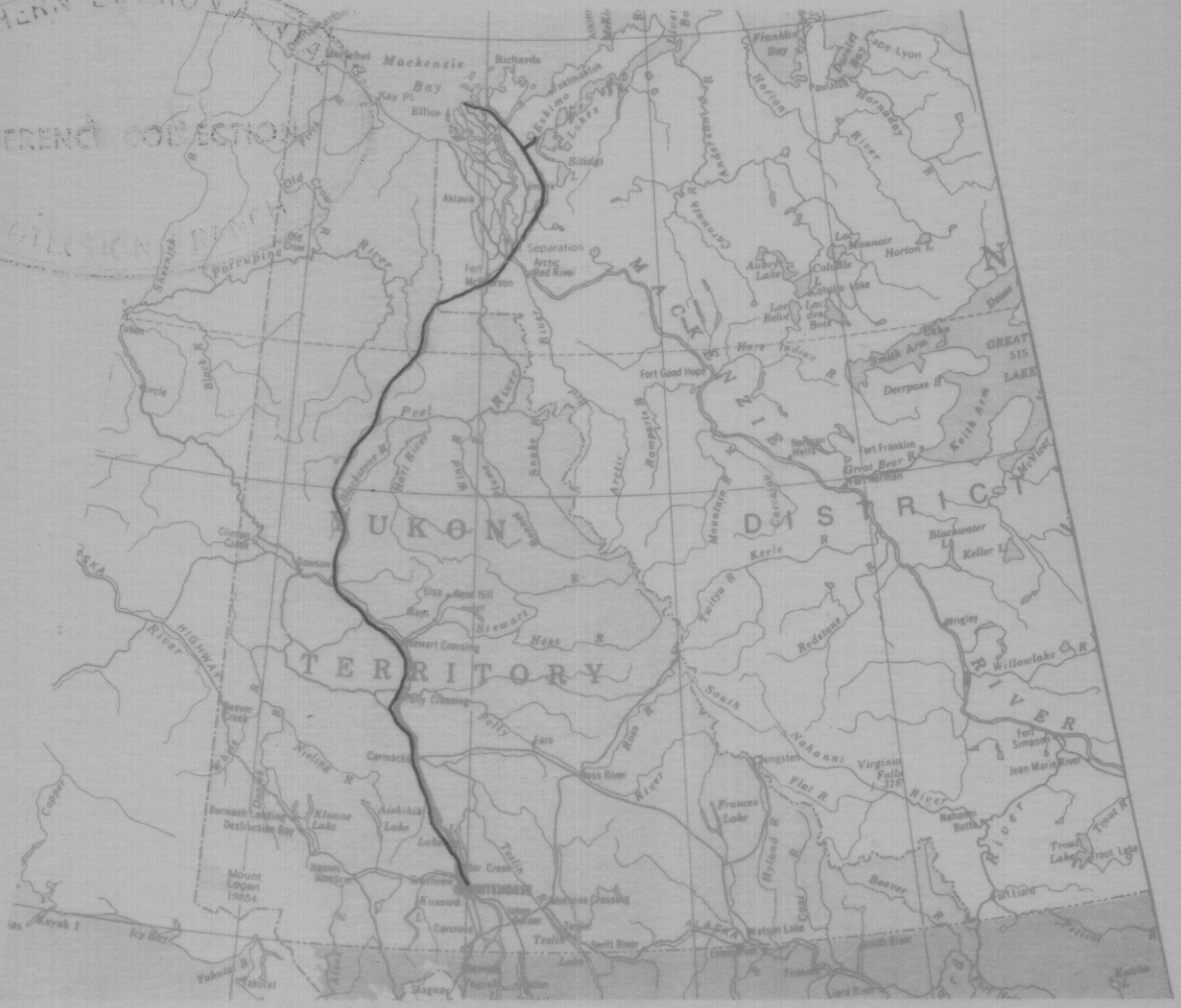
DEMPSTER LATERAL DRILLING PROGRAM

VOLUME 1

NORTHERN ENVIRONMENTAL
REFERENCE COLLECTION
PROTECTION BRANCH



FOOTHILLS PIPE LINES (YUKON) LTD.

D001646

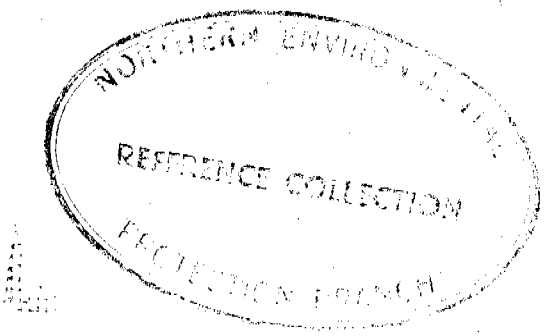
OCTOBER, 1978

KLOHN LEONOFF CONSULTANTS LTD.
Civil · Geotechnical · Hydraulic

KLOHN LEONOFF CONSULTANTS LTD.
Civil · Geotechnical · Hydraulic

October 31st, 1978

OUR FILE NO.: AL1023



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

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

Dear Dr. Yip:

Re: Dempster Highway Lateral
Drilling Program

The following report contains the detailed test hole logs and laboratory data for the drilling program carried out between Carmacks and Inuvik, along the Klondike and Dempster Highways. For convenience, the report is divided into two volumes. Volume I contains the truck hole numbers 78-1 to 78-34 inclusive and heli-hole numbers 78-101 to 78-131 inclusive. Volume II contains the remaining heli-hole numbers 78-132 to 78-201 inclusive.

The data for each test hole contained in the two volumes are as follows:

1. Airphoto plan showing the test hole location.
2. Test hole log summarizing the physical soil and permafrost conditions.
3. Additional laboratory test results including grain size analyses and frozen bulk densities.

A general location plan for the test holes is provided on a series of 1:250,000 topographic maps contained in Appendix A at the end of each volume.

The symbols and terms used in the report are described on the two plates immediately following this introductory letter. A modified Burmister System is used for soil classification, while the N.R.C. System is used for

classification of permafrost. The individual test hole logs provide a concise summary of the soil and permafrost conditions at each drill location. The detailed laboratory description of each sample is not provided due to presentation constraints.

Prior to commencement of the field drilling program, a series of tentative drill hole locations were selected along the route based on an airphoto study and a review of existing geotechnical data. The tentative hole locations were selected by Klohn Leonoff Consultants in liason with the various consultants retained by Foothills Pipe Lines (Yukon) Ltd. Subsequent to the office study, a total of 135 test holes were chosen for drilling during a field reconnaissance carried out in June, 1978. The drill holes were located at river crossings and at specific locations to provide correlation with terrain typing and necessary geotechnical data relative to permafrost, soil classification, ground geothermal conditions, depth to bedrock, and groundwater conditions.

The field drilling program for the project consisted of both airborne and land based drilling operations. A total of 135 test holes were drilled along the corridor of the proposed route during July and August, 1978. Thirty-four test holes were drilled in the land based operation and 101 test holes were drilled in the airborne operation. The crews for both drilling operations were stationed at the various communities along the Klondike Highway, and at a catered mobile trailer camp in the north along the Dempster Highway.

The land based drilling program utilized a truck mounted Failing 1000 drill. Due primarily to land-use constraints, the truck drilling program was only carried out along the southern portion of the route between Carmacks and Chapman Lake. The airborne program utilized a Mayhew 200 heli-drill transported by a Bell 205 helicopter. Clearing of helicopter landing pads was required at many of the test hole sites prior to drilling.

The soil sampling procedures utilized during the program were by coring (CRREL barrel), split spoon, Shelby Tube and flight auger methods. Groundwater levels were observed during air drilling and standpipe piezometers were installed in

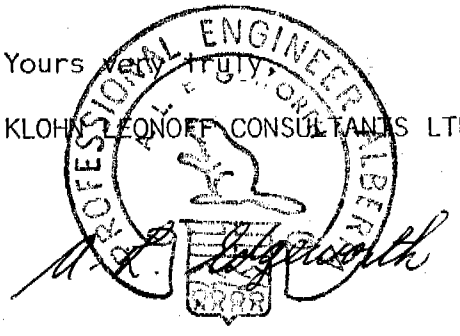
selected test holes located in non-permafrost areas. Thermistor strings were also installed in thirty selected test holes to allow future ground temperature monitoring. (A report concerning the thermistor installations has been forwarded under separate cover). All permafrost samples obtained in the field were stored in portable freezers during drilling and transported daily to larger freezers at the base camp for storage prior to shipment in insulated containers to our Calgary laboratory.

Laboratory testing was carried out in accordance with accepted CSA or ASTM Standards. The tests included: soil and ice classification; water and ice contents; and basic index tests such as Atterberg Limits, grain sizes, and organic contents. The frozen bulk densities of selected core samples were also estimated using a measured volume - weight method.

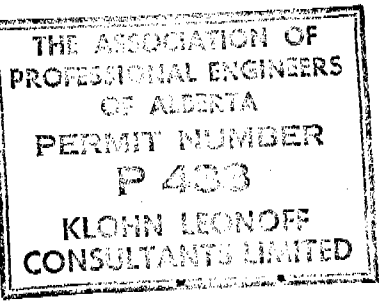
We would be pleased to provide clarification of any test hole data or answer questions you may have on the report.

Yours very truly,

KLOHN LEONOFF CONSULTANTS LTD.



A.L. Edgeworth, P. Eng. (Project Coordinator)



T. Murray, P. Eng. (Field Engineer)

D.A. Ross, P. Geol. (Field Geologist)

S. Shinde, P. Eng. (Field Engineer & Laboratory Supervisor)

D. Wasylyk, P. Geol. (Field Geologist)

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		50 or more	non plastic	0
	SAND			non plastic	0
	SILT			non to slight plastic	0 to 5
	SILT and CLAY			low	5 to 10
	CLAY and SILT			medium	10 to 30
	CLAY			high	30 and over
Minor Component	gravel	and	35 to 50	non plastic	0
	sand	some	20 to 35	non plastic	0
	silt	little	10 to 20	non to slight plastic	0 to 5
	silt and clay	trace	1 to 10	low	5 to 10
	clay and silt			medium	10 to 30
	clay			high	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	Poorly bonded
	Nbn	Well bonded
	Nbe	Excess Ice
Visible Ice Less than 1 inch thick	Vx	Individual ice crystals or inclusions
	Vc	Ice coatings or particles
	Vr	Random or irregularly oriented ice formation
	Vs	Stratified or distinctly oriented ice formation
Visible Ice Greater than 1 inch thick	ICE+	Ice with soil inclusions
	ICE	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. 78-1

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.
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 (X — 0 — X; 10 30 50 70 90%)
DEPTH	TYPE	BLOW 15 cm.	No.					
	B					NF	0.1m	
	B		1		Vx		PEAT AND MOSS	
	B		2		Vr		ORGANIC SILT - little to some sand - fine to coarse - trace fine gravel - dark brown	110%
1.0	B		3					
	B		4					
	B		5				1.5m	
2.0	C		6		Vs Vx		SILT - some sand-fine to coarse - some gravel - non to slight plasticity - organic pockets - brown	NP
	SPT	22 35 33	7		ICE+			
3.0					Nbe Nbn			
	C		8				3.12m Silt layer Ice lenses 1/2mm - 3/4mm spaced @ 2mm - 5mm	
4.0							SAND - fine to medium - little silt - trace gravel - organic pockets - light brown	
	SPT	50 for 10cm	9		Nbn		4.5m	
5.0							GRAVEL - some sand - some silt - very dense - light grey	
	SPT	50 for 10cm	10					
6.0								
7.0								
	SPT	50 for 10cm	11					
8.0							8.0m	
	SPT	61 for 15cm	12		Vx Nbe		SAND - fine to coarse - trace gravel - trace silt - orange specks - pockets of rusty brown silt - light brown	
9.0								
10.0							Boulder or coarse gravel (Cont'd)	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-1
DATE July 5/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

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

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	SPT	48	13				10.24m As above
11.0		50 for 9cm					END OF HOLE

PERMAFROST
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 10m west of road on hummocky ground.
2. Hole surrounded by moss, shrubs trembling aspen to 6m-15m.
3. Two very small erosion scars on east side of roadway just to the north of drill site.
4. Drainage poor to fair.
5. Initial hole augered to 1.5m, cored from 1.5 to 2.0m, then unable to core due to gravel so abandoned hole.
6. Second hole drilled with air to 3.0m, then cored from 3.0 to 3.5m. Air used as drilling fluid below 3.5m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

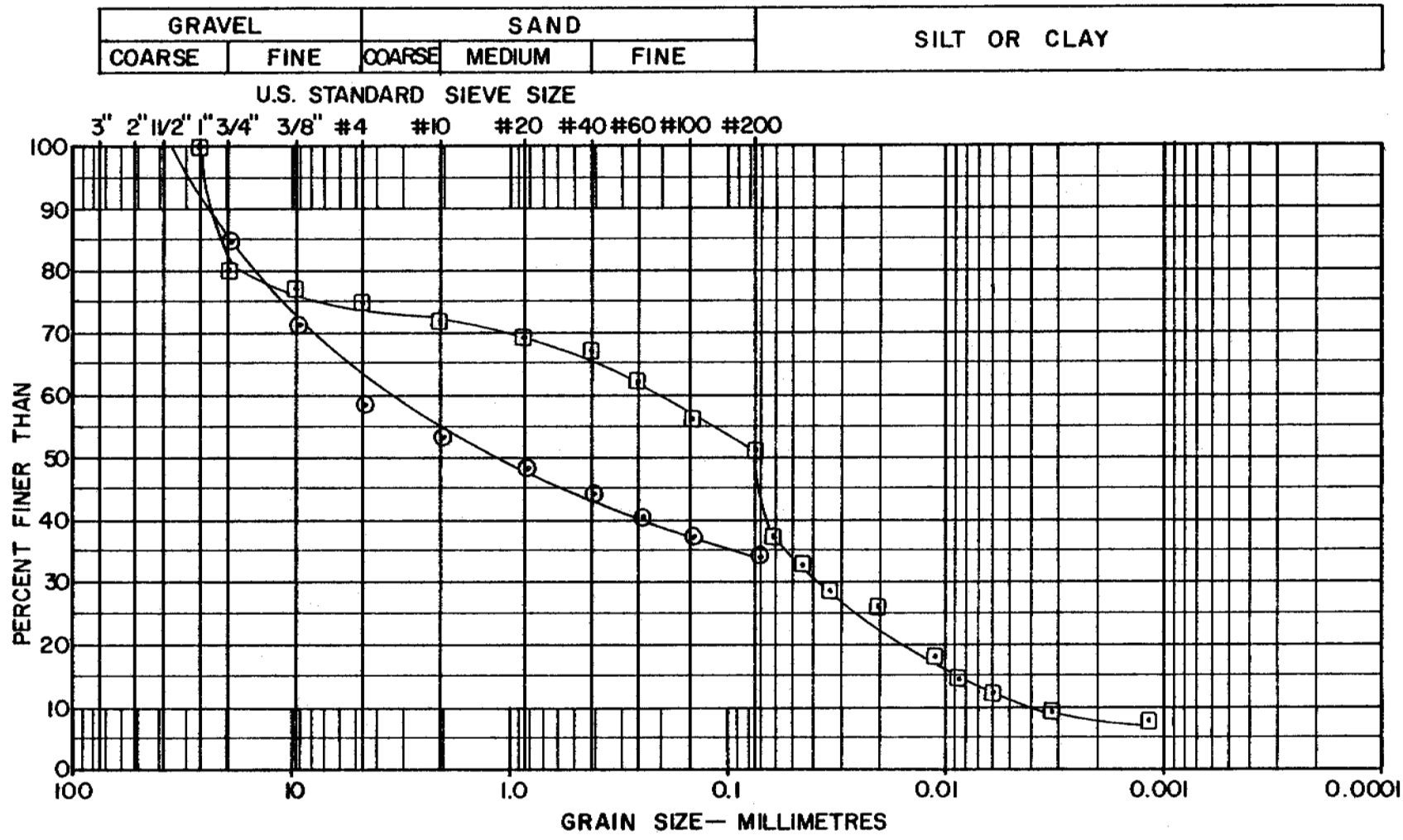
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-1
DATE July 5/78 PLATE

K.L.C. - METRIC

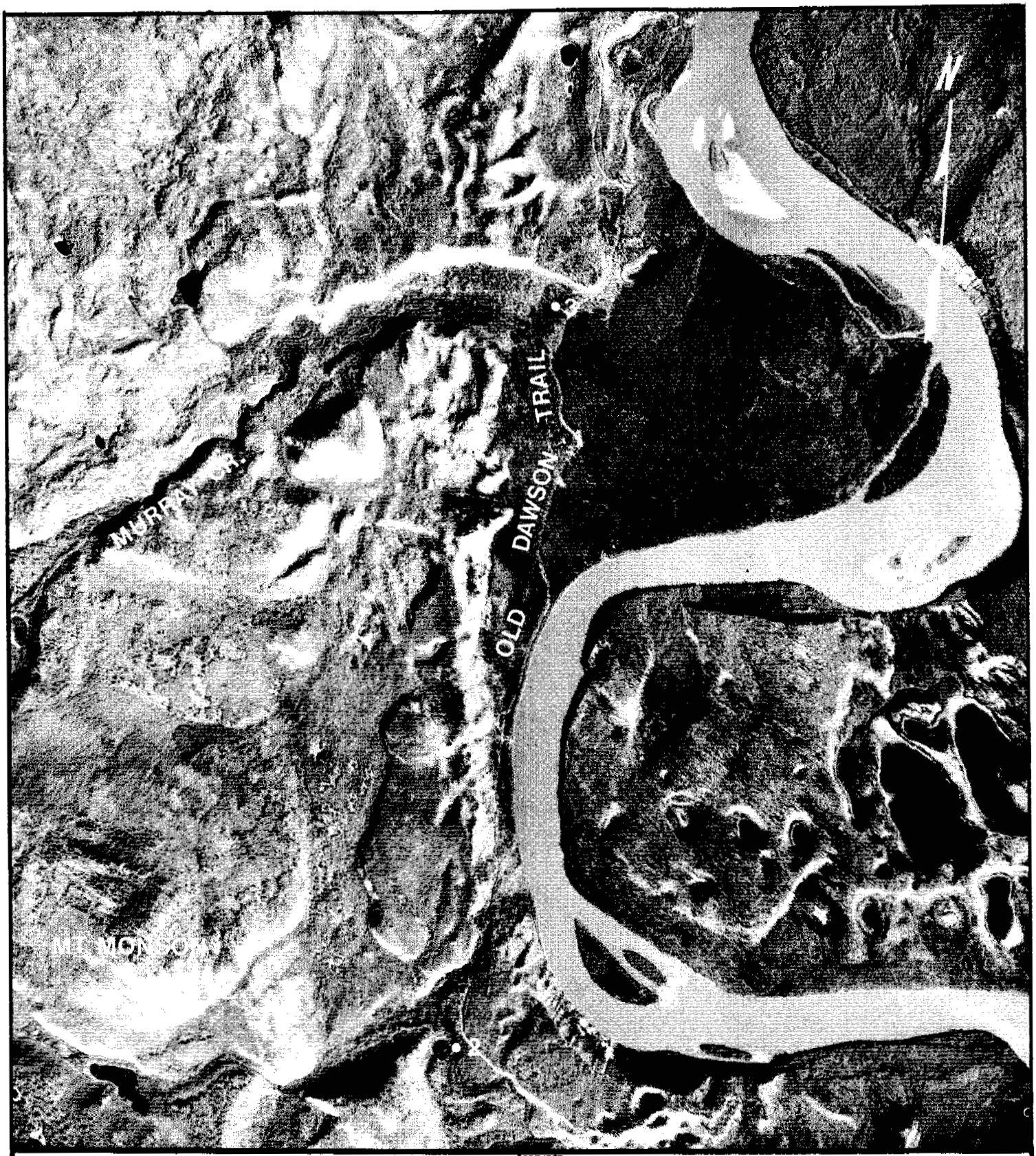
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-1 DEPTH
DATE Sept. 17/78

GRAIN SIZE CURVE



REMARKS:
- Sample No. 6 at 1.5-2.0m SILT - some sand, some gravel
- Sample No. 9+10 at 4.5-5.95m GRAVEL - some silt, some sand



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-2

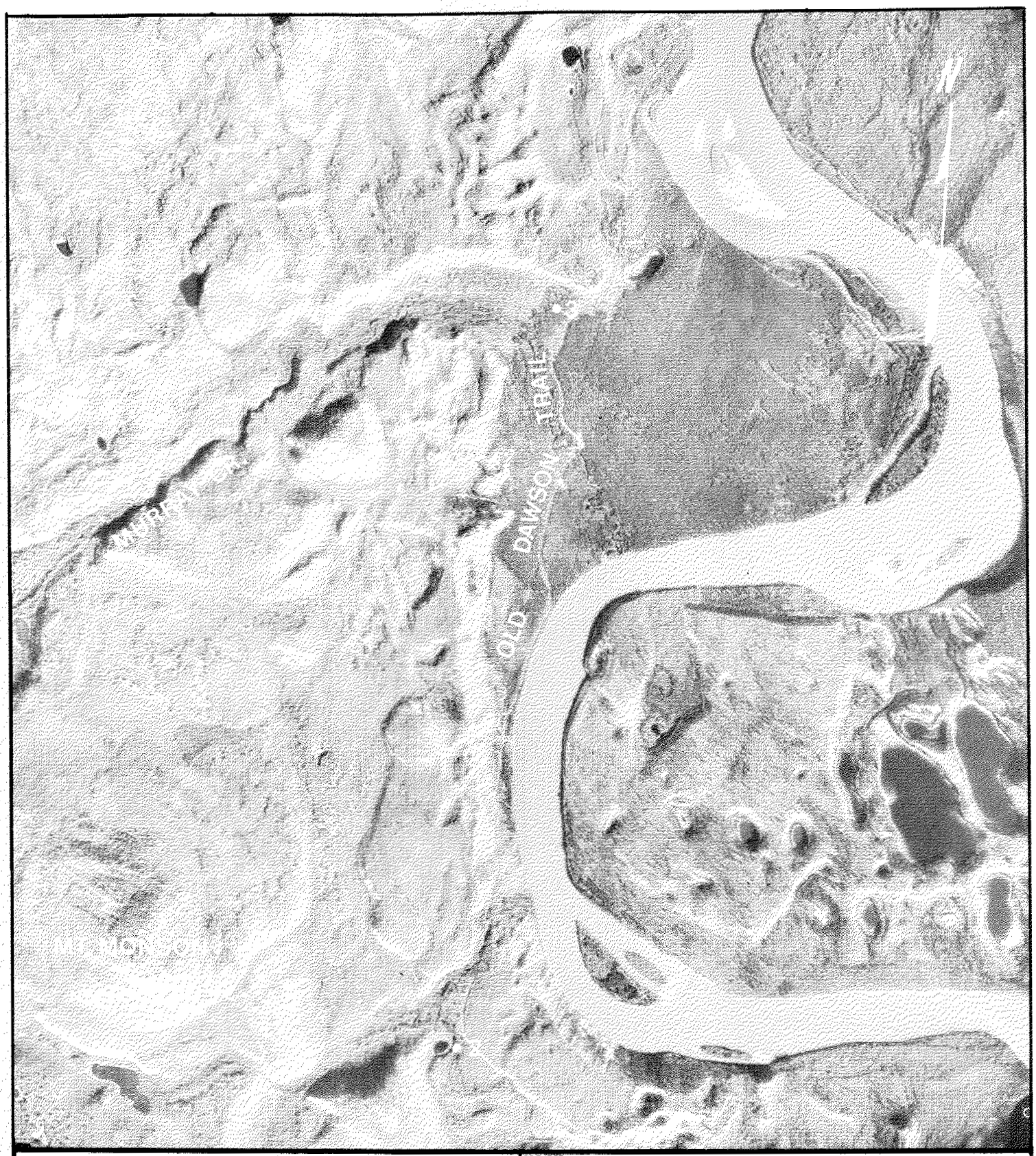
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

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

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-2

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.
	B		
1.0		7	
	SPT	17	1
		7	
2.0			
		9	
	SPT	7	2
		16	
3.0			
		14	
	SPT	40	3
		37	
4.0			
		15	
	SPT	29	4
		36	
5.0			
		10	
	SPT	23	5
		28	
6.0			
7.0			
8.0			
9.0			
10.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.15m
TOP SOIL

CLAY AND SILT
- trace fine sand
- trace gravel
- medium plasticity
- lenses of clay and silt
- brown

1.0m

GRAVEL
- little to some sand
- fine to coarse
- trace silt
- dense to very dense
- brown up to 1.3m grey below

NF

trace siltstone and sandstone

pink silt pocket

7.0m

END OF HOLE

Notes:

1. Hole located 45m west of road along a trail near the crest of a small hill.
2. Hole surrounded by poplars to 2m-15m, shrubs.
3. Hole drilled with air to 1.0m. Mud used as drilling fluid below.
4. Loss of circulation at 5.0m.
5. Hole caved in at 7.0m.

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. 78-2
DATE July 5/78 PLATE

R.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. 78-3

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
1.0	B		2
2.0	SPT	50 for 13cm	3
	B		4
3.0	SPT	48 50 for 15cm	5
4.0	SPT	50 for 8cm	6
5.0			
6.0	SPT	52 for 11cm	7
7.0	SPT	12 14 20	8
	SPT	16 54	9
8.0		23	

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC SILT AND MOSS

SILT
- trace to little volcanic ash
- trace fine sand
- rootlets
- brown

0.75m cobbles

organics

GRAVEL
- trace to little sand
- fine to coarse
- trace silt
- rusty specks
- very dense
- brownish grey

NF

3.0m partially frozen

silt and clay lense

5.0m

SAND-fine to medium
- trace to little silt
- trace gravel
- brown

Nbn

6.3m

med. sand

SAND-fine
- trace to little silt
- rusty silt & sand laminations
- brown

NF

7.4m

7.70m GRAVEL
- trace to little sand med. to coarse

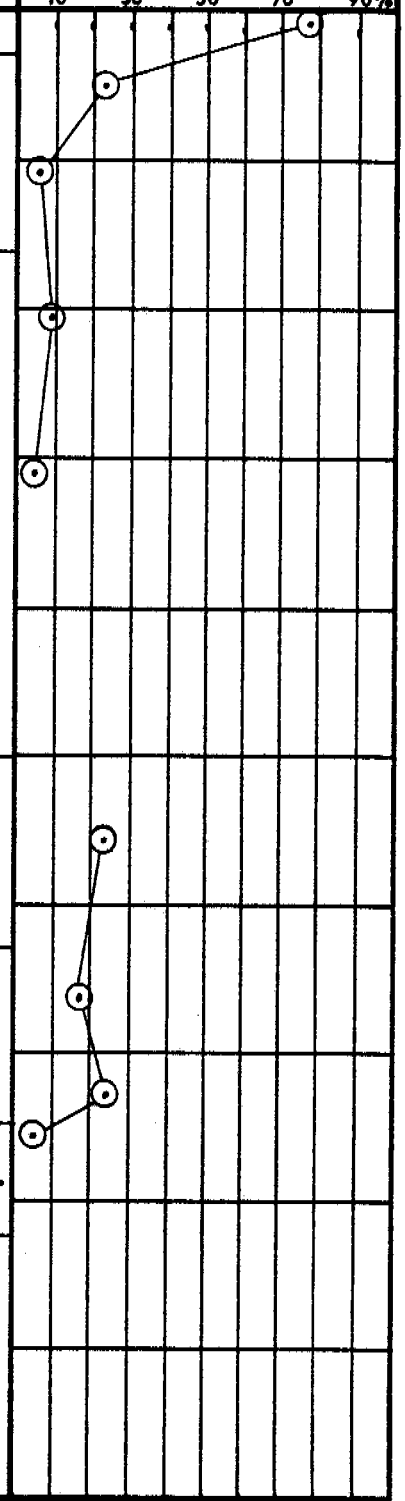
END OF HOLE

Notes:

1. Hole located 45m west of road on ground sloping 1% north-easterly.
2. Hole surrounded by spruces 20-25m, shrubs and moss. (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.	78-3
DATE	July 5/78 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:

3. Hole augered to 1.0m. Mud used as drilling fluid below.
4. Standpipe piezometer installed to the bottom of hole.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

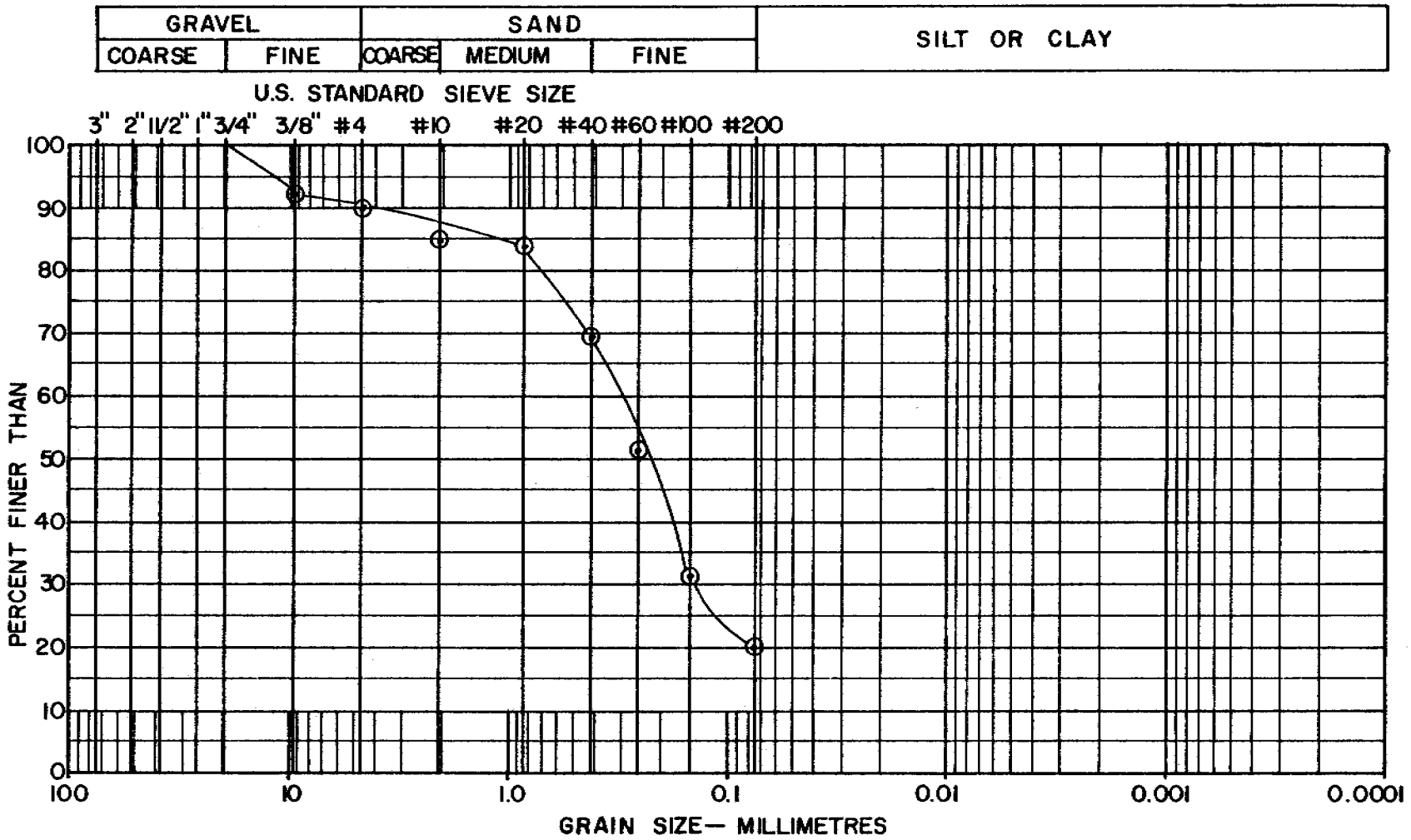
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-3
DATE July 5/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-3 DEPTH
DATE Sept. 17/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 7 at 5.5-5.61 m. SAND, little silt, trace gravel.

10



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. 78-4

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
1.0	B		3
		25	
2.0	SPT	25	4
		27	
3.0		44	
	SPT	37	5
		37	
4.0		21	
	SPT	21	6
		30	
5.0		22	
	SPT	23	7
		26	
6.0		30	
	SPT	30	8
		30	
7.0		18	
	SPT	20	9
		36	
8.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.06m
VOLCANIC ASH
- little silt-white and brown

GRAVEL - fine to coarse
- some sand - fine to medium
- trace silt
- rootlets
- dense to very dense
- brown

NF

← trace sandstone

6.3m
SAND - fine to coarse
- some to and gravel
trace gravel - rusty gravel and sand
- very dense - grey
7.45m

END OF HOLE

Notes:
1. Hole located on undulating ground 20m east of road.
2. Pit located to the west and gravel exposures to the south-west of hole.
3. Ground sloping 6-7% to south-east.
4. Hole surrounded by aspen

(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. 78-4
DATE July 6/78 PLATE

K.L.C. - METRIC

TEST HOLE LOG

HAMMER WT. 63.5 Kg.
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%

Notes;

to 10m, spruces to 20m and shrubs.

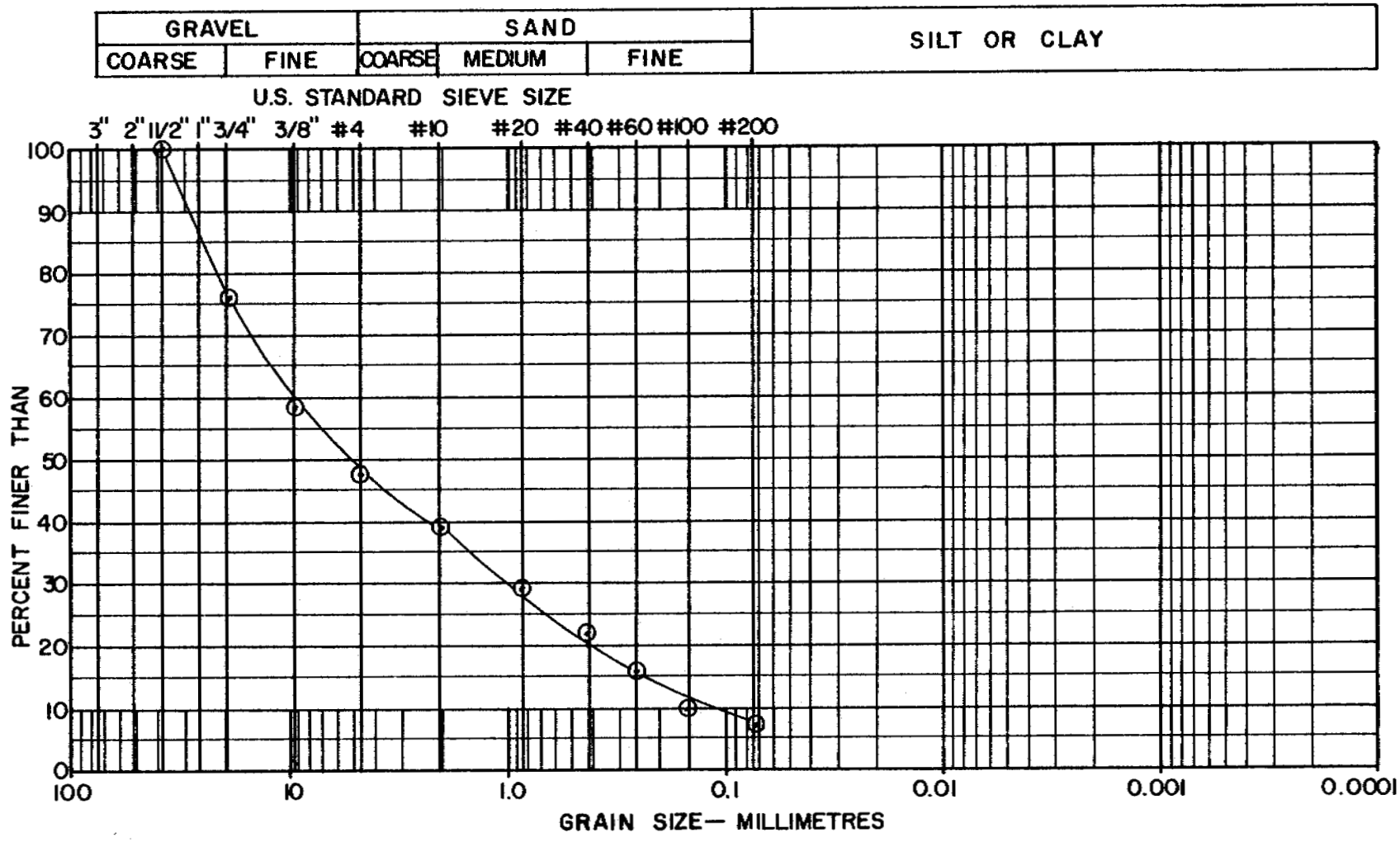
5. Hole drilled with mud.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-4
DATE July 6/78 PLATE

K.L.C. - METRIC

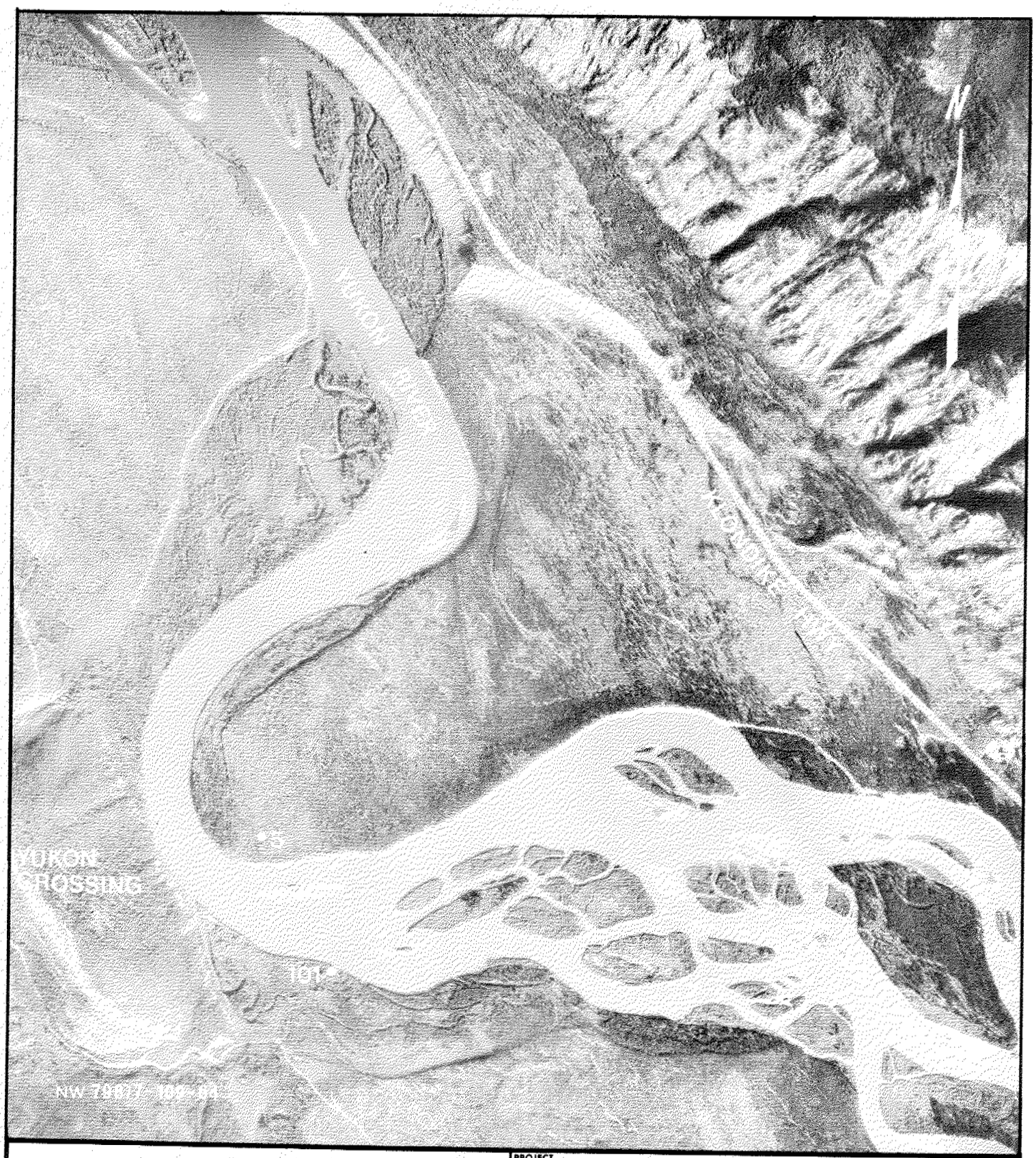
GRAIN SIZE CURVE



REMARKS: ⊙-⊙ Sample No. 3 at 1.0 m. GRAVEL, some sand, trace silt.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-4 DEPTH
DATE Aug. 8/78



KLOHN LEONOFF CONSULTANTS LTD. CIVIL • GEOTECHNICAL • HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-5		
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.
	B		
	B		1
1.0			
	B		2
	B		3
2.0		17	
	SPT	12	4
		14	
3.0		39	
	SPT	42	5
4.0		50	
	SPT	for	6
		5cm	
5.0			
6.0		50	
		for	
	SPT	10cm	7
7.0			

SYMBOL

PERMAFROST

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

LOCATION Yukon 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

0.03m TOP SOIL

0.75m

SILT
- some sand and gravel
- trace volcanic ash
- root fibers
- brown

NF

GRAVEL
- some sand - fine to coarse
- trace silt
- root fibers
- dense to very dense
- grey

3.5m

GRAVEL
- little to some coarse
- sand
- trace cobbles, boulders
- hard drilling
- pieces of sandstone

-trace carbonates

6.1m

END OF HOLE

Notes:
1. Hole located about 60-70m east of Yukon River at the junction of two trails.
2. Hole located on flat ground.
3. Ground sloping 10-15% to west towards the river. Steep slope of 45-50% towards north about 13m away from hole.
4. Hole surrounded with aspen to 20-25m, spruces 20-25m, shrubs and willows.
5. Hole augered to 1.5m. Mud used as drilling fluid below.
6. Loss of circulation at 1.8m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

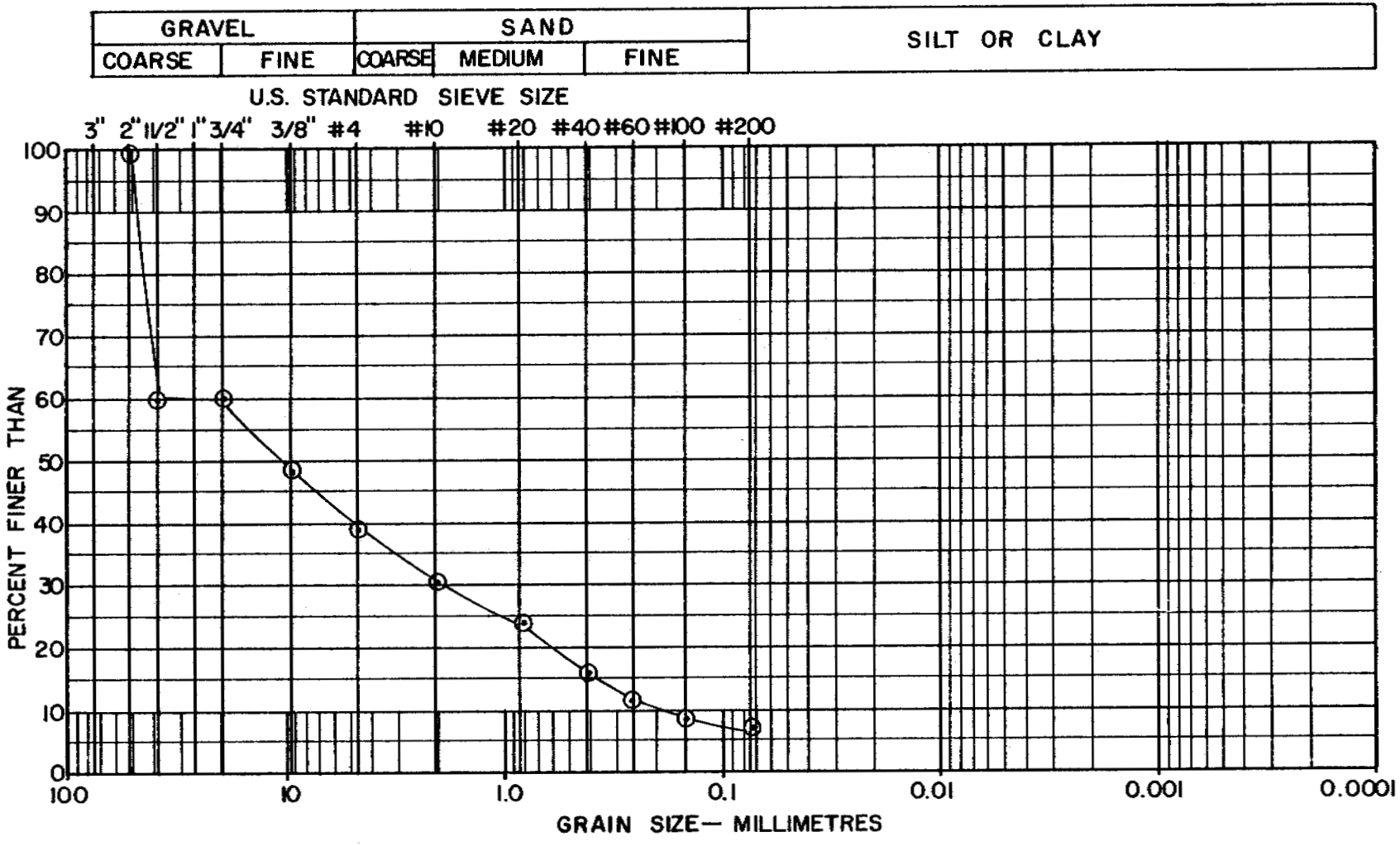
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-5
DATE July 7/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-5 DEPTH
DATE Aug. 9/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. (2 + 3) at 1.0-1.5 m. GRAVEL, some sand, trace silt.



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. 78-6

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.

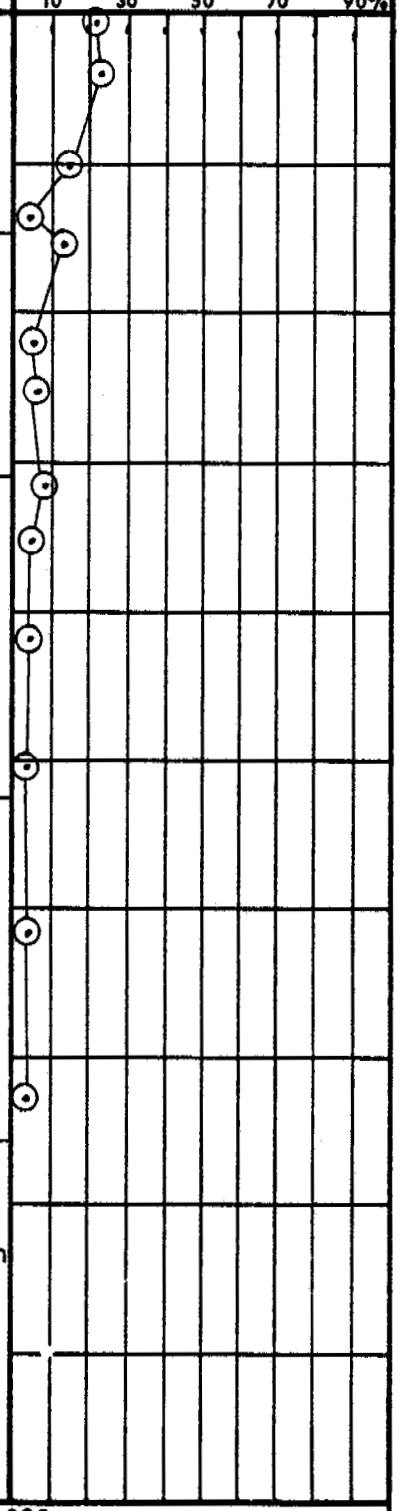
SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW/15cm.	No.		N.R.C. CLASS	N.F. or F.	
	B						SAND - fine
	B		1				- and volcanic ash
							0.75m
1.0			2				← silt layer - organics
	B		3				- root fibers
	B		4				- white and brown
	B						SAND - fine
2.0		4					- trace to little silt
	SPT	4					- coal pockets
	B	4	5				- laminations of sand and silt
			6				- loose - brown
3.0		1					3.10m
	SPT	1					SAND - fine to medium
	B	4	7				- little silt
			8				- trace gravel
4.0						NF	- loose to medium dense
	SPT	5					- brown
		7	9				← coarse sand
		11					
5.0		13					
	SPT	50 for 10cm	10				5.30m
							GRAVEL
6.0		8					- little sand-fine to coarse
	SPT	12					- trace silt
		27	11				- very dense
							- brown to 6.0m. grey below
7.0		46					
	SPT	42					
		35	12				← trace sandstone 7.45m
8.0							END OF HOLE

Notes:
1. Hole located about 20-25m south of McGregor Creek on hummocky ground.
2. Ground sloping gently towards creek.
3. Hole surrounded by spruces to 30m, aspen to 15-20m, shrubs and moss. (Cont'd)

LOCATION McGregor Creek
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. 78-6
DATE July 7/78 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:

4. Hole augered to 5.0 m. Air used as a drilling fluid below.
5. Piezometer standpipe installed to the bottom of hole.

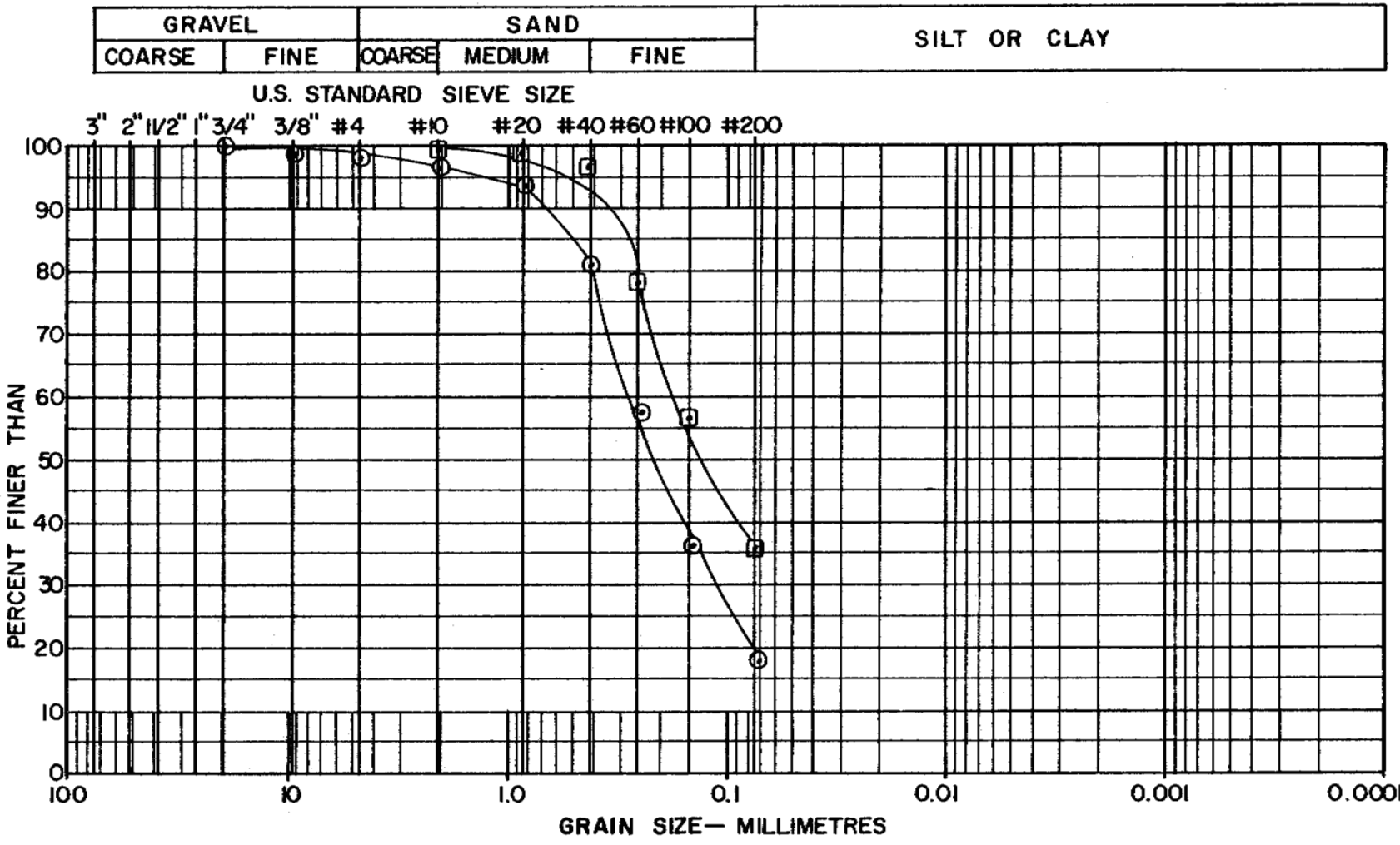
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-6
DATE July 7/78 PLATE

K.L.C. - METRIC

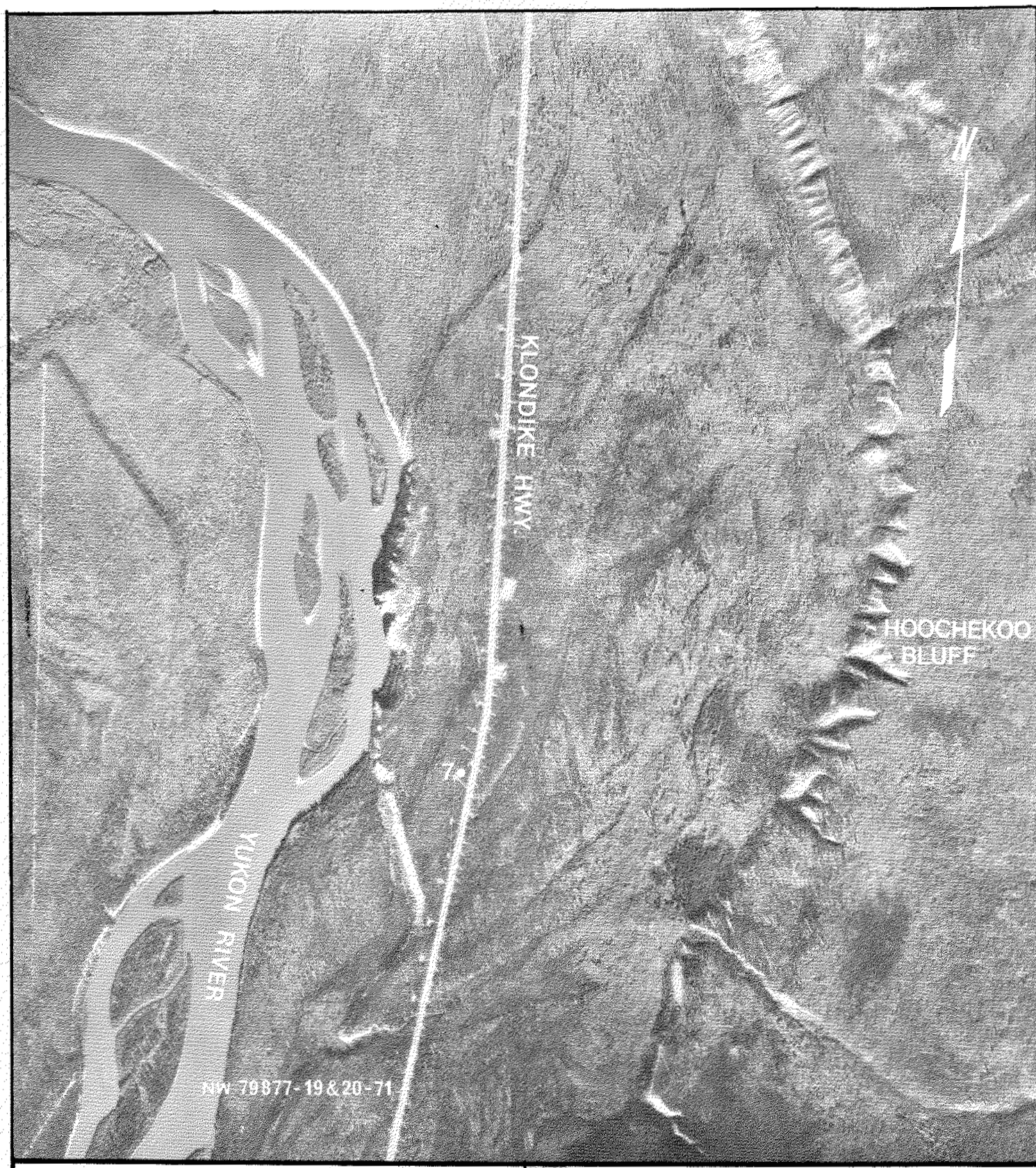
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS:
- Sample No. (3 + 4) at 1.25-1.5 m. SAND, some silt.
- Sample No. (7 + 8) at 3.0-3.5 m. SAND, little silt, trace gravel.

