	C		7		Vr		CLAY AND SILT - trace fine sand - medium plasticity - laminated - grey - ice lenses 5mm-20mm spaced @ 10mm-50mm
	C		8		Vs		
	C		9		Vx		
4	C		10		Nbe		
							SHALE - SILTSTONE - low to medium plasticity - coal laminations - grey - ice lenses 1/4mm-1/2mm spaced @ 2mm-10mm
	C		11				
5	C		12				5.00m
6							END OF HOLE

Notes:
1. Hole located near center of a broad shallow valley. Valley sides slope 2 to 5%.
2. Small creek located 25m east of site flows north.
3. Vegetation consists of sparse conifers to 5m.
4. Ground surface gently rolling.
5. Hole augered to 1.5m and cored to 5.0m.
6. Thermistors installed to depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0 and 4.0m.

LOCATION
ELEVATION

COHESION - Kg./Sq.cm.
0.2 0.6 1.0 1.4 1.8
● FIELD VANE △ LAB VANE ■ UNCONF.

PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X – – – – – 0 – – – – – X
10 30 50 70 90%

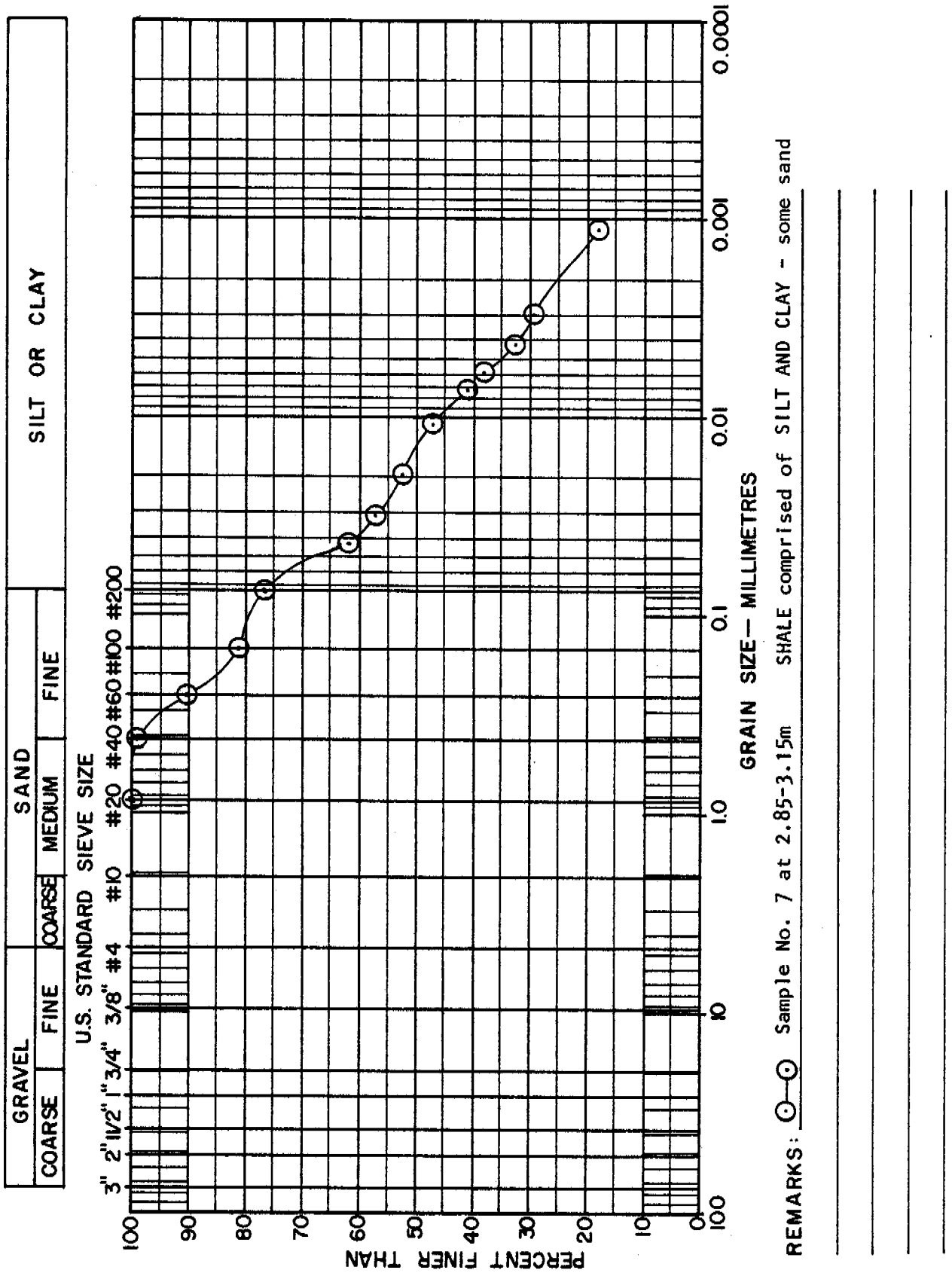


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-201
DATE	Aug. 18/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-201	DEPTH
DATE Oct.10/78	