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-6 DEPTH
DATE Aug. 3/78



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. 78-7

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
	B		2
1.0			
	SPT	50 for 15cm	3
2.0			
	SPT	6 50 for 0cm	4
3.0			
	SPT	10 20 46	5
4.0	B		6
		45 50	
5.0	SPT	for 10cm	7
6.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.06m VOLCANIC ASH AND MOSS

SILT
- little sand - fine
- trace volcanic ash
- rootlets
- brown

1.0m

GRAVEL-fine to medium
- little to some sand-fine to coarse
- trace silt
- very dense
- brown

NF

cobbles or boulder

5.25m trace sandstone

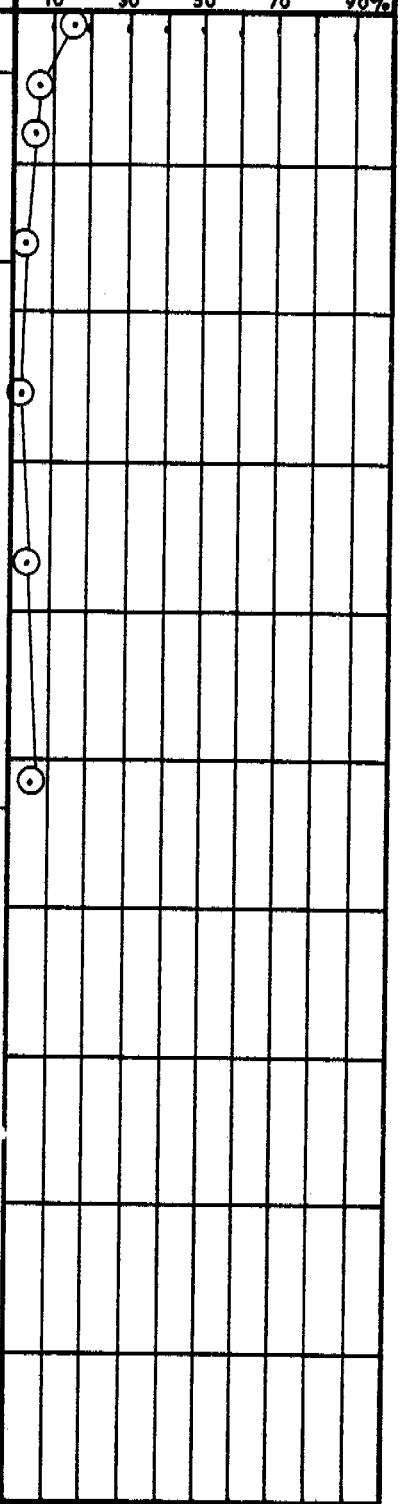
END OF HOLE

Notes:

1. Hole located on a flat ground surface near junction of two trails.
2. Hole surrounded by spruces to 20-25m, Few aspen to 1 - 4m
3. Hole augered to 1.0m. Air used as drilling fluid from 1.0 to 3.5m, drilling mud used below.
4. Hole caved in at 3.5m on completion of drilling.

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.	78-7
DATE	July 7/78 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. 78-8

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
1.0	B		2
	B		3
2.0		12	
	SPT	31	4
		26	
3.0			
	B		5a
		11	
	SPT	12	6
4.0		10	
	SPT	29	7
		50 for 15cm	
5.0		19	
	SPT	29	8
		27	
6.0			

SYMBOL

PERMAFROST

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

NF

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

SILT
- trace volcanic ash
- organic inclusions
- root fibers
- dark brown

0.5m

trace silt

SAND AND GRAVEL
- fine to coarse
- dense to very dense
- grey and white

3.0m

SAND- fine to medium
- trace gravel
- medium dense
- greyish brown

4.0m

GRAVEL-fine to medium
- little to some sand
- fine to coarse
- trace silt
- rusty specks
- pockets of silt
- grey (TILL-LIKE)

5.45m

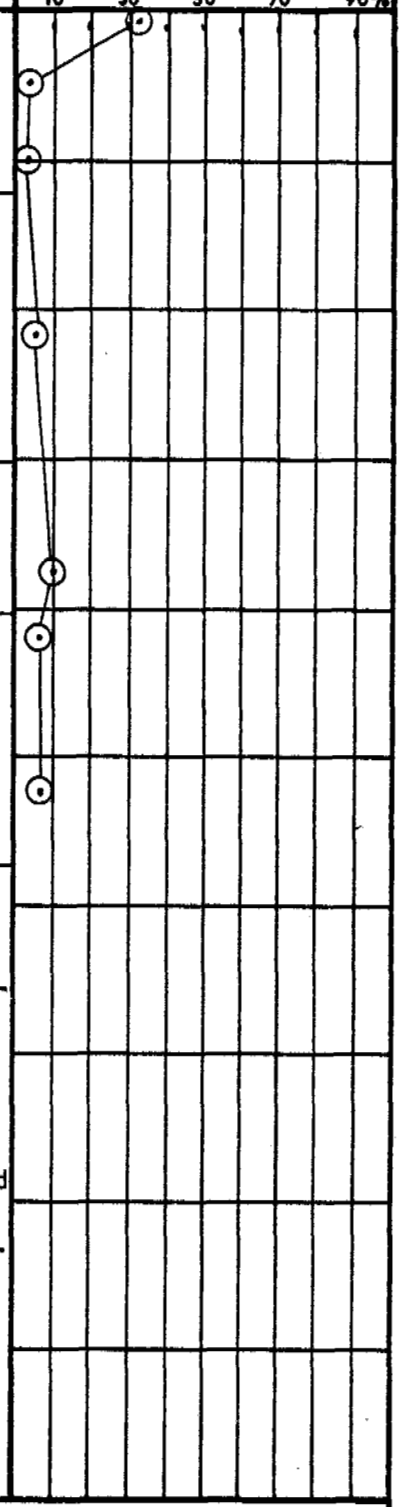
END OF HOLE

Notes:

1. Hole located about 0.6km north-east of Minto Airstrip.
2. Hole located on a terrace.
3. Hole surrounded by shrubs, aspen to 15m, spruces to 3-5m.
4. Good drainage.
5. Hole augered to 1.0m. Mud used as drilling fluid below.
6. Loss of circulation below 3.0m.
7. Standpipe piezometer installed to the bottom 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%

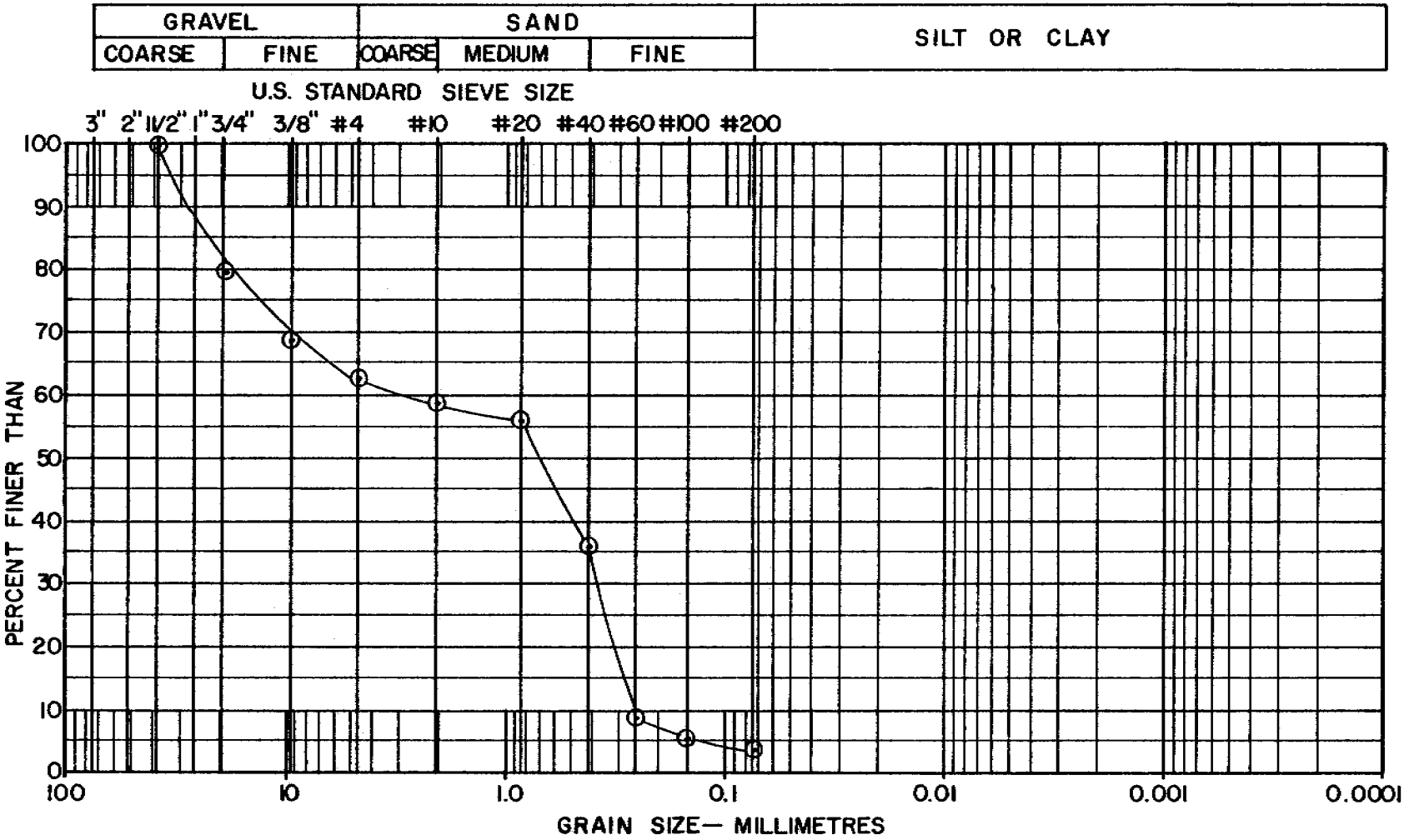


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-8
DATE	July 8/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 2 at 1.0 m. SAND, and gravel, trace silt.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-8 DEPTH
DATE Aug. 8/78



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. 78-9

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

PERMAFROST
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%

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B						SAND - fine - little to some silt - little to some gravel - silt pockets - brown
	B		1				
1.0							
	B		2				
	B		3				
	B		4				
2.0		19					2.0m
	SPT	27	5				SAND - fine to coarse - trace to little gravel - trace silt - rusty seams of oxide - shale and quartz inclusions - dense to very dense - brown (TILL)
		34					
3.0		37					
	SPT	41	6			NF	
		50 for 10cm					
4.0							
	SPT	12	7				
		14					
		13					
5.0							5.0m
	SPT	37	8				5.2m WEATHERED BEDROCK
		50 for 5cm					BEDROCK - hard drill action - refusal to split spoon - chip samples in drilling mud indicate intrusive rock type
6.0	SPT	Ref.	9				
7.0							Notes: 1. Hole located in a sanddune area 30m north of a trail. 2. Ground sloping 8-10% towards south. 3. Hole surrounded by pine to 20-25m. Spruces to 20-25m. 4. Well drained area. 5. Hole augered to 2.0m. Mud used as drilling fluid below.
	B		10				
8.0							
	B		11				
9.0							
							END OF HOLE
10.0	SPT	Ref.	12				10.0m

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

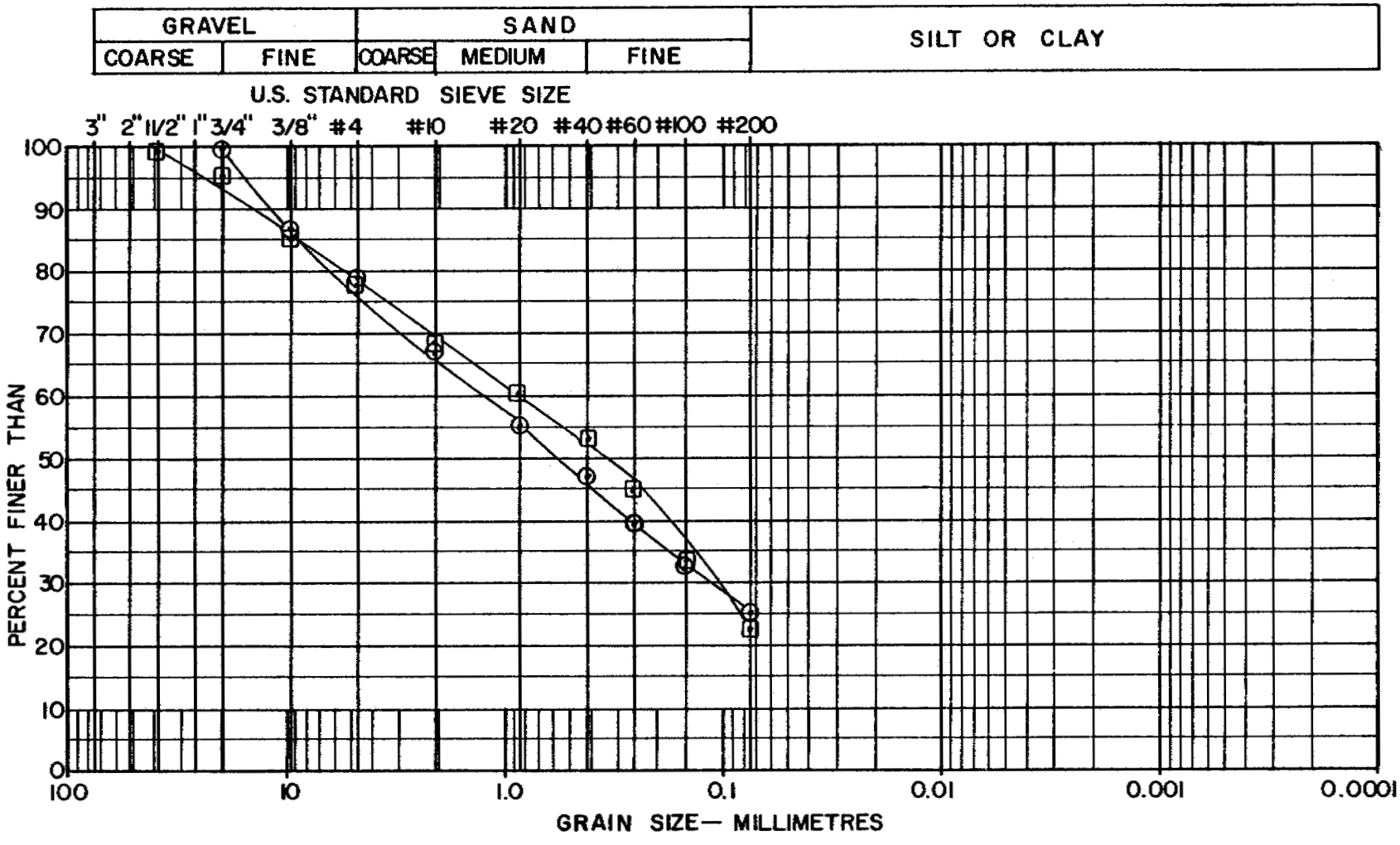
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-9
DATE July 8/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

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

GRAIN SIZE CURVE



REMARKS: ⊡—⊡ Sample No. 4 at 1.75 m. SAND, some gravel, some silt.

⊙—⊙ Sample No. 7 at 4.0-4.45 m. SAND, some silt, some gravel. (Shale & quartz inclusions)



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. 78-10

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
1.0	B		2
	B		3
2.0	SPT	50 for 13cm	4
	C		
3.0	SPT	25 50 for 8cm	5 6
4.0	SPT	72 for 15cm	7
5.0	SPT	65 for 5cm	8
6.0	SPT	90 for 7cm	9
7.0	SPT	100 for 13cm	10
8.0	SPT	100 for 6cm	11
9.0			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Nbn	2.0m
Vx	
Vc	
Vx	
	NF

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER

SILT
- little sand-fine to coarse
- trace gravel
- organic lenses
- grey

1.5m

SAND - fine to coarse
- and silt
- little clay
- trace gravel-fine
- grey silt and sand layer and lenses
- brown

2.5m

3.5m

GRAVEL AND SAND
- fine to coarse
- little silt and clay
- grey (TILL-LIKE)

SAND- fine to coarse
- and silt
- little gravel-fine
- trace clay
- coal pockets
- rusty specks
- grey
(TILL)

some gravel

8.4m
8.5m
8.56

GRAVEL
- trace to little coarse sand
- very dense grey

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% 195%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-10
DATE July 9/78 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 on hummocky ground surface in a swampy area. Gravelly area located about 100m to the north.
2. Hole surrounded by shrubs, grass and spruces to 3-5m.
3. Poorly drained area.
4. Hole augered to 2.0m. Cored to 3.0m. Air used as drilling fluid below.
5. Sample number 8 and 9 not recovered.
6. Thermistors installed at 2.0, 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. 78-10
DATE July 9/78 PLATE

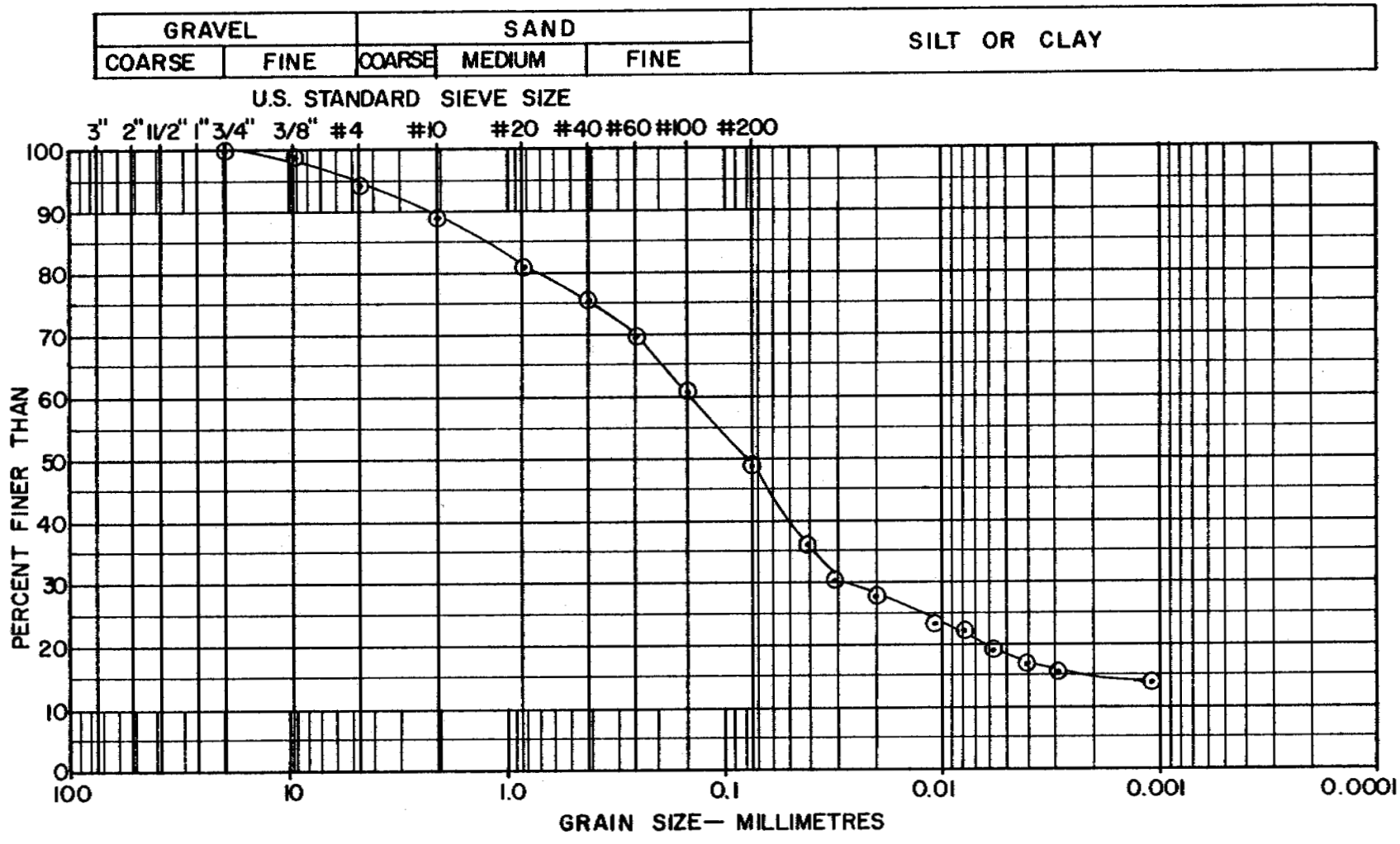
K.L.C. - METRIC

10

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

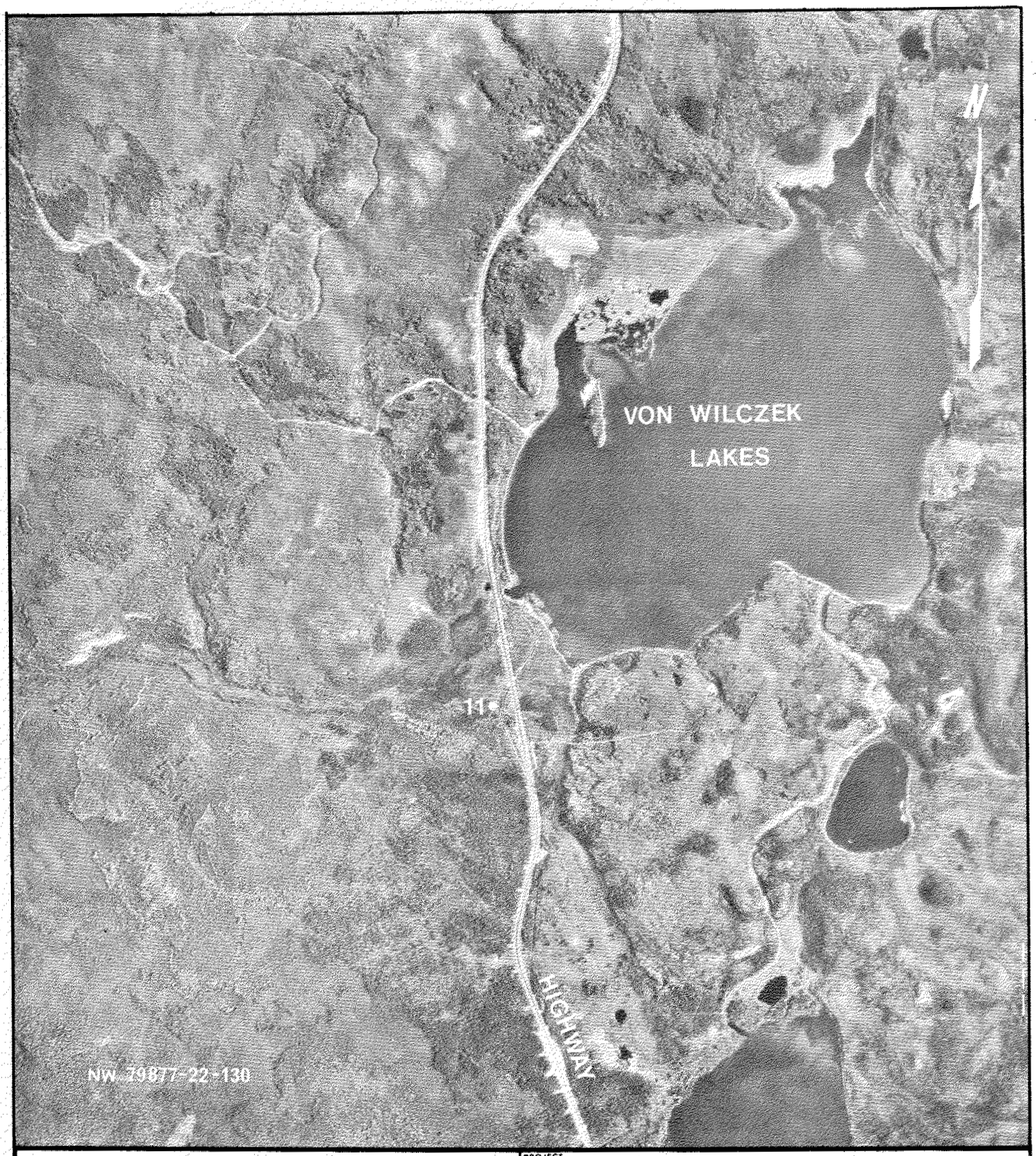
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-10 DEPTH
DATE Aug. 15/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.5 m. SAND, and silt, little clay, trace gravel.

33



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. 78-11

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						SILT - trace fine sand - trace gravel - organics & roots - grey silt pockets - brown (FILL)
	B		1				
1.0	B		2			NF	1.2m
	B		3				GRAVEL - fine to coarse - and sand - fine to coarse - little silt - brown
2.0	SPT	42 50 for 10cm	4			2.0 m	
3.0	B		5			Partially Frozen	
	SPT	50 for 8 cm	6				← cobbles or boulders
4.0	B		7				
5.0							4.8m
	C		8		Vs Nbe Nbn		SILT - some sand - fine to coarse - trace fine gravel - slight plasticity - organic odor - silt laminations - dark grey
6.0	C		9				
	C		10				
7.0	C		11				ice lenses 1/2mm-1 3/4mm spaced @ 2mm-25mm
	C		12				← organic silt & volcanic ash
8.0	C		13				
9.0	C		14				
	C		15				
10.0	C		16				10.0m (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.	78-11
DATE	July 9/78 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
					Vs		SAND - fine to coarse - little to some gravel - fine - little silt - pockets of silt - organic odor - grey
11.0							ice lenses 10-15mm spaced @ 27-45mm
12.0	C		17				- silt and clay laminitions
							12.0m
	C		18		Nbn		CLAY AND SILT - little sand - trace gravel
							12.5m - low plasticity - organic odor - grey
13.0							END OF HOLE @ 12.5 m.

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 by the side of a trail on undulating ground surface.
2. Hole surrounded by willows up to 10m and few spruces up to 20-30m to the east.
3. Hole augered to 2.25m. Mud used as drilling fluid below.
4. Thermistors installed at 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0 & 8.0 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

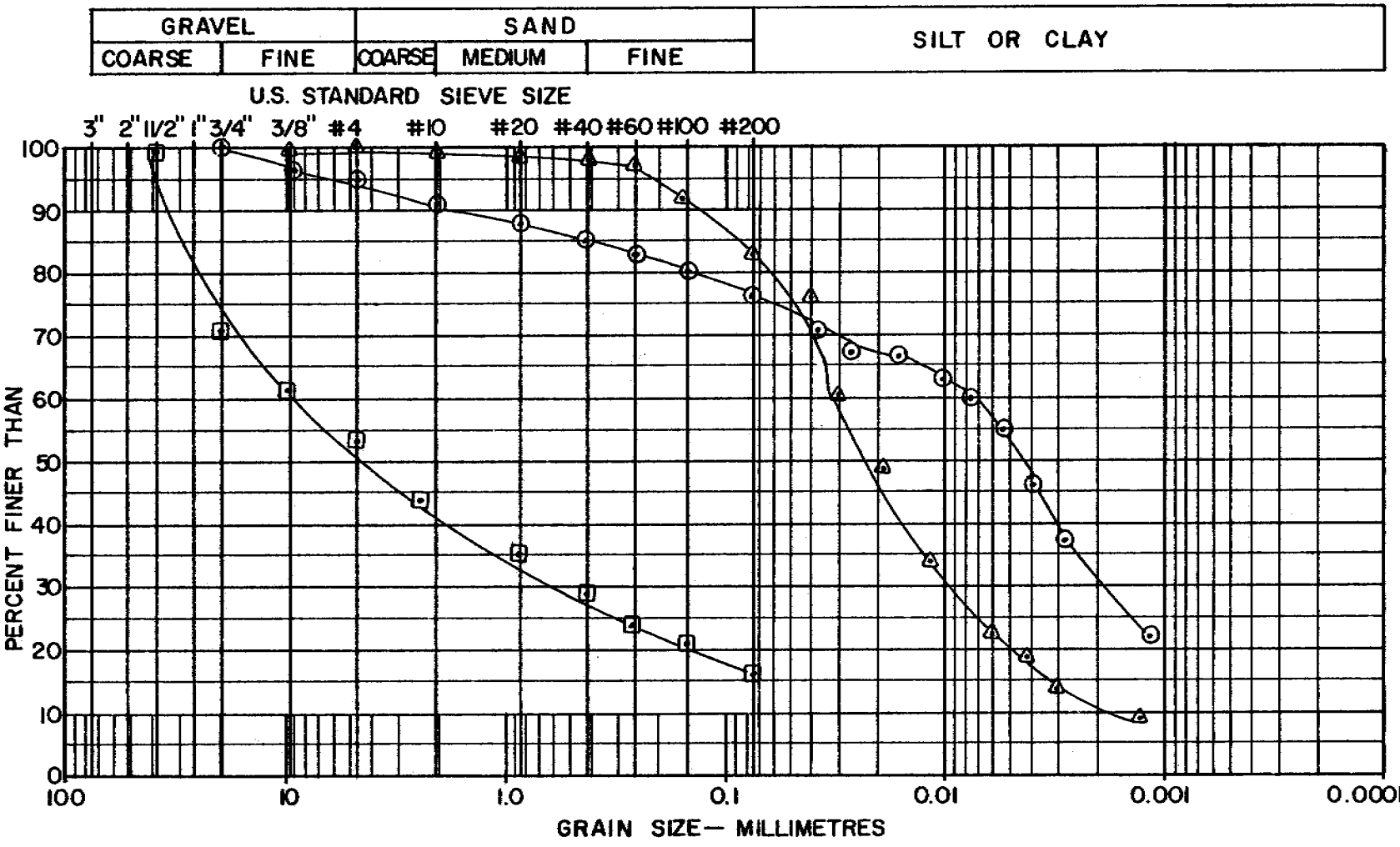
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-11
DATE July 10/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-11 DEPTH
DATE Sept. 14/78

GRAIN SIZE CURVE



REMARKS: ⊡—⊡ Sample No. 3 at 1.5 m. GRAVEL, and sand, little silt.

△—△ Sample No. 10 at 6.0-6.5 m. SILT, little clay, little sand, trace gravel

⊙—⊙ Sample No. 18 at 12.0-12.5 m. CLAY AND SILT, little sand, trace gravel.

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 11

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
13	7.5 - 7.83	1397.3	87.19
14	8.5 - 9.0	2051.7	128.03



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. 78-12

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
1.0	B		2
	B		3
2.0		8	
	SPT	11	4
		20	
3.0		15	
	SPT	8	5
		8	
4.0		35	
	SPT	24	6
		33	
5.0			
6.0		15	
	SPT	14	7
		7	
7.0		9	
	SPT	32	8
		50 for 10cm	
8.0			
	SPT	50 for 6cm	9
9.0			
10.0			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Nbn	2.3
	NF

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.35m
SAND
- trace to little silt
- rootlets
- light brown

SILT
- trace to little sand
- trace gravel - fine
- rootlets
- non to slight plasticity
- brown (TILL-LIKE)

1.5m
gravel layer

SAND - fine to coarse.
- some silt
- little gravel-fine to coarse
- trace clay
- rusty & orange specks
- brown (TILL)

4.0m
4.15m
4.3m
GRAVEL
- pieces of schist
- brown

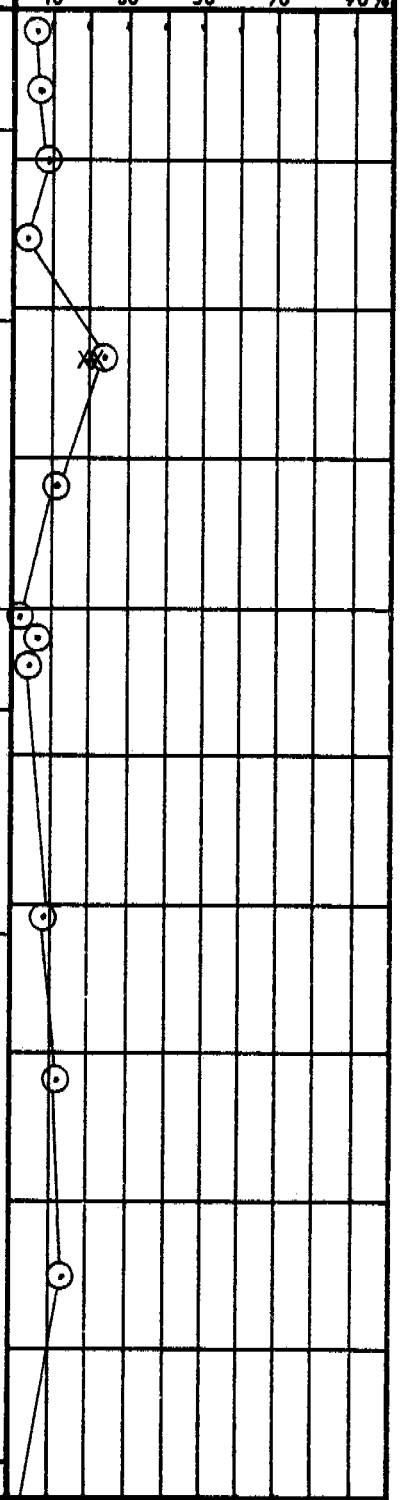
GRAVEL
- some sand
- trace silt & clay
- trace shale fragments
- rusty specks
- brown (TILL)

WEATHERED BEDROCK
- micaceous schist
- foliation plane inclined at 45°

9.75m
BEDROCK (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.	78-12
DATE	July 10/78 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.F. or F.
	SPT	50 for 2cm	10			
11.0						

PERMAFROST

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

10.02m As Above

END OF HOLE

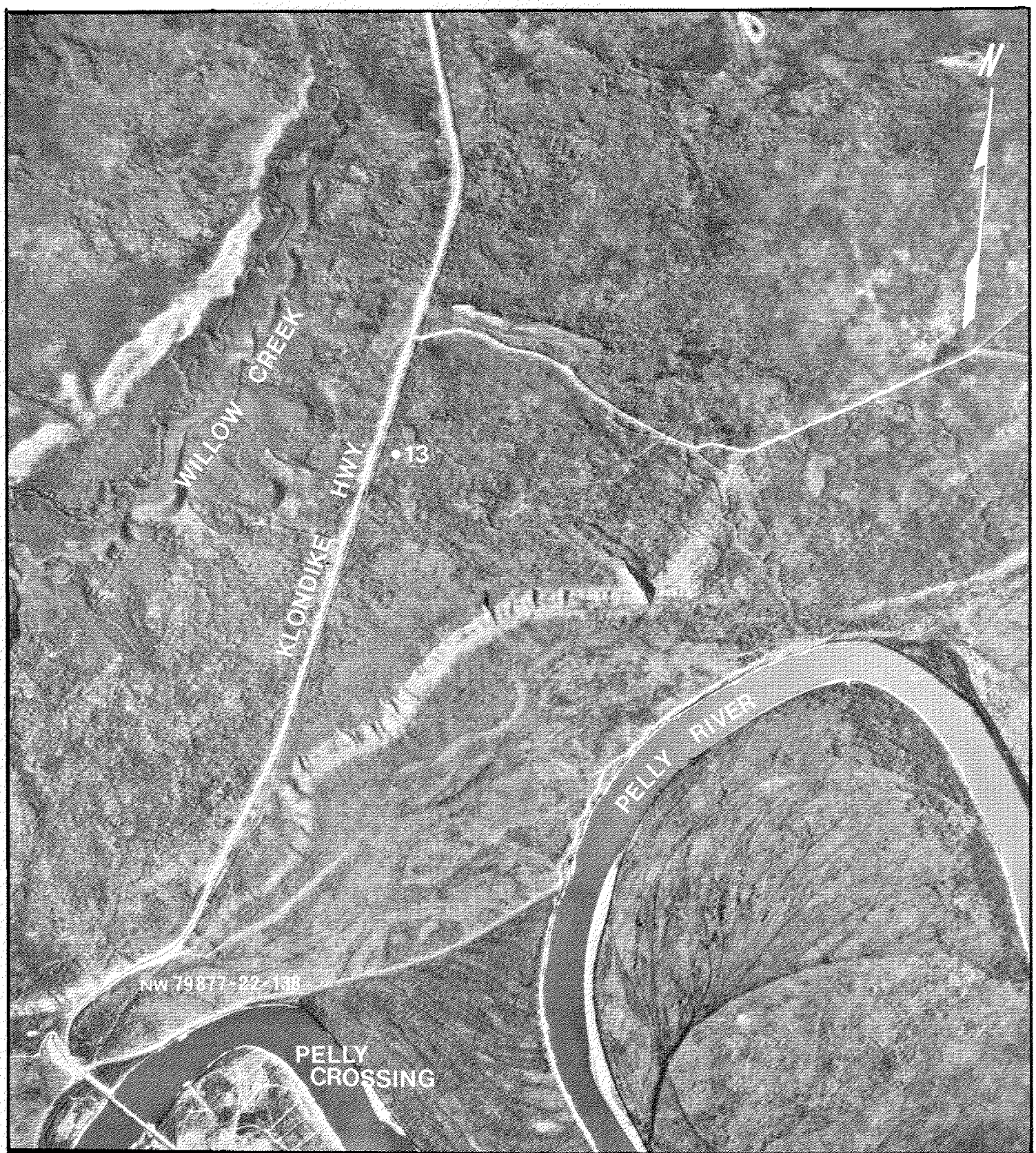
Notes:

1. Hole located about 20m north of a small trail on the west side of the Klondike Highway.
2. Ground slopes 1-2% easterly.
3. Hole surrounded by spruces to 20m.
4. Seasonal frost encountered from 2.3m to 3.0m.
5. Water seepage encountered at 5.62m during drilling.
6. Hole augered to 4.0m. Air used as drilling fluid below.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-12
DATE July 10/78 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. 78-13

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
1.0	B		2
	B		3
2.0	SPT	15 30 44	4
3.0	SPT	22 50 for 15cm	5
4.0	SPT	50 for 15cm	6
5.0	SPT	10 11 12	7
6.0			
7.0			

SYMBOL

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

LOCATION Pelly River
ELEVATION

DESCRIPTION OF MATERIAL

SILT
- trace to little fine sand
- slight plasticity
- rusty silt pockets
- greyish brown

1.5m
←fine to medium sand layer

NF

GRAVEL - fine to coarse
- some sand-fine to coarse
- trace silt
- brown

5.4m
SAND - fine to coarse
- trace gravel - fine
- grey

5.95m

END OF HOLE

Notes:
1. Hole located on a gravel terrace east of the highway.
2. Hole surrounded by aspen to 10-30m, grass and moss.
3. Well drained area.
4. Hole augered to 2.0m. Mud used as drilling fluid below.

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%

NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

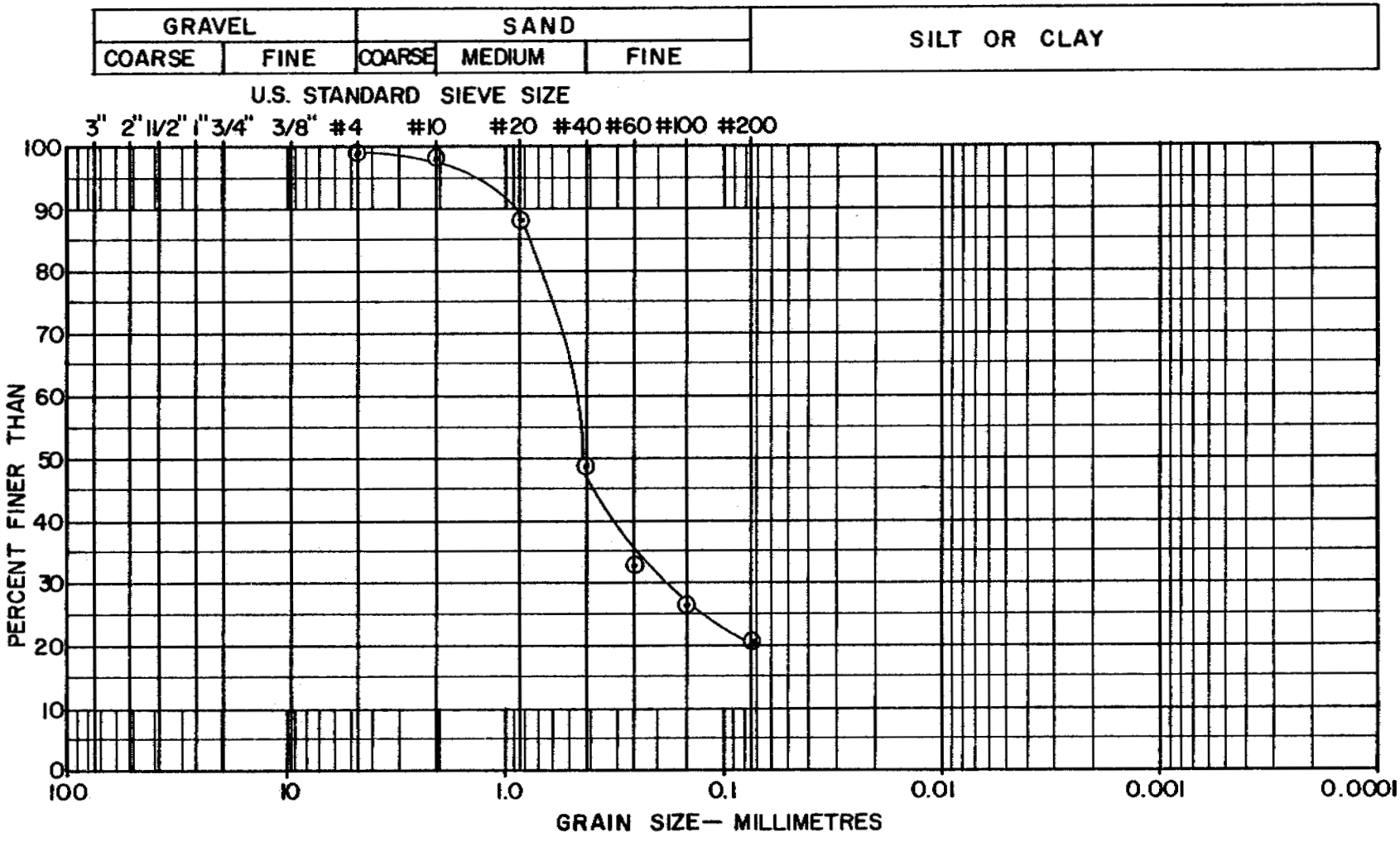
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-13
DATE July 10/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0995
PROJECT
LOCATION
HOLE No. 78-13 DEPTH
DATE Sept, 19/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.5m SAND, some silt



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. 78-14

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
1.0	B		2
	B		3
2.0		26	
	SPT	29	4
		29	
3.0	C		5
	C		6
	SPT	50 for 5cm	7
4.0			
	B		8
5.0		56	
	SPT	50 for 5cm	9
6.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

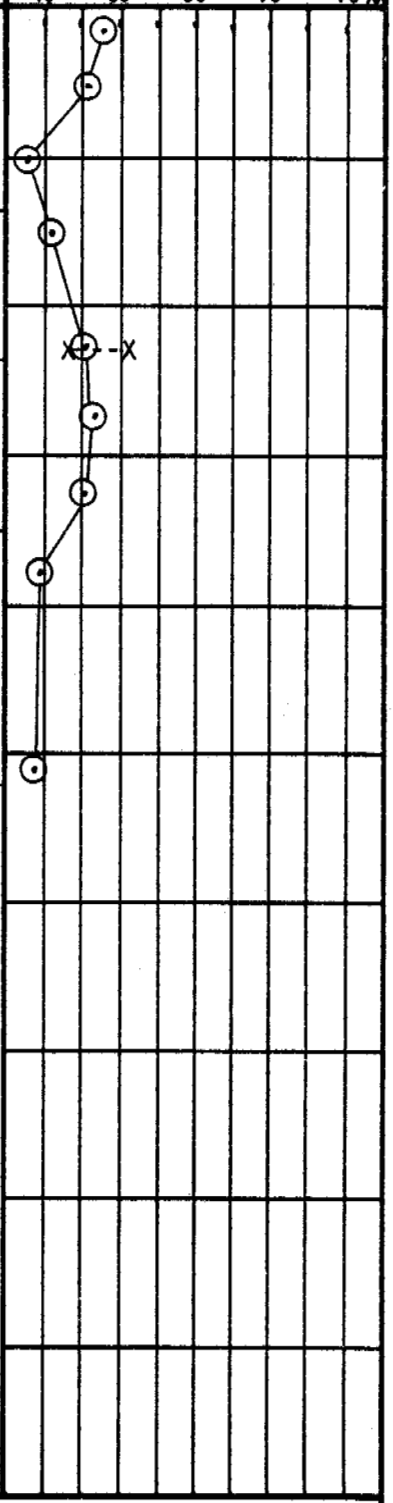
	SILT - trace to little fine sand - trace gravel - rootlets - sand and silt pockets - organic laminations - brown	NF
0.5m	SAND - trace gravel - trace silt - silt pockets - brown	
2.0m	silt & clay layer	Nbn
	SAND - fine to coarse - trace silt - trace gravel - grey	
3.5m	GRAVEL - trace sand - coarse - trace sandstone pieces - grey	NF
5.2m	END OF HOLE	

Notes:

1. Hole located about 150m west of Klondike Highway by the side of a trail. A lake is located 700-800m to the west.
2. Ground sloping 5-6% towards the lake.
3. Hole surrounded by aspen to 15m, few burnt spruces to 5-6m.
4. Fairly well drained area.
5. Seasonal frost encountered between 2.0m to 3.5m.
6. Hole augered to 2.0m. Cored from 2.0m to 3.75m. Drilling mud used below.
7. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, and 3.0m.

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

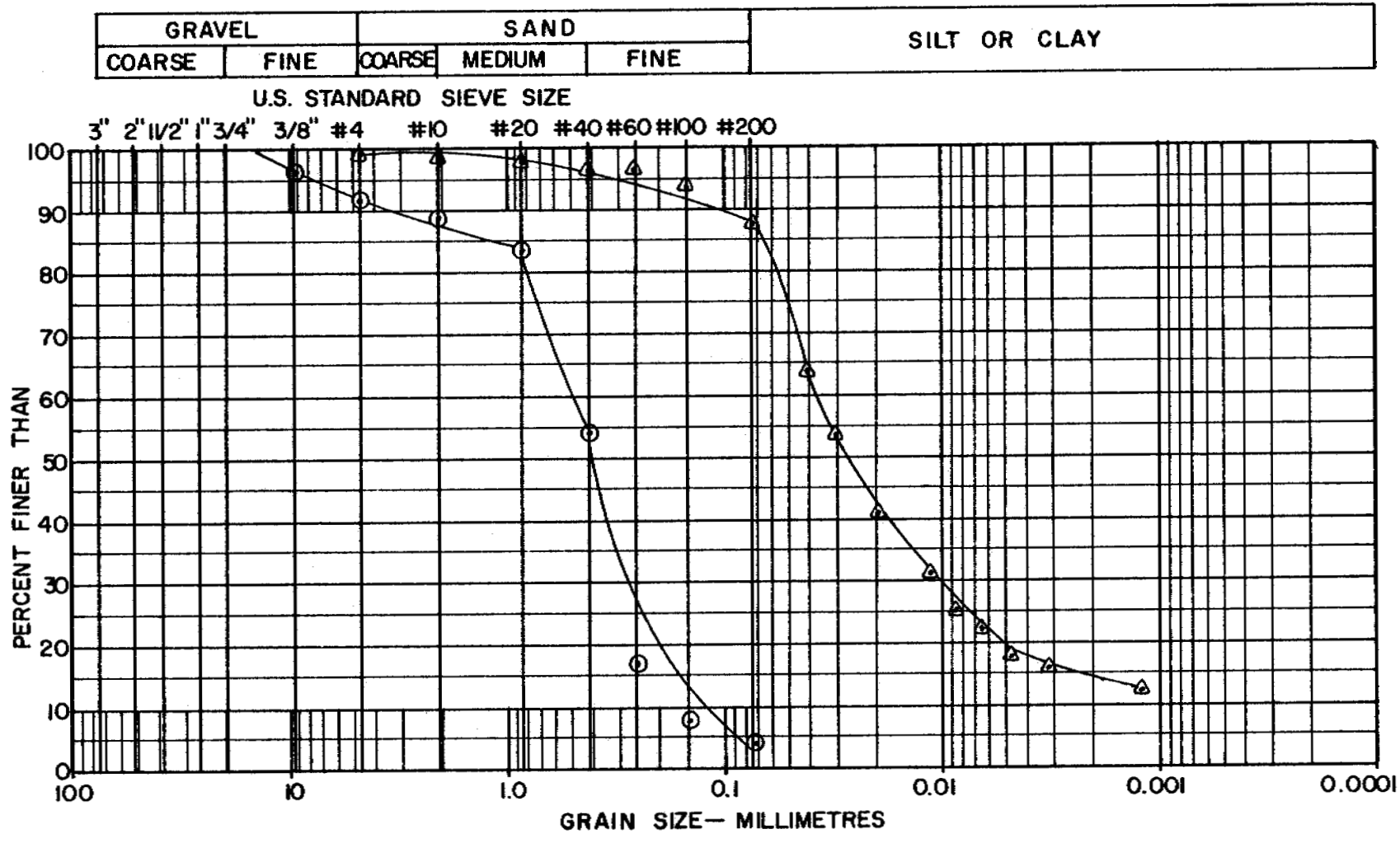
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-14
DATE	July 11/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

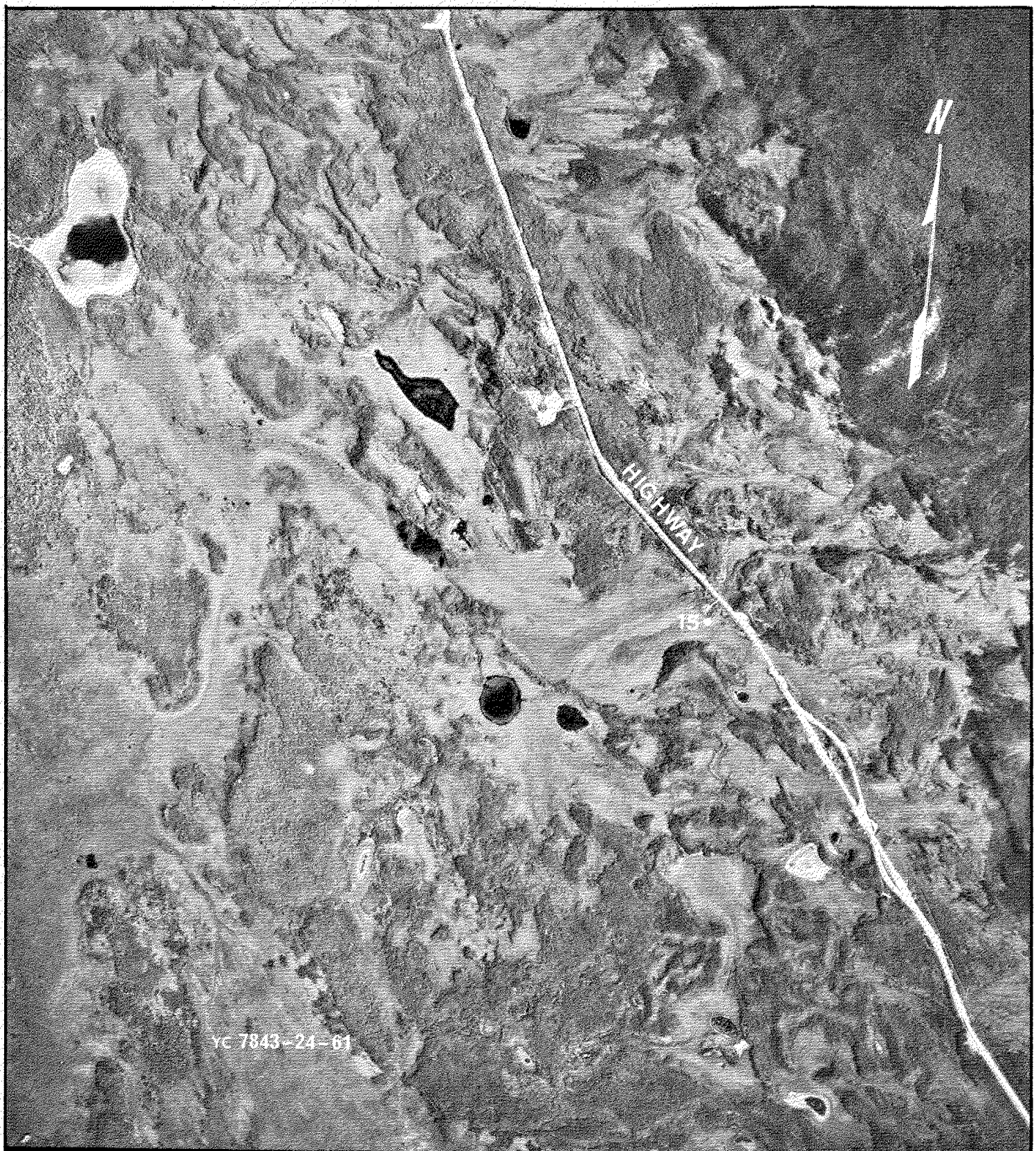
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-14 DEPTH
DATE Sept. 17/78

GRAIN SIZE CURVE



REMARKS: △—△ Sample No. 4 at 2.0-2.45 m. SILT - little clay, little sand

⊙—⊙ Sample No. 6 at 3.0-3.5 m. SAND, trace gravel, trace silt



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-15

CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

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

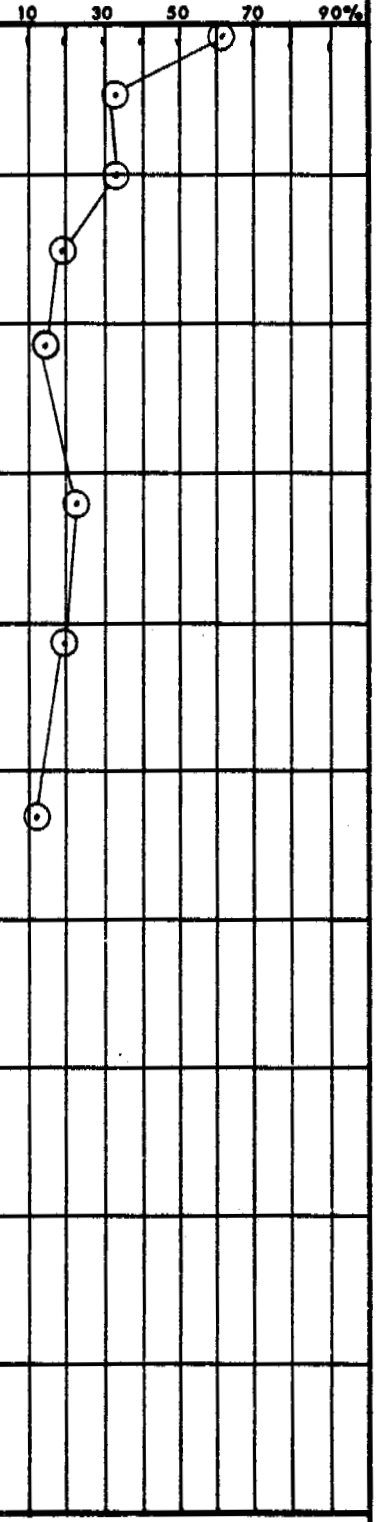
TEST HOLE LOG

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

DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B						0.1m ORGANIC COVER
	B		1			NF	SILT - trace fine sand - trace fine gravel - non to slight plasticity - organic lenses - rusty seams of oxide - dark brown silt and clay laminations
1.0	B		2				1.2m
	B		3			Partially Frozen	
2.0		46					2.0m
	SPT	50 for 10cm	4		Vs, Nbn, Nbe		SAND - fine to coarse - trace to little gravel - fine - trace to litttle silt - trace clay - greyish brown
3.0		20					
	SPT	40 50 for 10cm	5				3.8m
4.0		56					
	SPT	50 for 7cm	6		Vx, Vc		GRAVEL - fine to medium - some sand - fine to coarse - little silt - greyish brown
5.0							
	SPT	53 for 15cm	7				
6.0							6.0m
							END OF HOLE
7.0							Notes: 1. Hole located on a flat ground surface in a low area. 2. Hole surrounded by moss, aspen to 10-15m and willows. 3. Poor drainage. 4. Hole augered to 1.5m. Drilling mud used below. 5. Hole caved in at 6.0m.

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%

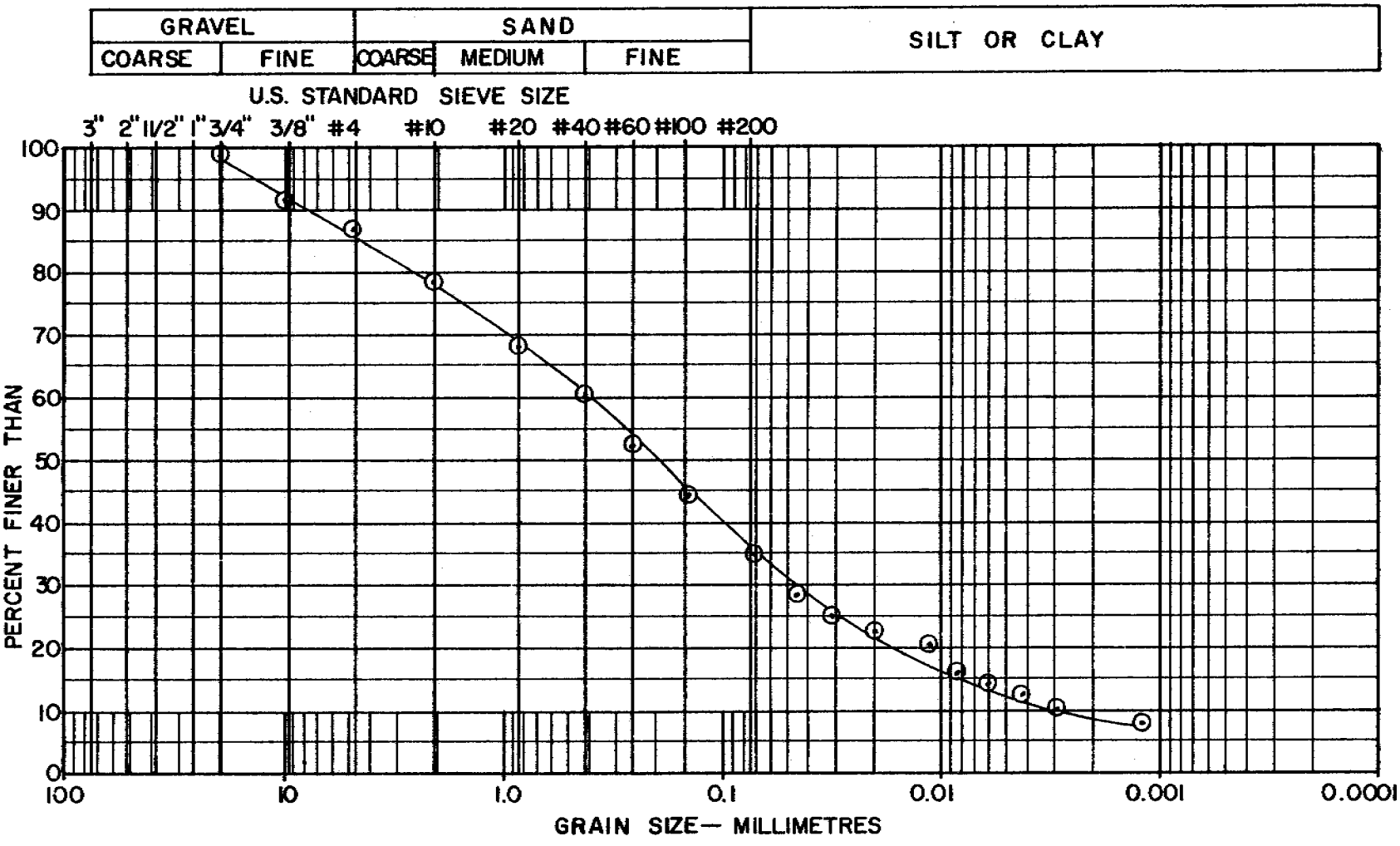


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-15
DATE	July 11/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙-⊙ Sample No. 4 at 2.0-2.25m SAND, some silt, little gravel, trace clay

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

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

50



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. 78-16

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						0.1m MOSS
1.0		17					GRAVEL - some sand - trace silt - rusty specks - brown
	SPT	14 15	1				
	B		2				
2.0							← cobbles
	SPT	Ref	3			NF	
	B		4				
3.0							
	B		5				← (TILL-LIKE)
		20					
	SPT	60 for 15cm	6				
4.0							
	B		7				
		58 for 15cm					← boulders
5.0	SPT		8				5.2m
							END OF HOLE
6.0							

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 about 40m west of Klondike Highway. Boulder and gravel exposures to the west.
2. Hole located on a flat ground surface. Steep hill located near the exposures.
3. Hole surrounded by moss, pines 6-10m, burnt spruces to 15-25m and aspen to 3-7m.
4. Fairly drained area.
5. Mud used as drilling fluid from 0.0m.
6. Sample No. 8 not recovered.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-16
DATE July 11/78 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. 78-17

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
1.0	B		2
	B		3
2.0		8	
	SPT	11	4
		12	
3.0	B		5
4.0	B		6
	B		7
5.0			

SYMBOL

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

LOCATION McQuesten 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

0.15m TOPSOIL

NF

GRAVEL
- little sand - medium to coarse
- greyish brown

⊙

← roots

← cobbles

5.0m

END OF HOLE

Notes:

1. Hole located 30m south of McQuesten River.
2. Hole located on a ground sloping gently northerly.
3. Hole surrounded by moss, spruces to 20-30m, aspen to 3-7m.
4. Gravel and sand exposures 25m northwest of hole.
5. Good drainage.
6. Hole augered to 0.25m. Mud used as drilling fluid below.
7. Hole caved in at 5.0m on completion of drilling.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-17
DATE July 12/78 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. 78-18

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				SYMBOL	PERMAFROST		LOCATION	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 X — WATER CONTENT — 0 — LIQUID LIMIT X; 10 30 50 70 90%
							DESCRIPTION OF MATERIAL	
	B					NF	0.1m ORGANIC COVER	
					Nbe		PEAT AND ORGANIC SILT - trace gravel - amorphous - dark brown	490%
1.0	B		1					
	C		2				1.28m	257%
2.0	SPT	110 for 5cm	3		Nf, Nbn		GRAVEL - fine to medium - and sand - fine to coarse - trace silt - organic pockets - grey	
3.0		125					3.0m	
	SPT	for 15cm	4		Nbn		SAND - fine to coarse - trace to little silt - trace gravel - organic inclusions	
4.0		23					4.0m - grey	
	SPT	53 for 3cm	5		N			
5.0	SPT	115 for 10cm	6				GRAVEL - little to some sand - fine to coarse - trace silt - organic inclusions - grey	
6.0								
7.0								
8.0								
							8.75m	
9.0						NF	GRAVEL - some sand - grey	
10.0							(Cont'd.)	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-18
DATE	July 12/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 18

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	1.0 - 1.28	989.3	61.73

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
						NF	As Above 10.5m
11.0							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 about 0.5 km west of Klondike Highway in a low area.
2. Hole surrounded by moss, buck-brushes.
3. Poor drainage.
4. Water level encountered at ground surface.
5. Hole augered to 1.0m. Cored to 1.5m. Air used as drilling fluid below.
6. No samples recovered below 5.0m. Soil and permafrost conditions based on drill action are cuttings in the air return.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-18
DATE July 12/78 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. 78-19

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
1.0	B		2
	B		3
2.0	SPT	46 50 for 5cm	4
3.0	SPT	90 for 15cm	5
4.0	SPT	65 65 50 for 7 cm	6
5.0	SPT	44 60 for 15cm	7
6.0			
7.0	SPT	37 83 for 15cm	8
8.0			
9.0	SPT	37 50 for 7cm	9
10.0			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Nbn Vc	2.2m
	NF

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m. TOPSOIL

SILT AND CLAY
- little gravel
- trace to little sand - fine to coarse
- low plasticity
- grey & rusty pockets of silt and clay
- firm to stiff
- brown

2.75m

GRAVEL
- some silt & clay
- little sand - medium to coarse
- organics
- rusty gravel and sand
- orange yellow silt pockets
- grey (TILL)

← boulders

7.3m

QUARTZITE
- hard

9.15m

QUARTZ-MICA SCHIST
- horizontal planes.

(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.	78-19
DATE	July 13/78 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
	SPT	65 for 10cm	10			NF	As above 10.6m
11.0							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 about 300-400m west of Gravel Lake.
2. Hole located on a flat ground surface.
3. Hole surrounded by spruces to 12-18m, few aspen to 2-7m.
4. Fairly drained area.
5. Seasonal frost encountered between 2.20m to 2.75m.
6. Hole augered to 2.0m. Mud used as drilling fluid below.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

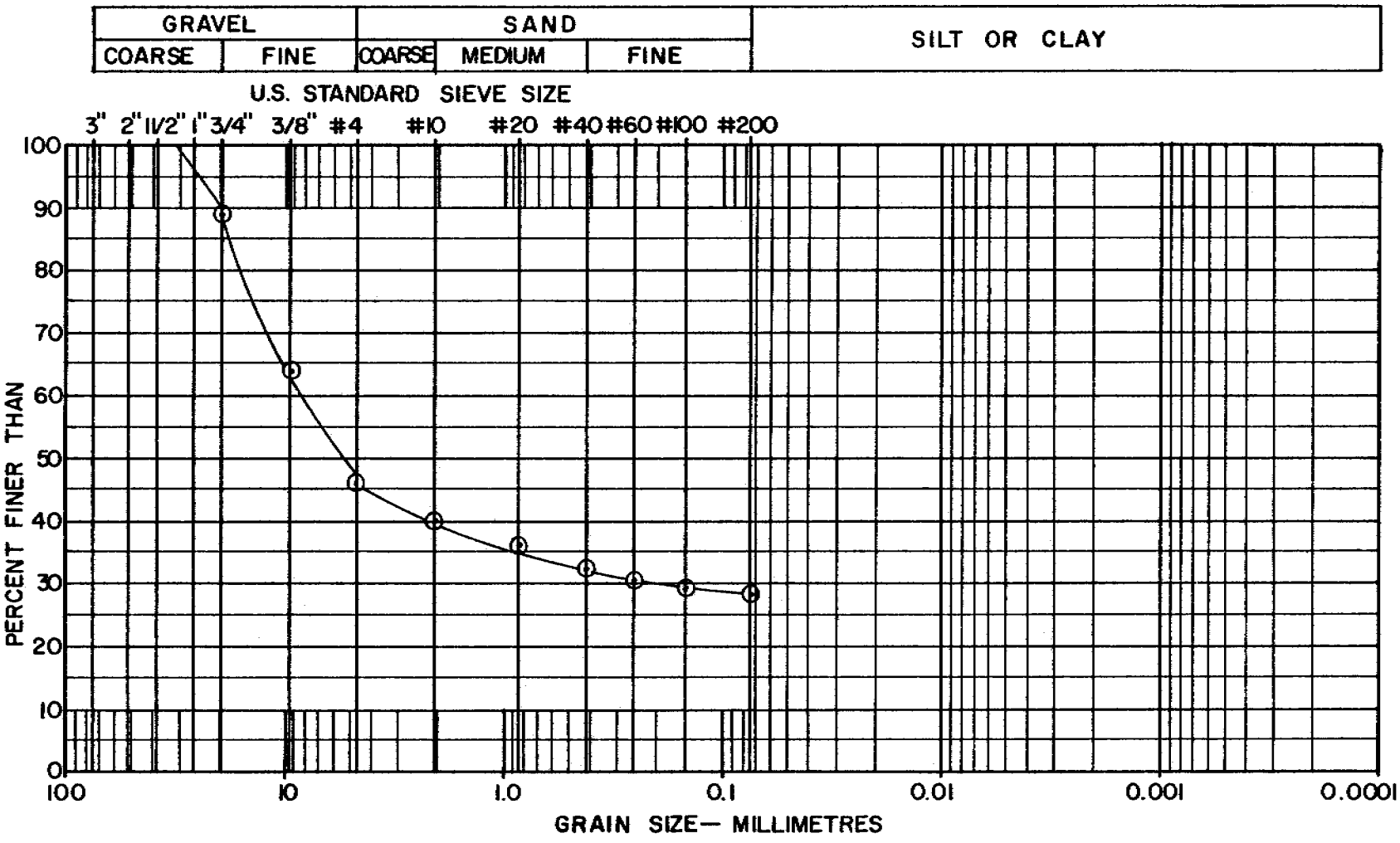
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-19
DATE July 13/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

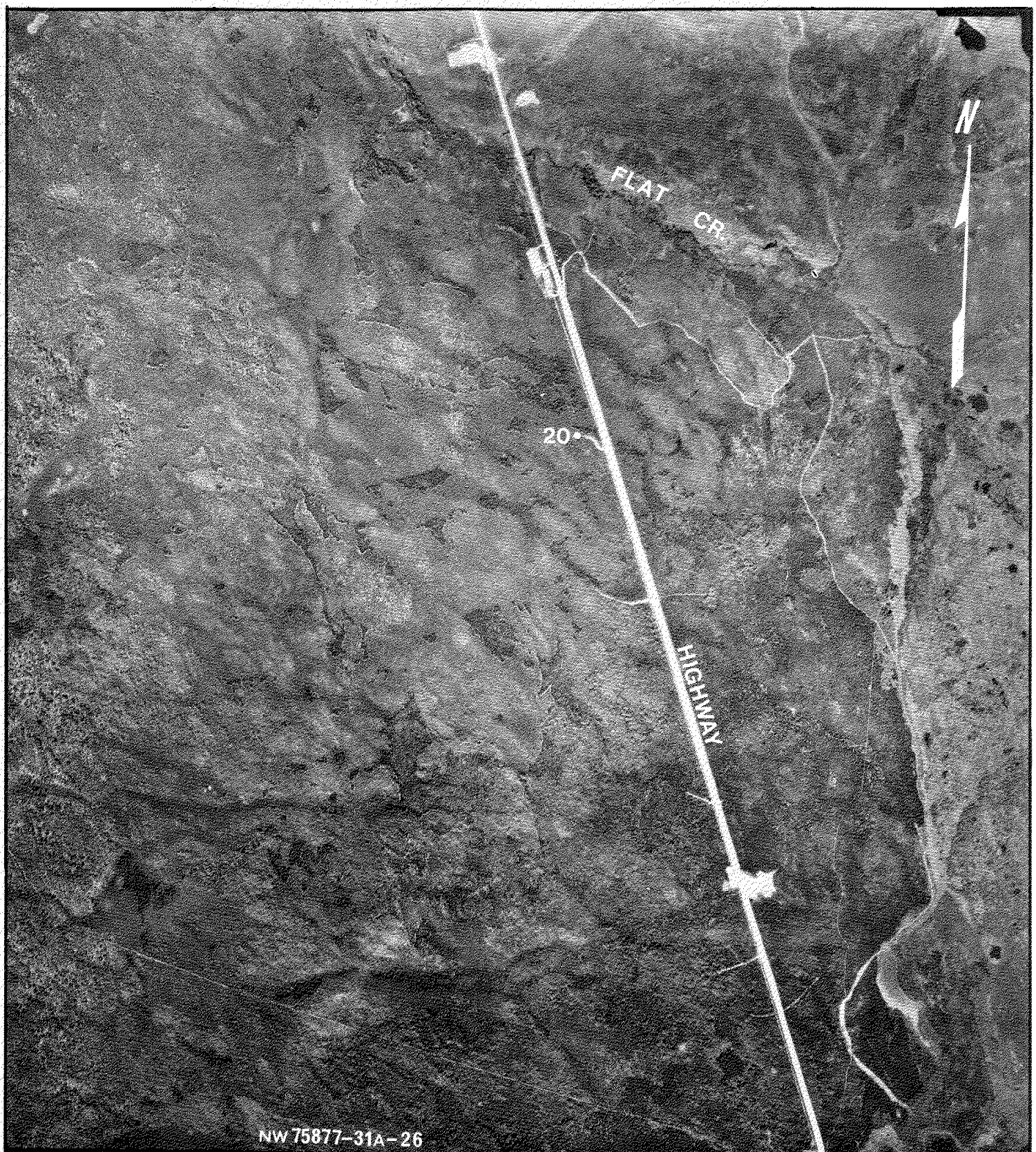
JOB No. AL0995
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-19 DEPTH
DATE Sept. 9/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 6 & 7 at (4.0 - 4.37m) (5.0 - 5.30) GRAVEL - some silt, little sand

62



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. 78-20

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
1.0	B		2
	B		3
2.0	SPT	55 for 13cm	4
3.0	SPT	60 for 5cm	5
	B		6
4.0	B		7
	B		8
5.0	SPT	100 for 15cm	9
6.0			

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

0.04m ORGANIC SILT AND MOSS

SILT AND CLAY
- trace sand-fine to medium
- trace gravel
- low to medium plasticity
- rusty specks
- organic pockets
- stiff to very stiff
- brown (TILL-LIKE)

2.0m

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

NF

← boulders

5.15m

END OF HOLE

Notes:

1. Hole located in a ditch about 150m west of highway.
2. Hole surrounded by moss, spruces to 10-15m.
3. Poor drainage.
4. Hole augered to 2.0m. Air used as drilling fluid below.

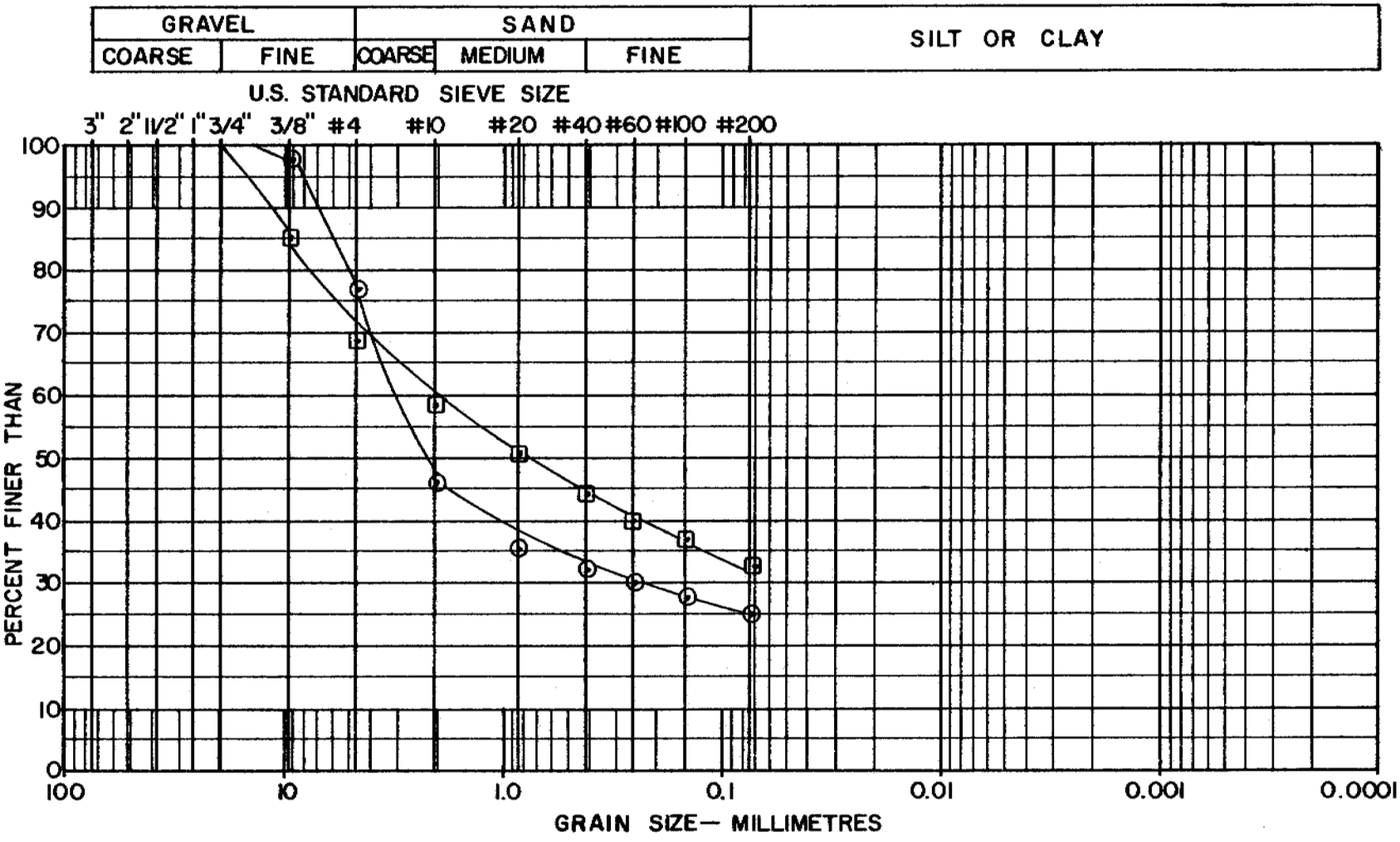
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-20
DATE July 13/78 PLATE

K.L.G. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

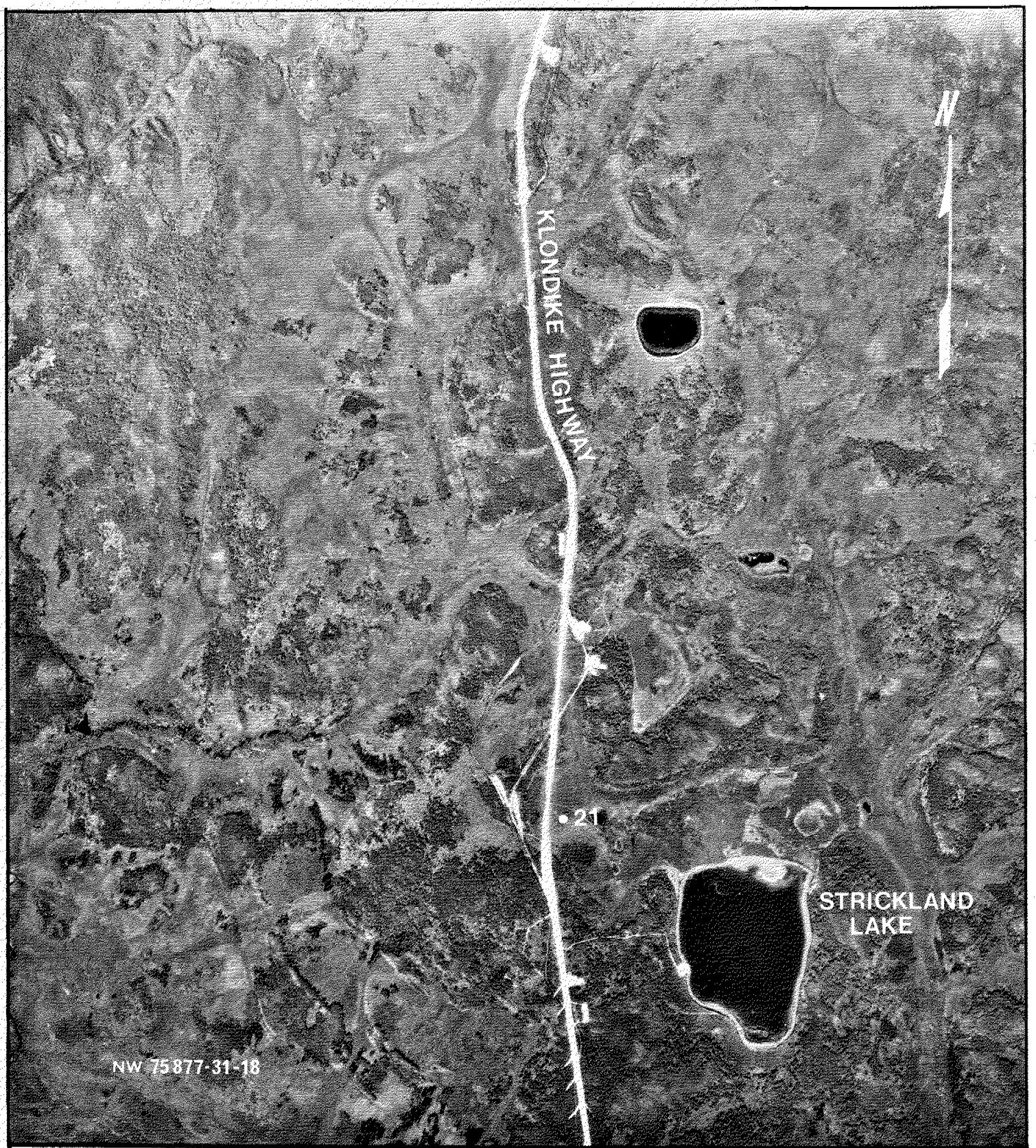
GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 4 & 5 at 2.0 - 3.05m SAND - some silt, some gravel

⊡—⊡ Sample No. 7 & 8 at 4.0-4.5m SAND - some silt, some gravel

JOB No. AL0995
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-20 DEPTH
DATE Sept. 19/78



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. 78-21

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
1.0	B		2
		32 42 52 for 10cm	
2.0	SPT		3
		11 9 5	
3.0	SPT		4
	B		5
	B		6
4.0			
	SPT (Pushed)		7
5.0		100 for 15cm	
	SPT		8
6.0			
7.0			
		11	
	SPT	17 52	9
8.0			
9.0		43 64 for	
	SPT	15cm	10
10.0			

SYMBOL

PERMAFROST
N.R.C. CLASS: Nbn
N.F. or F.: NF; Partially Frozen

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m MOSS AND PEAT

fine SAND AND SILT
- trace gravel
- trace clay
- grey silt pockets
- grey

1.0m

SAND - fine to coarse.
- some gravel - fine to coarse
- some silt
- silt and sand lenses
- grey

5.0m

SILT
- little fine sand
- trace fine gravel
- laminated with silt and sand
- grey

9.3m

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. 78-21
DATE July 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 | 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. Hole located about 30-40m east of Klondike Highway in a low area.
2. Hole surrounded by moss, bushes and peat tussocks.
3. Poor drainage.
4. Hole augered to 1.5m. Air used from 1.5 tp 2.5m. Augered from 2.5 to 5.0m. Air used as drilling fluid below.
5. Sample No. 4 not recovered.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

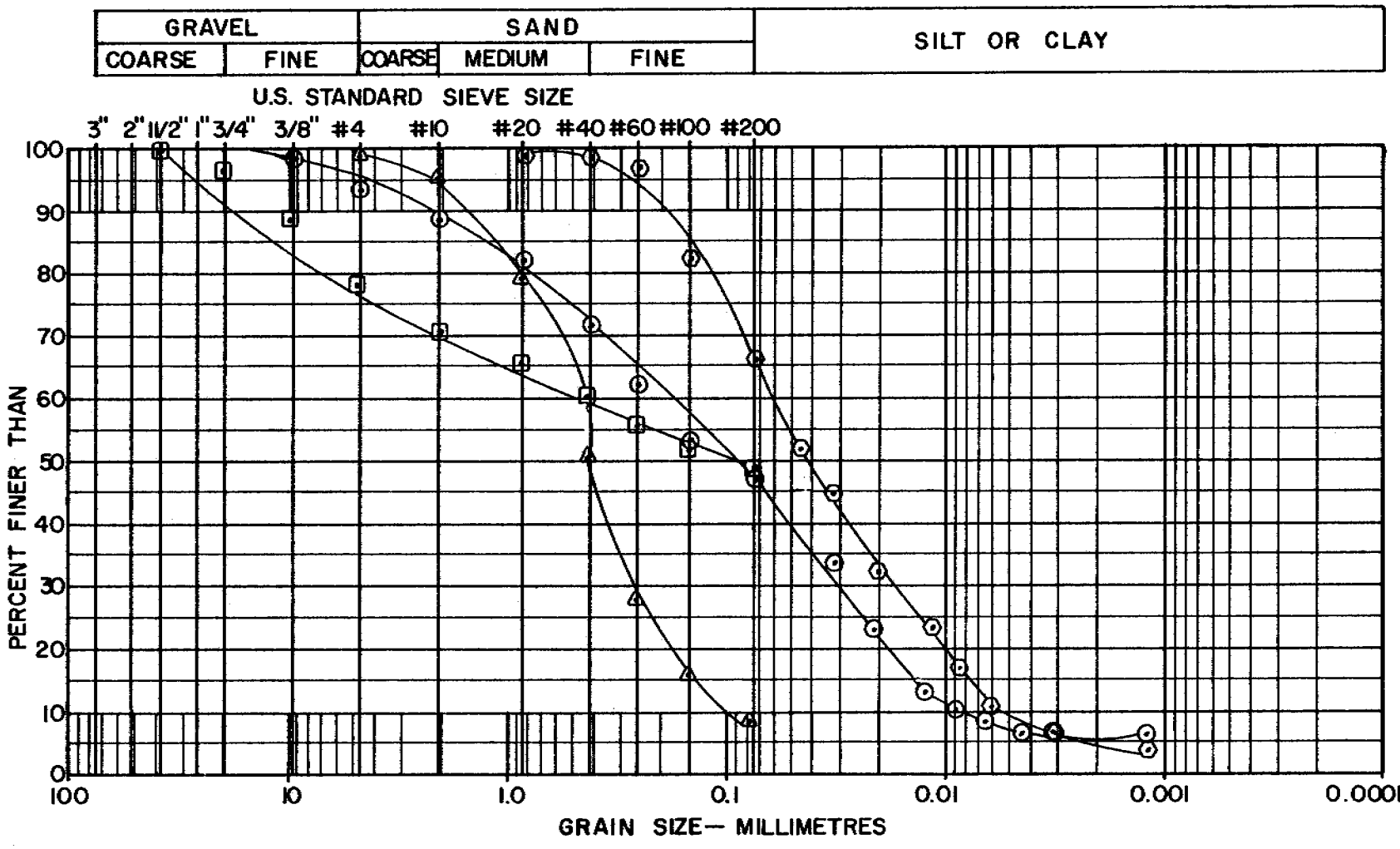
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-21
DATE July 14/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-21 DEPTH
DATE Aug. 23/78

GRAIN SIZE CURVE



REMARKS:

- Sample No. 2 at 1.0 m. SAND, and silt, trace gravel, trace clay.
- Sample No. 6 at 3.5 m. SILT, some sand, some gravel.
- Sample No. 8 at 5.0-5.15 m. SAND, trace silt.
- Sample No. 9 at 7.0-7.45 m. SILT, some sand



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-22

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.
1.0	B		
	SPT	4 7 8	1
2.0	B		2
	B		3
3.0	B		4
	B		5
4.0	SPT	9 15 17	6
5.0	SPT	11 14 16	7
6.0	C		8
	SPT	13 17 21	9
7.0			
8.0			
9.0	SPT	23 40 31	10
10.0			

SYMBOL

PERMAFROST

N.R.C. CLASS: Vs, Nbn, Nbn

N.F. 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

0.04m TOPSOIL

SAND AND SILT & CLAY
- little gravel
- organic pockets
- slight plasticity
- grey (FILL)

1.5m

ORGANIC SILT AND CLAY
- little gravel
- trace to little fine sand
- low plasticity
- pieces of wood
- dark brown

2.5m

SILT
- little fine sand
- little clay
- trace gravel
- slight plasticity
- organic silt and sand laminations (7mm)
- grey

4.0m

SILT
- little sand - fine to coarse
- trace gravel
- slight plasticity
- rusty sand & silt laminations
- grey up to 5.0m; dark grey below

ice lenses 15-20mm spaced @ 20mm

sand and organic laminations

9.0m

SAND - fine to coarse
- and silt
- trace gravel - fine
- trace clay (Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-22
DATE July 14/78 PLATE

K.L.C. - METRIC

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/15cm.	No.					X — 0 — X 10 30 50 70 90%
11.0	SPT	22 30 67 for 10cm	11		Nbn		- laminated - rusty brown 10.9m	⊙
							END OF HOLE	

Notes:

1. Hole drilled on east side of roadway embankment.
2. Hole surrounded by moss, spruces to 20m.
3. A water filled canal parallels the roadway on the north side.
4. Poor drainage.
5. Hole augered to 5.0m, air used as drilling fluid below.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-22
DATE July 14/78 PLATE

K.L.C. - METRIC

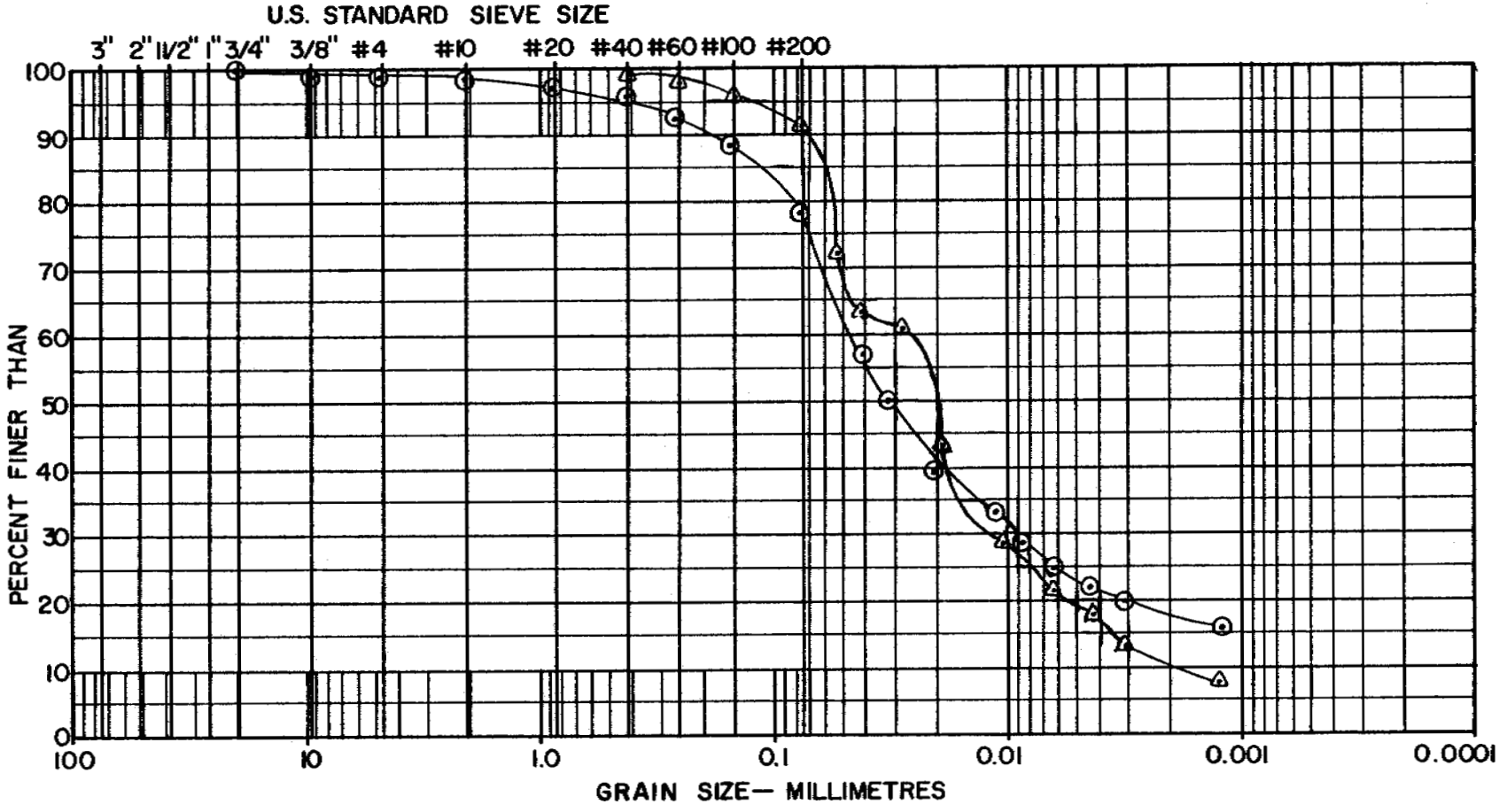
22

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-22 DEPTH
DATE Aug. 17/78

GRAIN SIZE CURVE

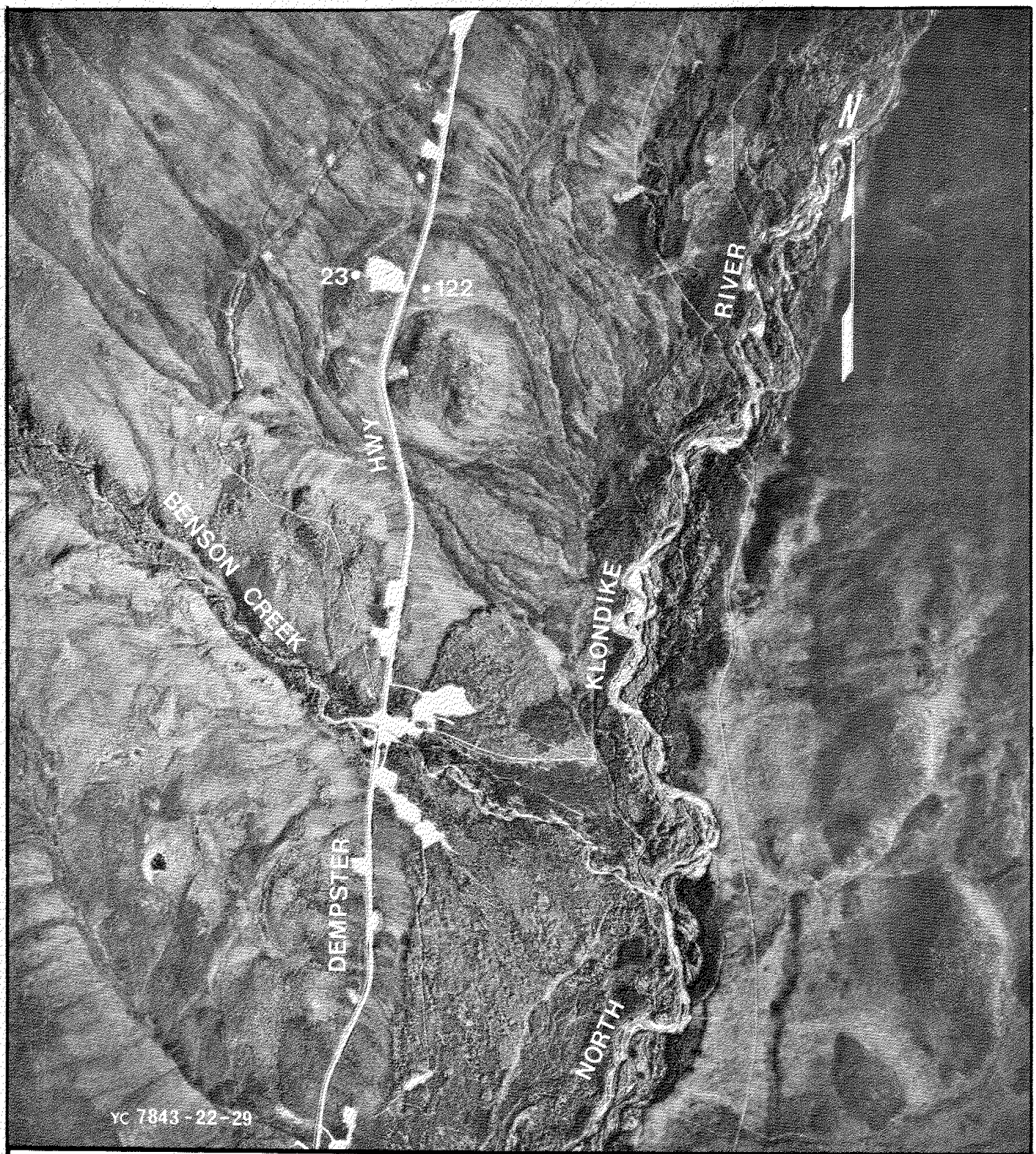
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



REMARKS: ⊙—⊙ Sample No. 4 at 3.0 m. SILT, little sand, little clay, trace gravel.

△—△ Sample No. 7 at 5.0-5.45 SILT, little clay, trace sand

73



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. 78-23

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
1.0	B		2
2.0	SPT	11 17 24	3
3.0	SPT	11 12 14	4
4.0	SPT	31 50 50 for 11cm	5
5.0	SPT	66 for 15cm	6
6.0	SPT	Ref.	7
7.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m TOPSOIL

SILT AND CLAY
- some fine sand
- trace to little gravel
- low plasticity
- massive structure
- brown

← mica and quartz laminations

5.0m

BEDROCK or BOULDER
- hard drilling

6.0m

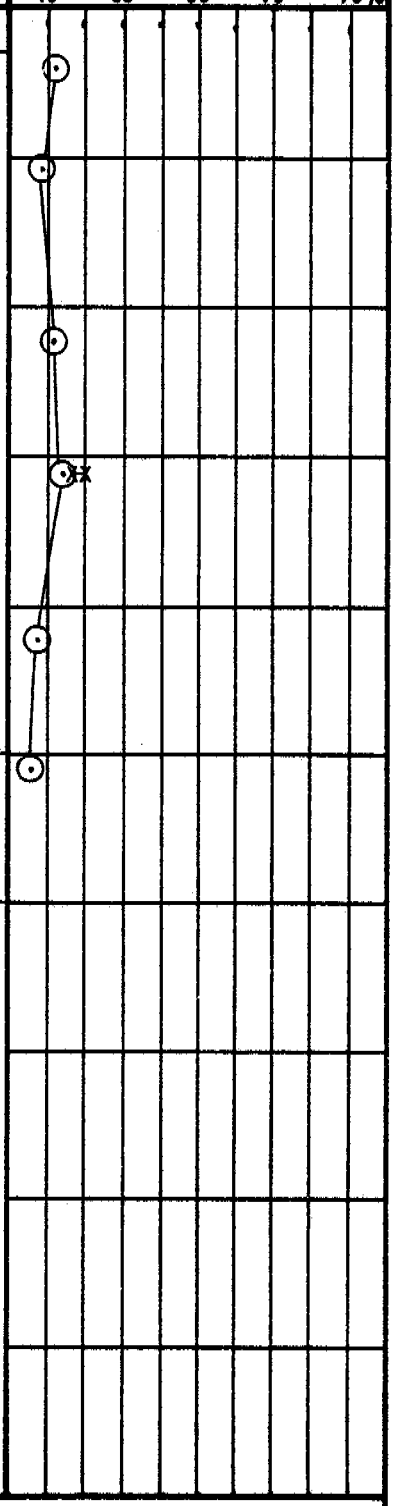
END OF HOLE

Notes:

1. Hole located on west of highway near a borrow pit.
2. Ground sloping westerly 5-6%.
3. Hole surrounded by moss, spruces to 30-35m.
4. Fair to good drainage.
5. Hole augered to 1.0m. Air used as drilling fluid from 1.0m. to 2.0m. Mud used as drilling fluid below.
6. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, and 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%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

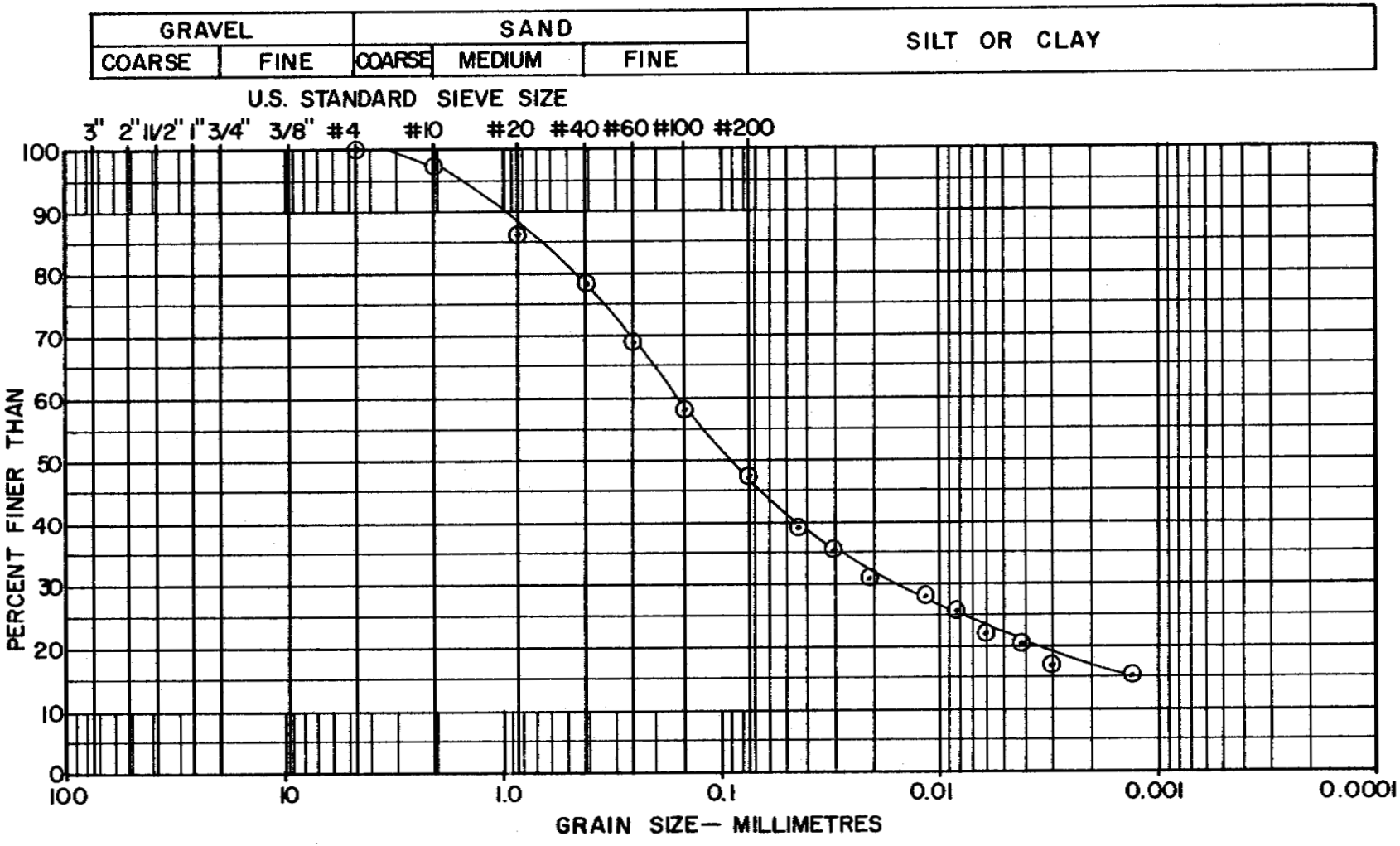
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-23
DATE July 15/78 PLATE

K.L.C. - METRIC

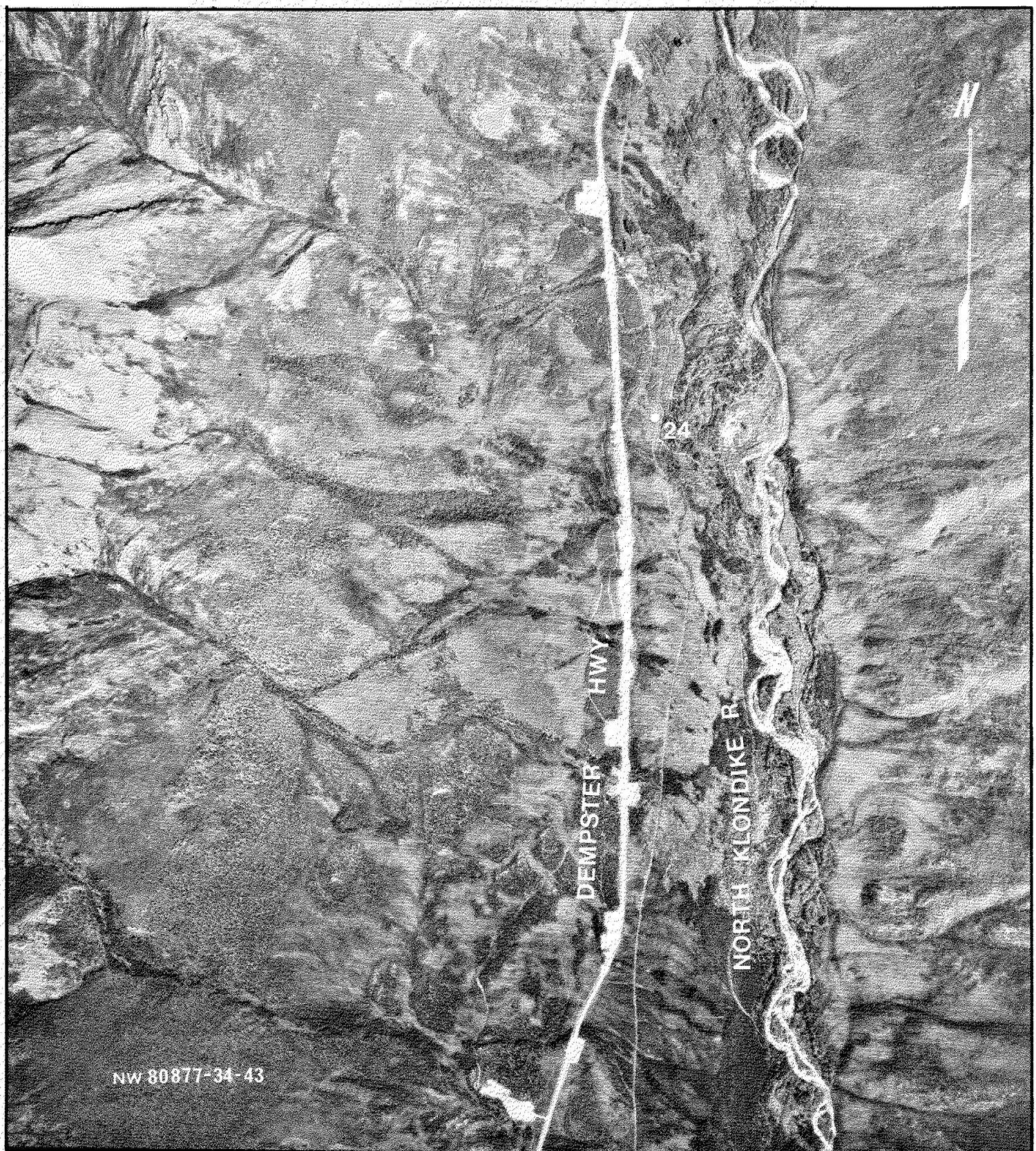
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-23 DEPTH
DATE Aug. 8/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 4 at 3.0-3.45 m. SAND, some silt, little clay. (Silt & clay portion mainly due to Mica Laminations)



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. 78-24

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		
1.0		3	
	SPT	3	2
		5	
2.0		30	
	SPT	43	3
		54	
3.0		30	
	SPT	62	4
		for 15cm	
4.0		60	5
	B SPT	for	6
5.0		10cm	

SYMBOL

PERMAFROST

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.03m TOP SOIL

SILT
- little to some sand
- fine to coarse
- trace gravel
- non to slight plasticity
- massive structure

1.8m. - grey

GRAVEL AND SAND
- trace silt and clay
- organic pockets
- very dense
- grey

cobbles and boulders

4.6m

END OF HOLE

Notes:

1. Hole located on undulating ground. Steep bank located on east of hole.
2. Hole surrounded by willows and aspen to 15m. Few spruces to 10-15m.
3. Fair drainage.
4. Mud used as drilling fluid from 0.0m.
5. Piezometer standpipe installed to the bottom 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%

NP
NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

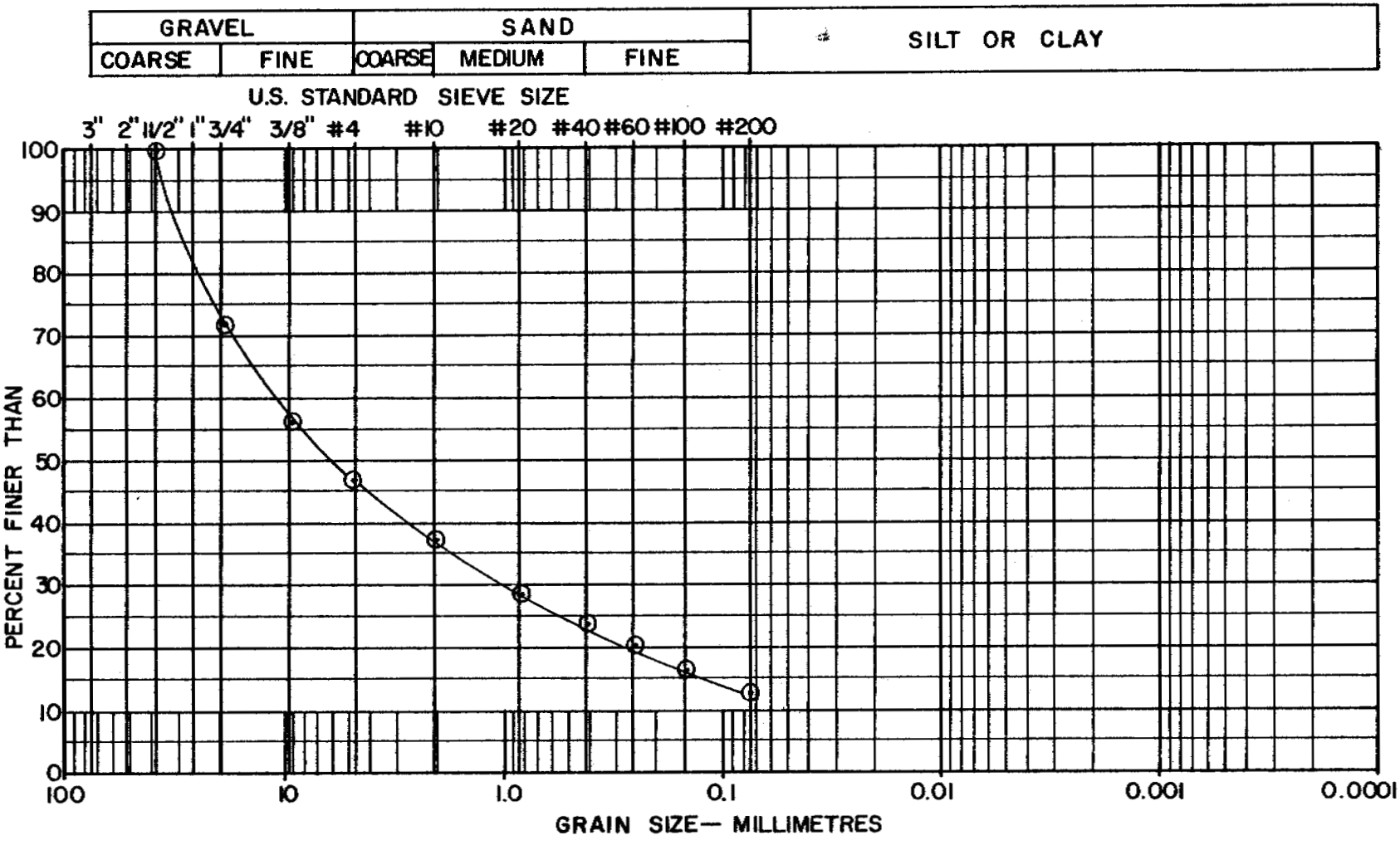
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-24
DATE July 15/78 PLATE

K.L.C. - METRIC

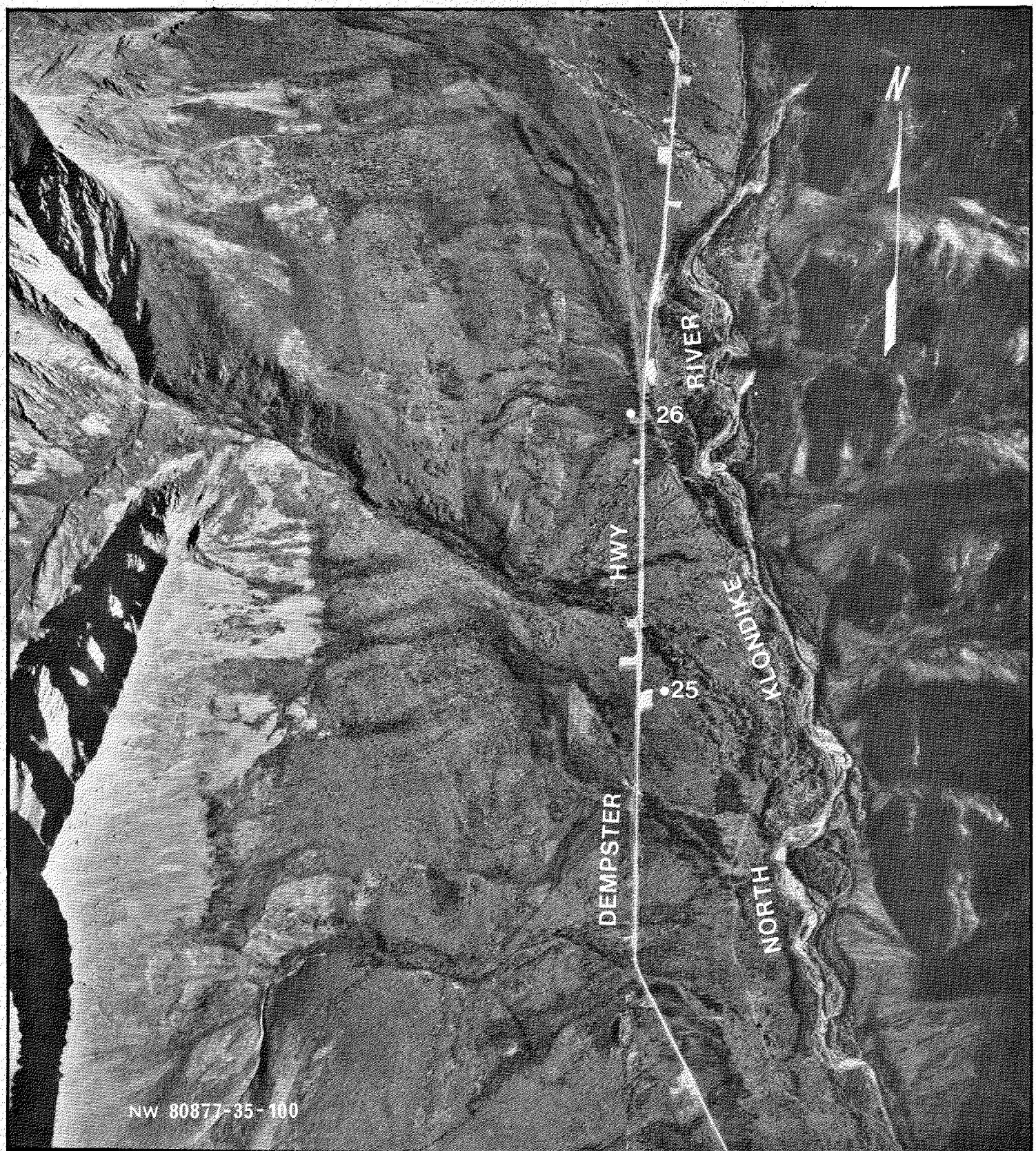
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-24 DEPTH
DATE Aug. 25/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. (3 + 4) at 2.0-3.30m. GRAVEL, and sand, trace silt, trace cobbles & boulders.



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. 78-25

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

TEST HOLE LOG

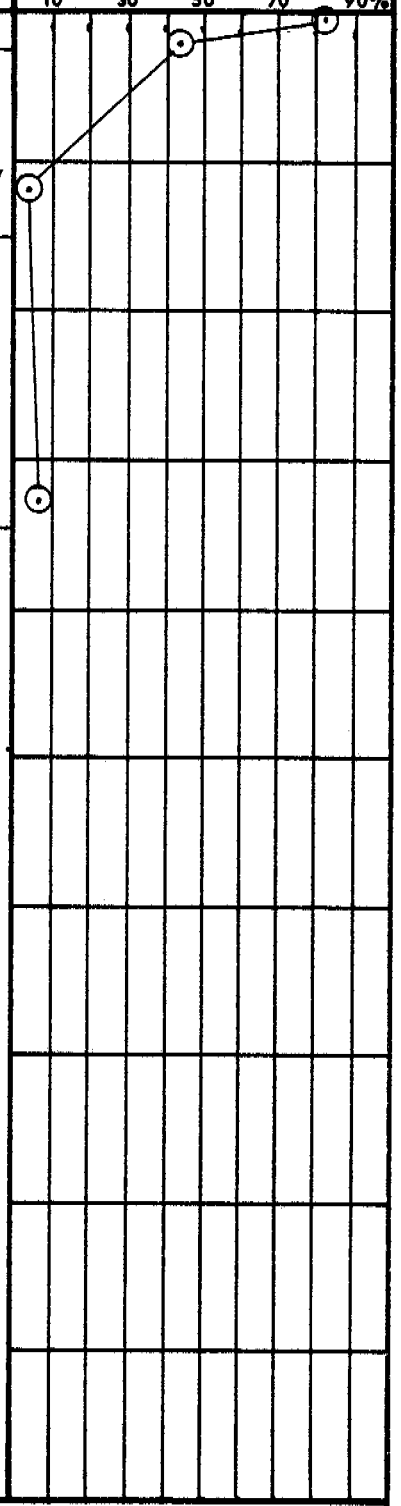
HAMMER WT. 63.5Kg.
HT. DROP 76 cm.

SAMPLE DATA				SYMBOL	PERMAFROST		LOCATION	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	DESCRIPTION OF MATERIAL
	B							0.1m ORGANIC SILT AND MOSS
	B		1					SILT - trace fine sand - trace fine gravel - rootlets - non to slight plasticity - brown
1.0		43					0.6m	
	SPT	30 50 for 10cm	2			NF		
2.0								GRAVEL - some silt - little sand - medium to coarse - trace shale fragments - very dense - grey (TILL-LIKE)
3.0		11						
	SPT	43 47	3				3.45m	
4.0								END OF HOLE

Notes:

1. Hole located about 50-60 m east of borrow pit on sloping ground.
2. Ground sloping 1-2% towards east.
3. Hole surrounded by moss, sprudes to 15-20 m, few aspen 2-5 m.
4. Fair drainage.
5. Mud used as drilling fluid from 0.0 m.
6. Material in borrow pit consists of cobbles, boulders and gravel.