532

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78-201

Sample No.	Sample Depth (m)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
5	2.05 - 2.50	2040.4	127.3

F CONSULTANTS LTD.
HNICAL • HYDRAULIC
ARY - WINNIPEG, CANADA

INES (YUKON) LTD

PROJECT
DEMPSTER LATERAL DRILLING PROGRAM

TITLE
TEST HOLE LOCATION PLAN

DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
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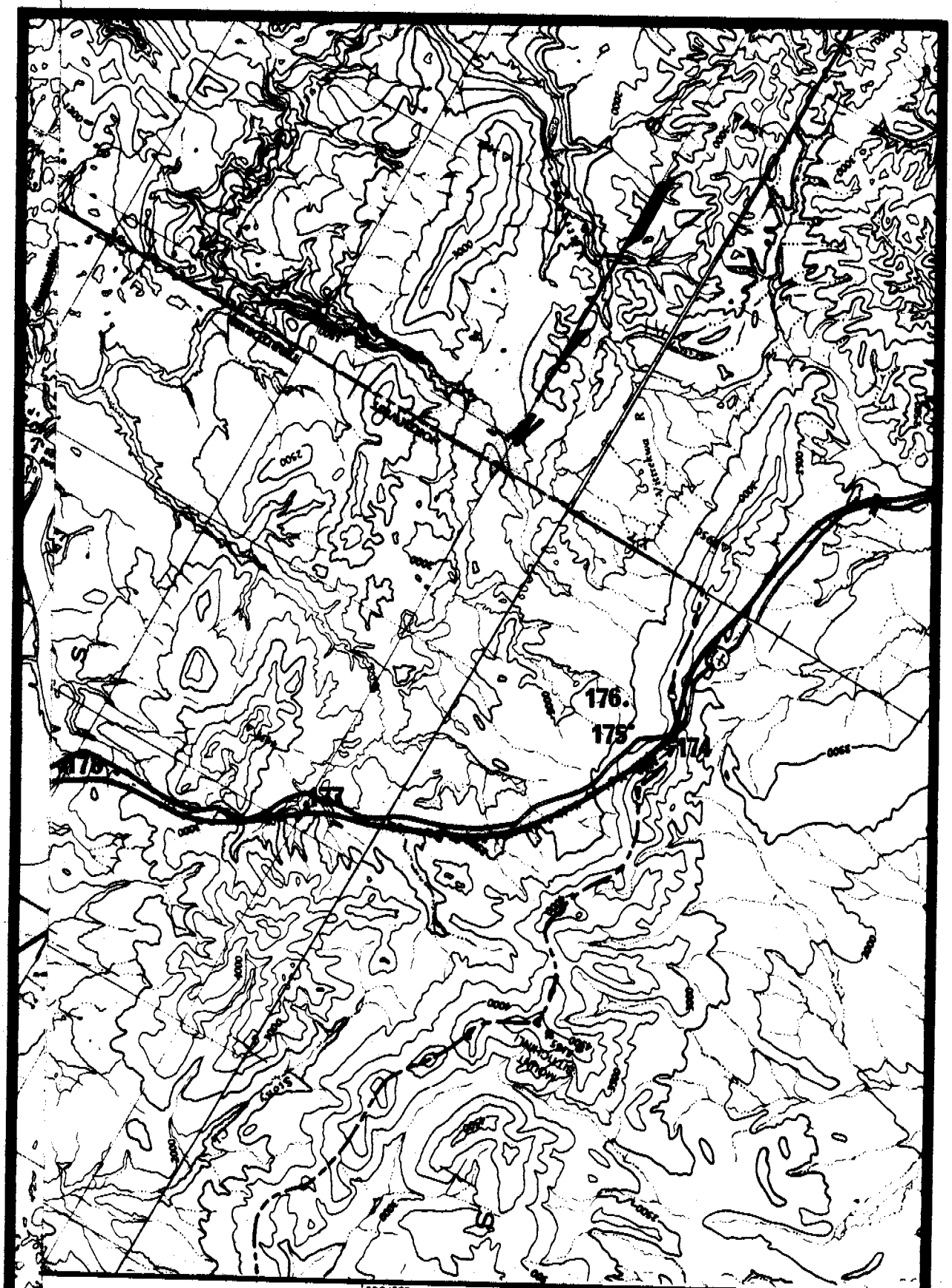

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