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

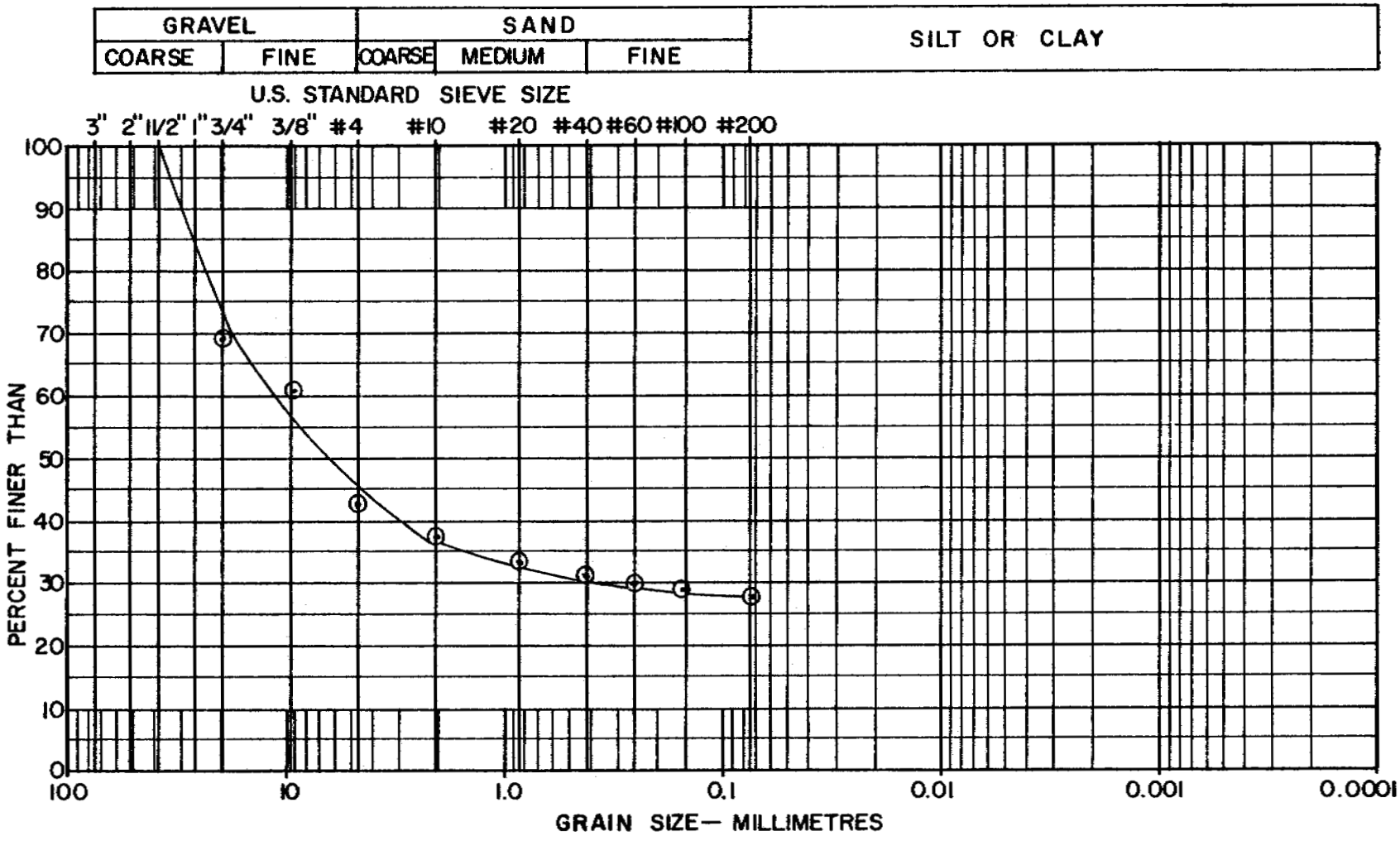


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-25
DATE	July 16/78 PLATE

K.L.C. - METRIC

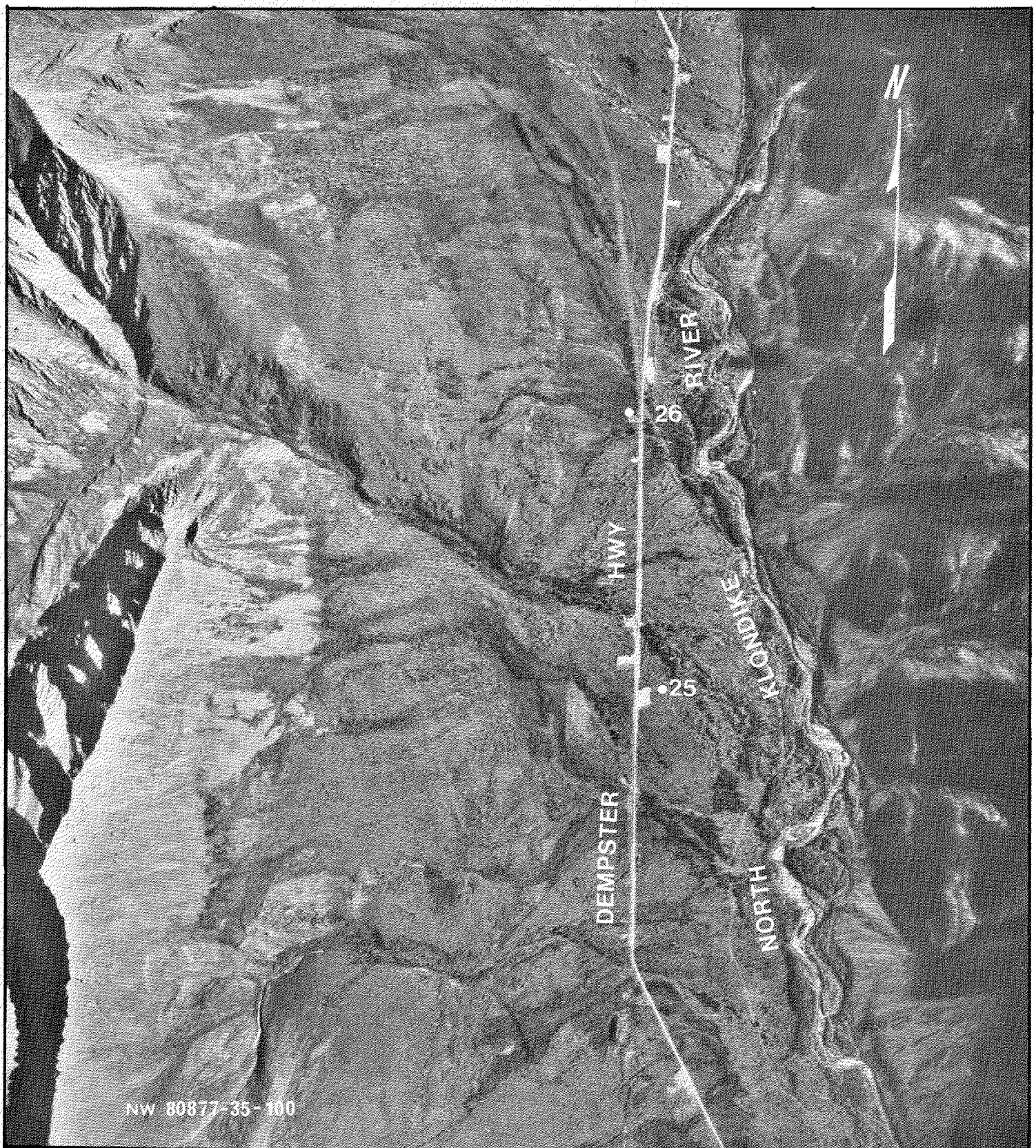
GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 3.0 - 3.45m GRAVEL- some silt, little sand

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL0995
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-25 DEPTH
DATE Sept 21/78



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. 78-26

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
1.0	B		2
	SPT	5 7	3
2.0	B		4
	SPT	7 24 18	5
3.0			
	SPT	21 21 15	6
4.0			
	SPT	17 34 39	7
5.0			
	SPT	12 18 24	8
6.0			
7.0			
8.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m PEAT - fibrous

SILT
- and fine sand
- rootlets
- massive structure
- brown

silt & sand (fine to medium) laminations

2.0m

cobbles

NF

GRAVEL AND SAND
- trace silt
- grey

cobbles or boulders

fine sand lens

boulders

7.0m

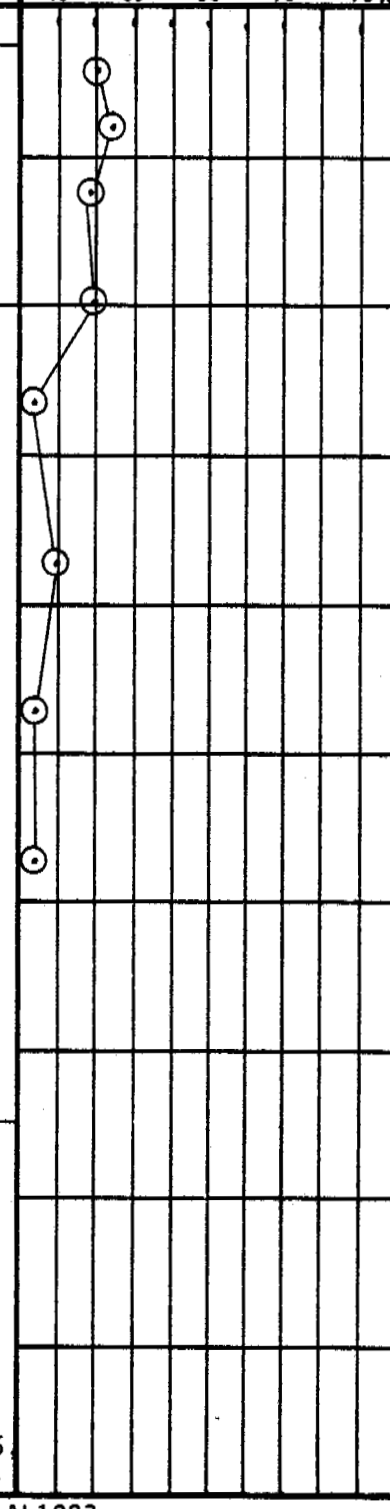
END OF HOLE

Notes:

1. Hole located on hummocky ground surface.
2. Hole surrounded by shrubs, spruces to 20-25 m.
3. Poor drainage.
4. Hole augered to 2.0 m. Air used as drilling fluid below.
5. Thermistors installed at 0.2,0.5, 1.0,1.5,2.0,2.5,3.0,4.0 & 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%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

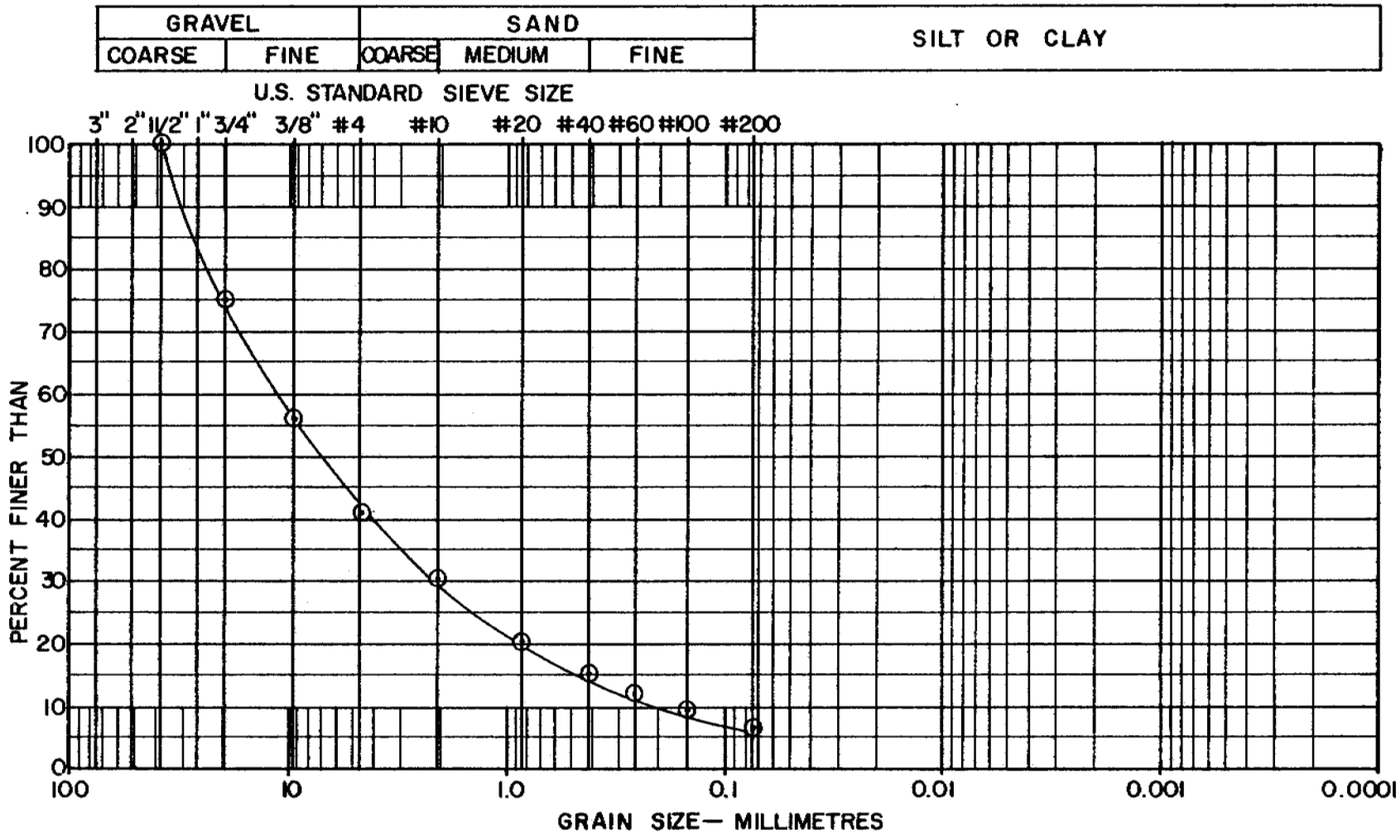
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-26
DATE	July 16/78 PLATE

K.L.C. - METRIC

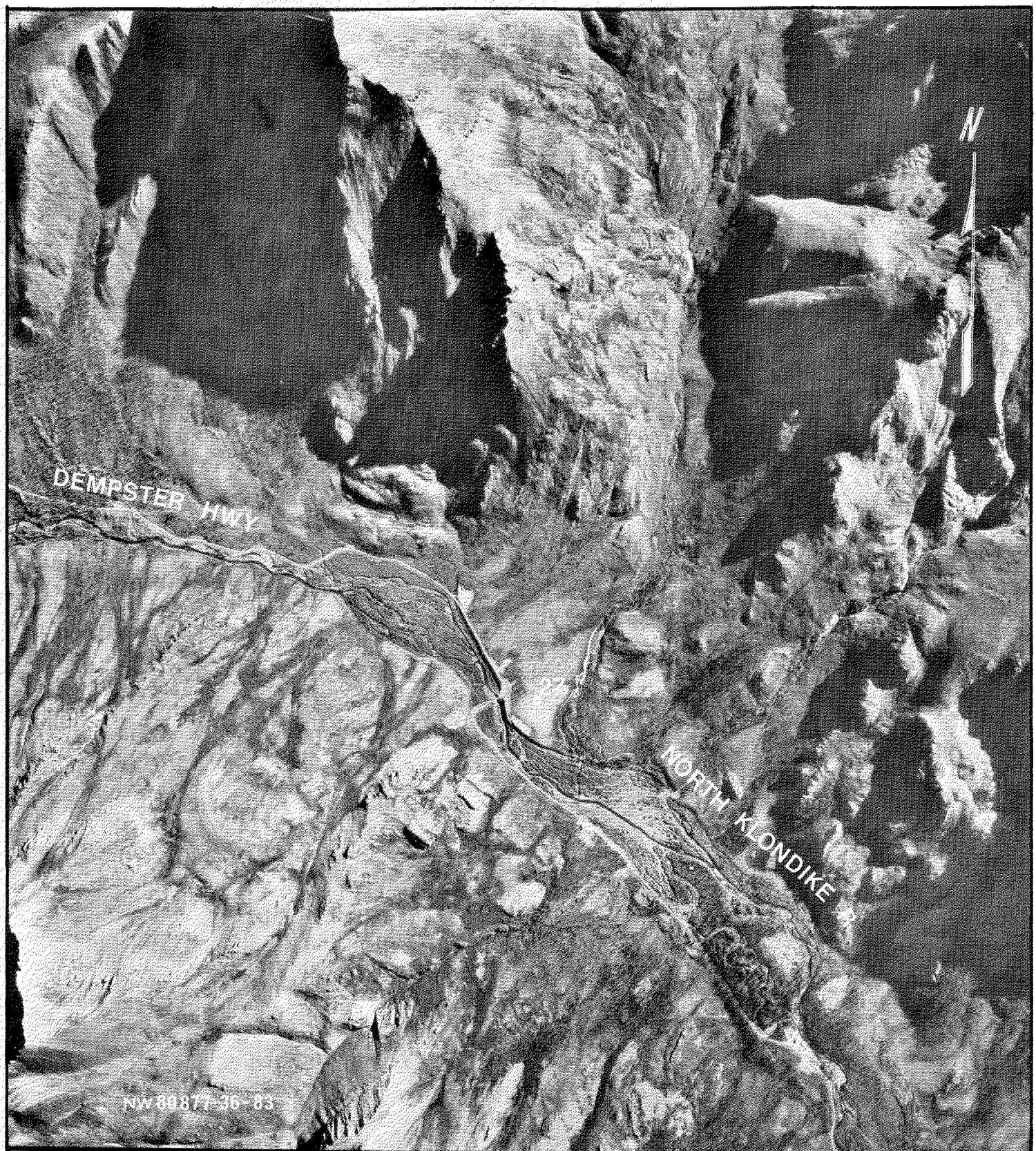
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-26 DEPTH
DATE Aug. 16/78

GRAIN SIZE CURVE



REMARKS: ⊙-⊙ Sample No. 5 at 2.5-2.95 m. GRAVEL AND SAND - trace silt



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-27

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.
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%

SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	
	B				Vs		0.05m ORGANIC COVER
	B		1		Nbe		ORGANIC SILT AND PEAT - trace fine sand - dark brown
1.0	C		2				0.75m
	SPT	125 for 10cm	3		Nbe		GRAVEL - some organic silt - some sand - fine to coarse - trace cobbles & boulders - brown ← trace silt-stone
2.0							
	SPT	Ref.	4				← Boulders 2.75m
3.0							END OF HOLE

Notes:

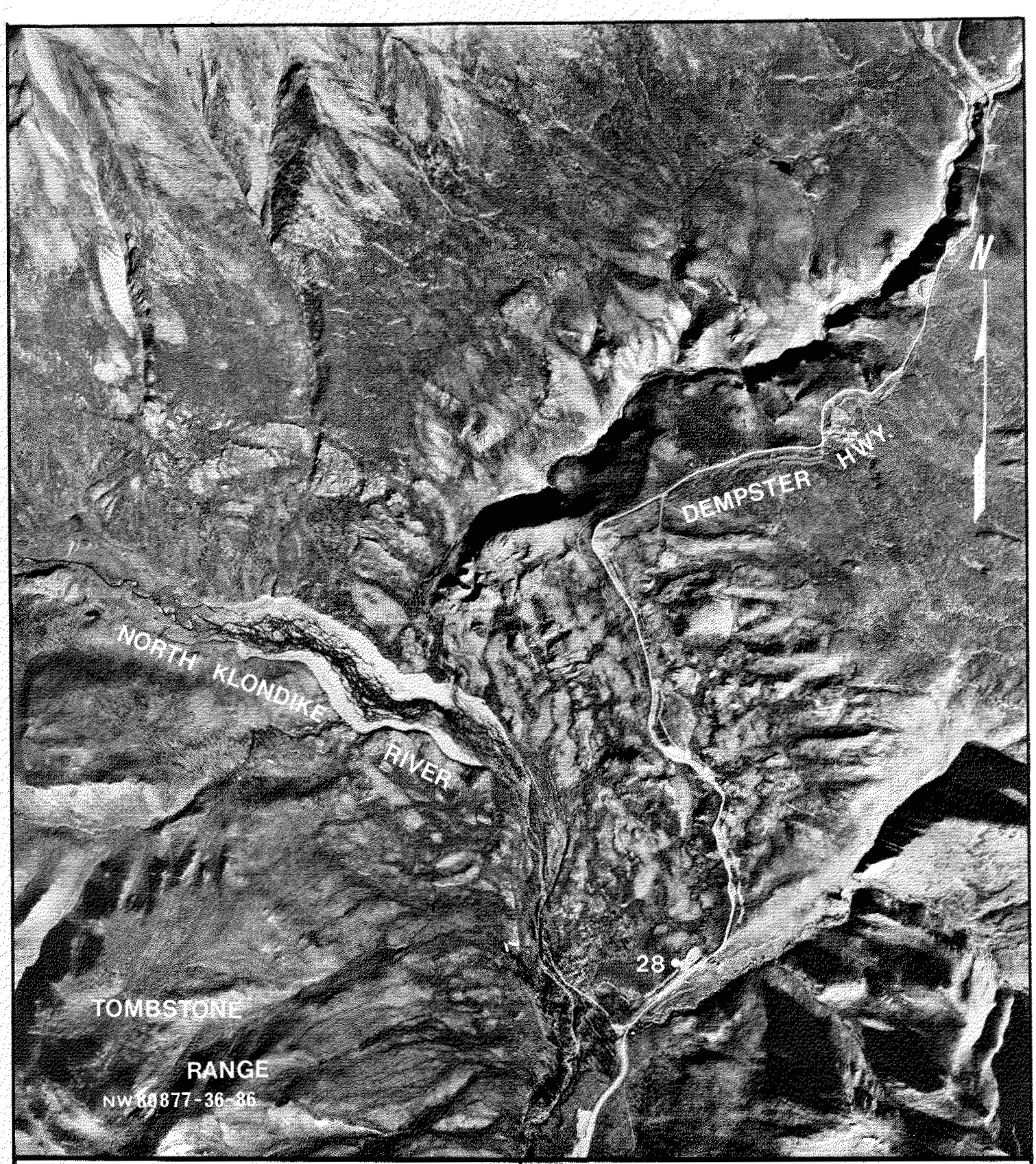
1. Hole located on a gravel fan and east of roadway cut.
2. Hole surrounded by moss and peat tussocks.
3. Poor drainage.
4. Hard drilling below 2.0 m.
5. Hole augered to 0.5 m cored from 0.5-0.9 m. Air used below.
6. Material exposed on the nearby roadway cut slope consists of boulders, cobbles and gravel.

118%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-27
DATE July 17/78 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. 78-28

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 X — WATER CONTENT 0 — LIQUID LIMIT X
DEPTH	TYPE	BLOW/15cm.	No.					10 30 50 70 90%
	B						0.03m PEAT	
	B		1				SILT AND CLAY - little sand - fine to coarse - trace gravel - slight to low plasticity - sand lenses - organic lenses - dark brown	
1.0	B		2					
	B		3					
2.0		4					2.0m	
	SPT	10 13	4				← trace siltstone	
	B		5				SAND AND GRAVEL - trace silt - trace cobbles & boulders - medium dense - dark brown	NP
3.0		10				NF		
	SPT	10 11	6				← little silt	
4.0		11						
	SPT	11 13	7					
5.0		23					5.0m	
	SPT	17 17	8					X-X
6.0								
		12					SAND AND GRAVEL - trace cobbles & boulders - little to some silt - trace clay - rusty orange specks - brown silt lens - medium dense to dense - dark grey (TILL-LIKE)	X-X
7.0	SPT	13 12	9					
8.0								
		15						
9.0	SPT	17 18	10					
10.0							10.0m (Cont'd.)	

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-28
DATE	July 17/78 PLATE

K.L.C. - METRIC

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 (X — 0 — X) 10 30 50 70 90%
DEPTH	TYPE	BLOW 15 cm.	No.					
	SPT	18 20 22	11			NF	10.45m As above	
11.0							END OF HOLE	

Notes:

1. Hole located in the southwest corner of a borrow pit on west side of an ablation moraine.
2. Ground slopes about 6-7% toward west. Fair to good drainage.
3. Hole surrounded by moss and small bushes.
4. Hole augered to 3.5m. Mud used as drilling fluid below.
5. Thermistor installed at 0.2m, 0.5m, 1.0m, 1.5m, 2.0m, 3.0m, 4.0m and 5.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

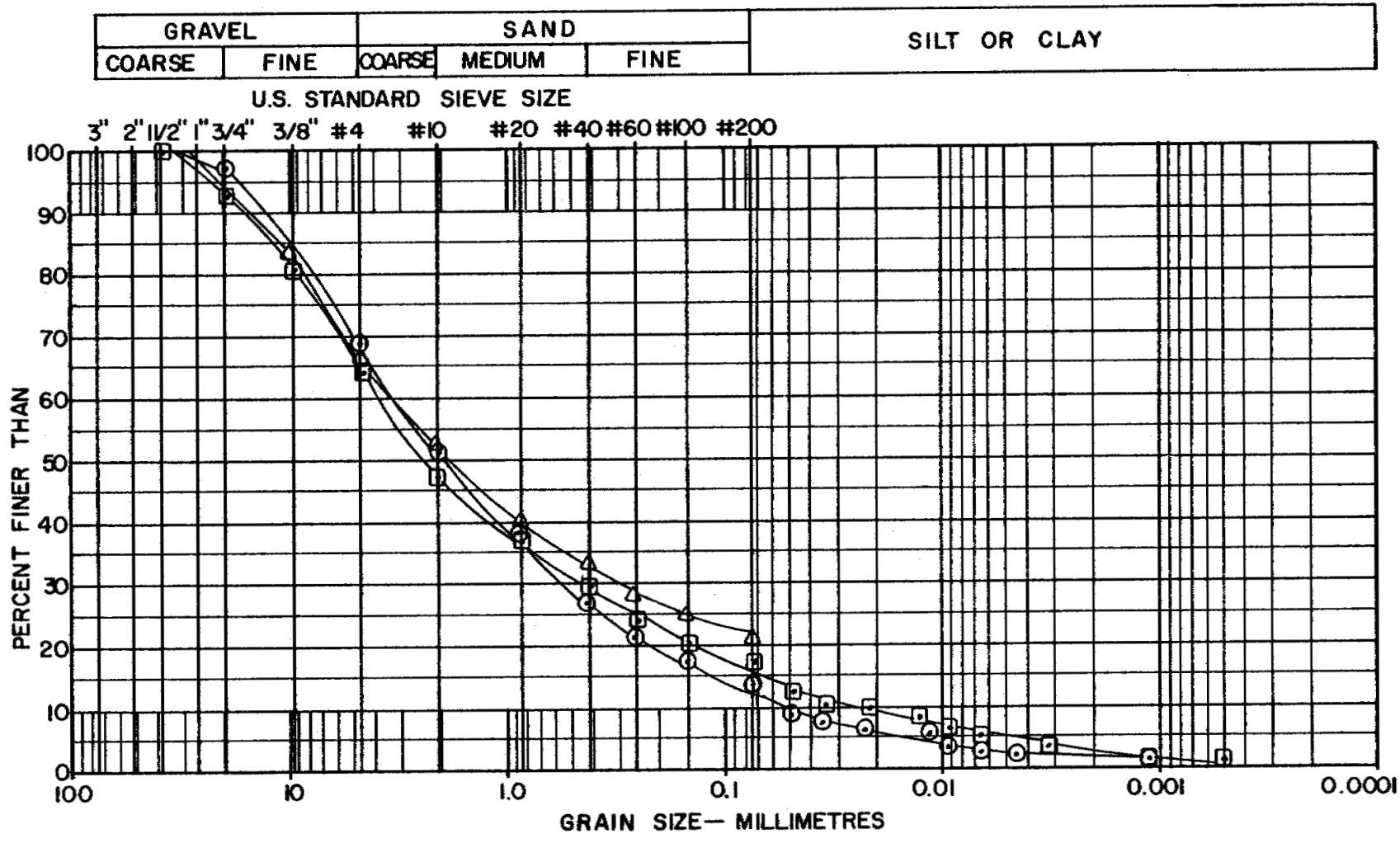
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-28
DATE July 17/78 PLATE

K.L.C. - METRIC

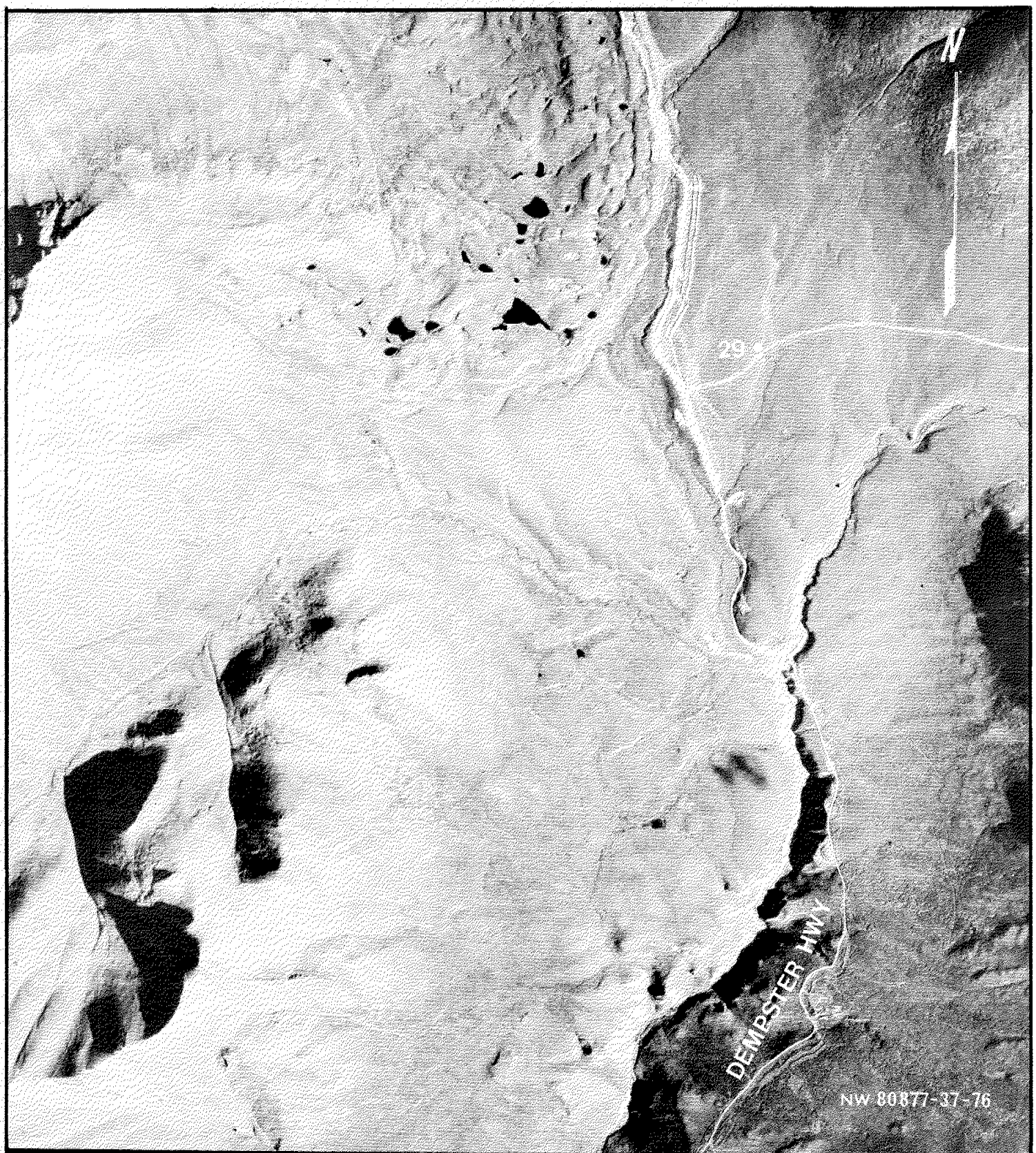
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

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

GRAIN SIZE CURVE



REMARKS:
- ⊙—⊙ Sample No. 6 at 3.0-3.45 m. SAND, some gravel, little silt, trace clay, trace cobbles & boulders
- ⊡—⊡ Sample No. (8+9) at 5.0-6.95 m. SAND, and gravel, little silt, trace clay, trace cobbles & boulders
- △—△ Sample No. (10+11) at 8.5-10.45 m. SAND, some gravel, some silt



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. 78-29

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.
	B		
	B		1
1.0	B		2
	SPT	11 9 10	3
2.0			
	SPT	17 18 18	4
3.0			
	SPT	17 43 53	5
4.0			
	SPT	35 60 for 10cm	6
5.0			
	B		7
6.0			
7.0			
	SPT	18 26 50	8
8.0			
9.0	SPT	Ref.	9
10.0			

SYMBOL

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

SILT
- little sand-fine to coarse
- trace gravel
- root fibres
- slight plasticity
- massive structure
- organic pockets
- brown

0.75m

NF

SILT AND CLAY
- some sand
- trace gravel, cobbles
- low plasticity
- brown (TILL-LIKE)

some coarse sand

3.5m

SAND
- some gravel
- some silt
- trace clay, cobbles
- organic pockets
- rusty specks
- very dense
- brown (TILL)

← boulder

← gravel layer

boulder 9.0m

END OF HOLE

Notes:
1. Hole located on undulating ground surface. (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. 78-29
DATE July 18/78 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

2. Ground sloping 3-4% to the south.
3. Hole surrounded by bushes, moss and shrubs.
4. Fair drainage
5. Hole augered to 1.0m. Mud used as drilling fluid below.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-29
DATE July 18/78 PLATE

K.L.C. - METRIC

27

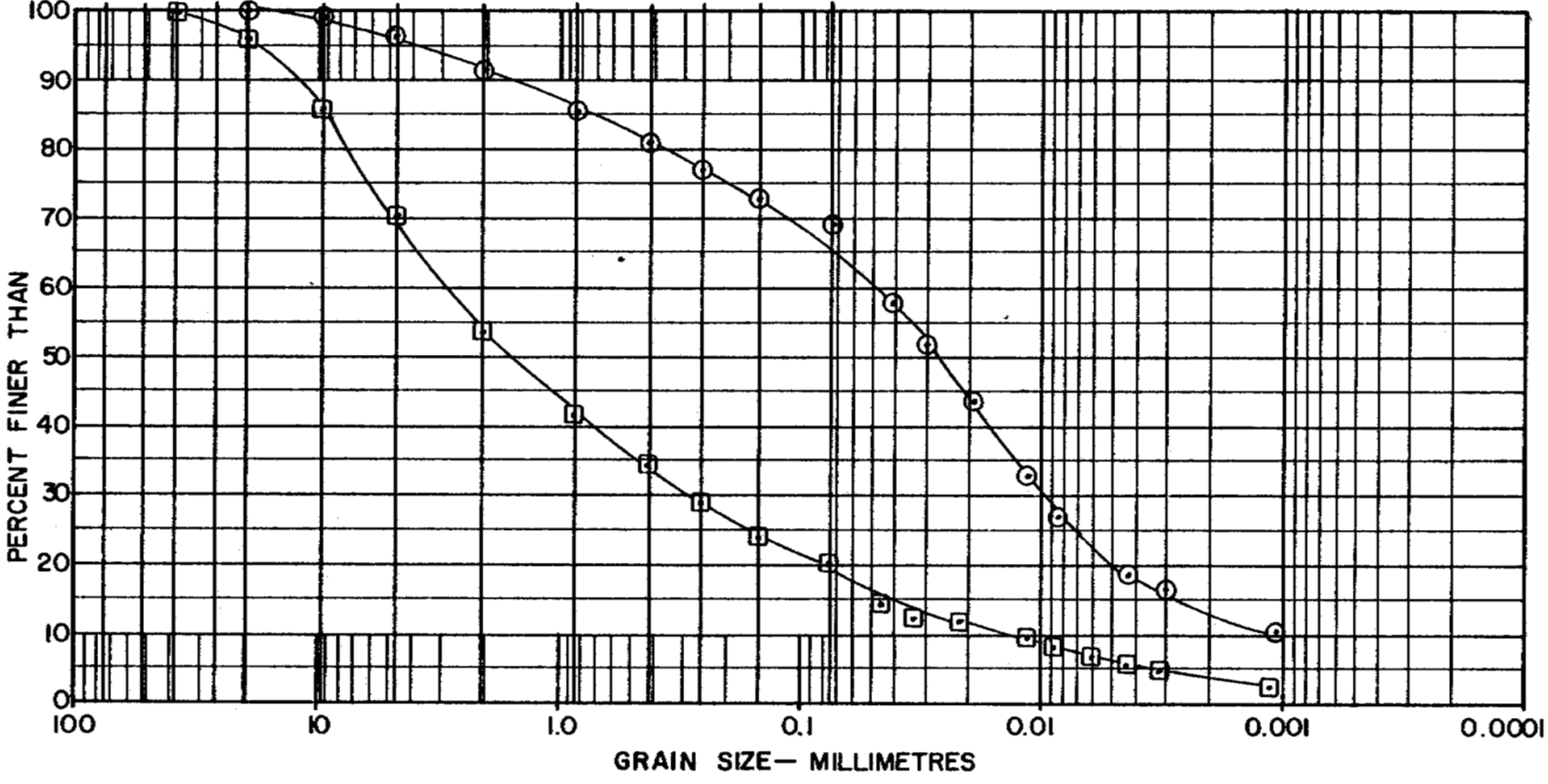
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-29 DEPTH
DATE Aug. 28/78

95

GRAIN SIZE CURVE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



REMARKS: ⊙—⊙ Sample No. 2 at 1.0 m. SILT & CLAY, some sand, trace gravel

⊡—⊡ Sample No. 5 at 3.5-3.95 m. SAND, some gravel, some silt, trace cobbles (TILL)



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. 78-30

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.
PERMAFROST
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%

SAMPLE DATA				SYMBOL	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW/15cm.	No.				
	B						0.06m ORGANIC COVER
1.0	SPT	10 14 11	1			NF	SILT - trace fine sand - slight plasticity - brown 0.8m
2.0	SPT	12 15 14	2				SILT AND CLAY - little sand - fine to coarse, trace boulders - trace to little gravel - low plasticity - rusty specks - organic pockets - brownish grey (TILL)
3.0	SPT	12 20 20	3				← little to some gravel ← boulder
4.0	SPT	50 for 11cm	4				← gravel layer
5.0	SPT	20 21 21	5				← cobble or boulder
6.0	SPT	Ref.	6				boulder 6.3m
7.0							END OF HOLE Notes: 1. Hole located on east side of hummocky end moraine. Terrain slopes 8-10% east. 2. Hole surrounded by small bushes and shrubs. Boulder exposures located near the hole. 3. Good drainage. 4. Air used as drilling fluid from 0.0m.

X—X

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

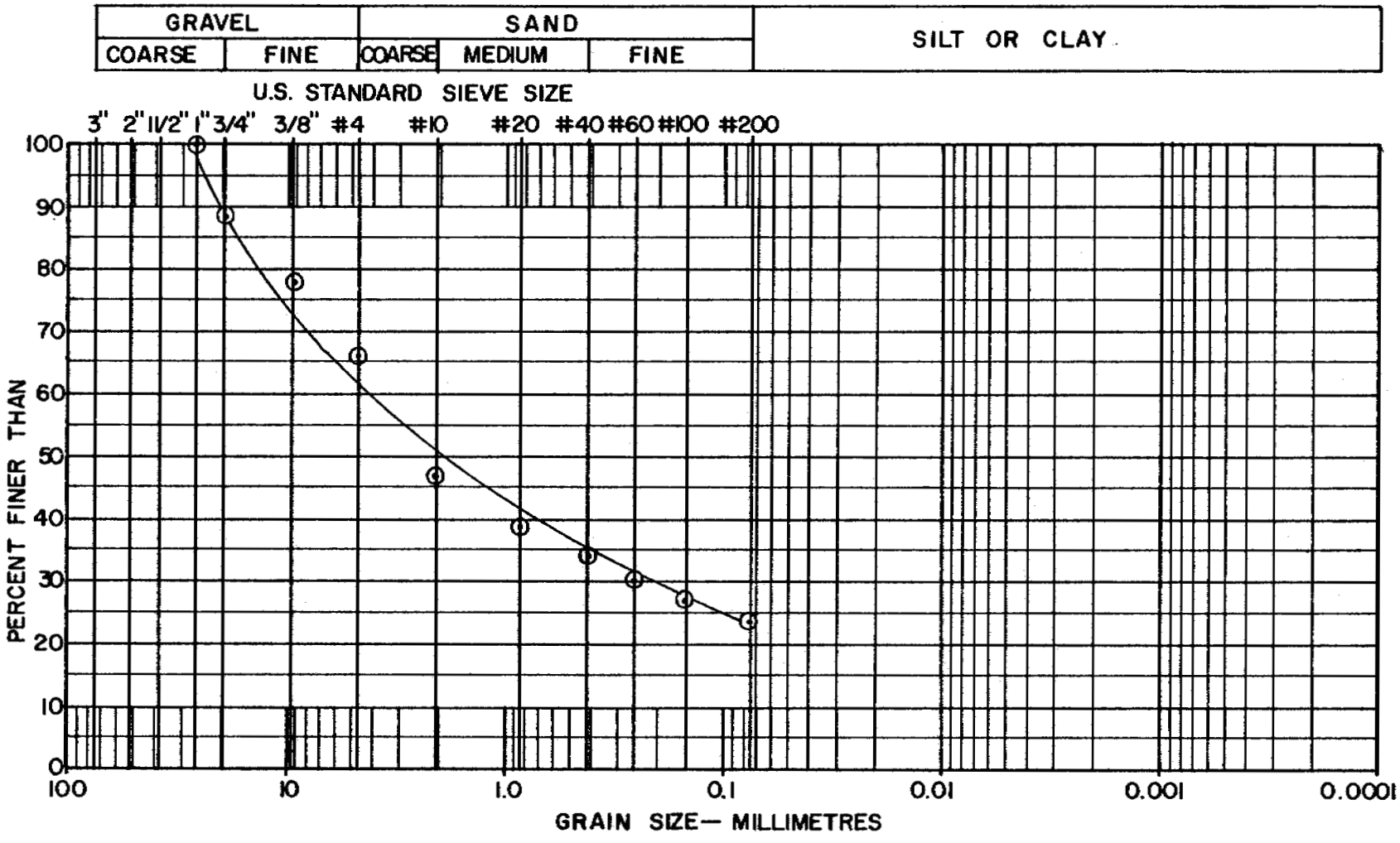
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-30
DATE	July 18/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-30 DEPTH
DATE Aug. 25/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 5 at 5.0-5.45 m. SAND, some gravel, some silt.

98



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. 78-31

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				Nbe		0.05m ORGANIC COVER
	B		1				ORGANIC SILT - little gravel - trace fine sand - grey
1.0	C		2		ICE+		1.0m
	C		3				SILT AND CLAY - and sand - trace gravel - fine - slight to low plasticity - organic inclusions - grey
	C		4		ICE+		
2.0	SPT	22 32 48	5		Vr, Vx Nbe		
3.0	SPT	80 for 10cm	6			F	3.0m
4.0	SPT	90 for 10cm	7				
5.0					N		
6.0	SPT	Ref.	8				GRAVEL - some sand - fine to coarse - trace to little silt - hard drilling below 5.0m. - trace cobbles - brownish grey
7.0							
8.0							8.5m
9.0							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%

X-X

471%
432%
143%
107%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-31
DATE	July 18/78 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. Hole located in a swamp.
2. Ground surface covered by moss.
3. Water level at ground surface.
4. Poor drainage.
5. Hole augered to 0.5 m. Cored to 1.75 m. Air used as drilling fluid below.
6. Hole caved in at 5.2 m.
7. Sampling not possible below 5.0 m. Hole logged by drilling observation below 5.0 m.

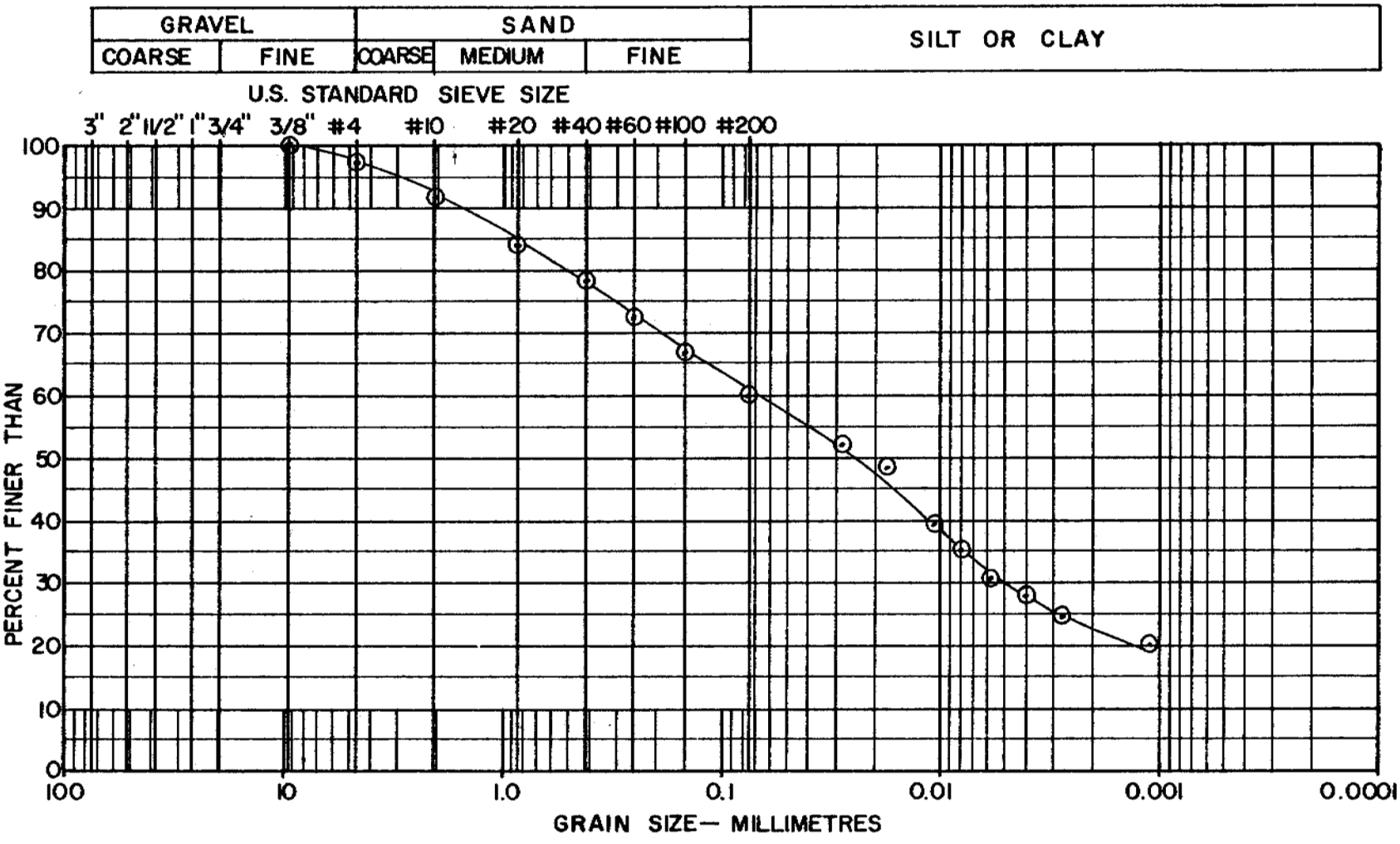
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-31
DATE July 18/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 3 at 1.0-1.5 m. SILT AND CLAY & SAND - trace gravel

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-31 DEPTH
DATE Aug. 25/78



KLOHN LEONOFF CONSULTANTS LTD. CIVIL ● GEOTECHNICAL ● HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-32		
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 East Blackstone 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	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B						0.05m ORGANIC COVER
	B		1				ORGANIC SILT - some sand - fine to coarse - roots - slight plasticity - dark brown
1.0	C		2		Nbe, Vr, Vx		
	C		3				
2.0	C		4				2.0m
	C		5		Vr, Vs, Nbe		SILT - some sand - trace gravel - organic inclusions - sand lenses - grey
3.0	C		6				
	C		7				← sand and silt laminations
4.0	C		8				
	SPT	32 45 57	9				4.5m
5.0					Nbe		SILT AND CLAY - little fine to coarse sand - low plasticity
	SPT	34 48 52	10				5.45m - grey
6.0					N		
7.0		Ref.	11				GRAVEL OR BOULDERS - hard drilling
8.0							8.1m
9.0							END OF HOLE

Notes:

1. Hole located in a swampy area. A pond located 50m east of hole.
2. Hole surrounded by peat tussocks. (Cont'd.)

NP
NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-32
DATE July 19/78 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. Poor drainage.
4. Hole augered to 0.5 m. Cored to 4.0 m. and air used as drilling fluid below.
5. Sample No. 8 not recovered
6. Sampling not possible below 5.5 m. Soil logged by drilling observations.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

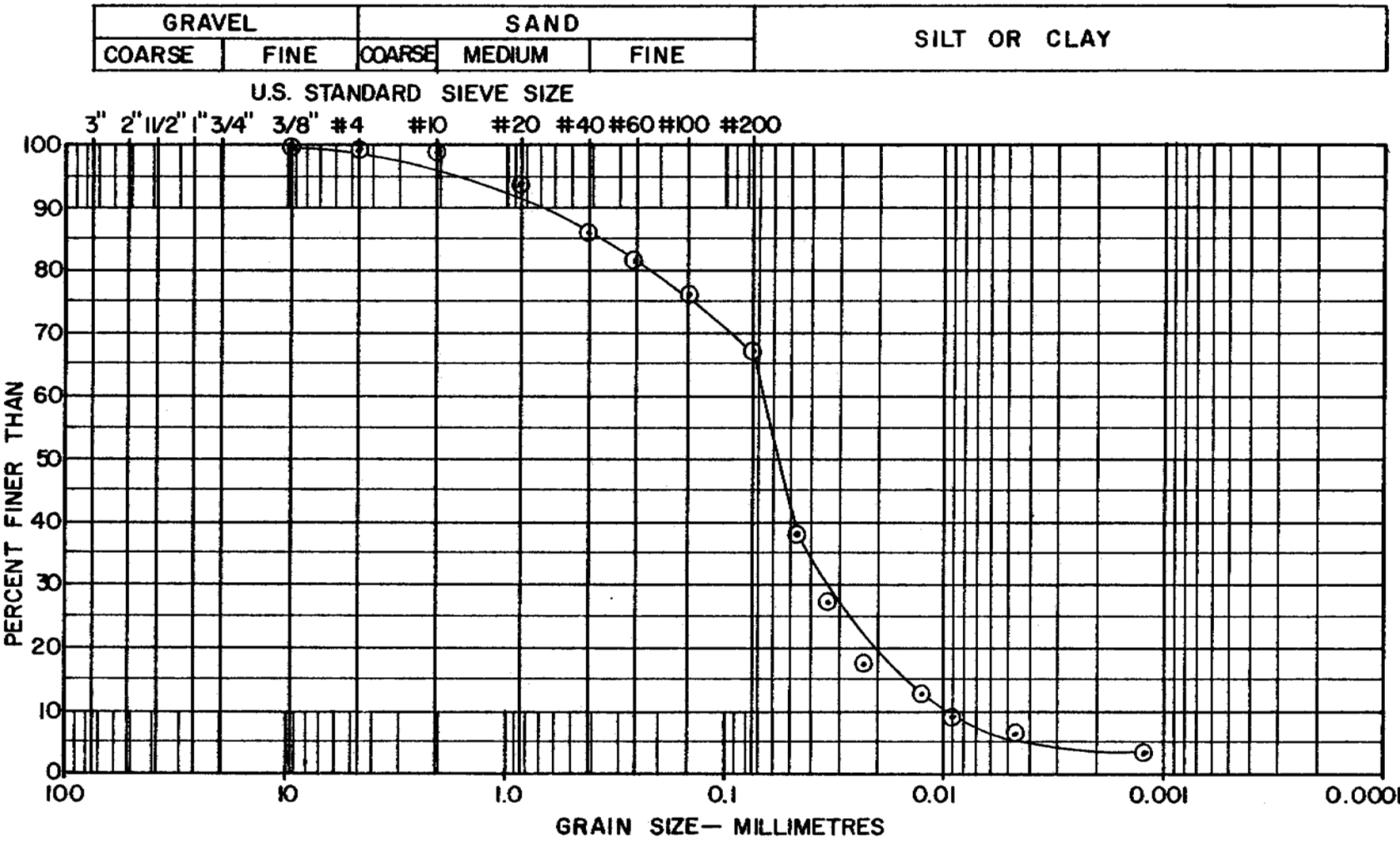
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-32
DATE July 19/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-32 DEPTH
DATE Sept. 17/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 7 at 3.0-3.5 m. SILT, some sand, trace clay, trace gravel.

106



KLOHN LEONOFF CONSULTANTS LTD. CIVIL ● GEOTECHNICAL ● HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-33			
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	N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B						0.04m ORGANIC COVER
	SPT	5 5 7	1			NF	SILT AND CLAY - little fine to coarse sand - little gravel - fine to medium - low plasticity - massive structure - rusty specks - brown (TILL-LIKE)
1.0							1.0m
	SPT	41 65 for 10cm	2			Partially Frozen	
2.0							GRAVEL - and sand - fine to coarse - little silt and clay - organic pockets - brown (TILL)
	SPT	100 for 10cm	3				
3.0	B		4				
	SPT	50 50 for 3cm	5		Nbe		3.5m SAND - some gravel - little silt - orange brown
4.0							4.0m
	SPT	80 for 10cm	6				4.6m GRAVEL - and sand - brown
5.0	B		7			NF	
6.0							BEDROCK OR BOULDER - hard drilling
	B		8				6.5m
7.0							END OF HOLE

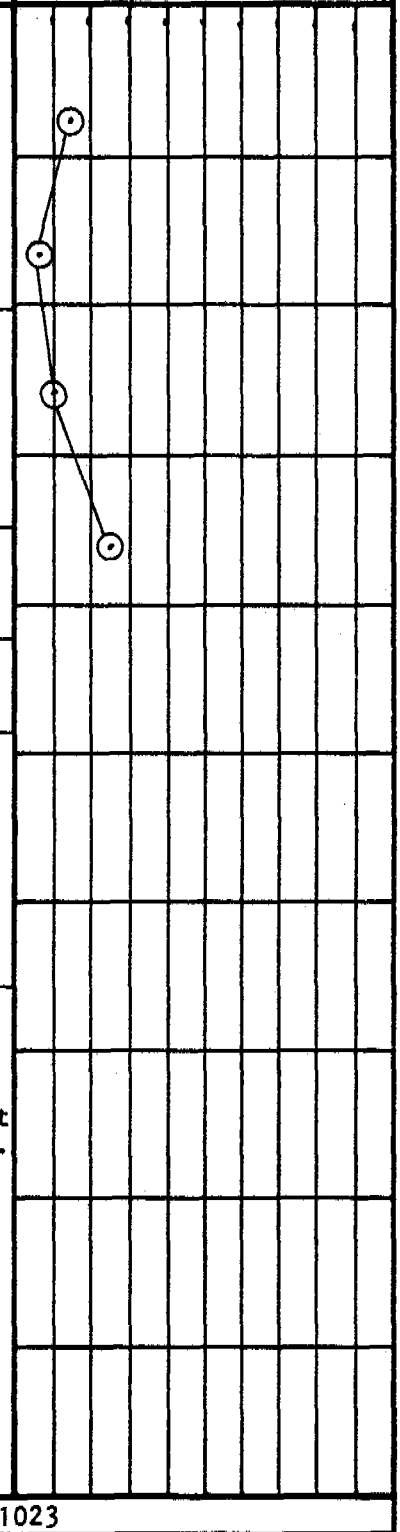
Notes:

1. Hole located west of borrow pit on hummocky ground surface about 40-50 m. west of E.Blackstone R.
2. Hole surrounded by moss.
3. Poor to fair drainage.
4. Drilling mud used from 0.0 m.
5. Hole caved in at 4.5 m.

PERMAFROST
LOCATION East Blackstone 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%



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-33
DATE	July 19/78 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. 78-34

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

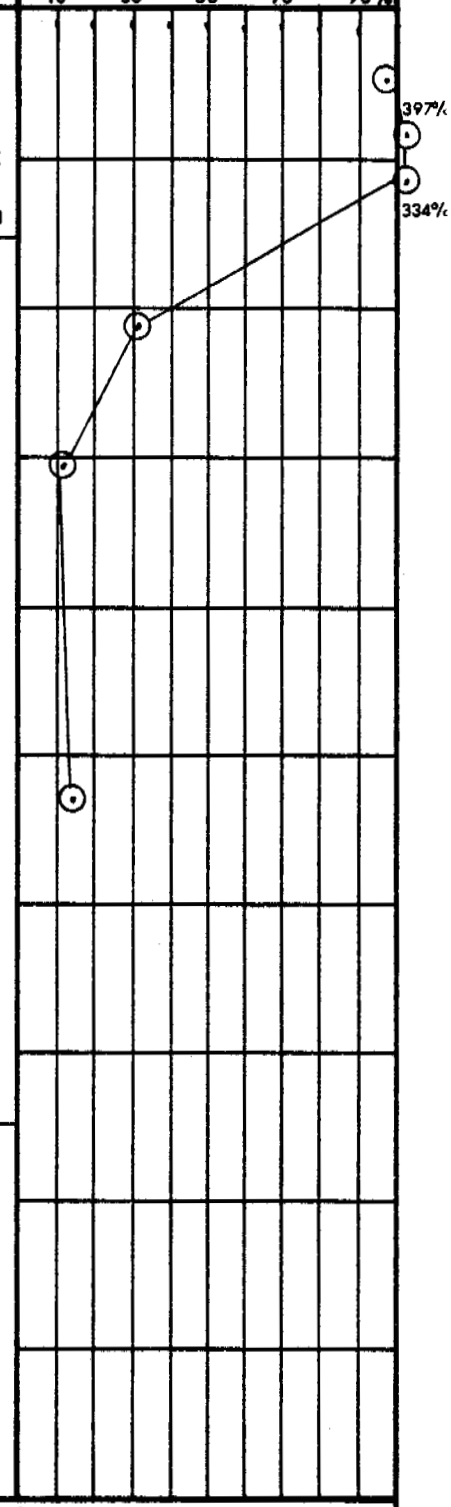
DEPTH	TYPE	BLOW/15cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B						0.05m ORGANIC COVER
	B		1		Vx,Vr		PEAT AND ORGANIC SILT - trace fine sand - trace fine gravel - pockets of organic silt - dark brown
1.0	C		2		ICE+		
	C		3				ice lenses 15mm-20mm @ 20mm-50mm
							1.55m
2.0		40					GRAVEL - some sand - fine to coarse - trace to little silt
	SPT	50 for 8cm	4		Nbe Nbn		
3.0		100					
	SPT	for 6cm	5				some silt
4.0							boulder
5.0		100					
	SPT	for 8cm	6				
6.0							boulder
7.0							boulder
							7.5m
8.0							END OF HOLE

Notes:

1. Hole located on a flat ground surface.
2. Hole surrounded by tundra vegetation.
3. Poor drainage.
4. Hole augered to 0.5 m. Cored to 1.3 m. Air used as drilling fluid below.

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

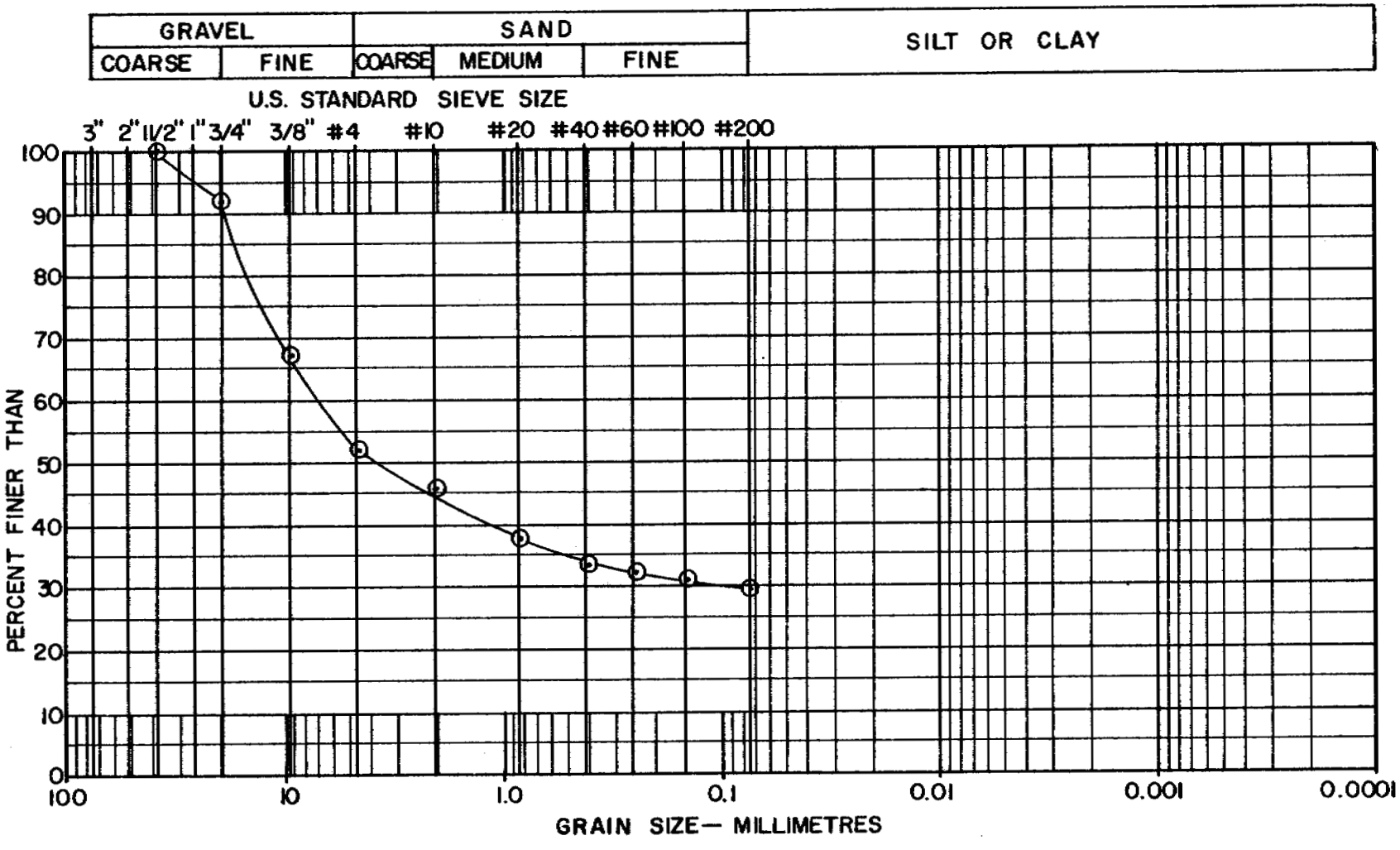
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-34
DATE July 20/78 PLATE

K.L.C. - METRIC

HELICOPTER TEST HOLES

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 5 at 3.0-3.06 m. GRAVEL, some silt, some sand.

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-34 DEPTH
DATE Aug. 28/78



KLOHN LEONOFF CONSULTANTS LTD. CIVIL • GEOTECHNICAL • HYDRAULIC VANCOUVER - CALGARY - WINNIPEG, CANADA	PROJECT: DEMPSTER LATERAL DRILLING PROGRAM TITLE: AIRPHOTO LOCATION PLAN TEST HOLE No. 78-101			
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
	B		2
	SPT (Pushed)		3
2	SY		4
	B		5
3	B		6
4	SPT	6 15 18	7
5	SPT	13 24 15	8
6			
7			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.6m
Nbe	
	NF

LOCATION Yukon 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

0.1 m ORGANIC COVER

SILT
- little fine sand
- trace organice
- trace rootlets
- 0.2 m. volcanic ash layer at 0.8m depth
- coal specks
- laminated
- slight to low plasticity
- grey & brown

1.0m

2.25 m

fine sand lenses

GRAVEL
- fine to medium
- some sand
- trace silt
- wet
- brown

coarser below 3.5 m.

7.10m.

END OF HOLE

NOTES:
1. Hole located approximately 18m west and 3m. above the Yukon River.
2. Hole located on a flat ground surface
3. Hole surrounded by poplars to 10-12 m.

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-101
DATE July 5/78 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.
DESCRIPTION OF MATERIAL
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — — 0 — — — — — X
10 30 50 70 90%

NOTES:

4. Seasonal frost encountered from 0.6m to 1.0m
5. Hole augered to 3.45 m., drilling mud used from 3.45 to 7.10 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

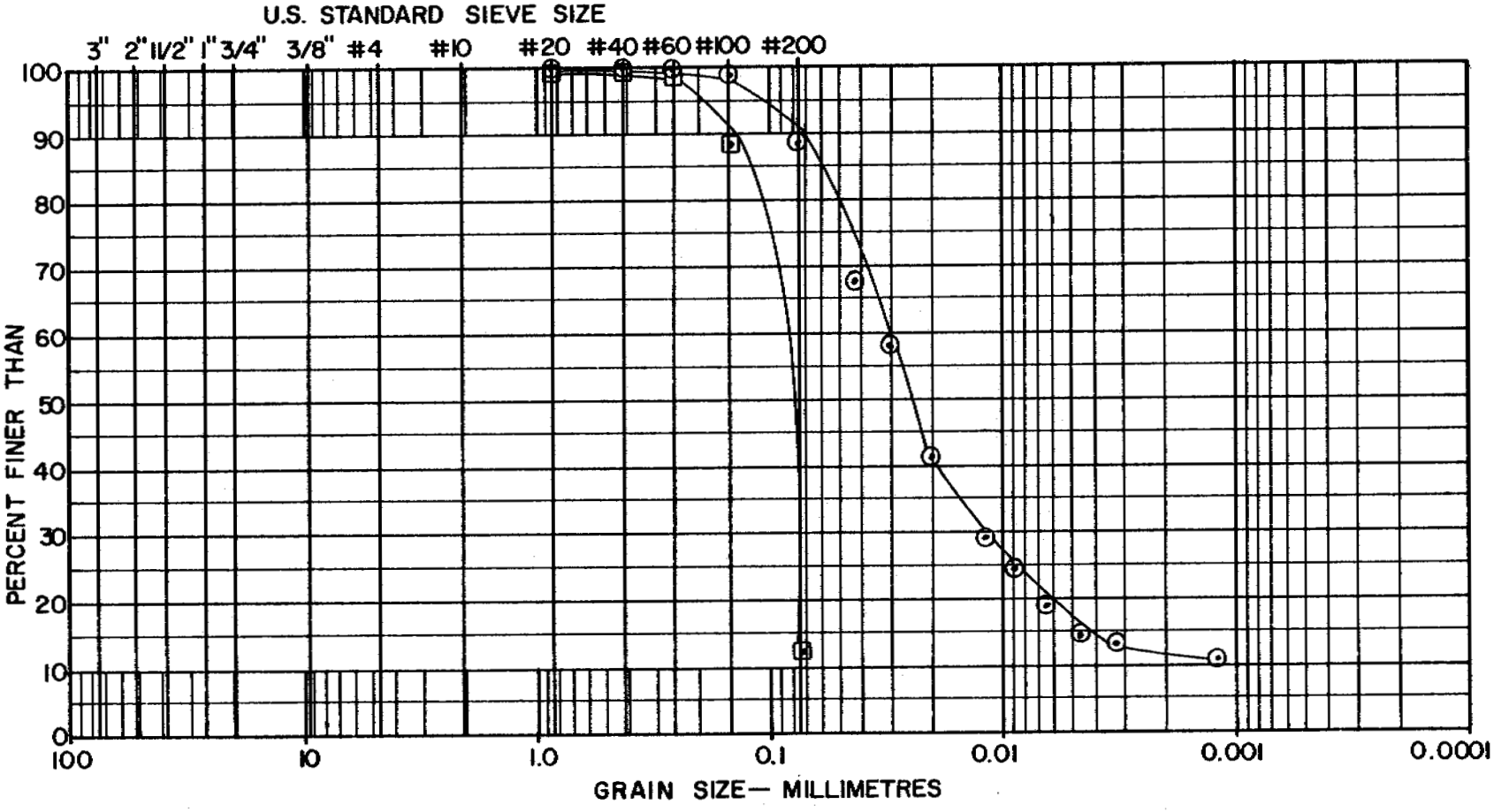
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-101
DATE	July 5/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

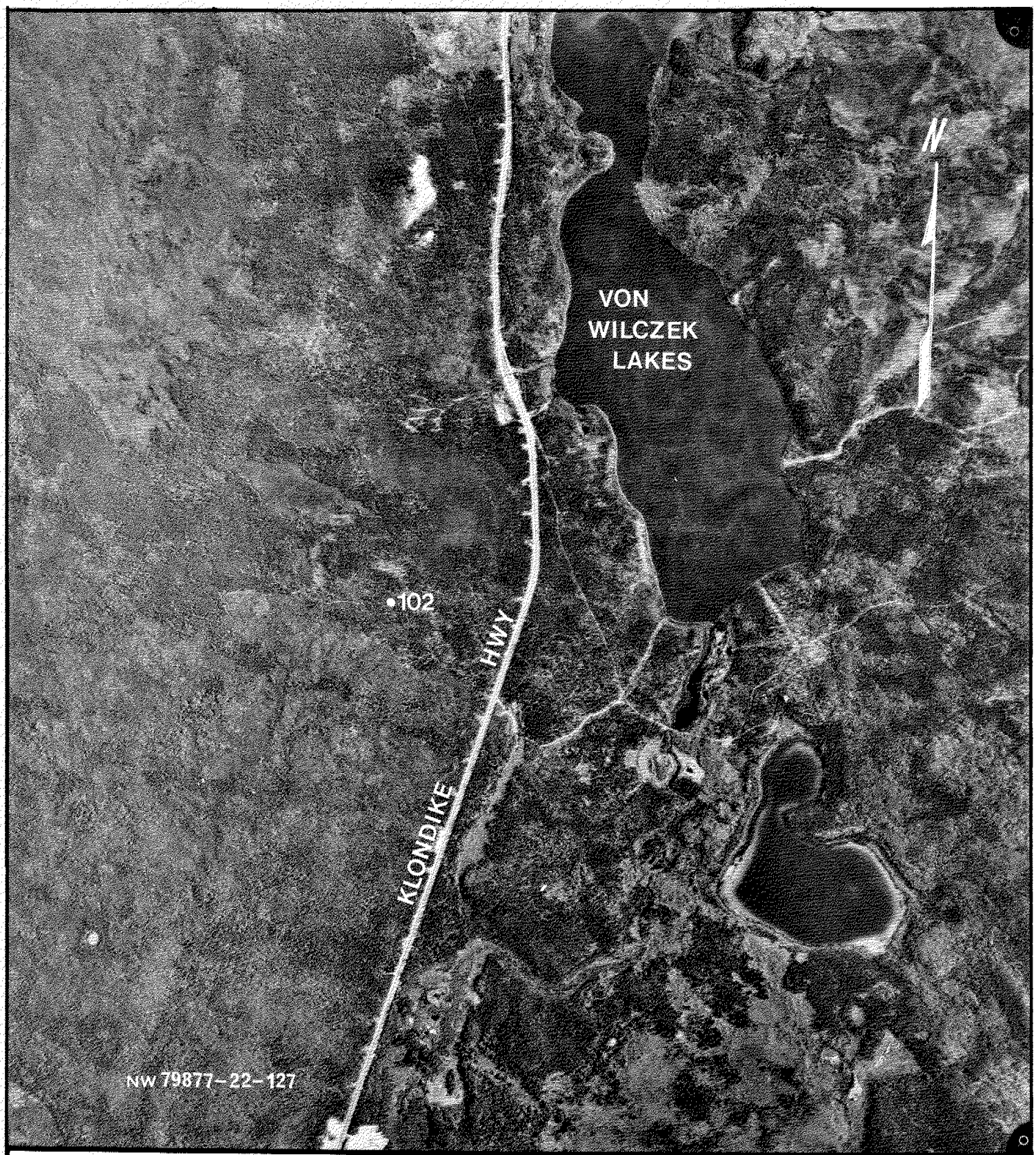
GRAIN SIZE CURVE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



REMARKS:
- ⊡—⊡ Sample No. 4 at (1.57 - 1.68m) — SAND - fine, little silt
- ⊙—⊙ Sample No. 4 at (1.68 - 1.8m) — SILT - little fine sand

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-101	DEPTH
DATE Aug. 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. 78-102

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
	B		2
1		25	
	SPT	42	3
		50	
2	SPT	31	4
		140	
	SPT	60	5
		72	
	SPT	33	6
3		60	
		58	
	SPT	90	7
4		for 7.5cm	
5		15	
	SPT	95	8
6			
		70	
		100 for 5 cm	
7	SPT		9

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
	0.7m
Vx	
Nbn	
	3.5m
	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

0.15m ORGANIC COVER
- moss and roots

0.5m

SILT
-little sand, trace clay
-slight plasticity
-grey brown

SILT AND CLAY
- some gravel
- little to some sand
- low plasticity
- yellow silt pockets
- sand lenses
- grey

(TILL)

← coarser drilling

- micaceous schist pieces

7.0m

END OF HOLE

NOTES:
1. Test hole located on flat lying terrain. The site is moss covered and poorly drained.
2. Vegetation consists of white spruce to 30m. and shrubs 2-3m high. An area with ponded water with dead trees is located to the west.

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-102
DATE July 6/78	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:
3. Test hole augered to 1.0m.
4. Drilling mud used from 1.0 to 7.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

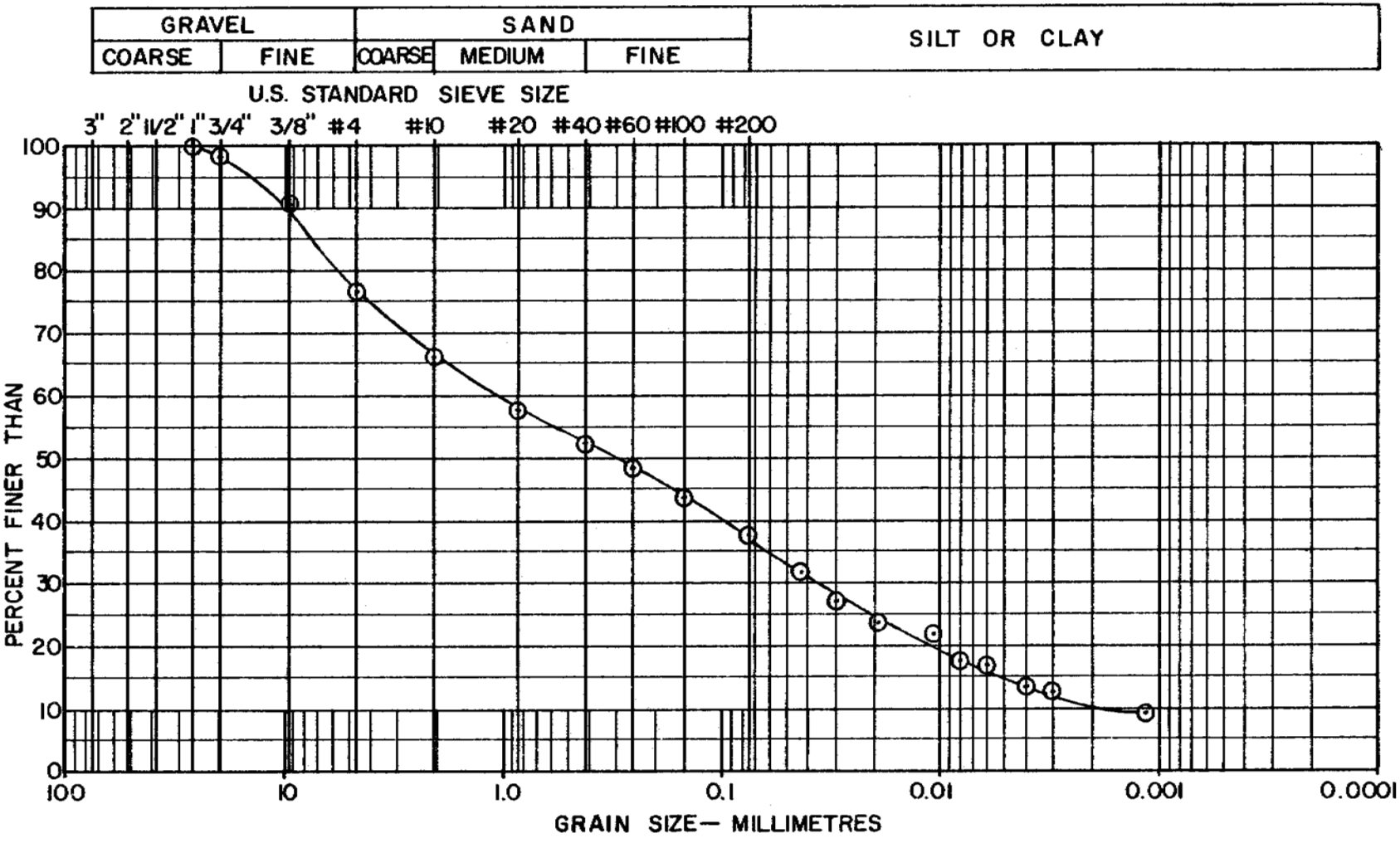
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-102
DATE July 6/78 PLATE

K.L.C. - METRIC

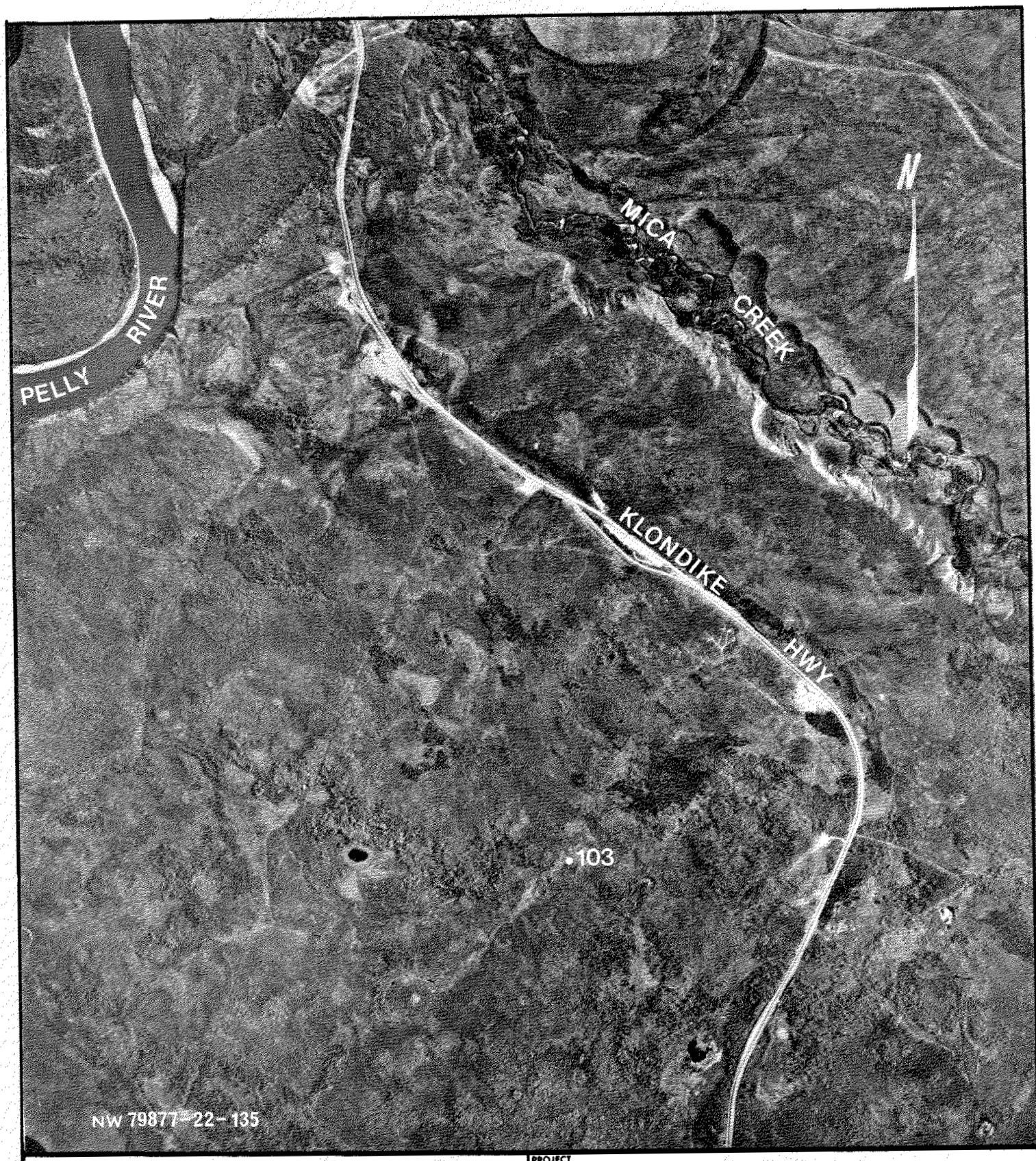
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-102 DEPTH
DATE Aug 15/78

GRAIN SIZE CURVE



REMARKS: Sample No. (8 + 9) at (5.0 - 7.0m) SAND - some silt, some gravel, little clay



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. 78-103

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	B		3
	B		4
		61	
2	SPT	99	5
		20	
	SPT	32	6
3		91	
	SPT	55	7
		119	
		48	
4	SPT	41	8
		41	
5			
		35	
		40	
6	SPT	54	9
		30	
7	SPT	70	10
		62	
8			
9			

SYMBOL

PERMAFROST

N.R.C. CLASS: Nbe; N

N.F. or F.: NF; 1.2 m

LOCATION

ELEVATION

DESCRIPTION OF MATERIAL

0.05m ORGANIC COVER

0.50m ORGANIC SILT
- trace fine sand
- organic odour
- fine roots
- black

SAND AND SILT & CLAY
- little to some gravel
- slight to low plasticity
- organic pockets
- yellowish grey lenses

← sand

(TILL)

← coarser drilling
- gravel & cobbles

← clay pockets

← gravel - coarse

9.20m BOULDER OR BEDROCK
- very hard drilling

9.40m 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%

X-X
X-X

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-103
DATE	July 8/78 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/15 cm.	No.					

Notes:

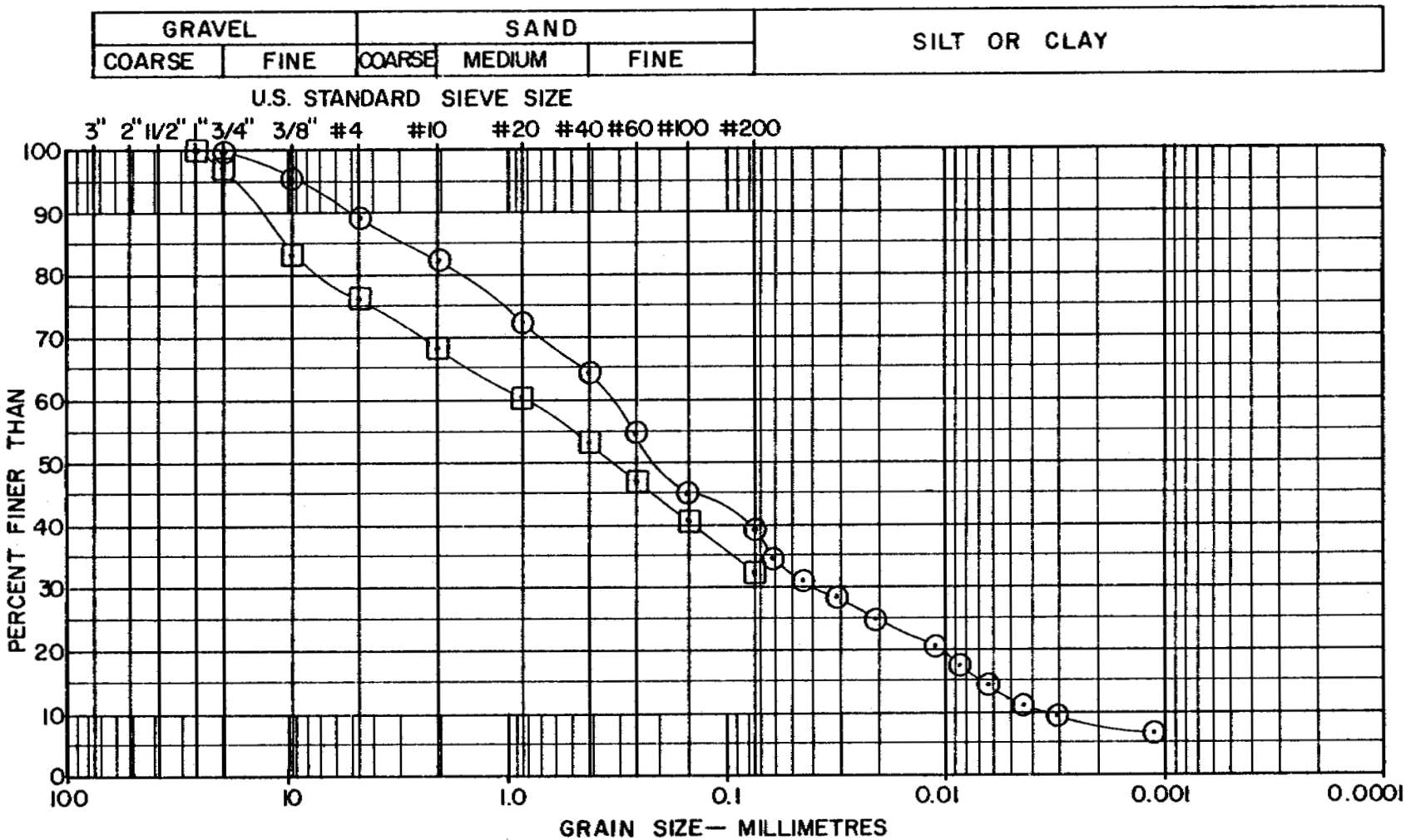
1. Test hole located in poorly drained swampy area.
2. Site was moss covered with grass and small shrubs.
3. Vegetation consists of 13-15m high poplars to the north with dead spruce to the east, west and south.
4. Test hole was augered to 1.5m. Mud used as drilling fluid, from 1.5m to 9.4m.
5. Test hole was left open overnight and filled with water to a depth of 0.15m.
6. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-103
DATE	July 8/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 8 at 3.80-4.25m SAND AND SILT & CLAY - little gravel

⊡—⊡ Sample No. 10 at 6.80-7.25m SAND - some silt, some gravel

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-103 DEPTH
DATE Oct. 3/78



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. 78-104

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
	B		2
1	B		3
	B		4
2	B		5
	B		6
3			
	SPT	56 70 for 7.5 cm	7
4			
5			

SYMBOL

PERMAFROST

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

LOCATION Pelly 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

0.25m ORGANIC COVER - moss

SILT AND CLAY
- trace of fine sand
- trace gravel
- slight to low plasticity
- organic pockets and lenses
- organic odor
- dark grey

ice lenses 1-2mm spaced @ 2-5mm

2.85m

GRAVEL
- fine to medium
- some to and sand
- trace silt

fine to medium sand layer

5.00m

109%

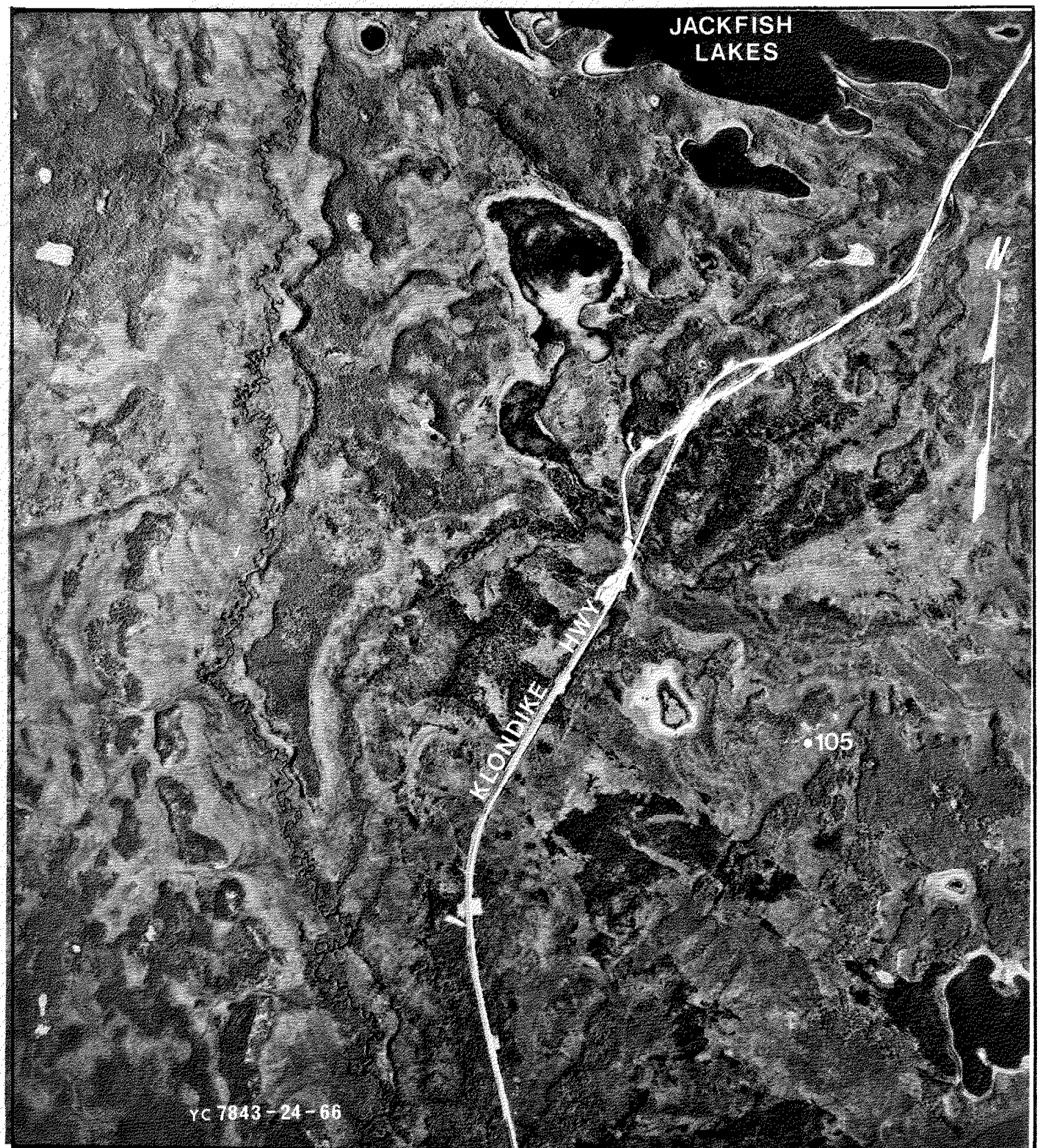
END OF HOLE

1. Test hole located in a level moss covered area with poor drainage.
2. Vegetation consists of a small stand of poplars to 10 m to west. Dead trees 8-10m.
3. Hole augered to 1.4m cored to 2.8m. Mud used as drilling fluid from 2.8m to 5.0m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-104
DATE	July 7/78 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. 78-105

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		1
	B		2
	B		3
	B		
2	SPT	32 40 66	4
3	SPT	75 for 7.5 cm	5
4	SPT	94 70 for 5cm	6
5			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
Vx Nbn	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

0.40m — PEAT
- non woody fine fibres
- dark brown

0.60m — SILT
- little fine sand
- trace clay
- trace fine gravel
- slight plasticity
- grey

0.90m — SAND
- fine to coarse
- little silt
- trace of fine gravel
- organic silt laminations
- grey

1.1m — SAND AND GRAVEL
- little silt
- trace cobbles & boulders
- pockets of fine to medium sand
- oxidized pockets
- grey

5.60m — END OF HOLE

Notes:

1. Hole located in an old burnt area on a flat ground surface.
2. Poor to fair drainage.
3. The site covered with moss and grass & vegetation consists of small fir and pine to 2.4m.
4. Test hole was augered to 1.65m and then drilled to 5.6m with mud circulation.
5. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0m.

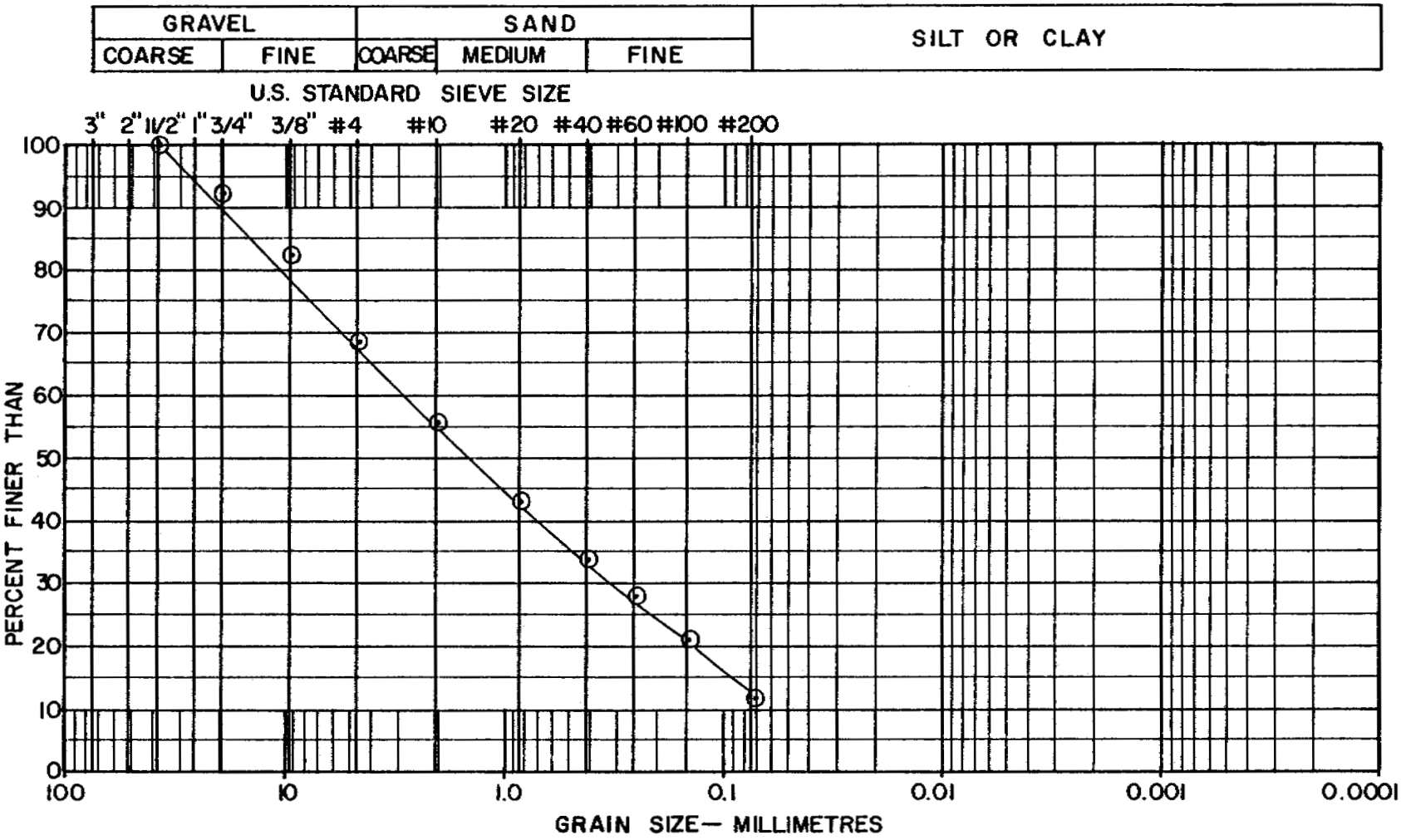
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-105
DATE July 8/78 PLATE

K.L.C. - METRIC

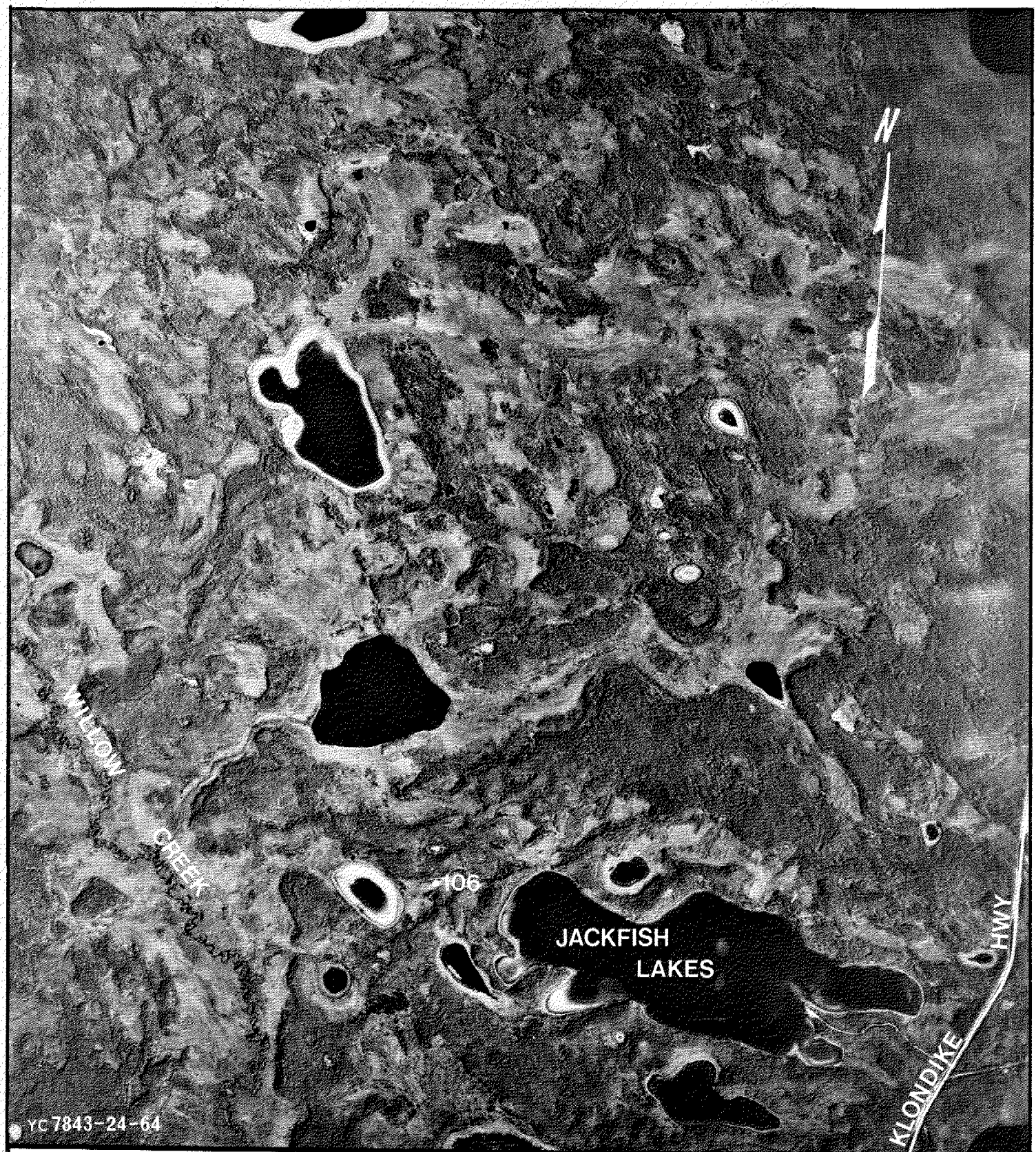
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 4 at (1.2 - 1.65m) SAND - some gravel, little silt

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-105 DEPTH
DATE Aug. 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. 78-106

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	PEAT - amorphous granular - dark brown
	B		1				0.50m
	C		2		VrVs		ORGANIC SILT - trace fine sand - trace clay - slight plasticity - rootlets - brown
1	C		3				0.85m
	C		4		Nbe		1.20m
	C		5		Vr		SILT - and fine sand - trace fine gravel - slight plasticity - laminated - brown - ice lenses 1/4-1/2mm spaced @ 1/4-2mm
2	C		6		Nbn		
	C		7				
	C		8				
3	C		9				
	C		10				
	C		11				
4	C		12				
	C		13				4.40m
5							SAND - fine - and silt - trace fine gravel - trace clay - micaceous specks - silt laminations - organic lenses - brown with grey
	C		14				
	C		15				
6							
	C		16				SILT - and fine sand - trace clay - non plasticity - micaceous specks - lenses of rusty sand and silt layer of brownish white volcanic ash
7	C		17				
	C		18				
8	C		19				
							8.40m
	C		20		Vx Vr		SAND - fine to medium - trace silt - silt and sand lenses - organic inclusion at 8.6 m - brown
9							
	C		21				9.70m

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%

(Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-106
DATE July 6-7/78 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

As above
- ice lenses 1-2mm @ 10-20mm.

END OF HOLE

Notes:

1. Test hole located approximately 100m east of lake in a former burnt area.
2. The site has thick moss cover with poor drainage. There is a slight grade to the west at 1-2%.
3. Vegetation consists of poplars and spruce to 20m located to the north and south. Dead trees and small shrubs are predominant in the immediate vicinity of the hole.
4. Test hole was augered to 0.5m and then cored to 9.7m.
5. Thermistors installed to 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

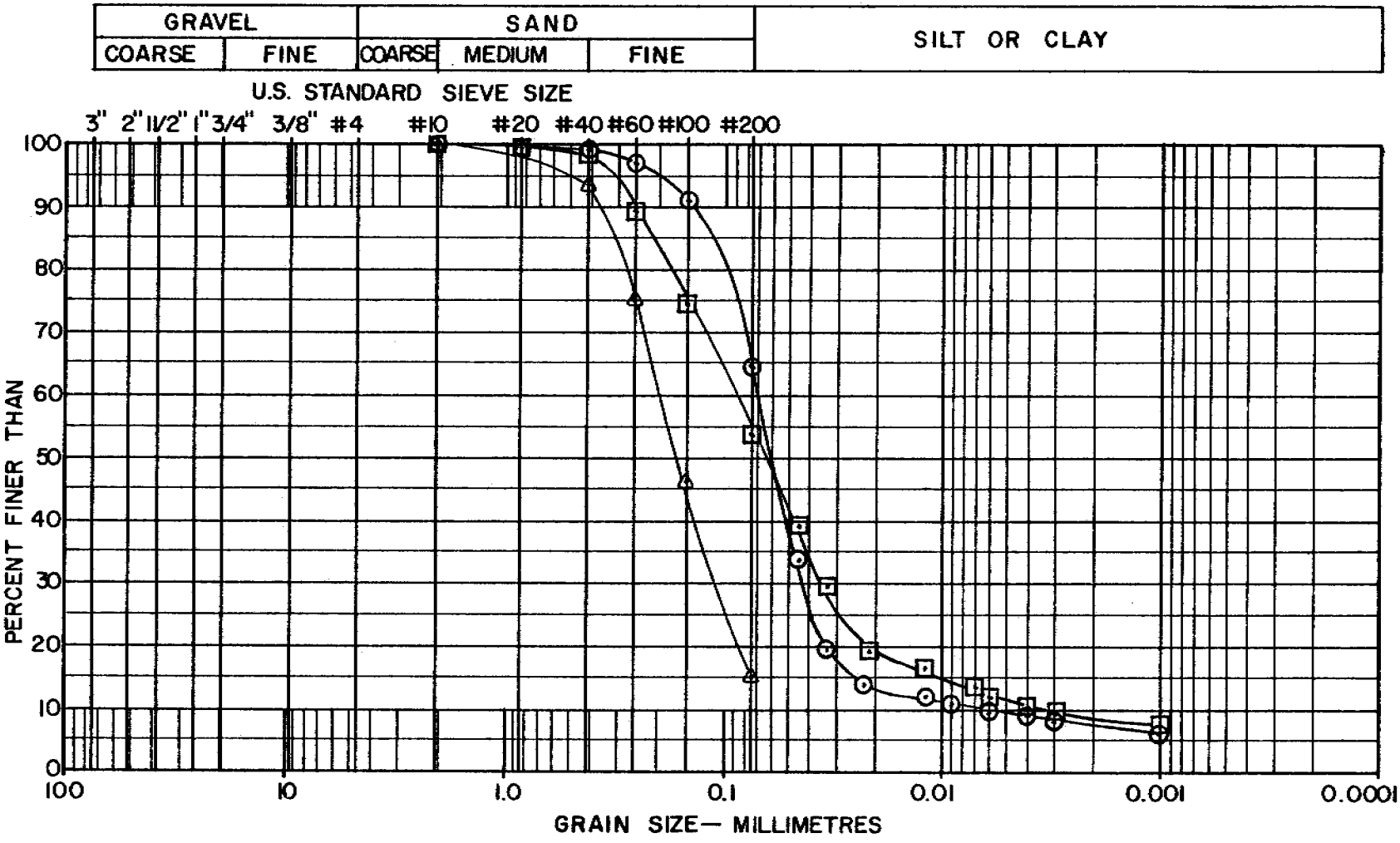
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-106
DATE July 6-7/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-106 DEPTH
DATE Aug. 14/78

GRAIN SIZE CURVE



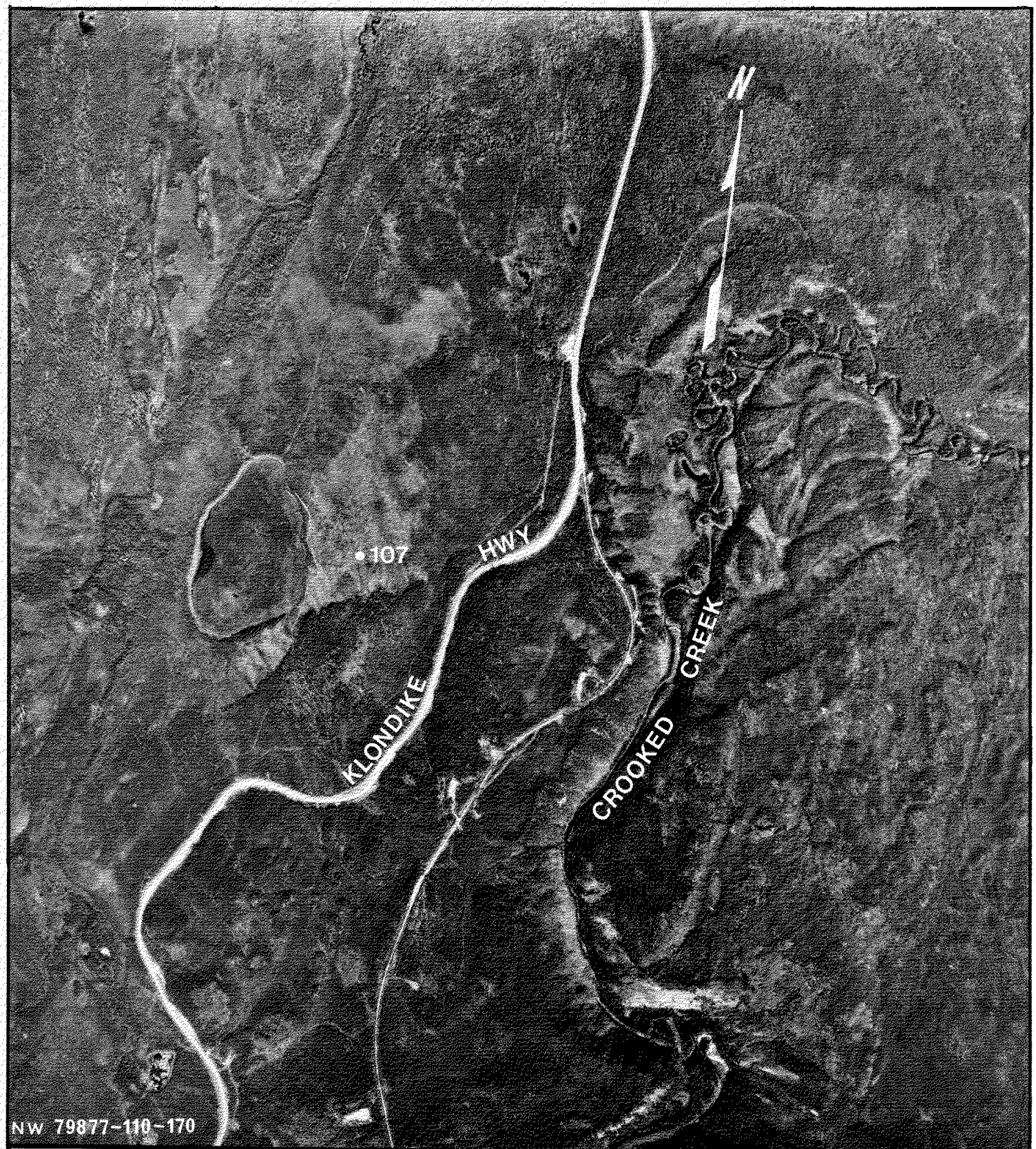
REMARKS:

△—△	Sample No. 4 at 1.2-1.5m	SAND - fine to medium, little silt
⊙—⊙	Sample No. 8 at 2.45-2.75m	SILT AND SAND - fine, trace clay
⊡—⊡	Sample No. 17 at 6.7-7.0m	SILT AND SAND - fine, trace clay

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE NO. 78 - 106

Sample No.	Sample Depth (M)	Frozen Bulk Denisty Kg/M^3	Frozen Bulk Density PCF
2	0.5 - 0.85	1528.5	95.3
4	1.2 - 1.5	1855.1	115.7
6	1.85 - 2.10	1906.5	118.9
8	2.45 - 2.75	1854.6	115.7
10	3.05 - 3.35	1885.7	117.6
12	3.65 - 3.95	1779.5	111.0
18	7.20 - 7.50	1382.4	86.3



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-107

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	SPT	38 81	3
3	SPT	50 88	4
4	SPT	70 120	5
5			
6	SPT	103	6

SYMBOL

PERMAFROST

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.25m MOSS AND PEAT TUSSOCKS

PEAT
- trace fine sand
- fibrous
- organic silt pockets
- sand pockets
- dark brown
- ice lenses 2-5mm spaced @ 2-5mm

0.90m

2.20m GRAVEL
- and sand
- coarse to fine
- little silt
- grey
- ice inclusions 5-10mm

3.00m CLAY AND SILT
- trace fine sand
- trace fine gravel
- medium plasticity
- grey
- ice lenses 1mm spaced @ 2-5mm

4.70m SAND
- little silt
- grey

GRAVEL AND SAND
- cobbles & boulders
- coarse

6.70m END OF HOLE

Notes:

1. Test hole located on a flat poorly drained site, east of lake.
2. Hole surrounded by peat tussocks with sparse black spruce to 6-8m.
3. Test hole augered to 0.25m, cored to 0.9m. Drilling mud used to 6.7m.
4. Sample no. 6 not recovered.

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

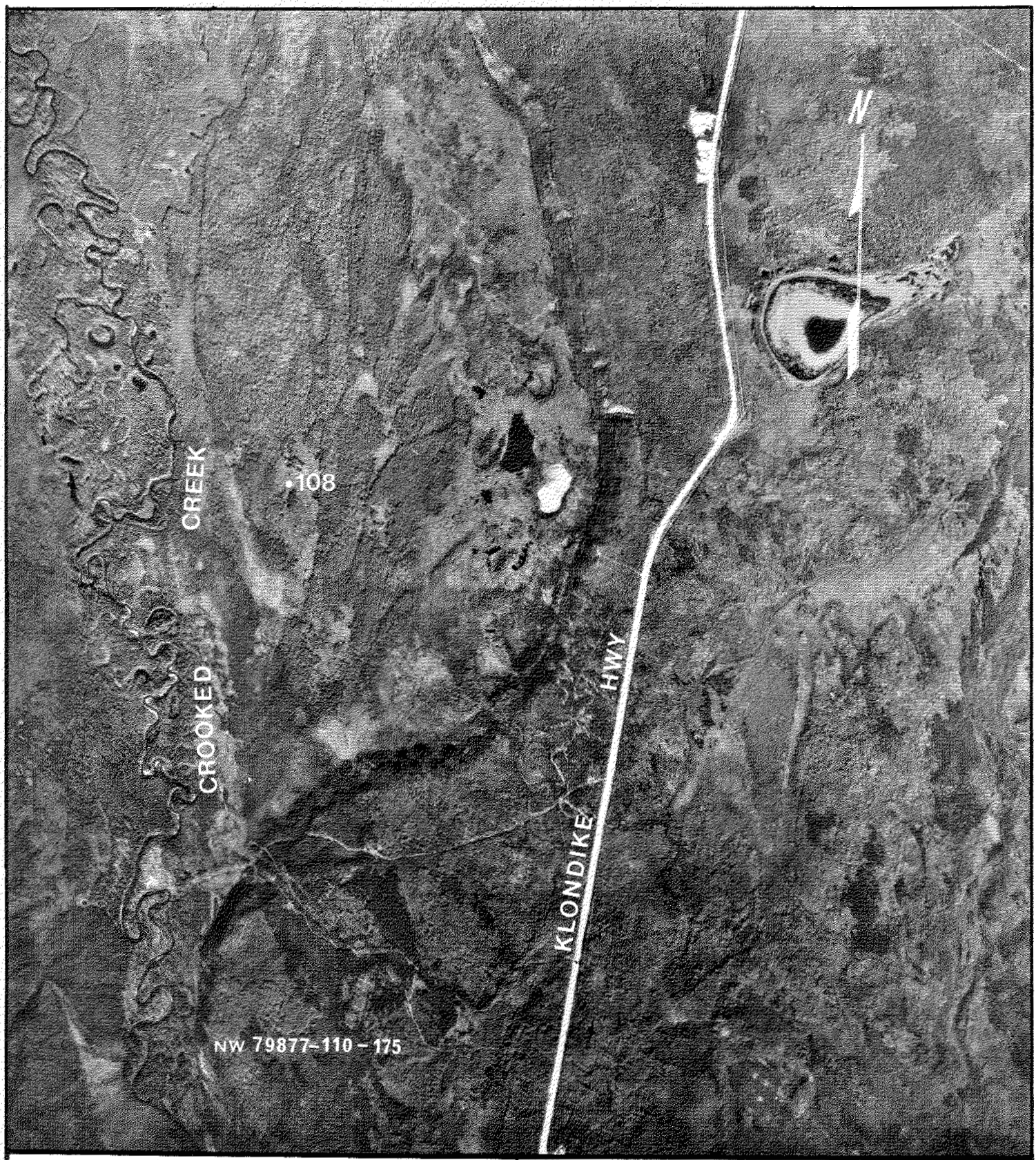
PLASTIC LIMIT | WATER CONTENT | LIQUID LIMIT
X — — — — 0 — — — — X
10 30 50 70 90%

426%
519%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-107
DATE	July 9/78 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. 78-108

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	B		3
	SPT	40 60 for 10cm	4
2			
	SPT	49 for 7.5cm	5
3			
4			
5			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Nbe	2.5m
Vx	

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

0.20m
PEAT
- non woody fine fibres
- rootlets
- black

0.80m
SILT
- little fine to coarse sand
- trace fine gravel
- slight plasticity
- peat inclusions
- grey

2.5m
SAND AND GRAVEL
- trace silt, grey
- determined by drill action below 2.6m.

silt - lenses

5.00m
END OF HOLE

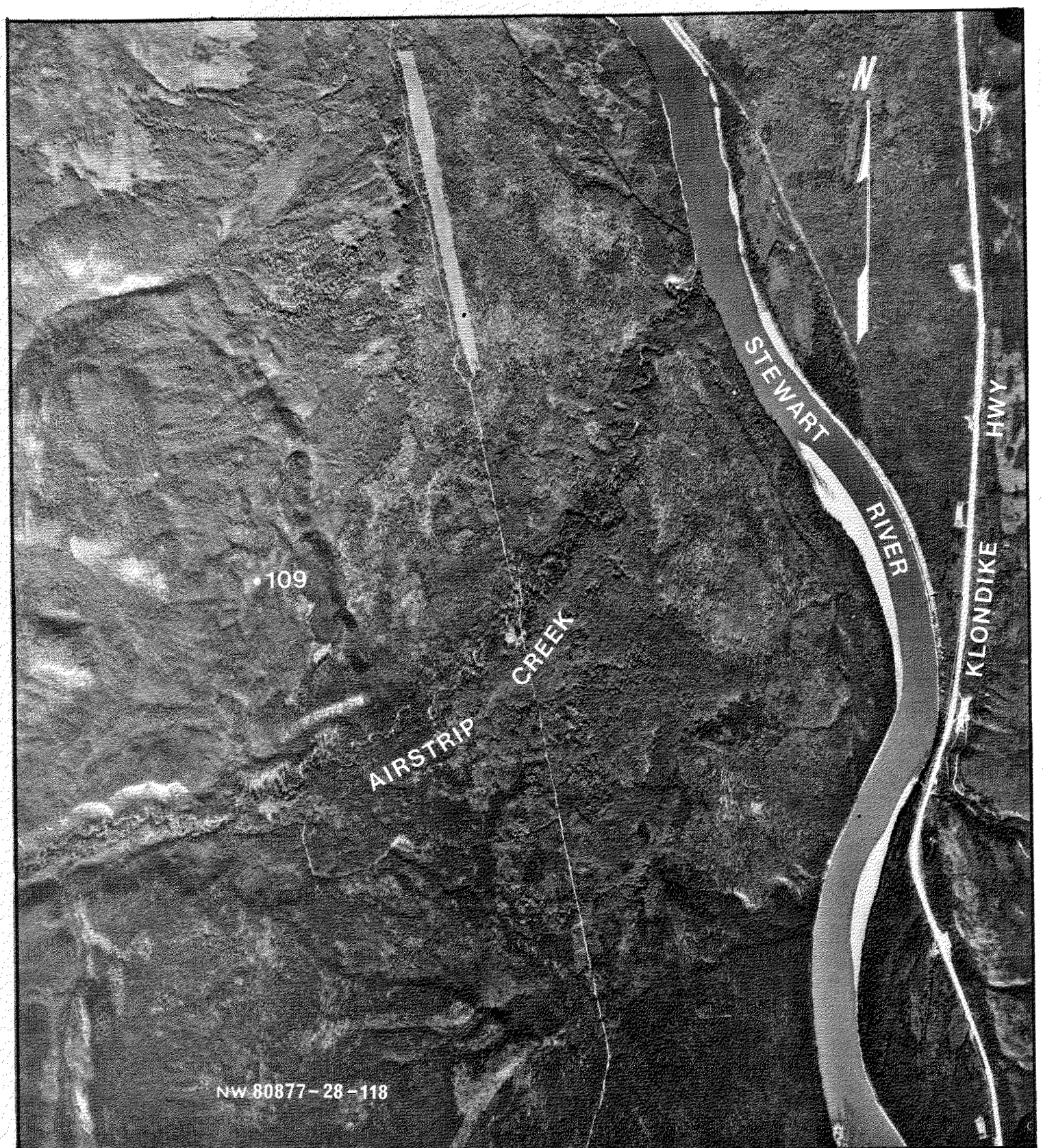
Notes:

1. Test hole located on a flat grass and moss covered site with fair to poor drainage.
2. Surrounding vegetation consists of 16-18m high poplars with low shrubs less than 1m in immediate vicinity of hole.
3. Test hole was augered to 0.7 m and then drilling mud used from 0.7m to 5.0m.
4. Soil logged from drilling observations below 2.6m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-108
DATE	July 9/78 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. 78-109

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.
	B		
	B		1
	B		2
1	B		3
	C		4
	C		5
2	C		6
	C		7
	C		8
3	C		9
	C		10
	C		11
4	C		12
	C		13
	C		14
5	C		15
	C		16
	C		17
6	C		18
	C		19
	C		20
7	C		21
8			
9			
10	SPT	42/65	22

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF
Vr	0.8m
Vs	
Vs	
Nbn	
Nbe	
Nbn	
Vs	
Vr	
Nbe	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.20m ORGANIC COVER

SILT
- some fine to coarse sand
- little fine gravel
- non to slight plasticity
- roots
- grey
- ice lenses ¼-2mm@ 1-3 mm

1.60m.

SILT
- trace fine sand
- non to slight plasticity
- organic laminations
- organic layer @2.1m
- brown with grey pockets

some sand

drilling mud return is black in color
- extensive organic material

(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%

NP
134%
NP
NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL 1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-109
DATE	July 10/78 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			
14			
15	SPT	40 43 69	23
16			

SYMBOL

PERMAFROST

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

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

- Continued easy drilling below 10.0 m.

CLAY AND SILT
- trace fine gravel
- medium to high plasticity
- grey
- ice lenses 10-15 mm.@ 10-15 mm.

15.60

BOULDER OR BEDROCK
- hard drilling
- sandstone chips in mud return

16.10 m.

END OF HOLE

NOTES:
1. Test hole located at the north-east base of a hill on a terrace sloping at 3% to the northeast.
2. The site has a thick moss cover with fair drainage
3. Vegetation consists of black spruce to 6-8 m.
4. Test hole augered to 1.0m, then cored to 7.0m and then mud used as drilling fluid to 16.1 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

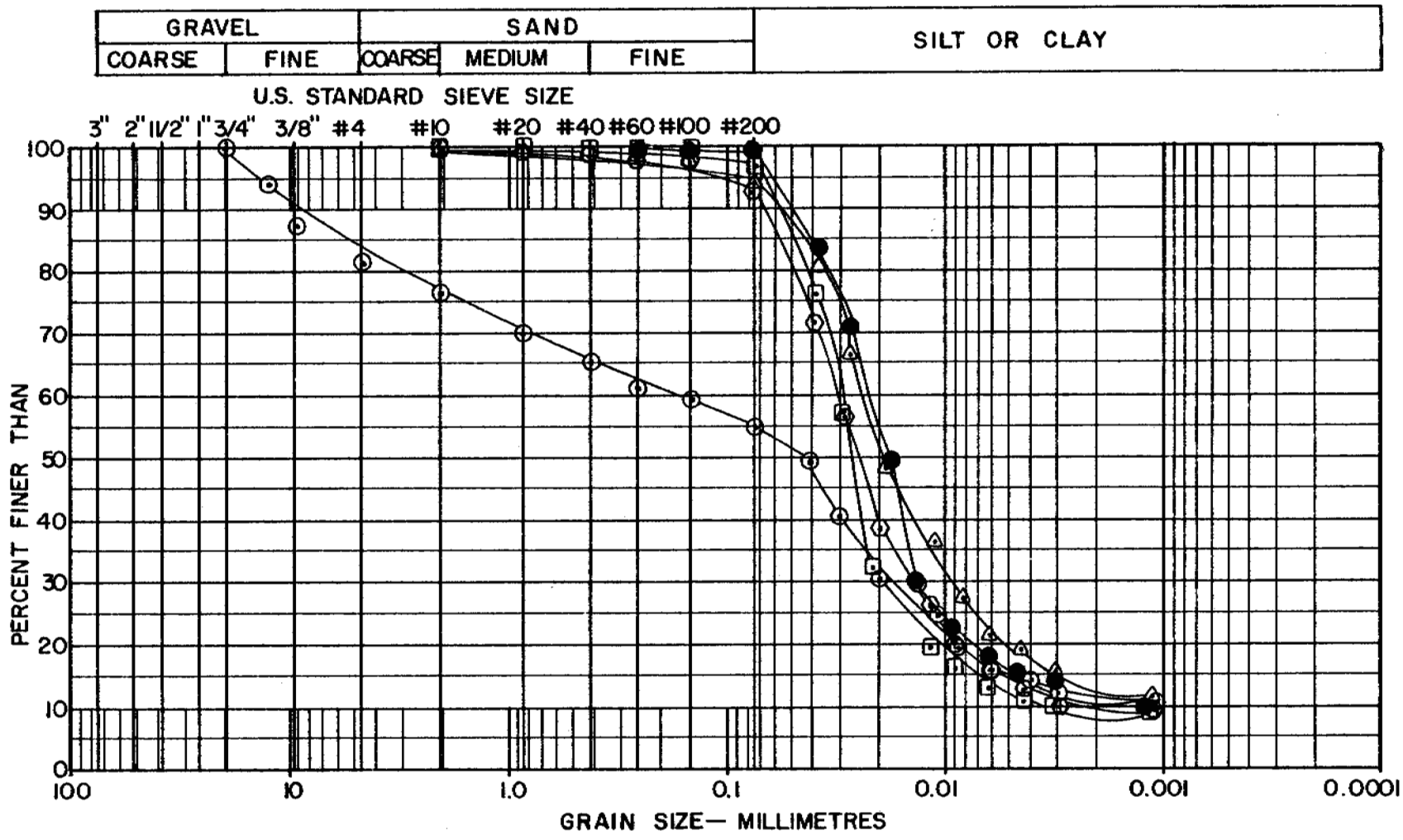
JOB No.	AL 1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-109
DATE	July 10/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-109 DEPTH
DATE Aug. 15/78

GRAIN SIZE CURVE

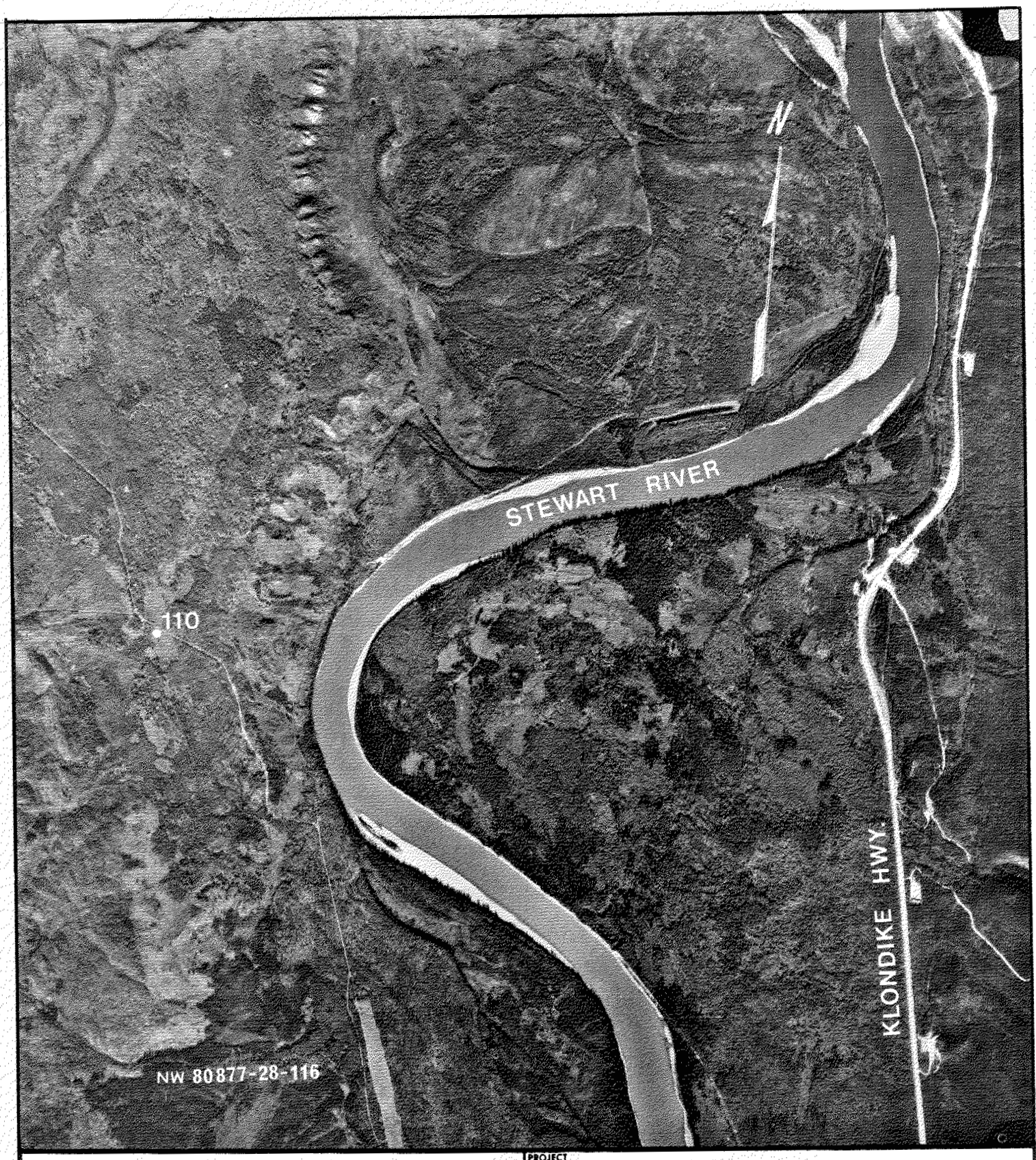


REMARKS:	Sample No. 5 at (1.3 - 1.6m)	SILT - some sand, little gravel, little clay
	Sample No. 8 at (2.35- 2.65m)	SILT - trace fine sand, trace clay
	Sample No. 15 at (4.75 -5.0m)	SILT - trace fine sand, little clay
	Sample No. 18 at (5.5 - 5.85M)	SILT - trace fine sand, trace clay
	Sample No. 19 at (5.85 - 6.25)	SILT - trace sand, little clay

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 109

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
5	1.3 - 1.6	1282	80.0
6	1.8 - 2.05	1526	95.2
8	2.35 - 2.65	1862	116.2
9	2.65 - 2.95	1973	123.1
10	2.95 - 3.30	1904	118.8
11	3.30 - 3.60	1803	112.6
12	3.60 - 3.90	1820	113.6
13	3.90 - 4.20	1729	107.9
14	4.20 - 4.50	1753	109.4
15	4.75 - 5.00	1792	111.8
16	5.00 - 5.30	1901	118.6
18	5.50 - 5.85	1943	121.2
19	5.85 - 6.25	1933	120.6
20	6.25 - 6.60	1957	122.1



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. 78-110

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	B		3
	B		4
2	B		5
	B		6
3			
		36	
4	SPT	79	7
5		28	
	SPT	29 44	8

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

0.15m ORGANIC COVER

SILT
- trace of fine sand
- organic specks
- non to slightly plastic
- brown

NF

2.30m

SILT
- and coarse to fine gravel
- trace coarse to fine sand
- light grey to brown

3.0m

SAND AND GRAVEL
- trace silt
- fairly well graded
- very dense
- grey

5.45m

END OF HOLE

NOTES:
1. Test hole located in a former burnt area with a slight grade of 1-2% to the north.
2. Vegetation consists of shrubs to 2m in the immediate vicinity of the hole with poplars to to 20m in the surrounding area
3. Test hole was augered to 2.5m and then drilling mud used used from 2.5m to 5.45m.
4. Piezometer standpipe installed to the bottom of the hole.

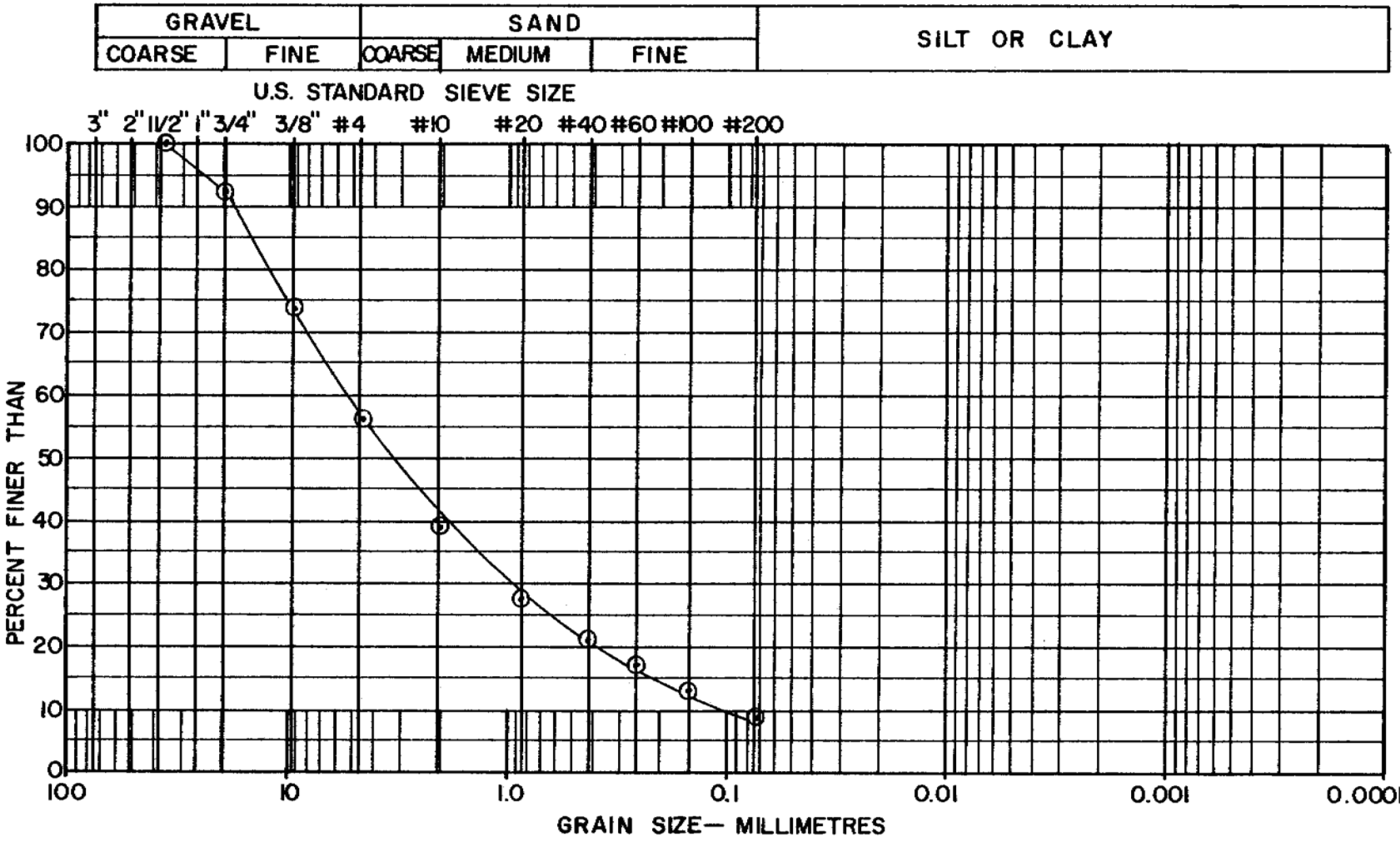
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-110
DATE July 10/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 7 at (3.6 - 3.9m) SAND - and gravel, trace silt

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-110 DEPTH
DATE Aug 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. 78-111

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		1
	B		2
	B		3
2	B		4
	SY		5
3	SPT	31 46	6
4	SPT	44 60	7
5			
6	SPT	82 45 for 7.5cm	8
7	SPT	78 95 5.0cm	9
8			
9	SPT	18 112 for 12.5cm	10
10			

SYMBOL

PERMAFROST

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

0.05m ORGANIC COVER-moss

0.50m SILT
- trace fine sand
- slight plasticity
- roots
- brown

2.0m SILT
- some fine to coarse sand
- some fine to coarse gravel
- trace clay
- slight plasticity
- TILL-LIKE below 2.5m

3.0m ← sand and gravel

9.40m PROBABLE BEDROCK
- hard, smooth drill action (Cont'd.)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-111
DATE	July 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
						NF	As above
							10.80m.
11							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 in a former burnt area with a swamp to the north and a lake to the southeast.
2. The site is moss-covered and slopes northeasterly at 2-4%.
3. The vegetation consists of moderate spruce, poplars and shrubs.
4. Test hole was augered to 2.8m and then drilled to 10.8m with mud circulation.
5. Seasonal frost encountered from 2.0m to 3.0m.
6. Sample no. 10 not recovered.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-111
DATE July 11/78 PLATE 148

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. 78-112

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
	C		2
1	C		3
	C		4
	C		5
2	C		6
	C		7
	C		8
3	C		9
	C		10
	C		11
4	C		12
	C		13
5			
	SPT	78 80	14
6			
		36	
7	SPT	51 53	15
8			
		38	
9	SPT	41 52	16
10			

SYMBOL

PERMAFROST

N.R.C. CLASS: NF; Vr; Vx; Nbn

N.F. or F.: NF; 0.5m

LOCATION

ELEVATION

DESCRIPTION OF MATERIAL

PEAT
- non woody fine fibrous
- roots
- dark brown
- ice lenses 2-5mm spaced @ 5mm

organic silt pockets

2.60m

3.15m

SILT
- little sand - trace clay
- sand and silt lenses
- non to slight plasticity
- organic odour
- grey

SAND - fine to medium
- and silt
- trace fine gravel
- grey

organic pockets

6.55m

SILT
- trace fine sand
- trace gravel
- laminated
- dark grey

- organic laminations

10.0m

(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%

376%
461%
376%
133%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-112
DATE	July 11/78 PLATE

K.L.C. - METRIC

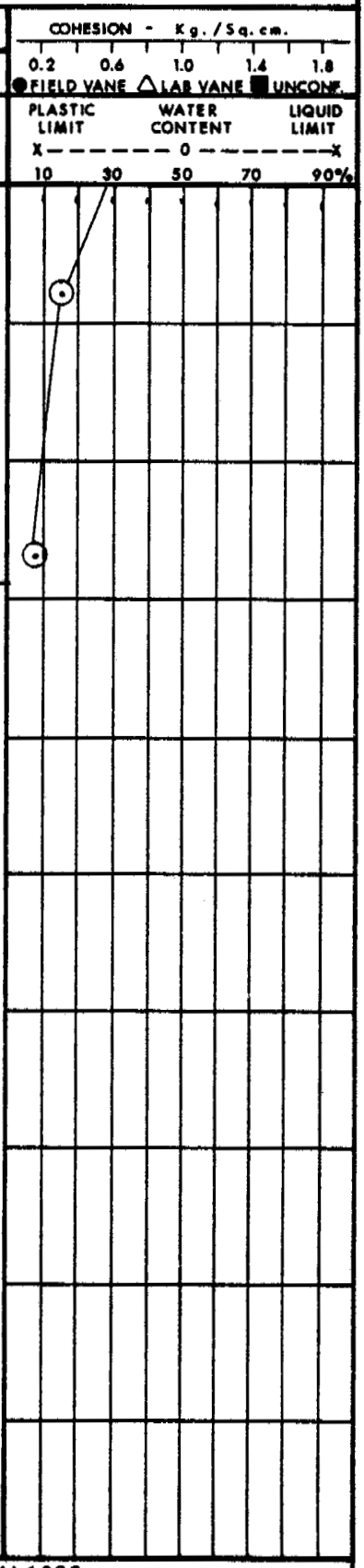
TEST HOLE LOG

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
11	SPT	31 75 95	17				GRAVEL & SAND - little silt - pockets of silt and sand - organic odor - grey to 11.2 m, rusty brown below
12							
13	SPT	21 104 for 13.6 cm	18				12.90m.
							END OF HOLE

LOCATION
ELEVATION

NOTES:
1. Test hole located in a former burnt area on a flat ground surface with poor drainage.
2. The site is covered by a thick peat and moss cover and niggerheads.
3. The vegetation consists of short shrubs and spruce 1-2m tall.
4. Test hole was augered to 0.5 m., then cored to 4.2m., and then drilled to 12.9m with mud circulation.
5. Thermistors installed at depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, and 6.0m.

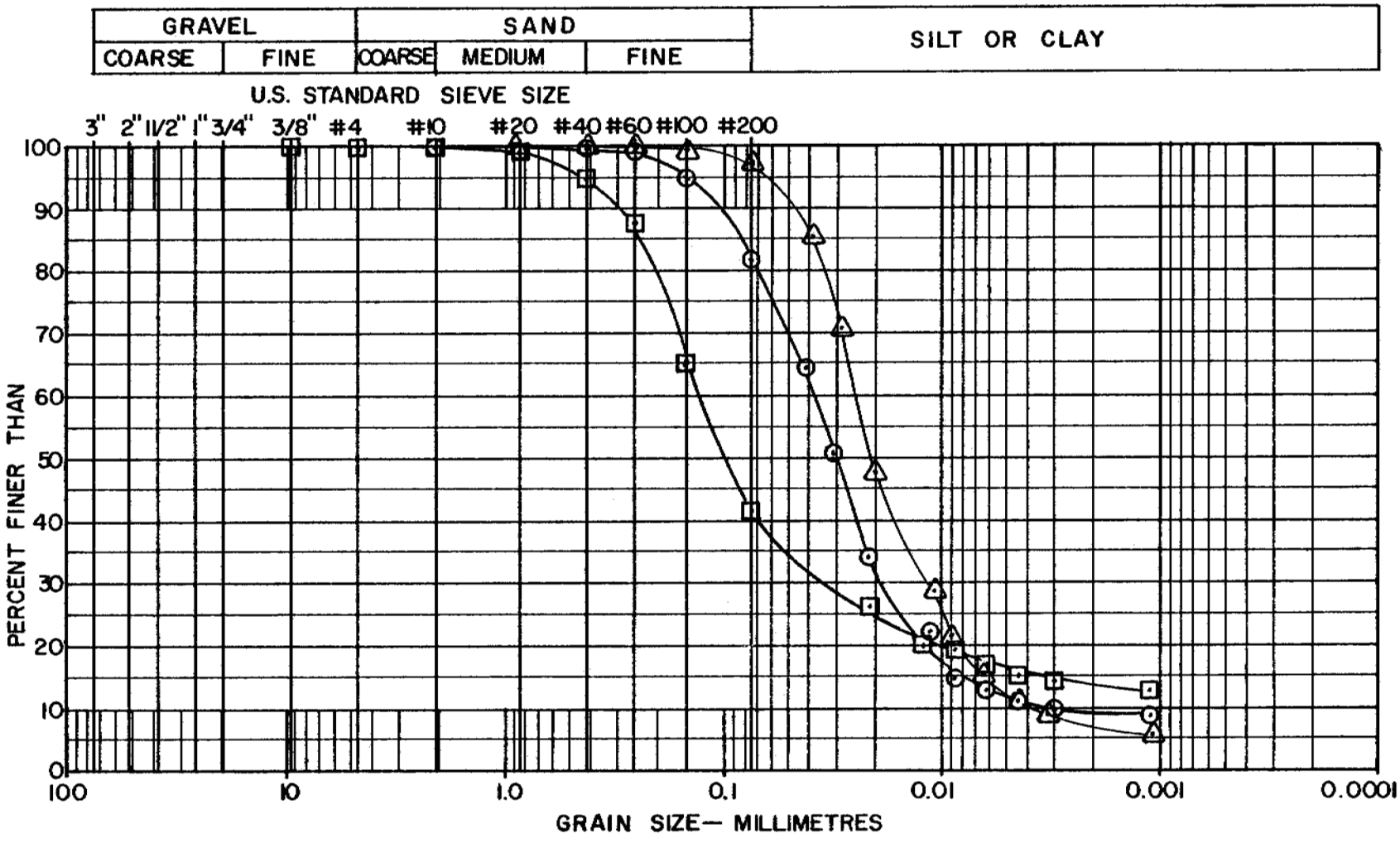


Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-112
DATE	July 11/78 PLATE

K.L.C. - METRIC

GRAIN SIZE CURVE



REMARKS:

- Sample No. 9 at 2.6-2.95m SILT - little fine sand, trace clay
- Sample No. 12 at 3.5-3.9m SAND - fine to medium, and silt, trace gravel
- Sample No. 16 at 8.60-9.08m SILT - trace fine sand

(Note: sample taken in silt layer)

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No.TH 78-112 DEPTH
DATE Aug. 15/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 112

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.50 - 0.70	857.4	53.5
8	2.25 - 2.60	1103.6	68.8
12	3.50 - 3.90	1855.2	115.7



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-113

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		
	C		1
1	C		2
	C		3
	C		4
	C		5
2	C		6
	C		7
	C		8
	C		9
3	C		10
4			
	C		11
	C		12
	C		13
5			
	SPT	33 108	14
6			
		6	
7	SPT	9 55	15
8			
		41	
9	SPT	100 for 5 cm	16
		9 31	
	SPT	78	17

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.3m
Vr	
Vs Vr	
Nbe Nbn	

LOCATION Stewart River
ELEVATION

DESCRIPTION OF MATERIAL

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

1.10m

ORGANIC SILT
- trace fine sand,-trace clay
- slight plasticity
- organic inclusions
- light grey

1.35m

SAND AND SILT
- trace gravel
- peat and organic silt layer
- grey

1.65m

SAND
- trace gravel, some gravel below 4.1m
- little silt & clay
- stratified
- grey
- TILL-LIKE below 4.0m

8.4 m

GRAVEL AND SAND
- little silt
- hard drilling

9.85 m.

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%

731%
55%
163%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78- 113
DATE	July 12/78 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 a flat swampy area with very poor drainage.
2. The site has a thick moss cover with very dense black spruce- 15 - 18 m high
3. Test hole augered to 0.45 m, then cored to 4.4m and then drilled to 9.85m with mud circulation.
4. Sample nos. 15, 16 and 17 not recovered.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

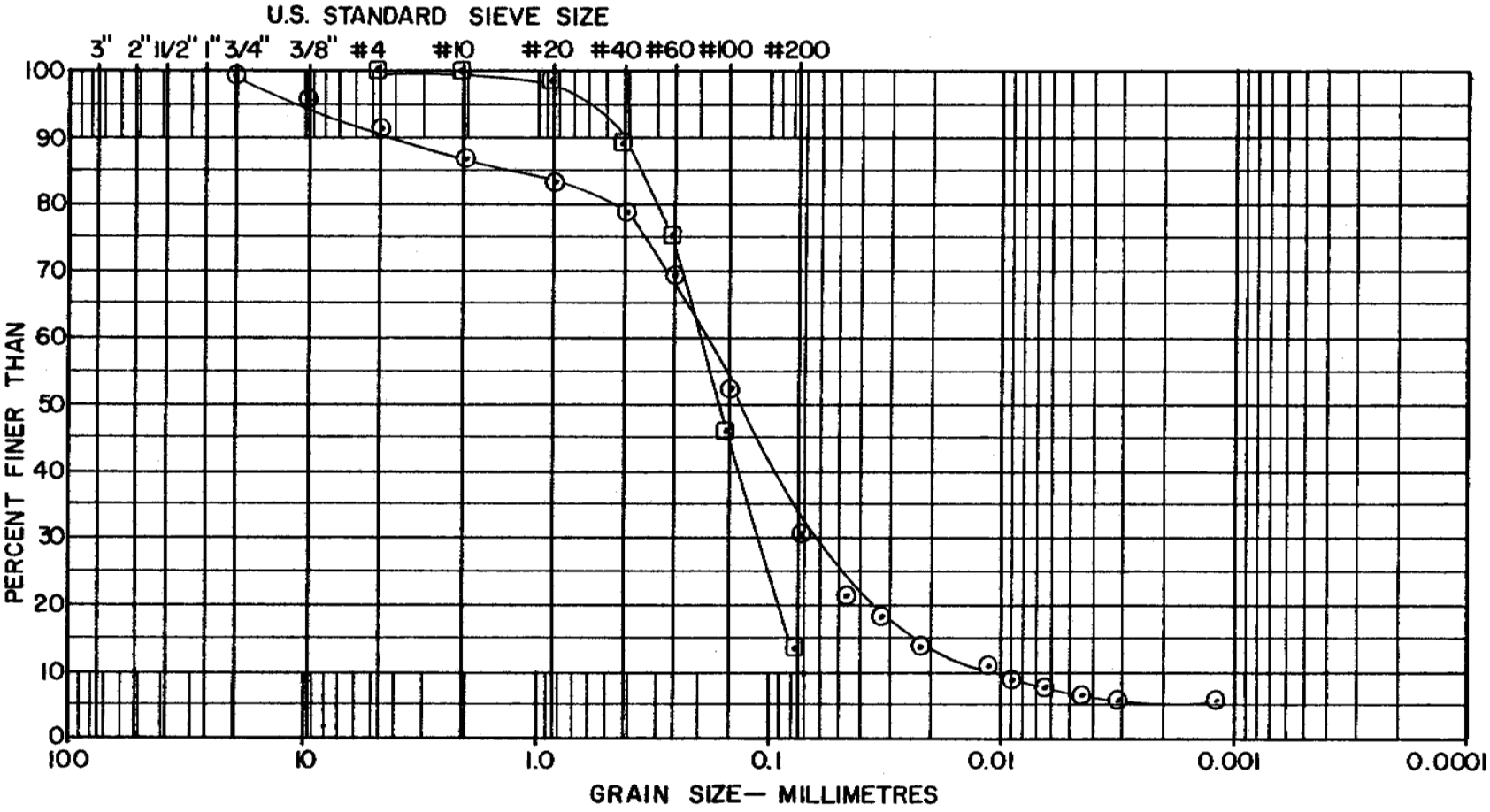
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-113
DATE July 12/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-113 DEPTH
DATE Sept. 11/78

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



GRAIN SIZE CURVE

REMARKS:
⊙—⊙ Sample No. 5 at 1.55-1.65m — SAND - some silt, trace gravel, trace clay
⊡—⊡ Sample No. 9 at 2.70-2.85m — SAND - fine to medium, little silt, trace gravel



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-114

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.

LOCATION Stewart River
ELEVATION

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

SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT
DEPTH	TYPE	BLOW/15cm.	No.		N.R.C. CLASS	N.F. or F.		X — 0 — X; 10 30 50 70 90%
	B						0.25m ORGANIC COVER	
	B		1					
1	B		2				GRAVEL AND SAND - coarse to fine - trace to little silt - very dense - peat inclusions - hard drilling below 2.0m - brownish grey	
	B		3					
2	SPT	100 for 15cm	4			NF		
3								
4	SPT	7 11 25	5					
5							5.70m	
							END OF HOLE	

NOTES:
1. Test hole located in a fairly level area.
2. The site is moss covered with shrubs to 3 m and dense white spruce to 18 m.
3. Test hole augered to 1.5 m and then drilled to 5.7 m with mud circulation
4. Sample No. 4 and 5 not recovered
5. Standpipe piezometer installed to 4m depth.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-114
DATE	July 12/78 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. 78-115

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
	C		1		Vx	
1	C		2		Vr	
	C		3			
	C		4		Vs	
2	C		5		Nbe	
	C		6			
	C		7		Vr Vs	
3	C		8			
	C		9		Ice+	
	C		10			
	C		11			
4	C		12		Vr Vs	
	C		13			
			14			
	C		15		Vr	
5	C		16		Vs Nbe	
	C		17			
	C		18			
6						
7						
8						
		8				
		91				
9	SPT	80	19		Nbe	
		for				
		7.5cm				

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.3m

PEAT
- non woody fine fibres
- dark brown

← Ice lenses spaced @ 5mm-10mm

2.15 m

SILT AND SAND
- fine to coarse
- trace fine gravel
- layers and lenses
- organic inclusions
- grey

← silt layer

← cobbles

← silt layer

5.25 m

GRAVEL
- fine to coarse
- and fine to coarse sand
- little silt
- coarser drilling from 6.0m to 7.8m.
- grey

7.80m

SILT AND SAND
- 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%

515%
471%
504%
374%
343%
195%
106%
139%
110%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-115
DATE	July 13/78 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. Test hole located on a flat poorly drained area with some swampy sections.
2. The site has thick moss with peat tussocks. The surrounding vegetation is moderate to sparse, black spruce to 10-13 m.
3. Test hole was augered to 0.35 m, then cored to 5.5 m, and then drilled to 9.8m with mud circulation.
4. Hole caved in at 9.8m
5. Soil logged by drilling observations below 5.25.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

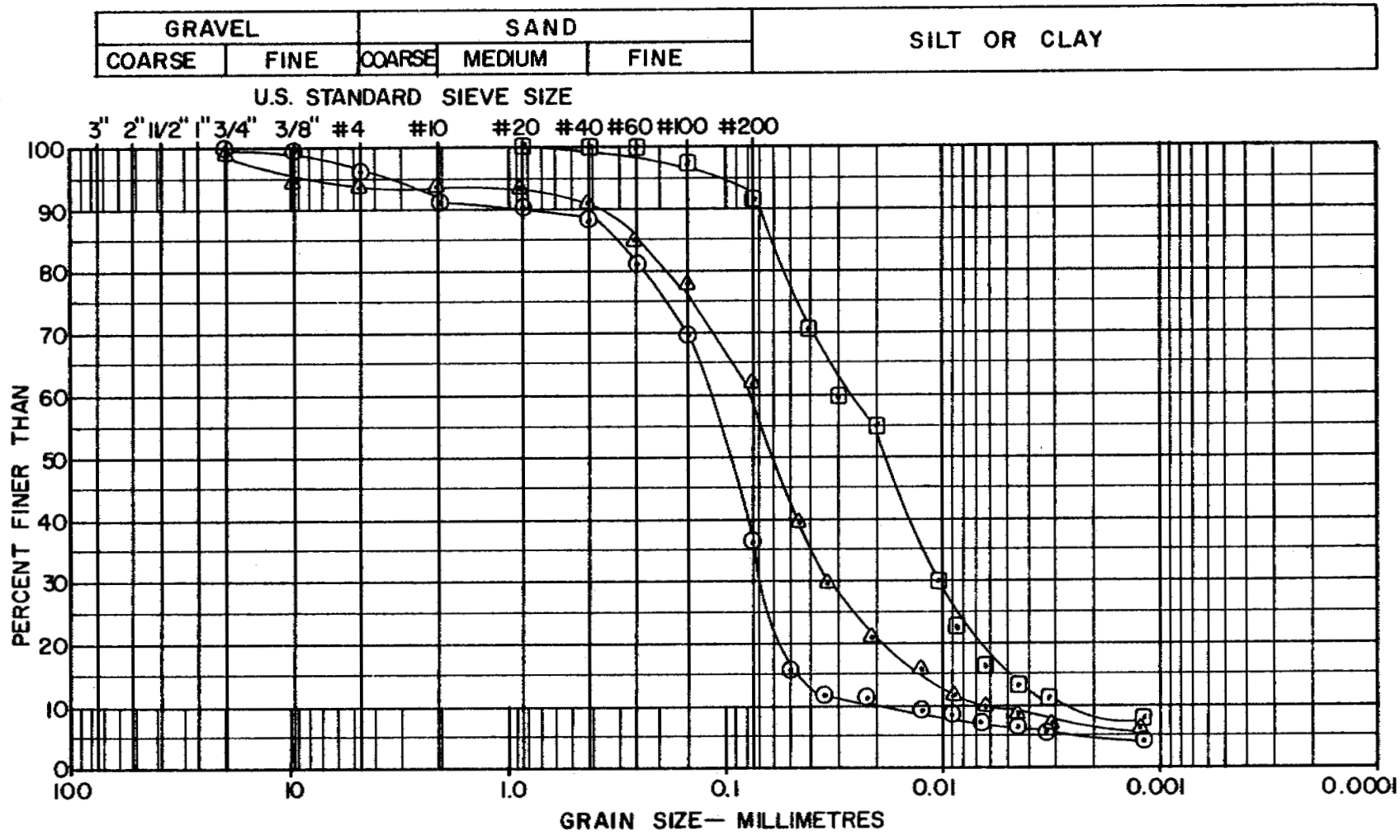
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-115
DATE July 13/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-115 DEPTH
DATE Aug. 17/78

GRAIN SIZE CURVE



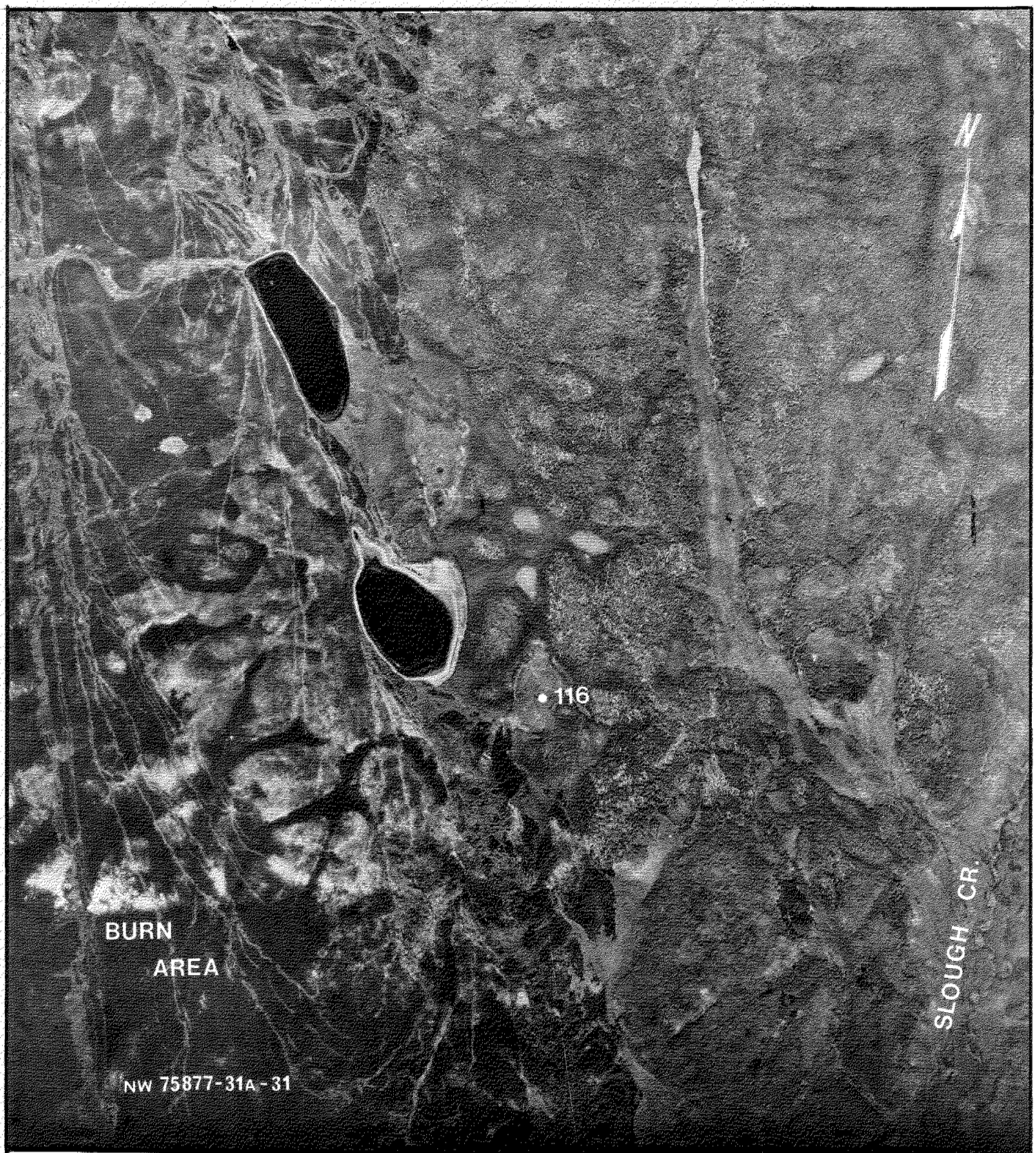
REMARKS:

⊙—⊙	Sample No. 7 at (2.15 - 2.55m)	SAND - and silt, trace gravel
⊡—⊡	Sample No. 9 at (2.85 - 3.15m)	SILT - trace fine sand, trace clay (Note: Sa # 9 taken from silt layer)
△—△	Sample No 14 at (4.2 - 4.35m)	SILT AND SAND - fine, trace fine gravel

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 115

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.65 - 0.90	947	59.1
4	1.30 - 1.60	994	62.1
6	1.85 - 2.15	1047	65.3
8	2.55 - 2.85	1636	102.1
10	3.15 - 3.35	1338	83.5
12	3.55 - 3.90	1551	96.8
15	4.35 - 4.65	1411	88.0



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. 78-116

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		
	C		1
	C		2
1	C		3
	C		4
	C		5
2	C		6
	C		7
	C		8
	C		9
3	C		10
	C		11
	C		12
4	C		13
5			
	SPT	65 65 for 2.5cm	14
6			
7	SPT	17 171	15
8	SPT	11 26 158	16
9			
10			

SYMBOL

PERMAFROST

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

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

0.3m

PEAT
- amorphous and granular
- fine root fibres
- dark brown
- ice lenses 1/2mm-1mm spaced @ 2mm-20mm

1.90m.

ORGANIC SILT
- and fine sand
- wood specks
- grey
- ice lenses 1/4mm-12mm spaced @ 1/4mm-12mm

2.35m

SILT AND SAND
- fine to coarse
- trace to little fine gravel
- silt and sand laminations and layers 3.4 to 3.8m
- grey
- ice lenses 1/4mm-5mm spaced @ 1/4mm-10mm
- ice lenses 2mm- 10mm spaced @ 15mm-50mm

4.05m

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

9.80m

END OF HOLE (Cont'd.)

578%
482%
426%
533%
532%
451%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-116
DATE Aug. 13/78 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 a flat poorly drained area southeast of a lake.
2. The site has a thick moss cover with moderate density spruce 2-6m.
3. Test hole was augered to 0.3 m then cored to 4.05m and then drilled to 9.8m with mud circulation.
4. Thermistors installed at depths of 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, and 6.0m.
5. Sample No. 14 not recovered.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

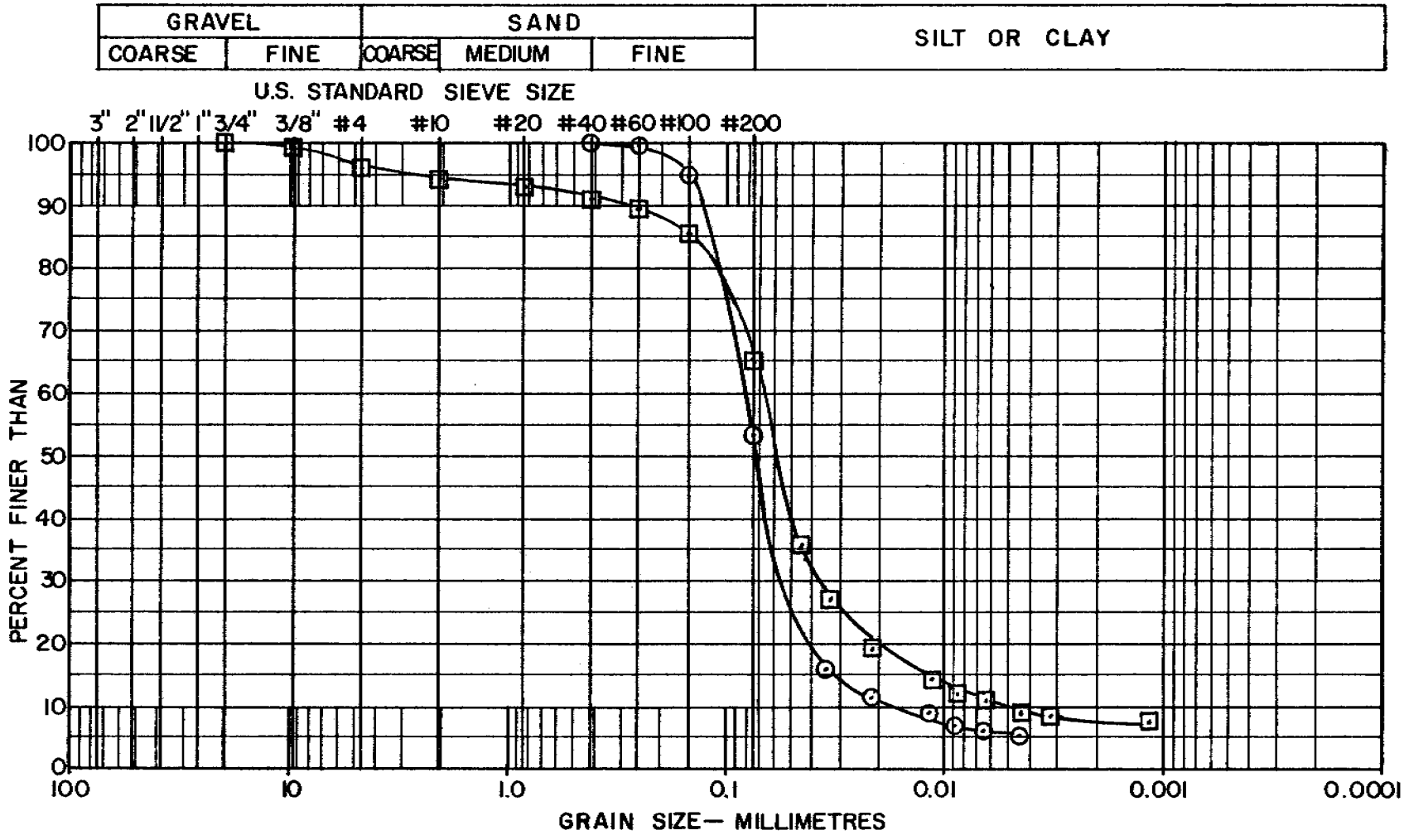
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-116
DATE July 13/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-116 DEPTH
DATE Aug. 17/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 7 at 1.9-2.05m SILT AND SAND - fine

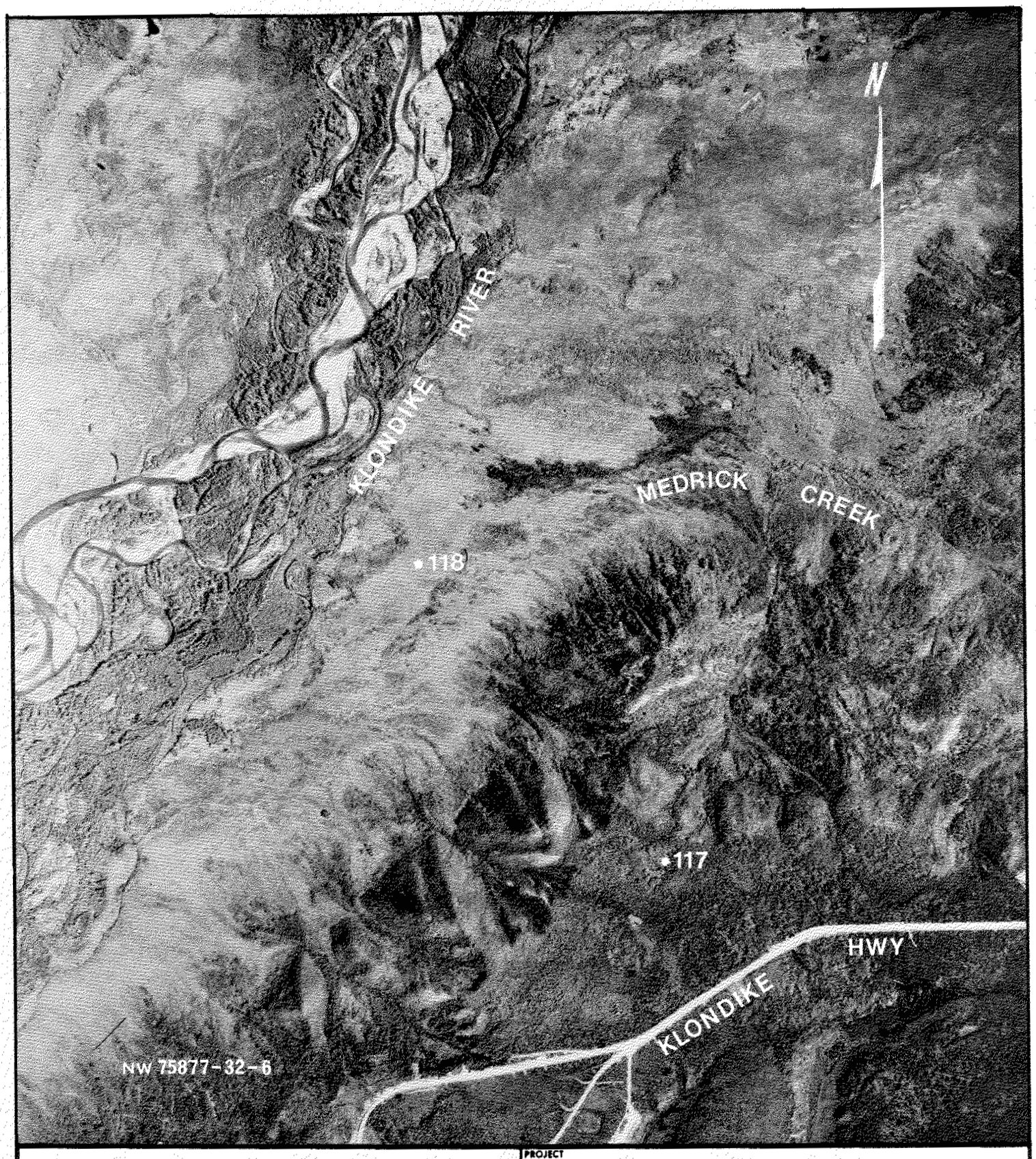
⊡—⊡ Sample No. 12 at 3.4-3.8m SILT - some sand, trace gravel, trace clay

(Note : Sample #12 has silt laminations and is not representative of complete stratum).

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 116

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.65 - 0.90	961	60.0
4	1.10 - 1.45	919	57.4
7	1.90 - 2.05	1605	100.2
11	3.00 - 3.30	1668	104.1



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-117

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
	B		2
1	B		3
	SY		4
2	B		5
3			
	B		6
4		16 42	
	SPT	75 for 10cm	7
5			
		25	
6	SPT	27 53	8
7			
8			
9			
10			

SYMBOL

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

LOCATION Klondike R. valley upland
ELEVATION

DESCRIPTION OF MATERIAL

0.03m ORGANIC COVER

SILT AND CLAY
- trace to little sand
- fine to coarse
- trace gravel
- low plasticity
- brown

NF

little gravel
3.10m

GRAVEL
- little sand
- coarse to fine
- trace to little silt
- light brown

6.0 m.

GRAVEL
- chip samples in drilling mud return indicate fine to med. gravel

9.80m
END OF HOLE (Cont'd.)

COHESION - Kg./5q. 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%

>2.2

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-117
DATE July 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 | 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 a flat moss covered area on the southern upland slopes of the the Klondike River Valley.
2. The dense vegetation consists of poplars to 16-18m, shrubs, and the occasional spruce and birch.
3. Test hole augered to 1.8 m and then drilled to 9.8 m with mud circulation.
4. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 6.0 m.
5. Hole caved in at 6.0m.

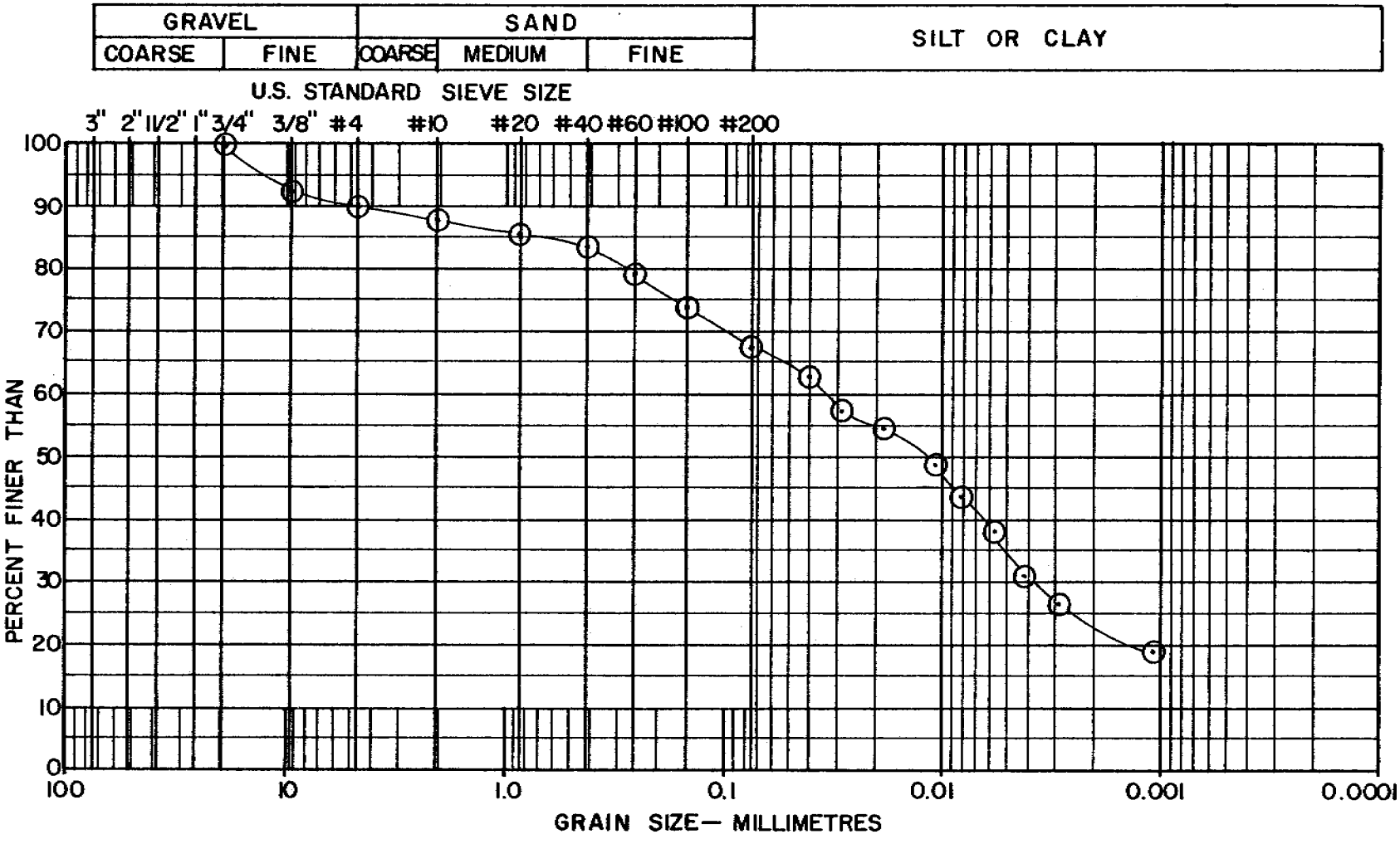
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-117
DATE	July 14/78 PLATE

K.L.C. - METRIC

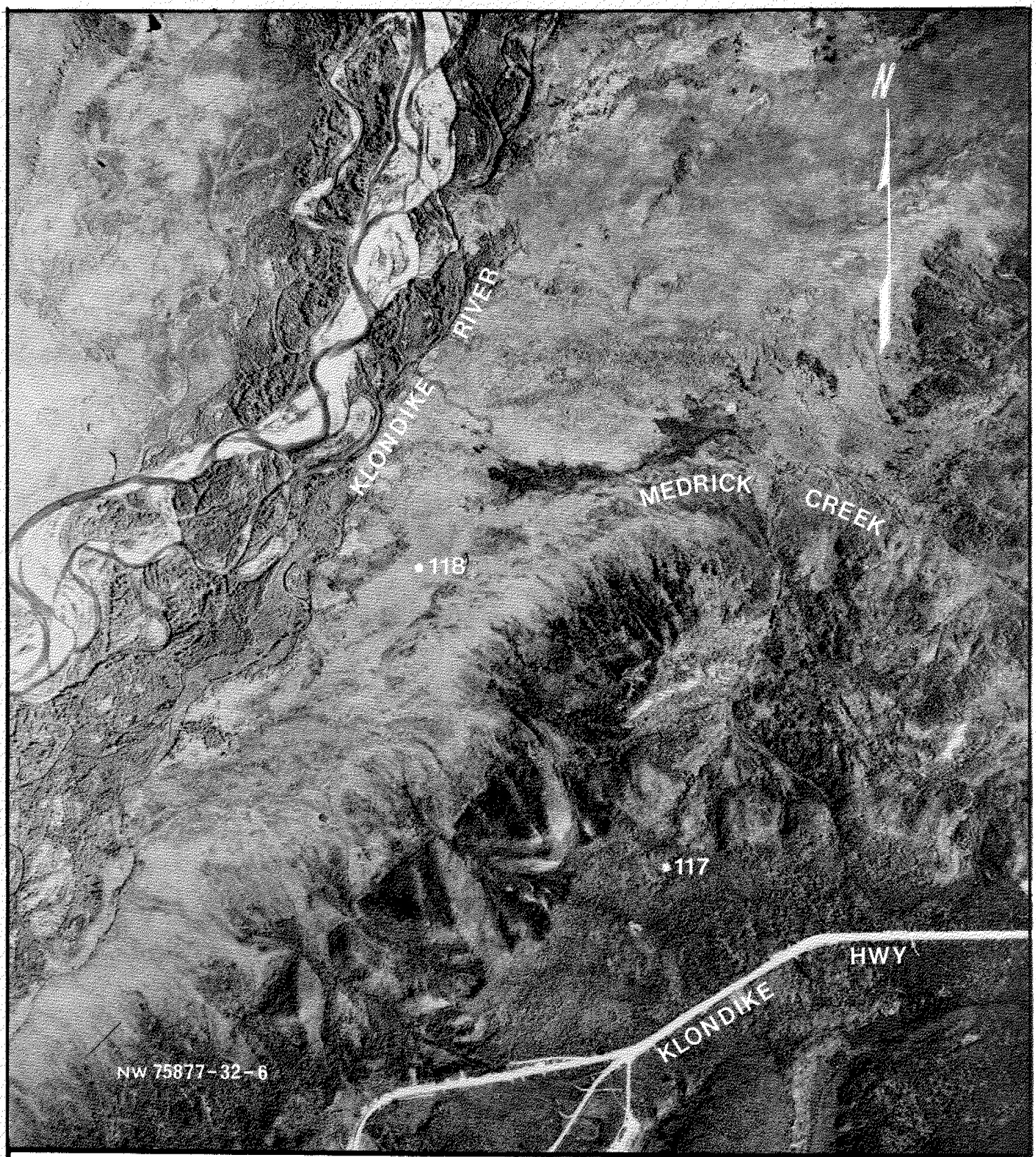
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 4 at 1.50-1.80m SILT AND CLAY - little sand, trace gravel

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No. 78-117	DEPTH
DATE Oct. 10/78	



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. 78-118

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	0.35m PEAT - amorphous - organic silt layer from 1.05-1.15m
1	C		1		Vr Nbe		
	C		2		Vs		
	C		3		Vs		1.30m
2	SPT	6 75 For 2.5cm	4				GRAVEL - coarse to fine - some sand - little silt - very hard, slow drilling
3							
4							
5							4.80m
6							SILT AND CLAY - grey (easier drilling below 4.8m, mud wash turning grey with occasional piece of silt and clay)
7							7.00 m.
							END OF HOLE 1. Test hole located in a flat poorly drained area along the south side of the Klondike River Valley. 2. The ground surface is irregular with numerous peat tussocks. 3. Vegetation consists of shrubs to 1-2 m. 4. Test hole was augered to 0.3m, then cored to 1.3m and then drilled to 7.0m with mud circulation.

LOCATION Klondike 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%

385% ⊙
871% ⊙
171% ⊙

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-118
DATE July 15/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 118

Sample No.	Sample Depth (M)	Frozen Bulk Denzity Kg/M^3	Frozen Bulk Density PCF
2	0.75 - 1.15	1001	62.5



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. 78-119

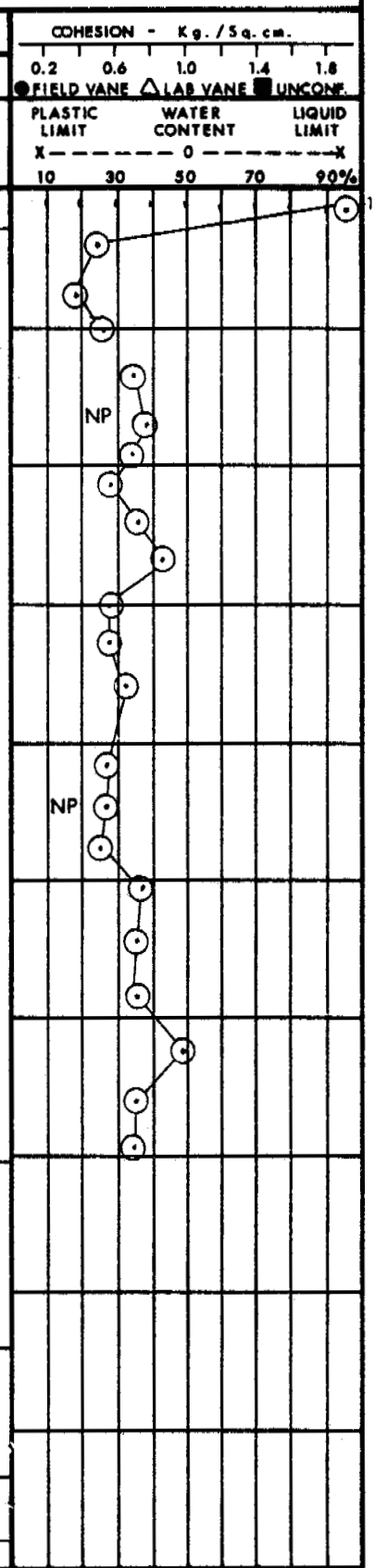
DATE OF ISSUE	PROJECT No.	AIRPHOTO SCALE	REV.
OCTOBER 1978	AL1023	1" = 2000' (approx)	
APPROVED: A. L. EDGEWORTH			

TEST HOLE LOG

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

LOCATION
ELEVATION

DEPTH	TYPE	BLOW 15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.1m ORGANIC COVER - moss
	B		1			0.5m	
	B		2		Nbn		SILT - little fine sand - trace gravel - non to slight plasticity - sand lenses - organic pockets - grey and rusty brown - ice lenses 1/4mm-1mm spaced @ 5mm-50mm to a depth of 2.8m
1	B		3		Vs		
	C		4		Vr		
2	C		5				
	C		6				
	C		7				
	C		8				
3	C		9				
	C		10				
	C		11				organic laminations
4	C		12				
	C		13				
	C		14		Nbn,		
5	C		15		Nbe		
	C		16		Vr		
	C		17				
6	C		18				
	C		19				
7	C		20				
	C		21				7.05m
	B		22				GRAVEL - coarse to fine - some sand - little silt
8					Vx Vc		
		14 32 72					8.50m
9	SPT		23		Nbe		SILT AND CLAY - low plasticity - grey with orange rust spots
							9.10m
					Vx		9.50m GRAVEL - coarse to fine
10							END OF HOLE (Cont'd)



Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-119
DATE	July 15-16/78 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

NOTES:
1. Test hole located on hillside sloping to northwest at 3-5%
2. The site is moss covered with good drainage.
3. The vegetation is moderate to dense poplars and white spruce 3-13m high with the occasional birch.
4. Test hole was augered to 1.2m, then cored to 7.05m and then drilled to 9.5m with mud circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

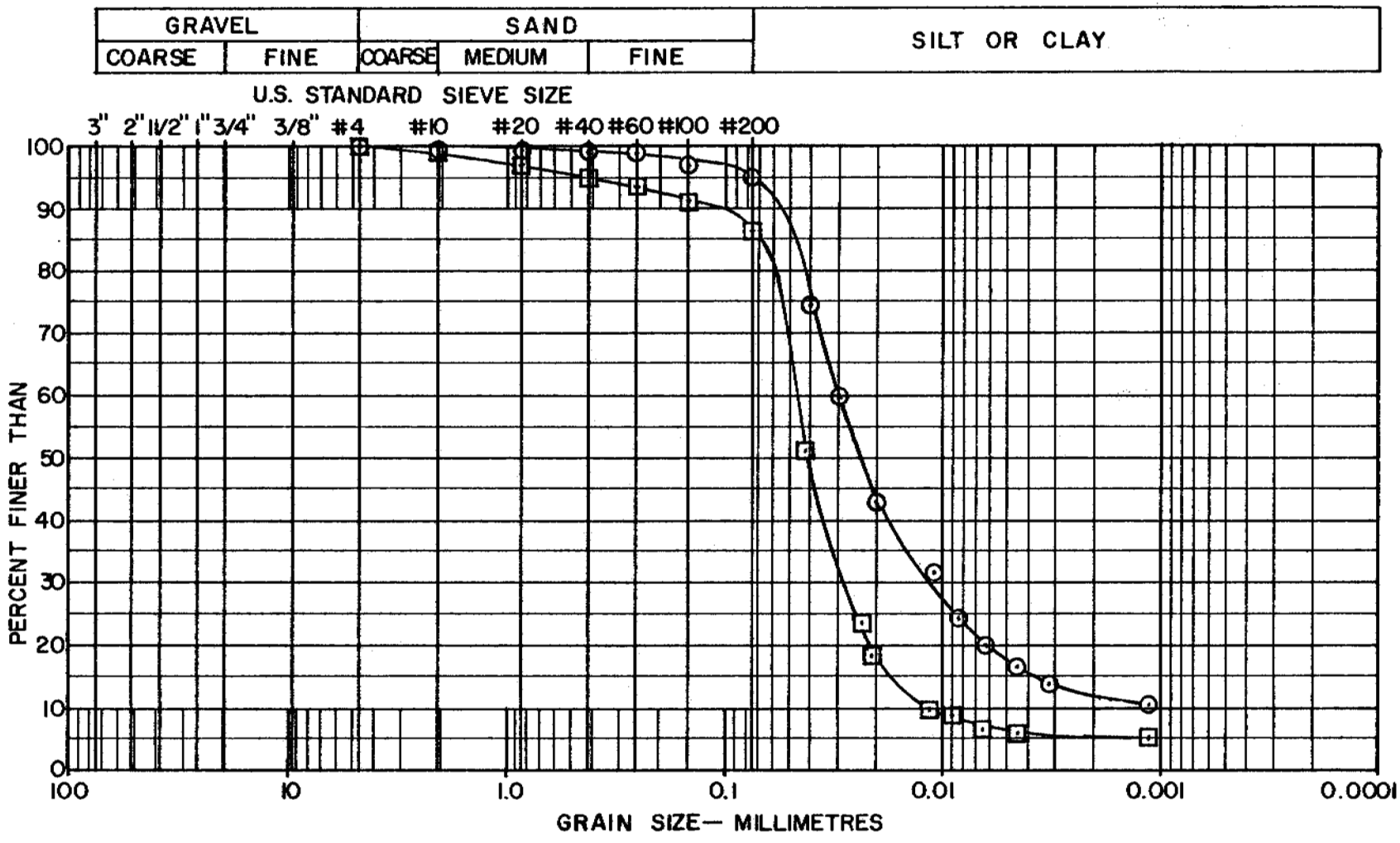
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-119
DATE July 15-16/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-119 DEPTH
DATE Aug. 17 - 78

GRAIN SIZE CURVE



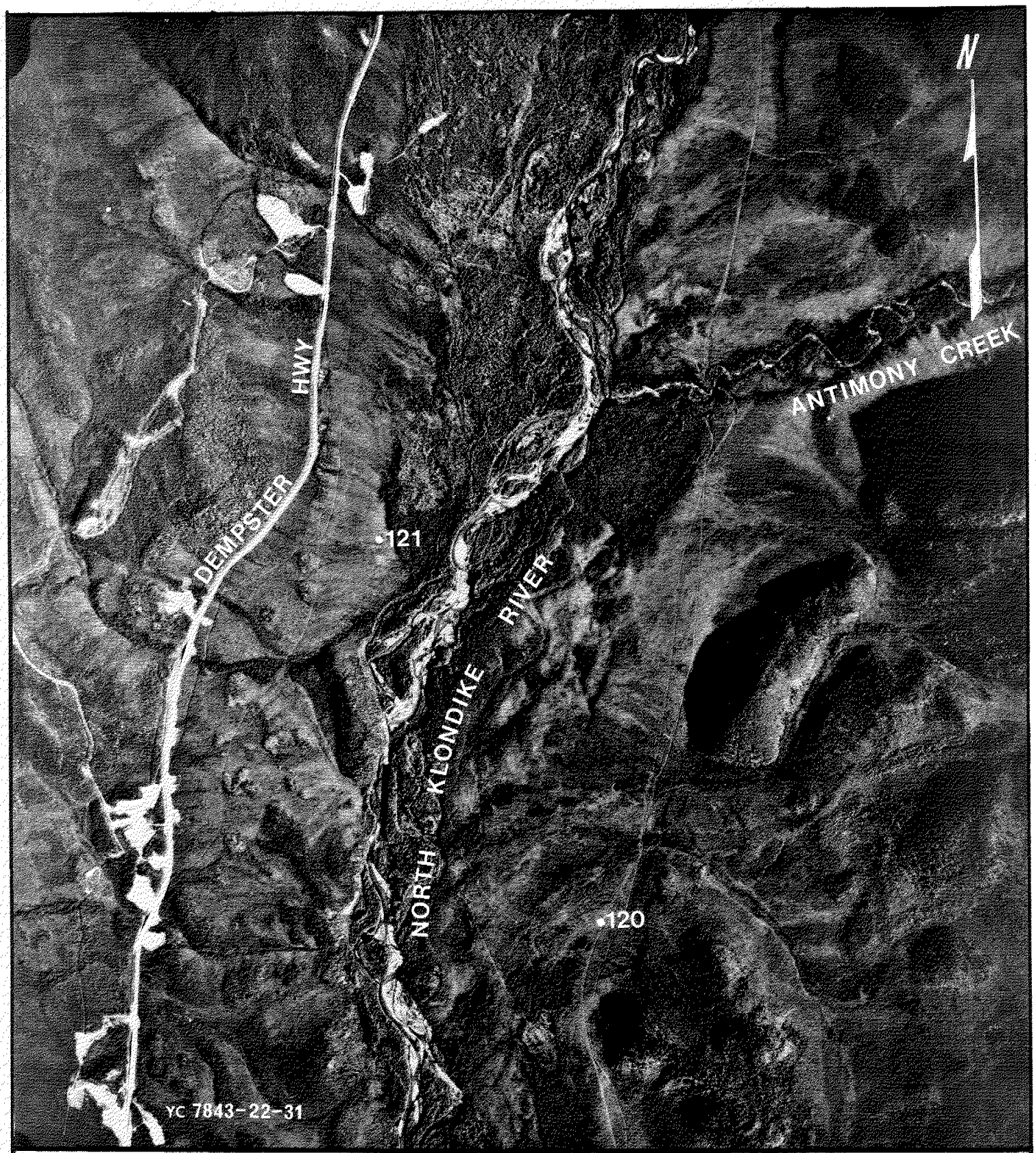
REMARKS: ⊙—⊙ Sample No. 5 at 1.55-1.90m SILT - trace fine sand, trace clay

⊡—⊡ Sample No. 14 at 4.3-4.65m SILT - little fine to medium sand, trace clay

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 119

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
5	1.55 - 1.90	1673	104.4
9	2.55 - 2.80	1664	103.9
11	3.20 - 3.40	1776	110.9
14	4.30 - 4.65	1849	115.5
17	5.20 - 5.65	1728	107.9
21	6.85 - 7.05	1497	93.4



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. 78-120

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

LOCATION North Klondike 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/15 cm.	No.	SYMBOL	PERMAFROST N.R.C. CLASS	PERMAFROST N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.3m PEAT- fibrous, brown
	C		1		Vr Vs		ORGANIC SILT & CLAY - trace fine sand - non to slight plasticity - peat inclusions - grey and brown layers - ice lenses 1/4mm-18mm spaced @ 1/4mm-50mm
	C		2				
1	C		3				
	C		4		Vr		
	C		5				
	C		6		Vs		
2	C		7		Nbe		
	C		8				
	C		9				SILT - some gravel - trace sand - non to slight plasticity - organic lenses - brown - ice lenses 1/4mm-1/2mm spaced @ 1/2mm-20mm
3	C		10				2.65m
	C		11		Nbn		
	C		12				
	SPT	74 for 12.5 cm	13				3.70m
4							GRAVEL - coarse to fine - coarser drilling
5					N		← cobble
							5.80 m.
6							END OF HOLE

NOTES:
1. Test hole located east of the North Klondike River. on a moss covered poorly drained site with a slight grade down to the southwest at less than 1%
2. The site is hummocky with low shrubs.
3. Test hole was augered to 0.25m then cored to 3.55m, and then drilled to 5.8m with mud circulation.

289%
61%
65%
152%
287%
111%
207%

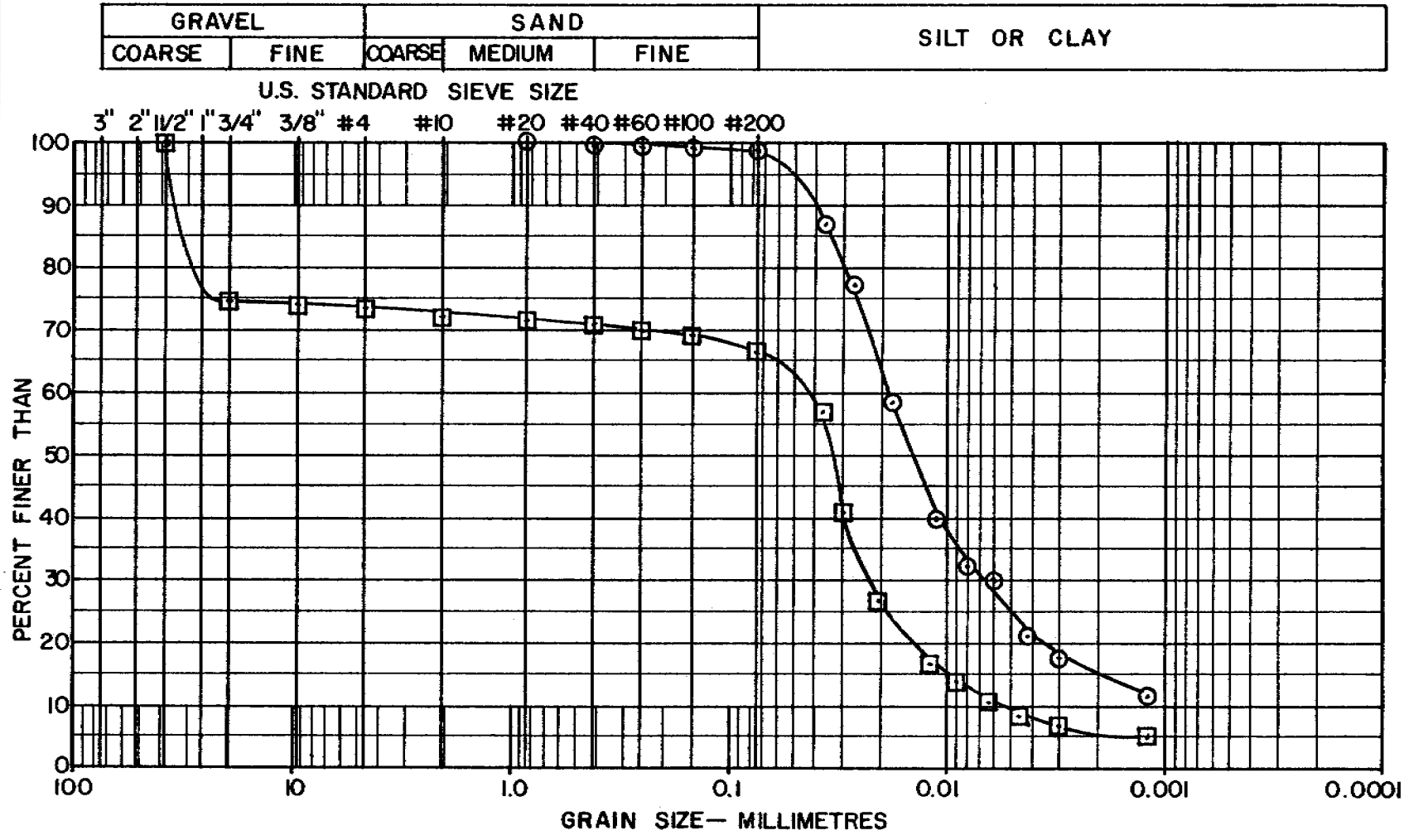
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-120
DATE	July 16/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-120 DEPTH
DATE Aug. 18/78



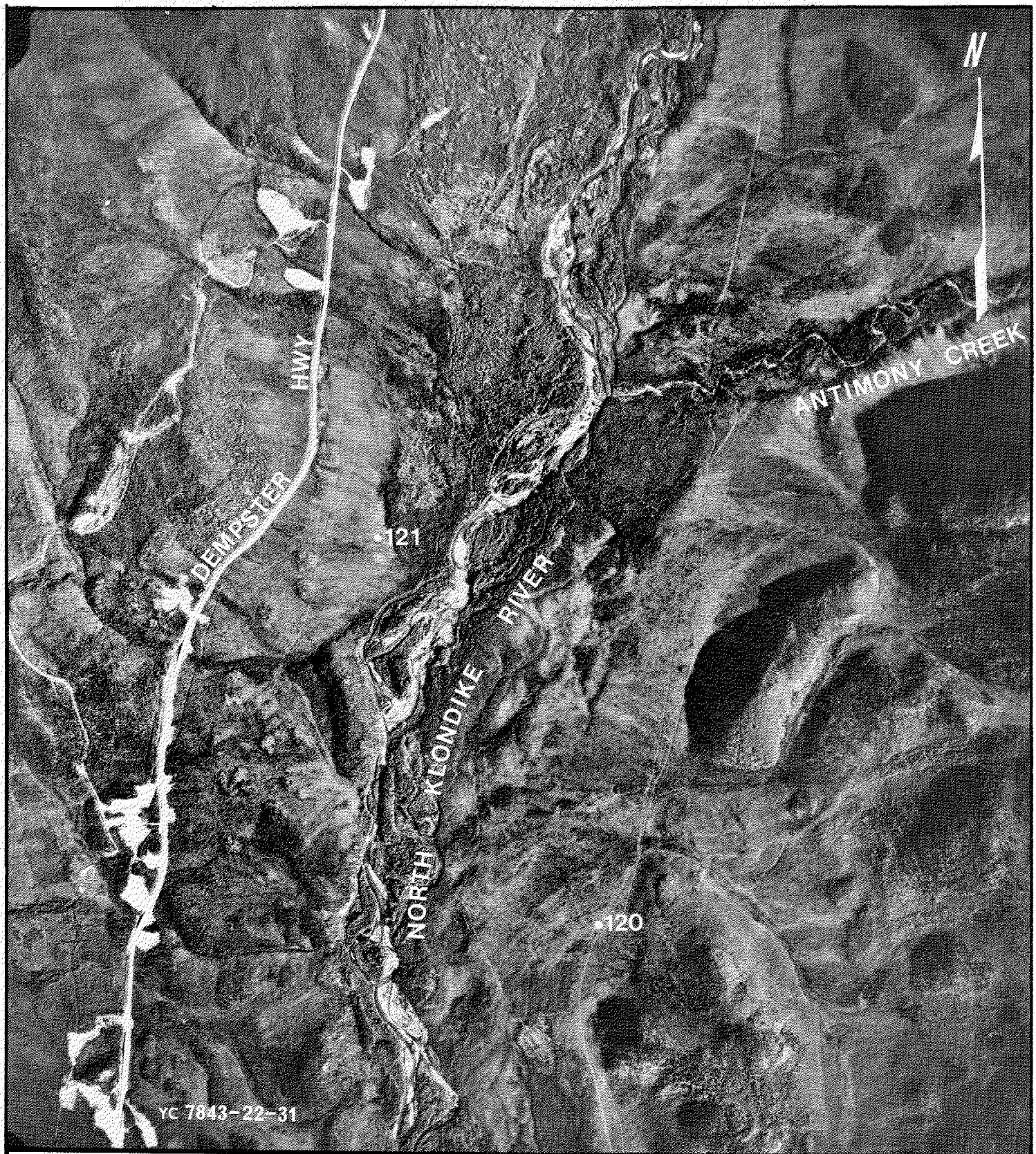
GRAIN SIZE CURVE

REMARKS:
⊙—⊙ Sample No. 7 at 1.75-2.05m ORGANIC SILT AND CLAY - trace sand
⊡—⊡ Sample No. 12 at 3.25-3.5 m SILT - some gravel, trace sand
(Note: Sample no. 12 has gravel inclusions)

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 120

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.60 - 0.70	1097	68.5
6	1.40 - 1.75	1162	72.6
10	2.65 - 2.95	1545	96.5



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. 78-121

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 North Klondike 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%

SAMPLE DATA				SYMBOL	PERMAFROST		DESCRIPTION OF MATERIAL
DEPTH	TYPE	BLOW/15 cm.	No.		N.R.C. CLASS	N.F. or F.	
	B					NF	0.15m PEAT - amorphous and granular - dark brown - ice lenses 1mm-5mm spced @ 1mm-15mm
	C		1		Vr Vx Nbe		
	C		2				
1	C		3				
	C		4				1.10m
	C		5		Vr		ORGANIC SILT - trace to little fine sand - slight plasticity - stratified - grey - ice lenses 1/4mm-4mm spaced @ 1mm-20mm - ice lenses 3mm-10mm spaced @ 2mm-5mm
	C		6				
2	C		7		Vs Nbe		
3							2.5m
4					N		GRAVEL - coarse to fine - coarser drilling below 2.5m
5							
							5.60m
							END OF HOLE

NOTES:
1. Test hole located southwest of the North Klondike River and east of the Dempster Highway
2. The site is moss covered and level with poor drainage.
3. The vegetation consists of sparse black spruce 2-5 m high.
4. Test hole was augered to 0.25m, then cored to 2.2m and then drilled to 5.5m with mud circulation.

369%
442%
174%
112%
NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

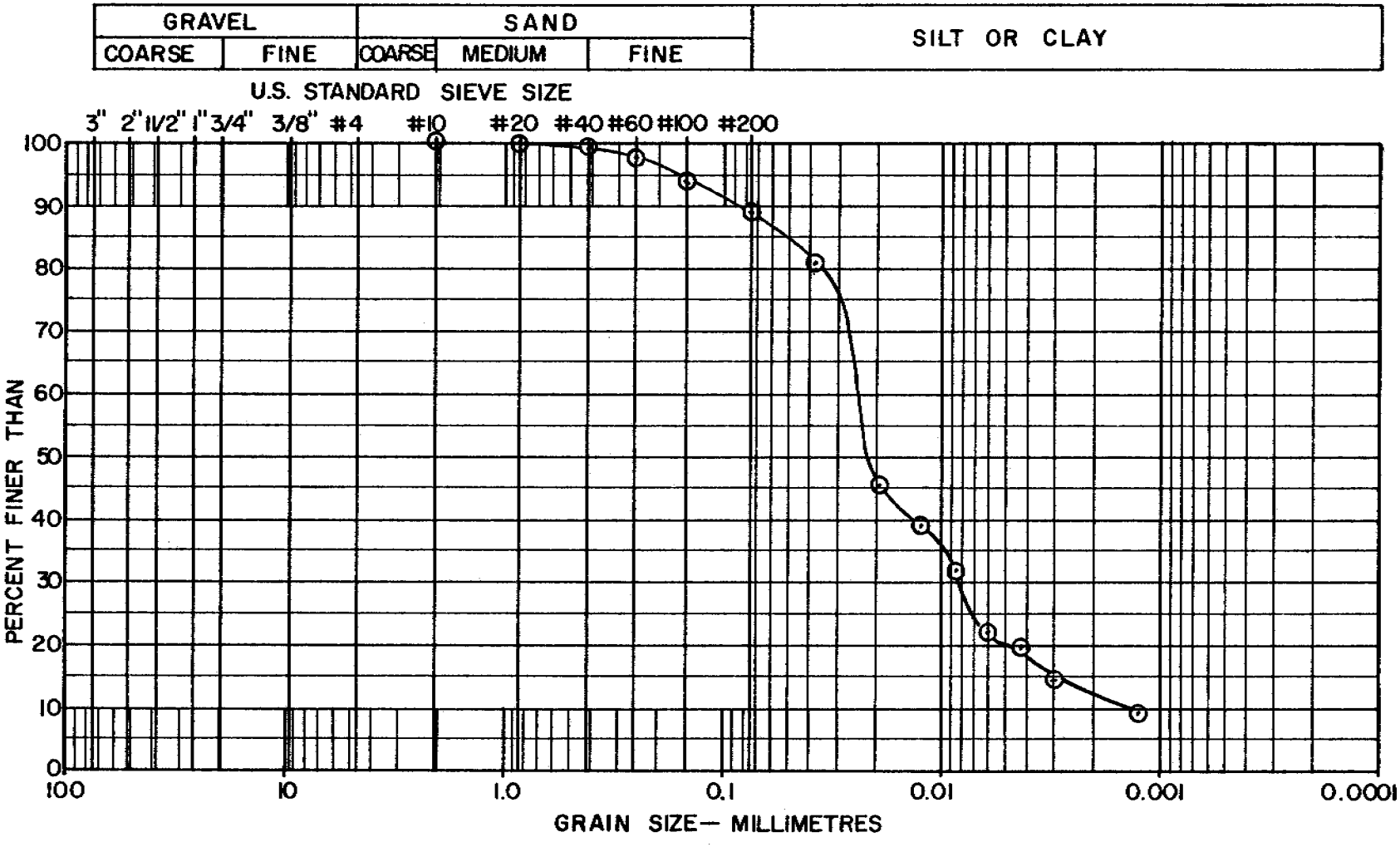
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-121
DATE	July 16/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-121 DEPTH
DATE Aug. 16, 78

GRAIN SIZE CURVE

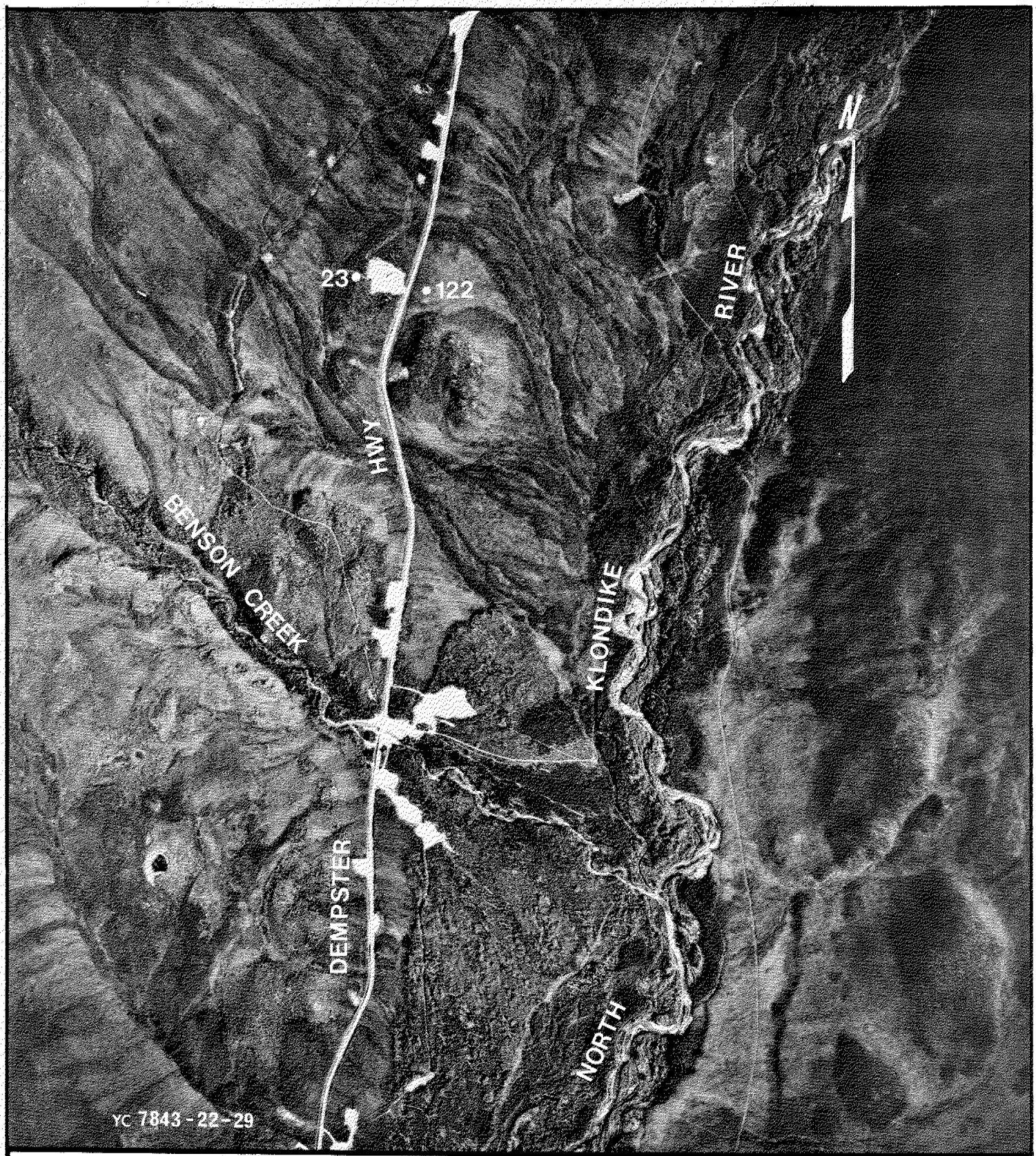


REMARKS: ⊙—⊙ Sample No. 7 at 1.9-2.2m ORGANIC SILT - trace to little fine sand

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 121

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.6 - 0.8	866	54.1
7	1.90 - 2.20	1647	102.8



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-122

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 PEAT-amorphous and granular 0.4m - dark brown
	C		1		Vr		peat layer ORGANIC SILT - trace fine sand - trace fine gravel - grey
1.0	C		2		Vs		
	C		3				1.15m
	C		4		ICE+		SILT AND CLAY - trace to little gravel - trace fine sand - trace shale fragments - slight to low plasticity - grey - ice lenses 3mm-10mm spaced @ 3mm-15mm
	C		5		Vr		
2.0					ICE +		
	C		6		Vs		
							2.25m
	C		7				
3.0	C		8		Nbe		SHALE - laminated - rusty layers - weathered to 4.7m - grey
	C		9		Nbn		
	C		10		Nf		
4.0	C		11				
	C		12				
	C		13				ice lens 3mm spaced @ 3mm
5.0	C		14				5.0m

END OF HOLE

Notes:

1. Test hole located approximately 100 metres east of Dempster Highway.
2. The site is hummocky with a general slope to the northeast of 5-8%.
3. The site is moss covered with fair to poor drainage.
4. The vegetation consists of moderate black spruce 6-8m high with small shrubs.
5. A gravel pit is located on the west side of the highway.
6. Test hole was augered to 0.3m and then cored to 5.0 m.
7. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 5.0 m.

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%

195%
222%
101%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

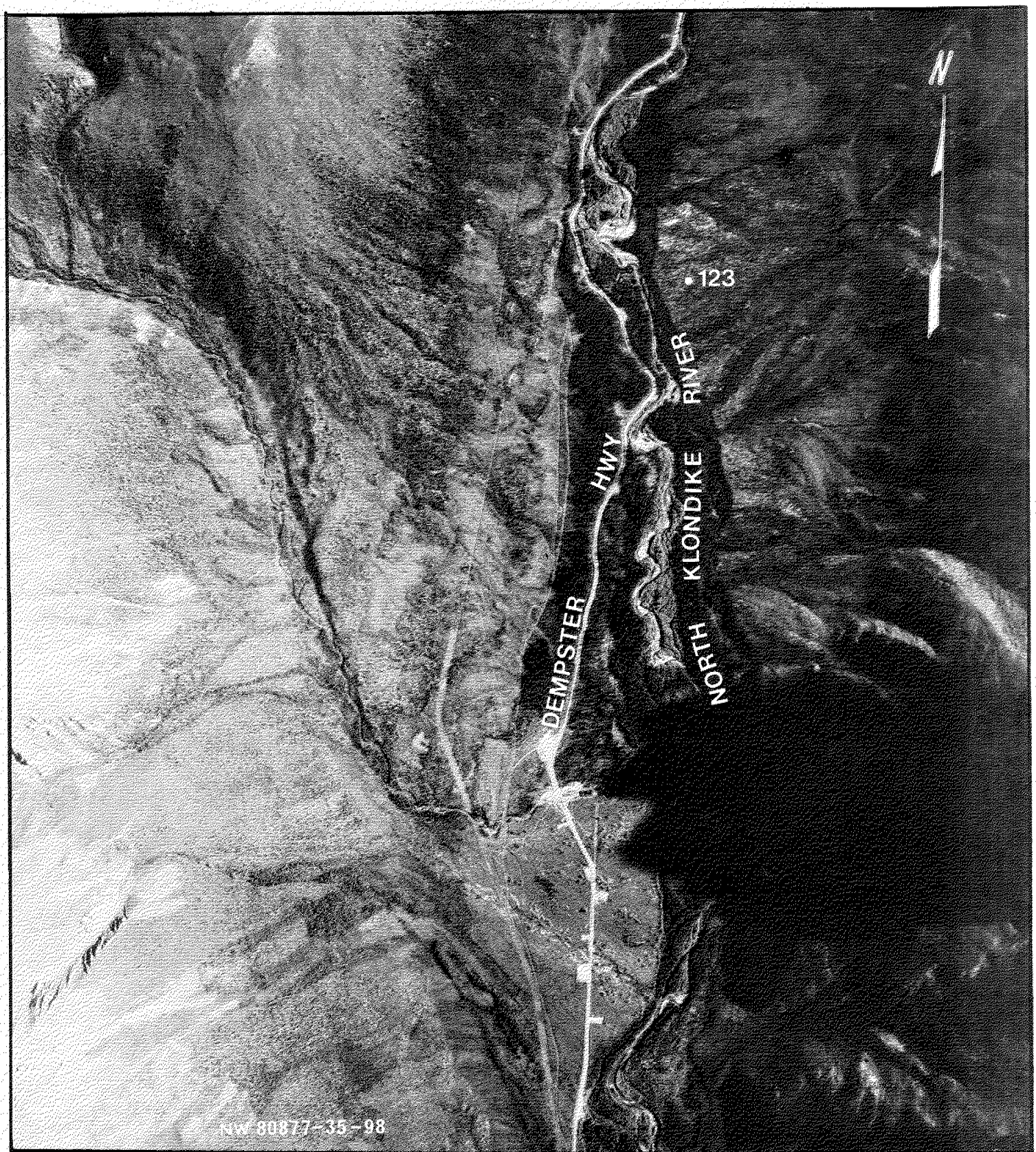
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-122
DATE July 16/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 122

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	0.90 - 1.15	1350	84.3
6	1.75 - 2.25	1869	116.7
8	2.55 - 3.0	2061	128.6



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. 78-123

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
1.0	B		3
	B		4
	SPT	28 83 for 7.5 cm	5
2.0			
3.0			
4.0	SPT	116 for 15cm	6
5.0			
6.0			

SYMBOL

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

LOCATION North Klondike 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

0.6m

SILT AND CLAY
- trace to little gravel
- trace sand - coarse to fine
- low plasticity
- roots
- brown

NF

GRAVEL
- some sand - coarse to fine
- trace silt and clay
- very dense
- brown

5.6m

END OF HOLE

Notes:

1. Test hole located east of the North Klondike River on a fairly level area sloping slightly down to the south at less than 1%.
2. The site is moss covered with moderate to dense white spruce to 20 metres and shrubs.
3. Test hole augered to 1.75 m and then drilled to 5.6 m with mud circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	Yukon
HOLE No.	78-123
DATE	July 17/78 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. 78-124

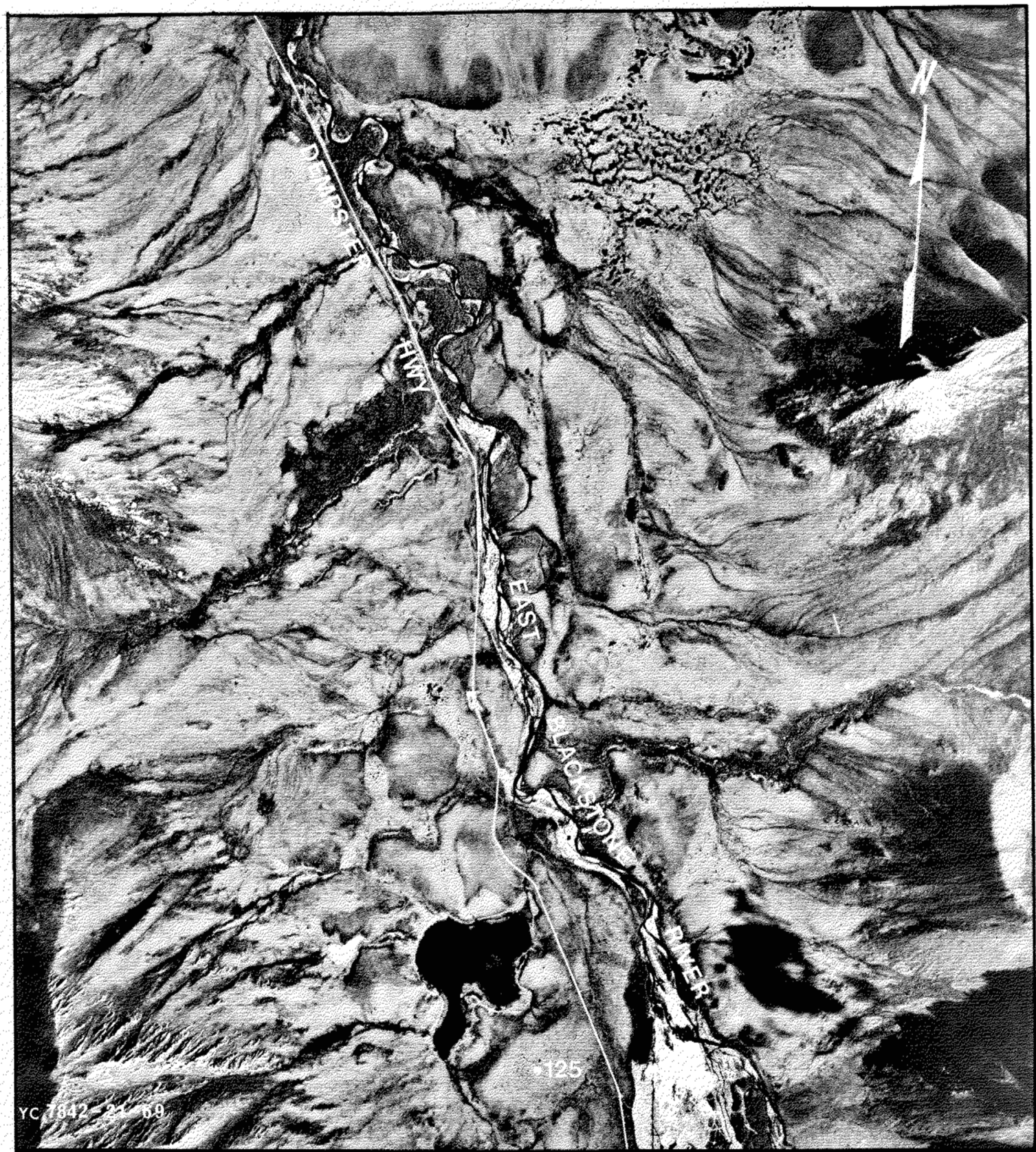
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

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

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-125

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.
	B		
	C		1
1	C		2
	B		3
2			
3			
4			
5			

SYMBOL

PERMAFROST

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.3m — PEAT
- amorphous granular
- brown

0.5m — SILT
- and gravel
- little to some sand
- grey
- ice lenses 3-5mm @10-30 mm

1.50m — GRAVEL
- coarse to fine
- coarser drilling below 1.5m

cobbles

5.00m — END OF HOLE

NOTES:
1. Test hole located east of the North Klondike River in a flat poorly drained area.
2. The site is covered with a very thick moss cover.
3. Vegetation consists of sparse black and white spruce with shrubs.
4. Test hole was augered to 0•3m, then cored to 1.0m and then drilled to 5.0m with mud 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%

354%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-124
DATE	July 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.
	B		
	C		1
1	C		2
	C		3
	C		4
2	C		5
	C		6
	C		7
	C		8
3	C		9
	C		10
	C		11
	C		12
4	C		13
	C		14
	C		15
5			
6	SPT	Ref.	16
7			
8			
9			
10			

SYMBOL

PERMAFROST

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.25m
PEAT
- amorphous & granular
- organic silt lenses
- dark brown
- ice lenses 1/2mm-2mm spaced @ 1-5mm

1.45m
ice lenses 17mm spaced @ 30mm

ORGANIC SILT
- trace fine sand
- trace clay
- non to slight plasticity
- peat layers
- grey
- ice lenses 1mm-15mm spaced @ 1mm-15mm

3.55m
ice lenses 5-15mm @ 10-40mm

some sand and gravel

GRAVEL & SAND
- and silt
- trace clay
- grey
- coarser drilling below 4.55m

ice lenses 2mm-15mm spaced @ 2mm- 12mm

10.0m 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%

193% 209% 239% 343% 288% 318% 459% 398% 260% 140% 188% 123%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-125
DATE	July 18/78 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. Test hole located west of the East Blackstone River.
2. The ground surface displays ice wedge polygons. The terrain is barren except for small brush. The ground surface is moss covered with peat tussocks and has ponded water above the permafrost.
3. Test hole was augered to 0.4 m then cored to 4.5m and then drilled to 10.0m with mud circulation.
4. Thermistors installed to 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0 and 8.0 m.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

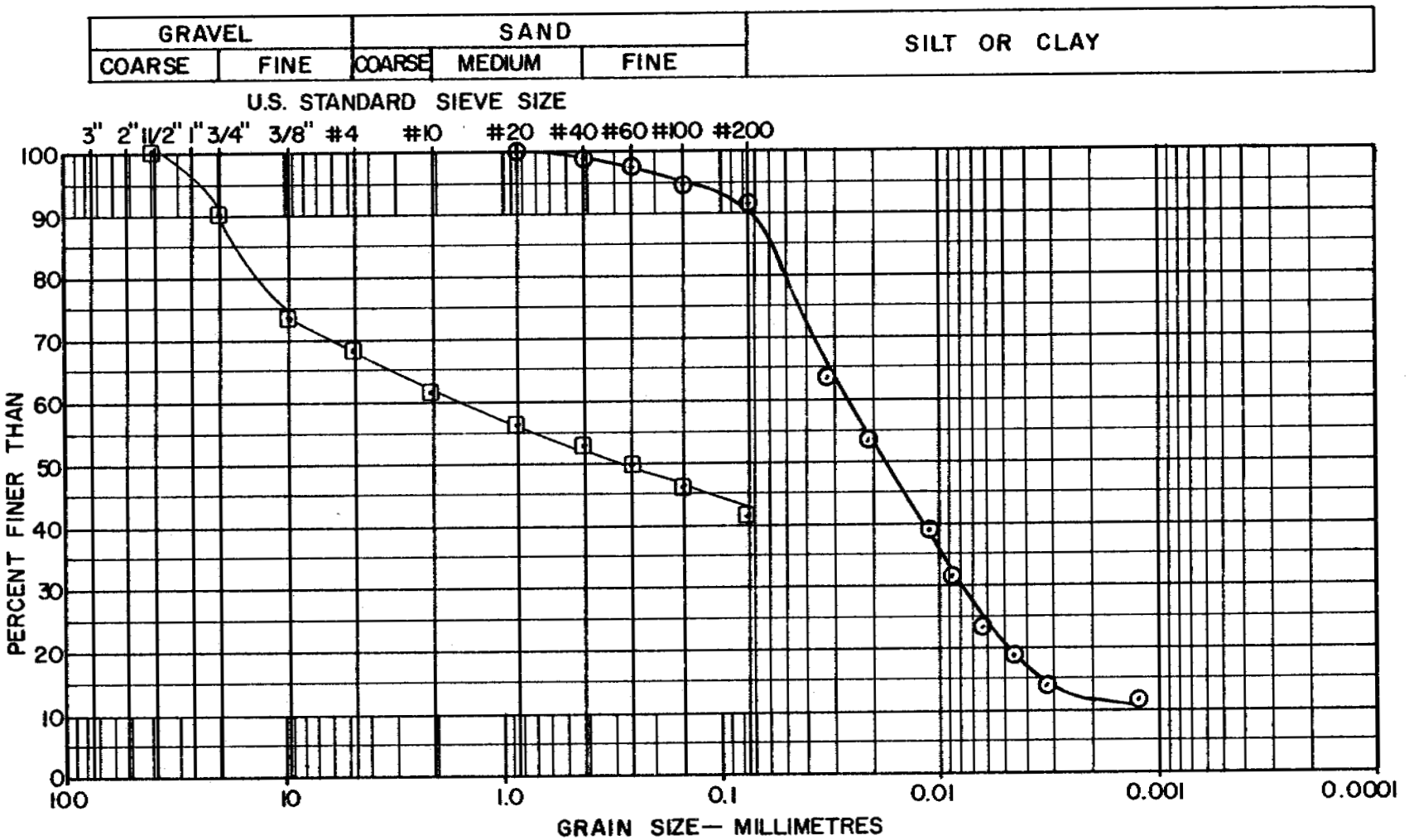
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-125
DATE July 18/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-125 DEPTH
DATE Aug. 23/78

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 5 at 1.55-1.85m ORGANIC SILT - trace fine sand

⊡—⊡ Sample No. 15 at 4.25-4.5m GRAVEL & SAND, AND SILT

200

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 125

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.70 - 1.00	1061	66.2
6	1.85 - 2.25	1033	64.5
9	2.75 - 3.05	1289	80.4
13	3.75 - 3.95	1192	74.4



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-126

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	N.F. or F.	DESCRIPTION OF MATERIAL
	B					NF	0.3m 0.1m ORGANIC COVER - moss
	C		1		Nbe ICE		ORGANIC SILT - trace fine sand - peat inclusions - cobble @ 0.6m - grey
1	C		2		Vr Vs		
	C		3				
	C		4				1.60m ice lenses 1/4mm-1mm spaced @ 1/2mm-2mm
2	C		5				1.90m
	C		6				SILT AND SAND - fine - little gravel - stratified - grey
	C		7		Vr Nbe Nbn		
3							
	B		8				GRAVEL AND SAND - fine to coarse - some silt - carbon specks - grey
4							
							4.5m
5	SPT	60/87	9		Nbe		SAND - fine to medium - little silt - trace fine gravel - organic odor - sand & silt lenses - dark grey
6							
							6.8m
7	SPT	37/62	10		Vs Nbe		SILT AND CLAY - trace sand - coarse to fine - trace gravel-fine - slight to low plasticity - organic odor - dark grey
8							
9							bedrock or boulder
							9.60m
10							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%

400%
139 %

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-126
DATE	July 18/78 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 west of the East Blackstone River and Dempster Highway.
2. Hole is 70-80m. from edge of terrace.
3. The site slopes slightly to the east at 1% and has poor to fair drainage.
4. Vegetation consists of a thick moss cover with dwarf shrubs 15m high
5. Test hole was augered to 0.3m then cored to 2.4m, and then drilled to 5.5m using mud circulation.

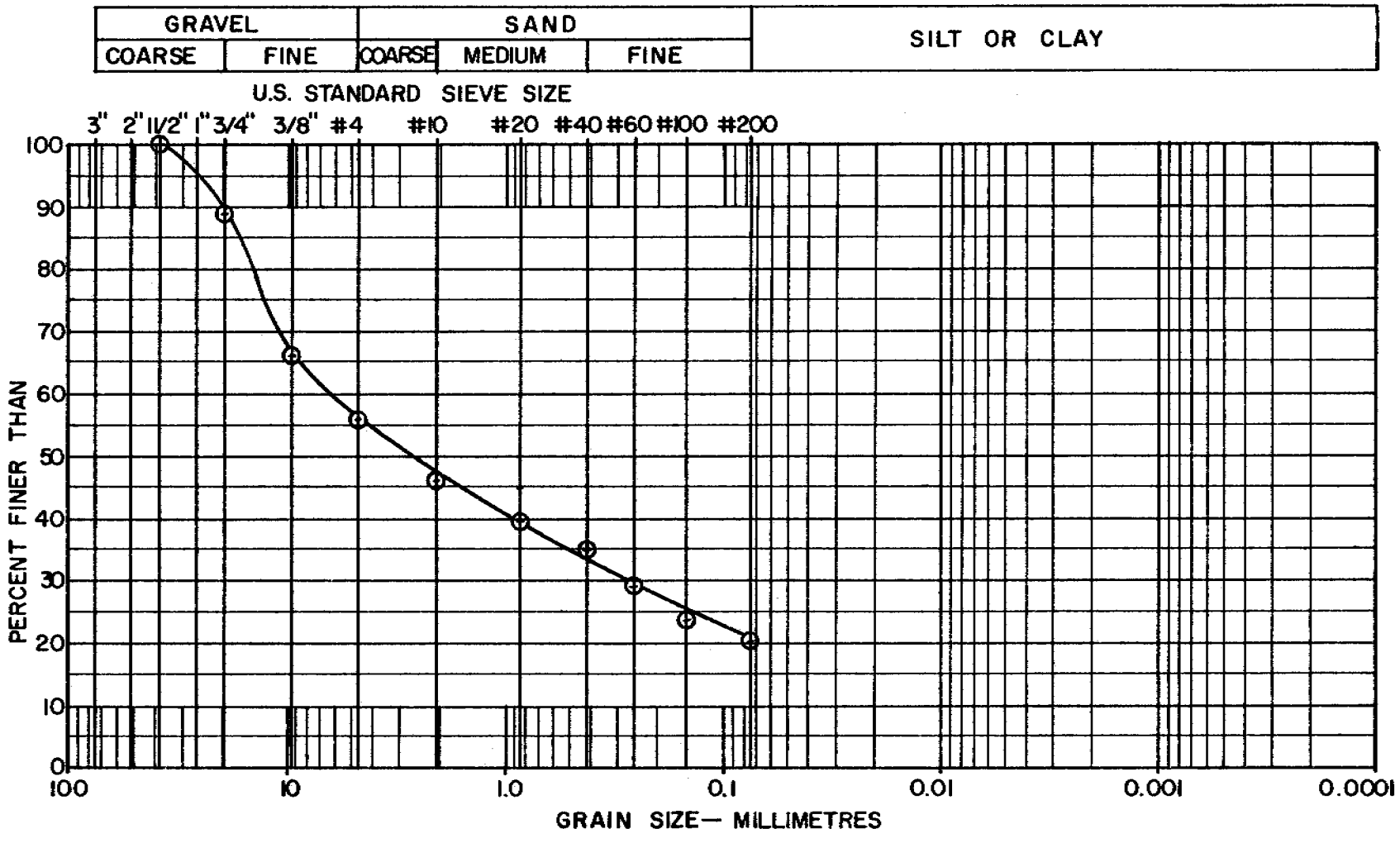
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-126
DATE	July 18/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 7 at 2.1-2.4m GRAVEL AND SAND - fine to coarse, little to some silt

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-126 DEPTH
DATE

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 126

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.70 - 1.10	1282	80.0
5	1.60 - 1.95	1659	103.6

TEST HOLE LOG

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

DEPTH	TYPE	BLOW/15 cm.	No.
	B		
	C		1
	C		2
1	C		3
	C		4
	C		5
2	C		6
	C		7
	C		8
3	C		9
	C		10
	C		11
4	C		12
5			
6	SPT	67/87	13
7	SPT	36/55	14
8			
9			
10			

SYMBOL

PERMAFROST

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

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.1m ORGANIC COVER-moss
0.25m

ORGANIC SILT
- trace fine sand
- pockets of amorphous granular peat.
- grey
- ice lense 1/4mm-30mm spaced @ 1mm-20mm

← ICE+ (25mm layer)

← ICE+ (30mm layer)

← trace fine gravel

3.15m

SILT
- little sand
- fine to coarse
- trace gravel
- pockets of peat
- sand pockets
- grey
- ice lenses 1/2mm-10mm spaced @ 1mm-15mm

6.50m

SILT AND CLAY
- trace fine gravel
- trace fine sand
- low plasticity
- grey

← coarser drilling

← cobbles

9.80m

END OF HOLE (Cont'd.)

COHESION - Kg./5q.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%

129%
146%
165%
284%
238%
126%
195%
126%
190%
121%
155%
155%
194%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-127
DATE	July 19/78 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. Test hole located on a slight grade sloping 2-3% to the southwest.
2. The site is covered with thick moss and the ground surface displays ice wedge polygons.
3. Vegetation consists of dwarf shrubs 15cm high.
4. Test hole was augered to 0.3m, then cored to 3.75m and then drilled to 9.8m with air circulation.

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

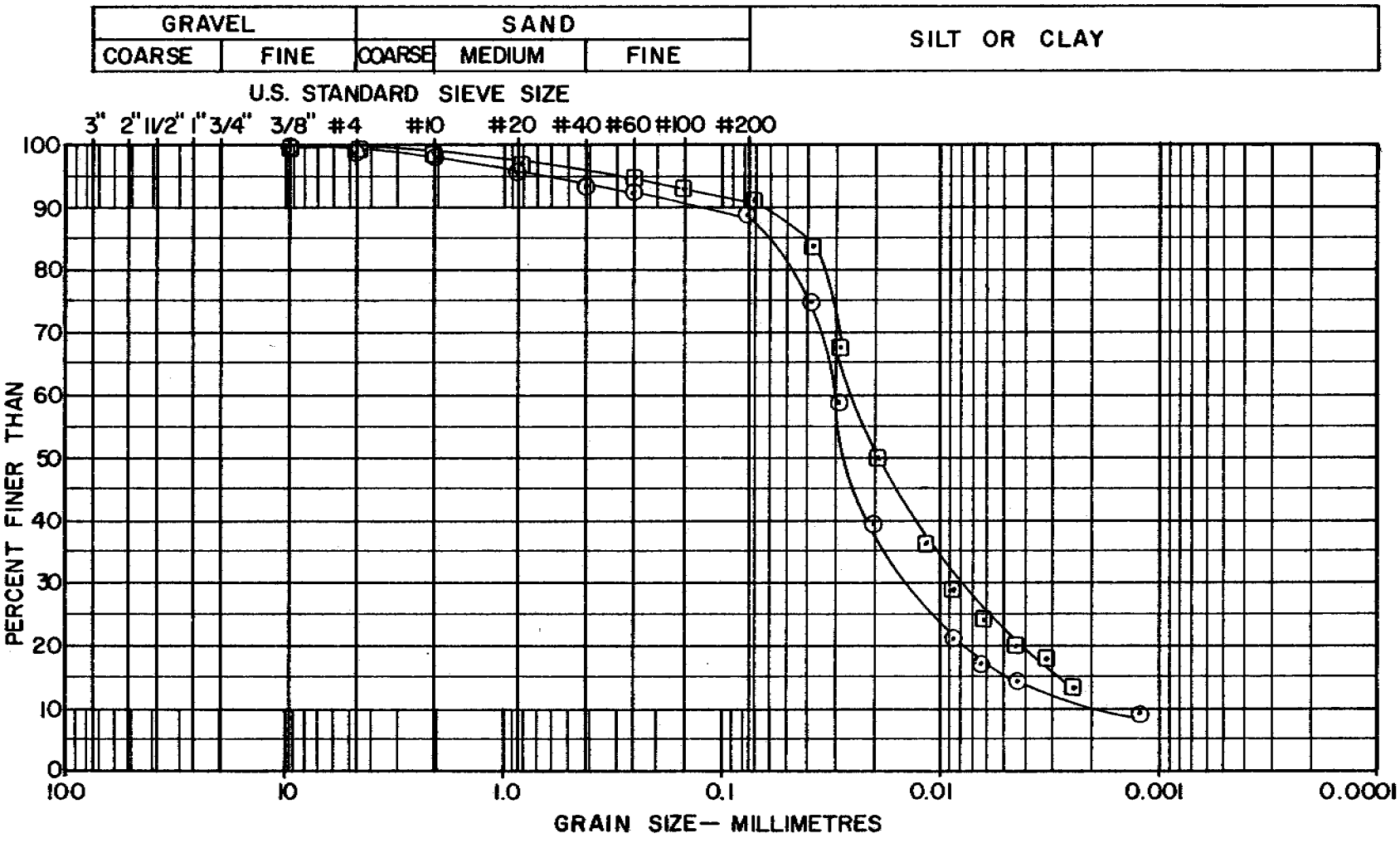
JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-127
DATE	July 19/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-127 DEPTH
DATE Aug. 22/78

GRAIN SIZE CURVE



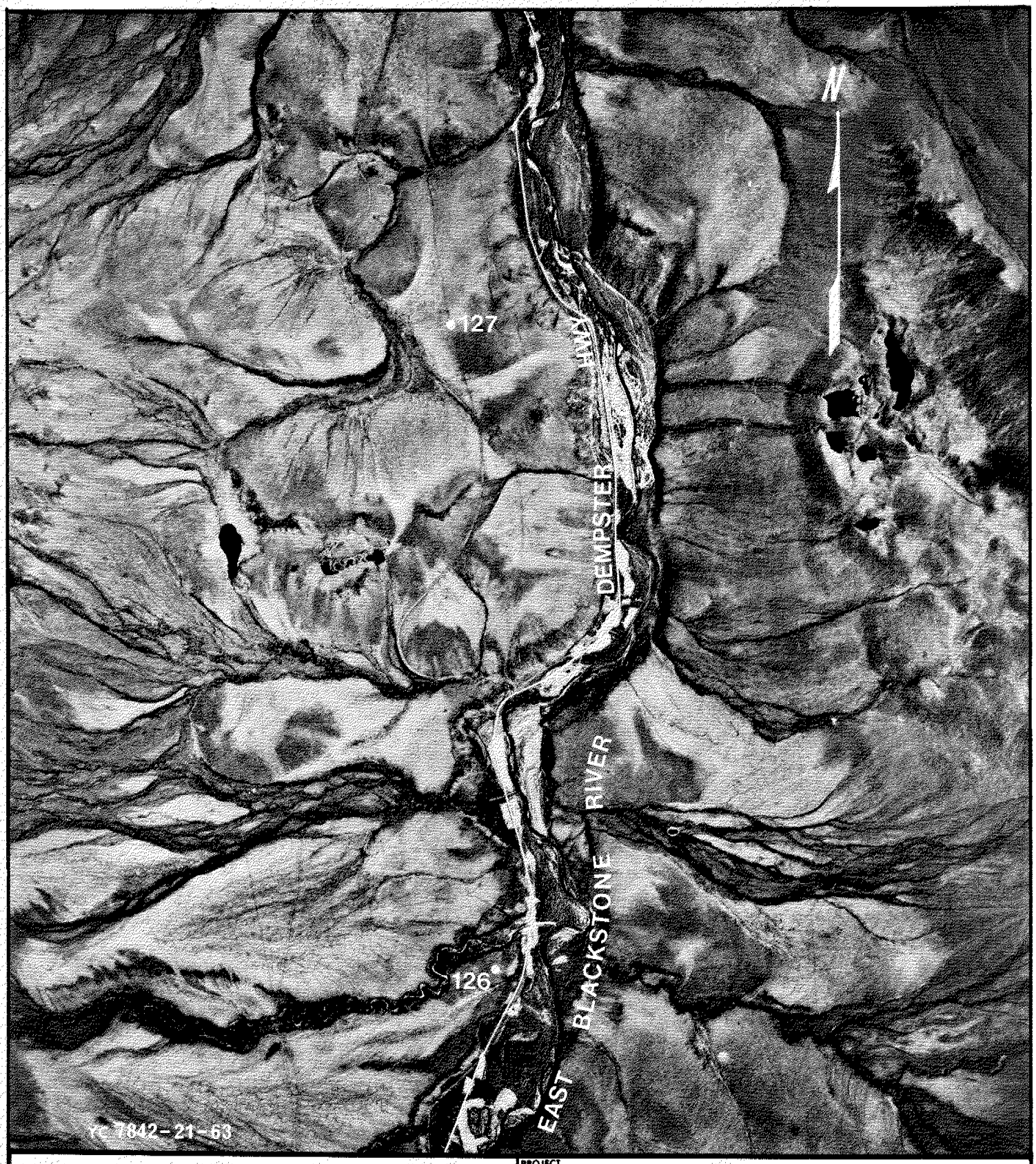
REMARKS: ⊙—⊙ Sample No. 11 at 3.15-3.5m SILT - little fine to coarse sand, trace gravel, trace organics

⊡—⊡ Sample No. 13 at 5.7-6.0m SILT - trace sand, trace gravel

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 127

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.50 - 0.80	1083	67.6
5	1.40 - 1.75	1139	71.1
8	2.30 - 2.60	1184	73.9
11	3.15 - 3.50	1444	90.1



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

PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: AIRPHOTO LOCATION PLAN
TEST HOLE No. 78-127

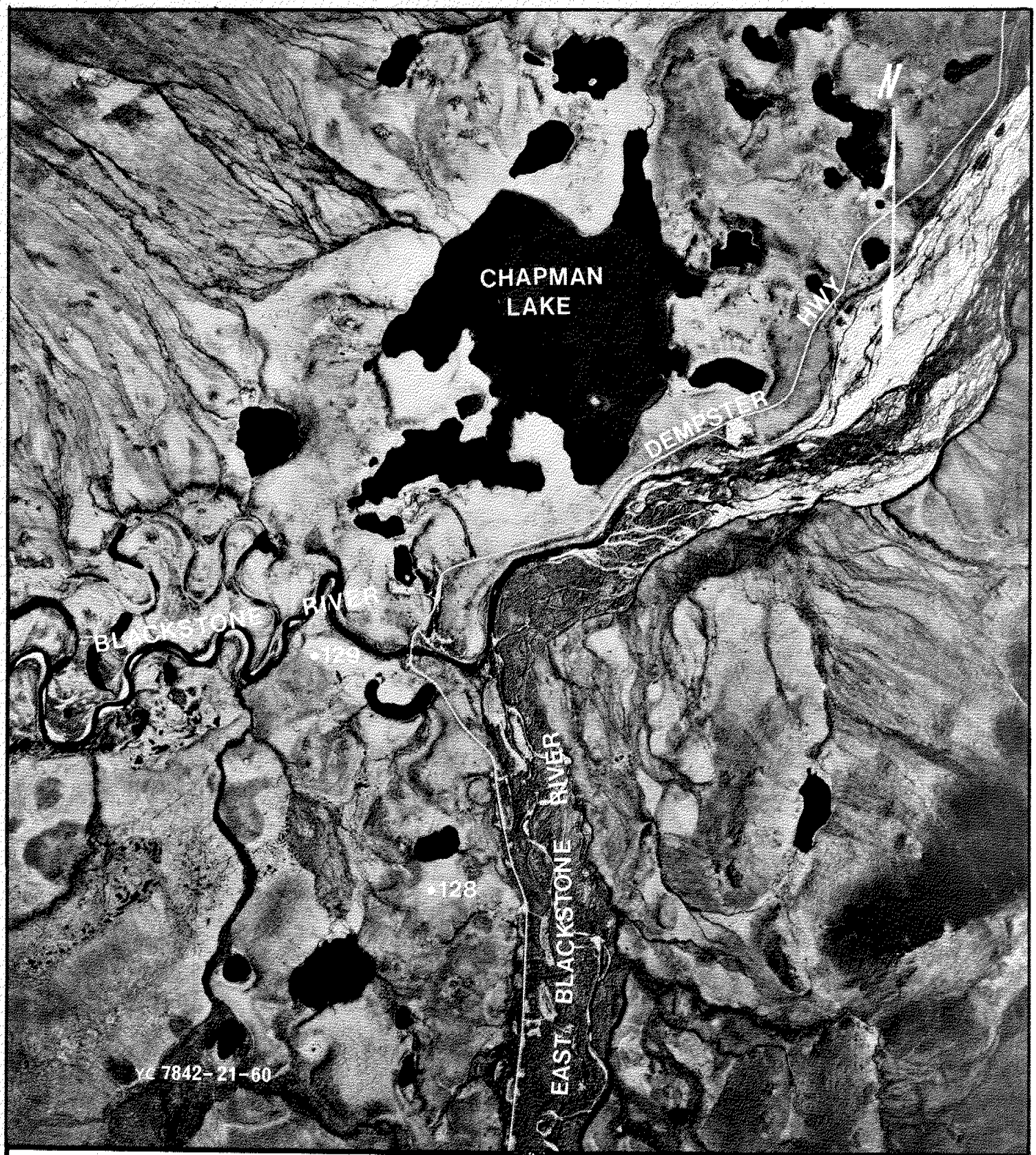
CLIENT: FOOTHILLS PIPELINES (YUKON) LTD.

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

PROJECT No.: AL1023

AIRPHOTO SCALE: 1" = 2000' (approx)

REV.



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. 78-128

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
	C		2
1			
	C		3
	C		4
	C		5
2	C		6
	C		7
	C		8
3	C		9
	C		10
	C		11
4	C		12
	C		13
	C		14
5	C		15
	C		16
6	C		17
7			
8			
9			
10			

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
Vr Nbe	
Nbe Nbn	
Vr Nbn Nbe	
ICE	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

0.30m — PEAT
- amorphous
- brown

ORGANIC SILT
- trace fine sand
- peat inclusions
- grey
- ice lenses 1/2mm-3mm spaced @ 4mm-30mm

1.75m

SILT
- trace fine sand
- organic pockets
- grey
- ice lenses 1/4mm-1mm spaced @ 10mm-15mm below

← vertical ice lens 1mm thick

← small pockets and lenses of sand
- trace gravel

6.0m

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%

158%
142%
NP

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-128
DATE	July 19/78 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					ICE		As above
							11.80m
12	B		18		N		12.10m SILTSTONE (BEDROCK OR BOULDER
							END OF HOLE

LOCATION
ELEVATION

NOTES:
1. Test hole located on a terrace south of a thermokarst lake.
2. The site slightly hummocky with thick moss.
3. Vegetation consists of dwarf shrubs.
4. Test hole augered to 0.3m, then cored to 7.3m and then drilled to 12.1m 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

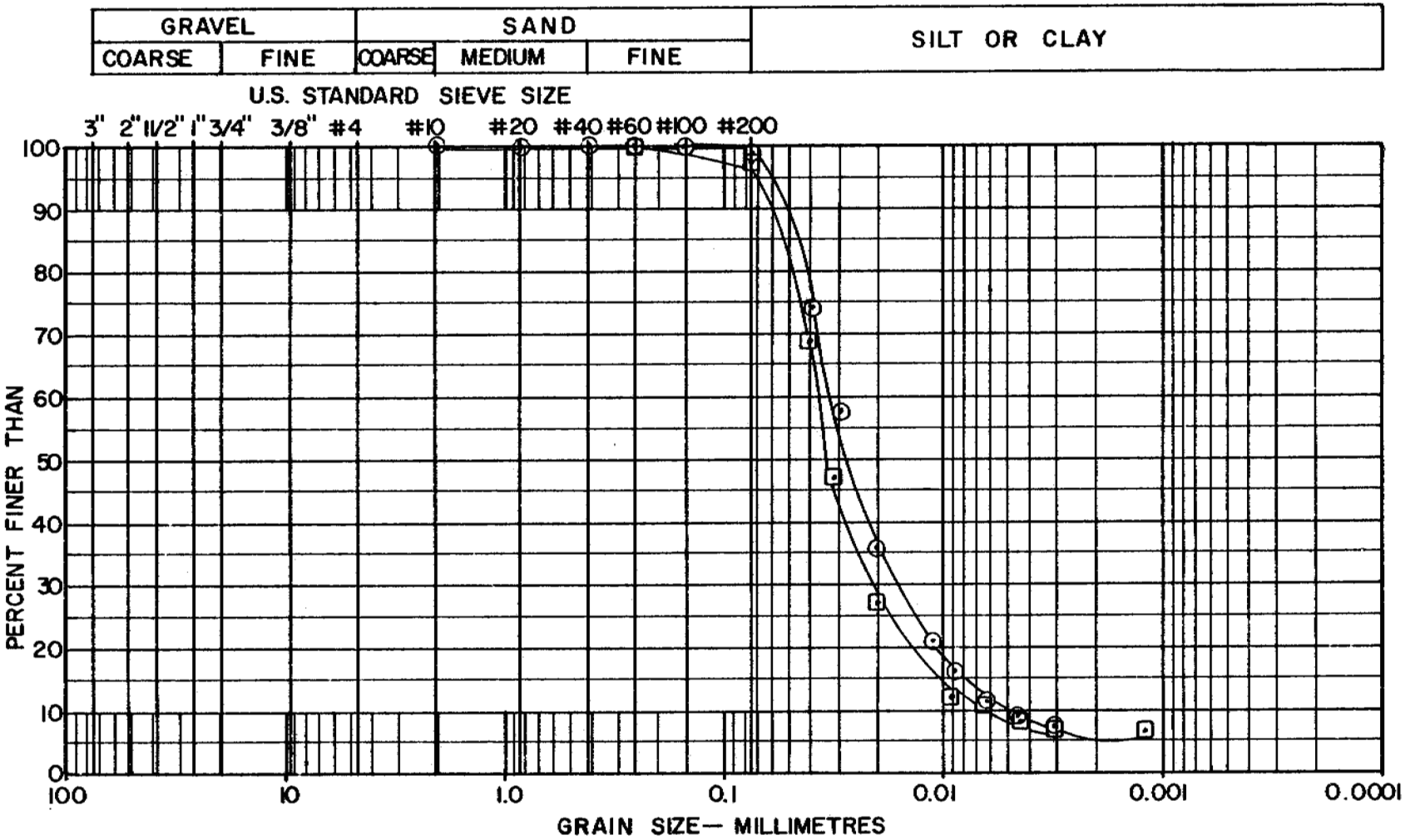
JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-128
DATE July 19/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-128 DEPTH
DATE Aug. 23/78

GRAIN SIZE CURVE



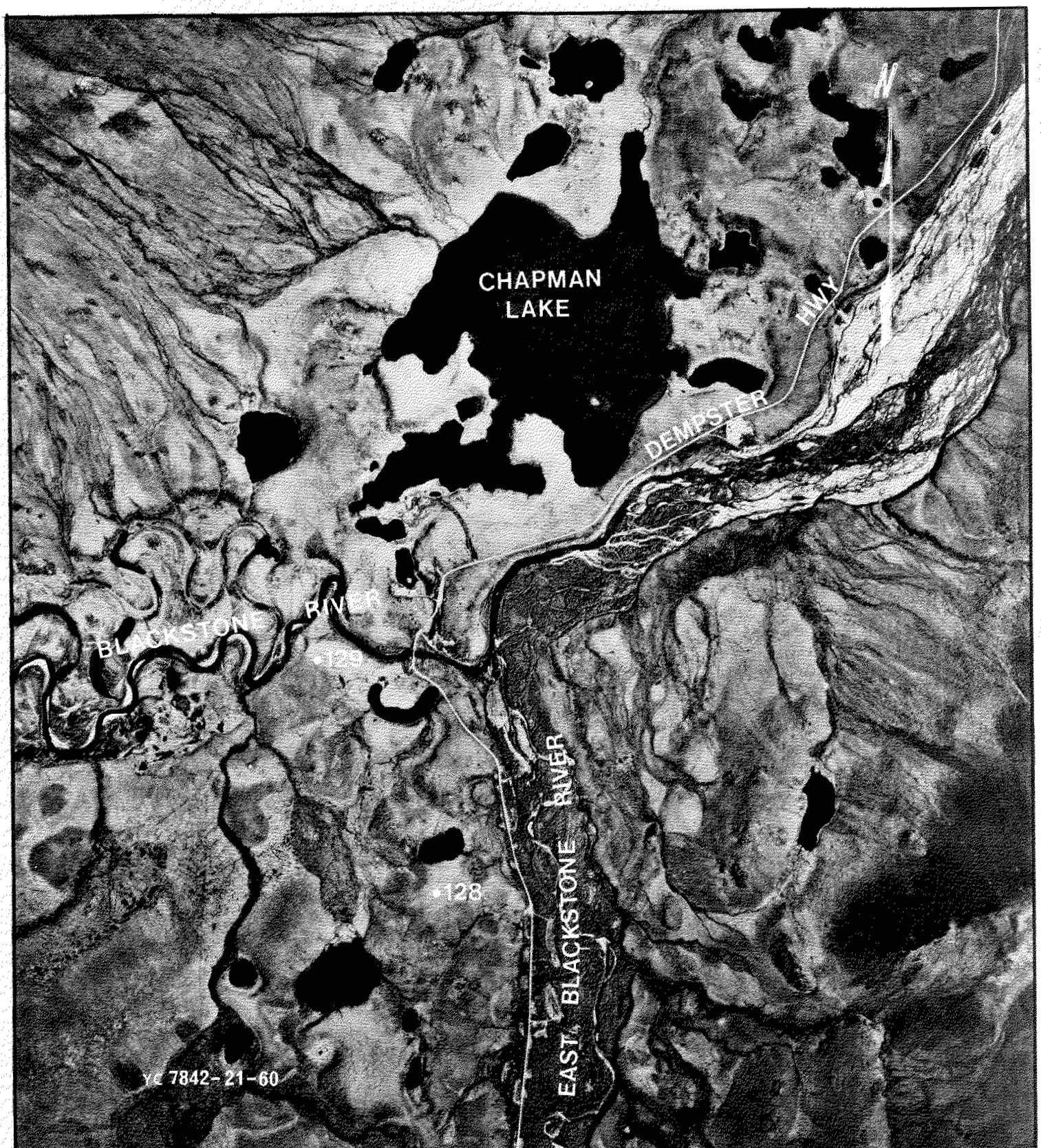
REMARKS: ⊙—⊙ Sample No. 5 at 1.3-1.75m ORGANIC SILT - trace fine sand

⊡—⊡ Sample No. 13 at 4.0-4.37m SILT - trace fine sand, trace clay

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 128

Sample No.	Sample Depth (M)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
2	0.50 - 0.85	1484	92.6
6	1.75 - 1.95	1573	98.2
10	2.95 - 3.25	1654	103.2
14	4.37 - 4.75	1563	97.6



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. 78-129

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
2	C		2
3			
4			
	B		3
5			
6			
	B		4
7			
8			
9			

SYMBOL

PERMAFROST

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

LOCATION Blackstone River
ELEVATION

DESCRIPTION OF MATERIAL

0.25m
PEAT
- amorphous and granular
- little gravel
- dark brown

0.50m
ORGANIC SILT
- trace fine to coarse sand
- trace gravel- fine
- grey
- ice lenses 1/4mm-5mm spaced@ 1mm-10mm

1.20m
ICE

3.95m
GRAVEL AND SAND
- some silt and clay
- hard drilling

8.80m
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%

152%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-129
DATE	July 19/78 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 20-25m from edge of terrace south of the Blackstone River.
2. The site is moss covered, level, and has no trees.
3. Test hole was augered to 0.3m, then cored to 1.1m and then drilled to 8.8m with air circulation.
4. Difficult to obtain samples below 4.0m. Soil logged from drilling observations below 4.0m.
5. Thermistors installed to 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
LOCATION	
HOLE No.	78-129
DATE	July 19/78 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. 78-130

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
	C		1				0.50m PEAT - amorphous and granular - non woody - fine fibrous - dark brown
1					Nbe		cobbles
	B		2				SILT AND CLAY - some coarse to fine sand - little coarse to fine gravel - low plasticity - organic odor - dark grey
2							2.10m
	SPT	25 30 33	3		Nbe Vr		
3							PEAT - amorphous and granular - woody fine fibres - dark brown - ice lenses 1/2mm-2mm spaced @ 1/2mm-2mm
	SPT	24 39 33	4				
4							4.50m
	SPT	49 60	5				GRAVEL - some sand-fine to coarse - little silt and clay - organic pockets - grey
5					Vx Vr		
	SPT	16 for 1cm	6				
6							organic silt laminations -ice lenses 2mm-2mm spaced @ 1mm-3mm
	SPT	25 43 for 10cm	7				7.0m
7							ICE + GRAVEL
8					ICE+		8.50m
	SPT	16 for 5cm	8				GRAVEL - some sand- coarse to fine - little silt and clay - grey ice lenses 2mm-3mm spaced @ 2mm-5mm
9					Vr		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%

386%
101%
279%
809%
121%
572%
176%

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-130
DATE	July 20/78 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 a gully sloping slightly down to the south at less than 1%.
2. Vegetation consists of thick moss and dwarf shrubs.
3. Drainage is poor with frequent wet spots.
4. Test hole was augered to 0.4m, then cored to 0.6m 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.	78-130
DATE	July 20/78 PLATE

K.L.C. - METRIC

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 130

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
1	0.40 - 0.60 (Top)	988	61.7
1	0.40 - 0.60 (Bottom)	1439	89.8

TEST HOLE LOG

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

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

SYMBOL

PERMAFROST

N.R.C. CLASS	N.F. or F.
	NF 0.5m
Vr Nbe Vs	
Vs Vx	
ICE+	
Vs Vx	
Vs Vr Nbe	
N	

LOCATION
ELEVATION

DESCRIPTION OF MATERIAL

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

1.35m

ORGANIC SILT
- little gravel
- little sand - trace clay
- slight plasticity
- peat inclusions
- dark brown
- gravel pocket

3.05m

PEAT
- wood pieces
- trace organic silt
- trace fine sand
- brown

4.75m

GRAVEL
- trace to little sand
- trace silt
- trace cobbles below 5m
- dark brown

6.20m

END OF HOLE

NOTES:
1. The test hole located in a valley, south of the creek on a grade falling to the north at 6-10%.
2. Vegetation consists of thick moss and dwarf shrubs.
3. Test hole augered to 0.4m, then cored to 4.85m and then drilled to 6.2m 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%

206%
178%
295%
112%
279%
449%
229%
720%
685%
645%
1072
513%
329%
393%
109%

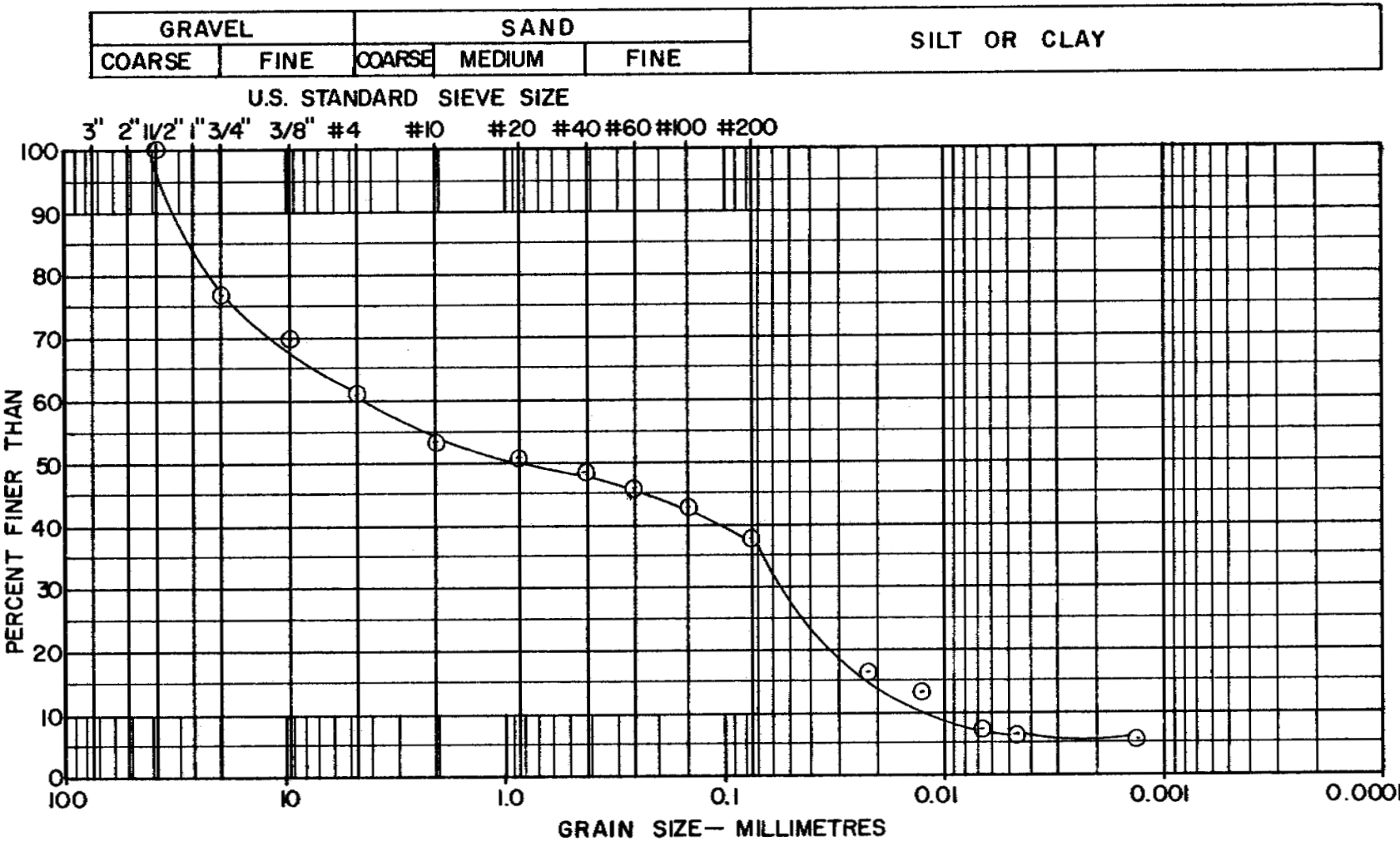
Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

JOB No.	AL1023
PROJECT	Dempster Lateral
LOCATION	
HOLE No.	78-131
DATE	July 20/78 PLATE

K.L.C. - METRIC

Klohn Leonoff Consultants Ltd.
CIVIL & GEOTECHNICAL ENGINEERS

GRAIN SIZE CURVE



REMARKS: ⊙—⊙ Sample No. 5 at 1.35-1.65m SILT AND SAND AND GRAVEL - trace clay, organic specks
(Note: Sample taken from silt and gravel pocket).

JOB No. AL1023
PROJECT Dempster Lateral
LOCATION
HOLE No. 78-131 DEPTH
DATE Aug 23/78

FROZEN BULK DENSITY TEST RESULTS

TEST HOLE No. 78 - 131

Sample No.	Sample Depth (M.)	Frozen Bulk Density Kg/M^3	Frozen Bulk Density PCF
3	0.70 - 1.00	960	59.9
7	1.80 - 2.20	985	61.5
12	3.40 - 3.65	955	59.6
15	4.20 - 4.65	1031	64.3



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. 78-131

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

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

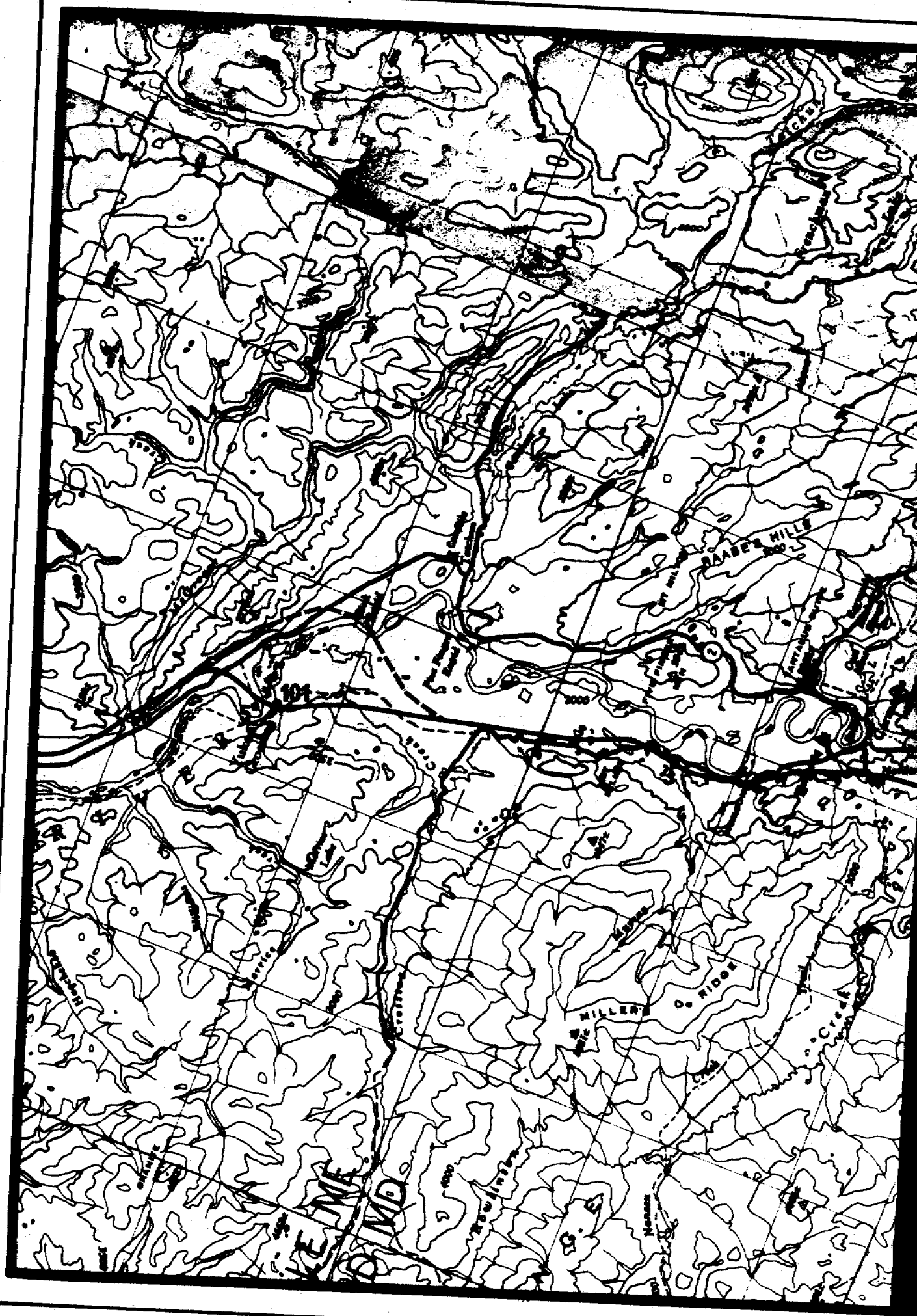
CLIENT:
FOOTHILLS PIPE LINES (YUKON) LTD

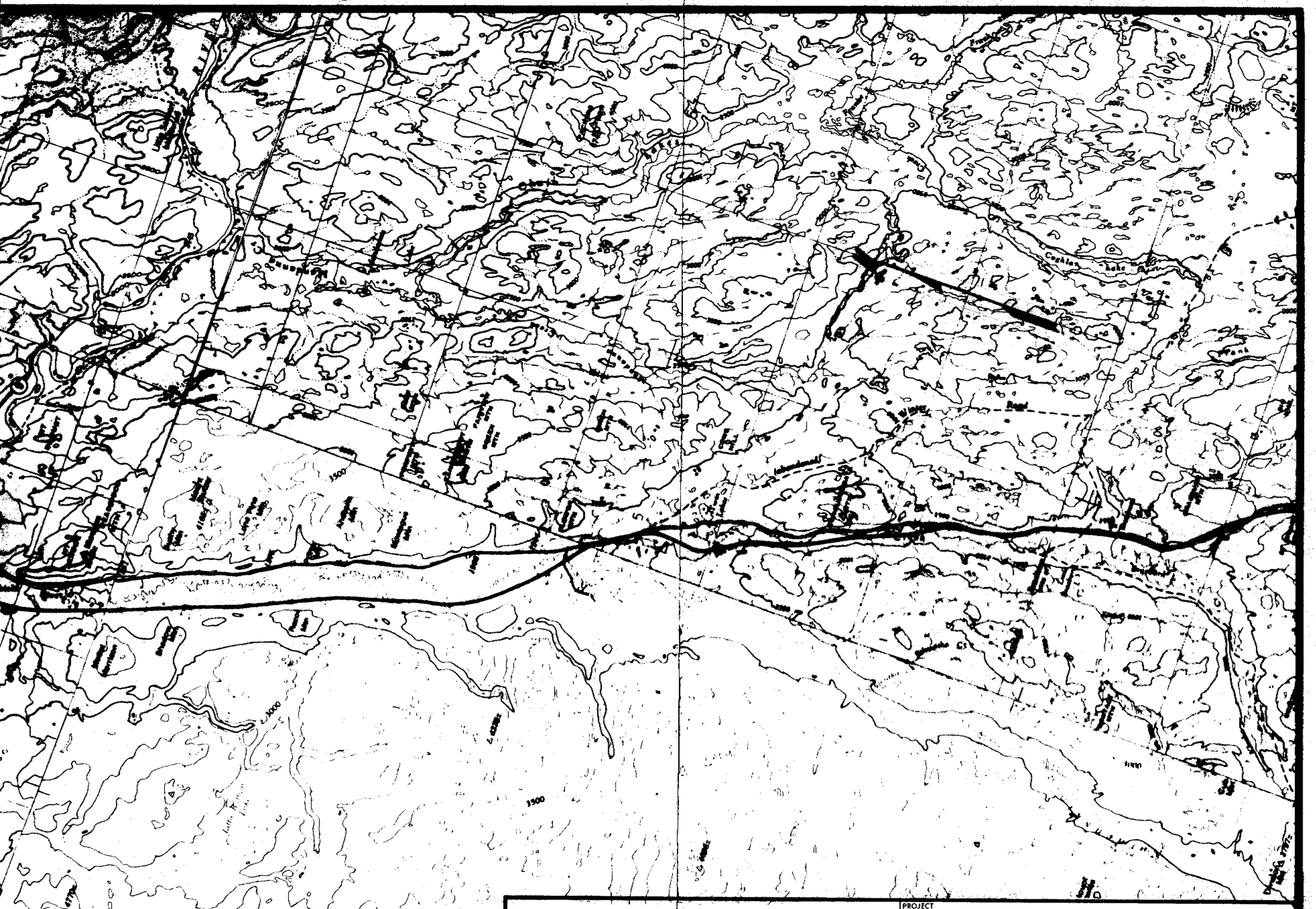
PROJECT
DEMPSTER LATERAL DRILLING PROGRAM

TITLE
TEST HOLE LOCATION PLAN

DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
Oct 1978	AL 1023	1	

APPROVED A Edgeworth


RAABE'S HILLS
MILLER'S RIDGE
101
2000
3000
4000



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

CLIENT: FOOTHILLS PIPE LINES (YUKON) LTD

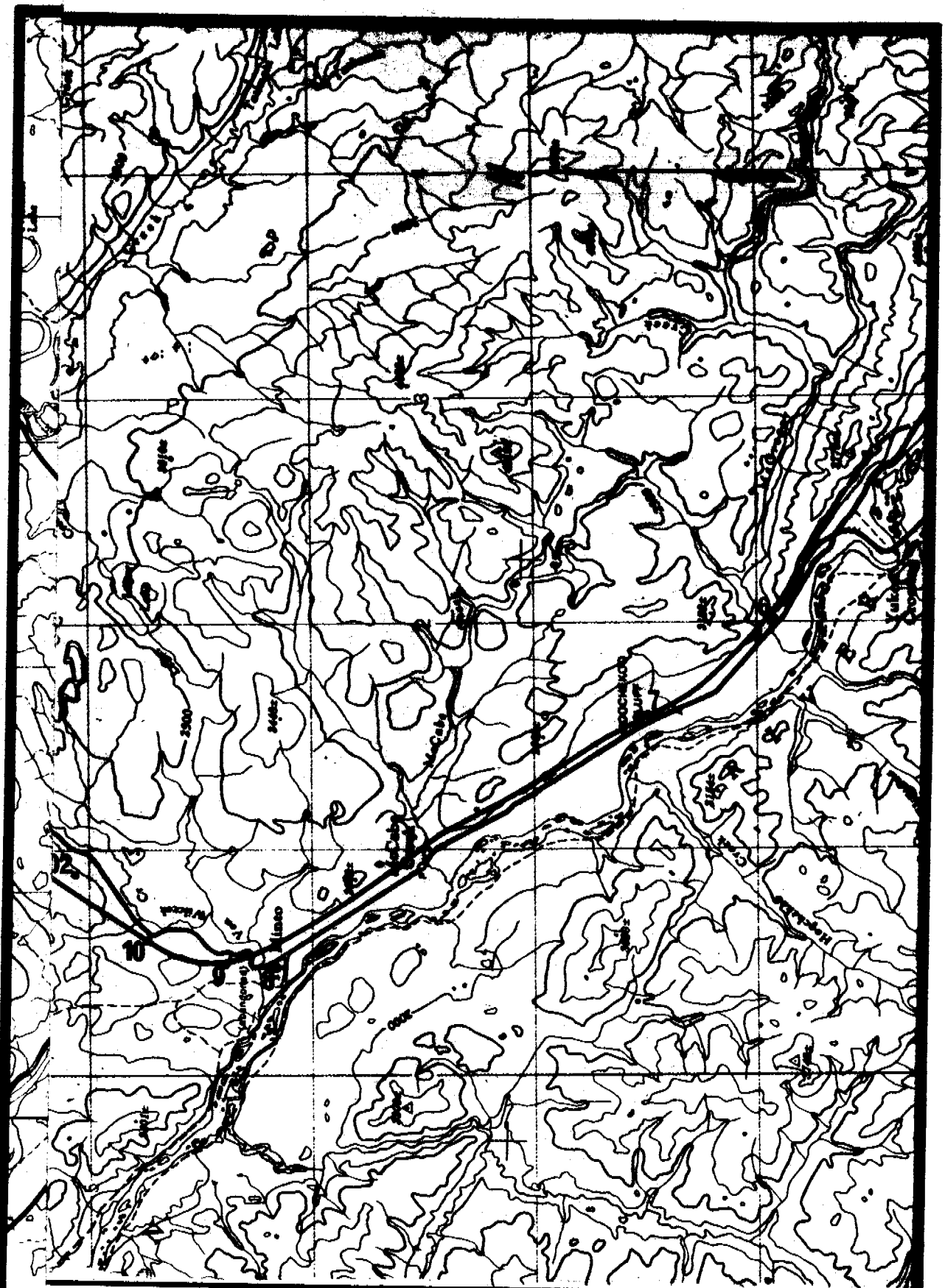
PROJECT: DEMPSTER LATERAL DRILLING PROGRAM

TITLE: TEST HOLE LOCATION PLAN

DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
Oct 1978	AL 1023	1	

APPROVED A Edgeworth


E ME
D MD
Hill
Ridge
Creek
Trail
Mine
Lake
Spring
Cabin
Tank
Road
Pass
Peak
Mt.
Gap
Flat
Valley
Canyon
Basin
Meadow
Forest
Station
Ranger
Campground
Picnic
Parking
Bridge
Dam
Reservoir
Pond
Marsh
Swamp
Cliff
Rock
Boulder
Sand
Gravel
Dune
Beach
Shore
Island
Bay
Harbor
Port
Airport
Runway
Hangar
Tower
Light
Buoy
Channel
Anchorage
Mooring
Dock
Pier
Wharf
Jetty
Breakwater
Seawall
Levee
Ditch
Canal
Aqueduct
Tunnel
Bridge
Overpass
Underpass
Interchange
Ramp
Toll
Gate
Fence
Wall
Building
House
Barn
Shed
Garage
Silo
Windmill
Tower
Antenna
Transmitter
Receiver
Satellite
Dish
Solar
Panel
Battery
Generator
Transformer
Substation
Power
Line
Pole
Tower
Wire
Cable
Pipeline
Valve
Meter
Gauge
Sensor
Camera
Monitor
Alarm
Siren
Horn
Bell
Whistle
Flag
Pole
Sign
Post
Marker
Buoy
Beacon
Light
Reflector
Mirror
Lens
Prism
Filter
Shutter
Aperture
Focus
Zoom
Pan
Tilt
Roll
Yaw
Pitch
Gyro
Accelerometer
Magnetometer
Barometer
Thermometer
Hygrometer
Anemometer
Rain
Gauge
Snow
Gauge
Wind
Vane
Cup
Propeller
Turbine
Blade
Hub
Nacelle
Tower
Foundation
Anchor
Guy
Wire
Insulator
Conductor
Fuse
Switch
Breaker
Relay
Contactor
Motor
Starter
Drive
Gear
Belt
Pulley
Shaft
Bearing
Coupling
Clutch
Brake
Spring
Damper
Shock
Absorber
Mount
Bracket
Clamp
Screw
Bolt
Nut
Washer
Rivet
Weld
Solder
Braze
Glue
Adhesive
Tape
Seal
Gasket
O-Ring
Lubricant
Grease
Oil
Filter
Element
Housing
Cover
Lid
Door
Hatch
Window
Glass
Frame
Sash
Screen
Vent
Louver
Duct
Fan
Blower
Compressor
Pump
Motor
Engine
Turbine
Rotor
Stator
Armature
Field
Coil
Magnet
Core
Yoke
Pole
Piece
Gap
Flux
Density
Permeability
Reluctance
Inductance
Capacitance
Resistance
Impedance
Admittance
Conductance
Susceptance
Reactance
Voltage
Current
Power
Energy
Work
Force
Torque
Speed
Velocity
Acceleration
Mass
Weight
Density
Volume
Area
Length
Width
Height
Depth
Thickness
Diameter
Radius
Circumference
Perimeter
Angle
Degree
Radian
Sine
Cosine
Tangent
Cotangent
Secant
Cosecant
Arc
Chord
Tangent
Normal
Vector
Scalar
Matrix
Determinant
Inverse
Transpose
Eigenvalue
Eigenvector
Singular
Value
Decomposition
Least
Squares
Regression
Correlation
Covariance
Variance
Standard
Deviation
Mean
Median
Mode
Range
Quartile
Percentile
Histogram
Frequency
Probability
Distribution
Normal
Gaussian
Poisson
Binomial
Exponential
Uniform
Chi-Square
Student
F
Test
Hypothesis
Confidence
Interval
Error
Bias
Precision
Accuracy
Resolution
Sensitivity
Specificity
Noise
Signal
Filter
Low-Pass
High-Pass
Band-Pass
Band-Stop
Notch
Comb
Adaptive
Kalman
Wiener
Fourier
Transform
Inverse
Discrete
Fast
Short-Time
Wavelet
Laplace
Z
Bilinear
Impulse
Response
Step
Ramp
Sine
Wave
Square
Triangle
Sawtooth
Pulse
Train
Modulation
Amplitude
Frequency
Phase
Pulse-Width
Pulse-Position
Pulse-Code
Delta
Sigma
Quantization
Sampling
Nyquist
Aliasing
Anti-Aliasing
Reconstruction
Interpolation
Decimation
Multirate
Polyphase
Filter
Bank
Subband
Coding
Compression
Lossless
Lossy
Entropy
Huffman
Arithmetic
Run-Length
Dictionary
LZW
Deflate
Gzip
Zip
Tar
Archive
Backup
Restore
Mirror
Replicate
Synchronize
Version
Control
Git
Commit
Branch
Merge
Rebase
Tag
Release
Build
Compile
Link
Assemble
Debug
Profile
Optimize
Refactor
Test
Unit
Integration
System
Acceptance
Regression
Coverage
Continuous
Integration
Deployment
Pipeline
Container
Docker
Image
Registry
Kubernetes
Cluster
Node
Pod
Service
Ingress
Volume
Secret
ConfigMap
Namespace
Deployment
StatefulSet
DaemonSet
Job
CronJob
Helm
Chart
Values
Template
Repository
Package
Dependency
Lockfile
Manifest
Vendor
Module
Import
Export
Interface
Class
Object
Method
Property
Field
Constructor
Destructor
Inheritance
Polymorphism
Encapsulation
Abstraction
Generic
Template
Trait
Mixin
Decorator
Annotation
Reflection
Introspection
Serialization
Deserialization
Marshalling
Unmarshalling
Protocol
Buffer
Schema
Evolution
Backward
Forward
Compatibility
Migration
Rollback
Transaction
Isolation
Level
Deadlock
Lock
Mutex
Semaphore
Condition
Variable
Thread
Process
Fork
Join
Spawn
Kill
Signal
Handler
Interrupt
Timer
Clock
Tick
Epoch
Timestamp
Duration
Interval
Schedule
Cron
Daemon
Service
Unit
Target
Dependency
Socket
Activation
Journal
Log
Rotate
Compress
Archive
Retention
Policy
Quota
Limit
Throttle
Rate
Burst
Token
Bucket
Leaky
Window
Sliding
Fixed
Counter
Gauge
Histogram
Summary
Quantile
Exemplar
Label
Metric
Alert
Rule
Threshold
Hysteresis
Debounce
Silence
Inhibit
Route
Receiver
Webhook
Email
Slack
PagerDuty
Opsgenie
Dashboard
Panel
Graph
Table
Heatmap
Flame
Trace
Span
Context
Propagation
Header
Baggage
Sampler
Exporter
Collector
Agent
Sidecar
Mesh
Envoy
Proxy
Upstream
Downstream
Load
Balancer
Round
Robin
Least
Connections
Weighted
Consistent
Hashing
Session
Affinity
Sticky
Failover
Active
Passive
Health
Check
Liveness
Readiness
Startup
Probe
Graceful
Shutdown
Drain
Connection
Pool
Keep-Alive
Timeout
Retry
Backoff
Jitter
Circuit
Breaker
Bulkhead
Fallback
Hedge
Request
Response
Status
Code
Method
GET
POST
PUT
PATCH
DELETE
HEAD
OPTIONS
TRACE
CONNECT
Header
Body
Query
Parameter
Path
Segment
Fragment
Scheme
Host
Port
Authority
URI
URL
URN
Encoding
Percent
Base64
Hex
Binary
Text
JSON
XML
YAML
TOML
CSV
TSV
Protobuf
Avro
Thrift
MessagePack
CBOR
Schema
Validation
Parse
Format
Pretty
Print
Minify
Compact
Indent
Whitespace
Comment
Key
Value
Array
Object
Null
Boolean
Number
String
Integer
Float
Double
Decimal
Precision
Scale
Overflow
Underflow
NaN
Infinity
Epsilon
Machine
Unit
Roundoff
Condition
Number
Stability
Convergence
Divergence
Iteration
Tolerance
Residual
Gradient
Descent
Newton
Raphson
Secant
Bisection
Interpolation
Extrapolation
Spline
Cubic
Linear
Quadratic
Polynomial
Chebyshev
Lagrange
Hermite
Bezier
B-Spline
NURBS
Knot
Control
Point
Weight
Basis
Function
Degree
Order
Clamped
Uniform
Open
Periodic
Rational
Non-Uniform
Surface
Patch
Tessellation
Mesh
Vertex
Edge
Face
Normal
Tangent
Binormal
Curvature
Torsion
Frenet
Serret
Arc
Length
Parameterization
Reparameterization
Offset
Blend
Fillet
Chamfer
Trim
Extend
Intersect
Union
Difference
Boolean
Operation
Solid
Modeling
Constructive
Geometry
Primitive
Sweep
Loft
Revolve
Extrude
Pattern
Mirror
Scale
Rotate
Translate
Transform
Matrix
Homogeneous
Coordinate
Projection
Perspective
Orthographic
Isometric
Dimetric
Trimetric
Oblique
Cavalier
Cabinet
Axonometric
Camera
Model
View
Clip
Plane
Near
Far
Field
Of
View
Aspect
Ratio
Viewport
Screen
Space
World
Space
Object
Space
Eye
Space
Clip
Space
Normalized
Device
Coordinate
Rasterization
Fragment
Shader
Vertex
Shader
Geometry
Shader
Tessellation
Control
Evaluation
Compute
Shader
Pipeline
Stage
Input
Assembler
Primitive
Assembly
Clipping
Culling
Back-Face
Front-Face
Winding
Order
Clockwise
Counter-Clockwise
Depth
Buffer
Stencil
Buffer
Color
Buffer
Framebuffer
Attachment
Texture
Sampler
Mipmap
Anisotropic
Filtering
Bilinear
Trilinear
Nearest
Neighbor
Wrap
Clamp
Repeat
Mirror
Border
Color
Level
Of
Detail
Lod
Bias
Gradient
Derivative
Partial
Finite
Difference
Forward
Backward
Central
Second
Order
Laplacian
Divergence
Curl
Green's
Theorem
Stokes'
Theorem
Gauss'
Theorem
Divergence
Theorem
Line
Integral
Surface
Integral
Volume
Integral
Flux
Circulation
Potential
Conservative
Field
Scalar
Potential
Vector
Potential
Helmholtz
Decomposition
Irrotational
Solenoidal
Harmonic
Function
Laplace's
Equation
Poisson's
Equation
Heat
Equation
Wave
Equation
Schrodinger
Equation
Boundary
Value
Problem
Initial
Value
Problem
Dirichlet
Neumann
Robin
Mixed
Boundary
Condition
Finite
Element
Method
Mesh
Refinement
Adaptive
Error
Estimate
Residual
Weak
Form
Galerkin
Petrov
Basis
Function
Shape
Function
Stiffness
Matrix
Mass
Matrix
Load
Vector
Assembly
Boundary
Element
Method
Finite
Difference
Method
Explicit
Implicit
Crank-Nicolson
Upwind
Lax-Wendroff
Courant
Stability
Condition
Cfl
Time
Step
Spatial
Step
Grid
Staggered
Collocated
Pressure
Velocity
Navier-Stokes
Incompressible
Compressible
Viscous
Inviscid
Laminar
Turbulent
Reynolds
Number
Mach
Number
Prandtl
Number
Nusselt
Number
Grashof
Number
Rayleigh
Number
Boundary
Layer
Thickness
Displacement
Momentum
Shape
Factor
Drag
Lift
Coefficient
Pressure
Skin
Friction
Form
Induced
Wave
Parasite
Profile
Airfoil
Wing
Span
Chord
Aspect
Ratio
Taper
Sweep
Dihedral
Winglet
Tip
Vortex
Trailing
Edge
Leading
Edge
Stall
Angle
Of
Attack
Camber
Thickness
Ratio
Naca
Series
Four-Digit
Five-Digit
Six-Digit
Symmetric
Cambered
Reflex
Flap
Slat
Aileron
Elevator
Rudder
Trim
Tab
Spoiler
Control
Surface
Hinge
Moment
Actuator
Servo
Linkage
Pushrod
Bellcrank
Torque
Tube
Cable
Pulley
Fairlead
Stop
Limit
Switch
Position
Sensor
Encoder
Resolver
Synchro
Potentiometer
Hall
Effect
Optical
Magnetic
Capacitive
Inductive
Eddy
Current
Ultrasonic
Radar
Lidar
Sonar
Gps
Inertial
Navigation
Unit
Attitude
Heading
Reference
System
Ahrs
Imu
Gyroscope
Accelerometer
Magnetometer
Barometer
Altimeter
Airspeed
Indicator
Pitot
Static
Tube
Vane
Angle
Sideslip
Flight
Data
Recorder
Black
Box
Telemetry
Downlink
Uplink
Command
Control
Station
Ground
Operator
Pilot
Autopilot
Mode
Waypoint
Route
Mission
Plan
Geofence
Boundary
Altitude
Hold
Heading
Hold
Speed
Hold
Navigate
Loiter
Return
Home
Land
Takeoff
Abort
Failsafe
Lost
Link
Battery
Low
Critical
Emergency
Kill
Switch
Arm
Disarm
Preflight
Check
Calibration
Compass
Accelerometer
Level
Horizon
Gyro
Drift
Bias
Temperature
Compensation
Vibration
Isolation
Damping
Resonance
Natural
Frequency
Damping
Ratio
Overshoot
Settling
Time
Rise
Time
Steady
State
Error
Transient
Response
Step
Response
Impulse
Response
Frequency
Response
Bode
Plot
Nyquist
Plot
Nichols
Chart
Root
Locus
Pole
Zero
Gain
Margin
Phase
Margin
Crossover
Frequency
Bandwidth
Roll-Off
Decade
Octave
Decibel
Logarithmic
Linear
Scale
Axis
Label
Title
Legend
Grid
Tick
Mark
Figure
Subplot
Plot
Scatter
Line
Bar
Stem
Stairs
Area
Pie
Contour
Surface
Mesh
Waterfall
Ribbon
Quiver
Feather
Compass
Rose
Polar
Semilogx
Semilogy
Loglog
Errorbar
Boxplot
Violin
Swarm
Strip
Jitter
Density
Kernel
Smoothing
Bandwidth
Rug
Ecdf
Qq
Pp
Residual
Leverage
Cook's
Distance
Influence
Outlier
Robust
Huber
Tukey
Bisquare
Ransac
Hough
Transform
Accumulator
Voting
Peak
Detection
Non-Maximum
Suppression
Canny
Sobel
Prewitt
Roberts
Laplacian
Of
Gaussian
Difference
Of
Gaussian
Scale
Space
Pyramid
Gaussian
Laplacian
Harris
Shi-Tomasi
Fast
Brief
Orb
Sift
Surf
Akaze
Kaze
Brisk
Freak
Daisy
Lbp
Hog
Haar
Cascade
Adaboost
Random
Forest
Decision
Tree
Support
Vector
Machine
Kernel
Trick
Linear
Polynomial
Rbf
Sigmoid
Soft
Margin
Hard
Margin
Slack
Variable
Dual
Primal
Lagrange
Multiplier
Karush-Kuhn-Tucker
Sequential
Minimal
Optimization
Platt
Scaling
Isotonic
Regression
Calibration
Curve
Reliability
Diagram
Brier
Score
Log
Loss
Cross
Entropy
Kullback-Leibler
Divergence
Mutual
Information
Entropy
Conditional
Joint
Marginal
Bayes
Theorem
Prior
Posterior
Likelihood
Evidence
Maximum
A
Posteriori
Maximum
Likelihood
Estimation
Expectation
Maximization
Gaussian
Mixture
Model
Hidden
Markov
Model
Viterbi
Forward-Backward
Baum-Welch
Conditional
Random
Field
Crf
Recurrent
Neural
Network
Rnn
Lstm
Gru
Attention
Transformer
Encoder
Decoder
Self-Attention
Multi-Head
Positional
Encoding
Embedding
Token
Vocabulary
Tokenizer
Byte-Pair
Encoding
Wordpiece
Sentencepiece
Unigram
Bpe
Merge
Rule
Special
Token
Padding
Truncation
Masking
Causal
Bidirectional
Pretraining
Fine-Tuning
Transfer
Learning
Zero-Shot
One-Shot
Few-Shot
In-Context
Learning
Prompt
Engineering
Chain
Of
Thought
Reasoning
Tool
Use
Function
Calling
Agent
Loop
Planner
Executor
Memory
Short-Term
Long-Term
Retrieval
Augmented
Generation
Vector
Database
Embedding
Similarity
Search
Approximate
Nearest
Neighbor
Hnsw
Ivf
Product
Quantization
Pq
Opq
Scann
Faiss
Annoy
Milvus
Weaviate
Pinecone
Qdrant
Chroma
Lancedb
Sqlite-Vss
Pgvector
Redis
Search
Hybrid
Bm25
Tf-Idf
Inverse
Document
Frequency
Term
Frequency
Stopword
Stemming
Lemmatization
Porter
Snowball
Lancaster
Wordnet
Synset
Hypernym
Hyponym
Meronym
Holonym
Antonym
Named
Entity
Recognition
Part-Of-Speech
Tagging
Dependency
Parsing
Constituency
Parsing
Coreference
Resolution
Sentiment
Analysis
Topic
Modeling
Latent
Dirichlet
Allocation
Non-Negative
Matrix
Factorization
Word2Vec
Skip-Gram
Continuous
Bag
Of
Words
Glove
Fasttext
Elmo
Bert
Roberta
Distilbert
Albert
Electra
T5
Gpt
Llama
Mistral
Mixtral
Falcon
Bloom
Opt
Palm
Gemini
Claude
Whisper
Wav2Vec
Hubert
Tacotron
Fastspeech
Vocoder
Griffin-Lim
Mel
Spectrogram
Mfcc
Chroma
Spectral
Centroid
Bandwidth
Rolloff
Zero-Crossing
Rate
Onset
Detection
Beat
Tempo
Pitch
Tracking
Yin
Pyin
Crepe
Harmonic
Percussive
Separation
Source
Separation
Demucs
Spleeter
Open-Unmix
Audio
Loudness
Lufs
Peak
Rms
Dynamic
Range
Compression
Limiting
Gating
Expander
Sidechain
Ducking
Crossfade
Fade
In
Out
Normalize
Peak
Loudness
Dither
Noise
Shaping
Bit
Depth
Sample
Rate
Wav
Flac
Mp3
Aac
Ogg
Opus
Vorbis
Container
Codec
Lossless
Lossy
Bitrate
Variable
Constant
Vbr
Cbr
Abr
Quality
Factor
Psychoacoustic
Masking
Threshold
Bark
Scale
Mel
Scale
Erb
Scale
Gammatone
Cochlear
Model
Auditory
Filterbank
Spectrogram
Cochleagram
Correlogram
Autocorrelation
Cepstrum
Liftering
Delta
Delta-Delta
Dynamic
Features
Cmvn
Mean
Variance
Normalization
Feature
Extraction
Front-End
Back-End
Acoustic
Model
Language
Model
Decoder
Beam
Search
Width
Pruning
Lattice
Wfst
Composition
Determinization
Minimization
Epsilon
Removal
Weight
Pushing
Shortest
Path
Forward
Algorithm
Backward
Algorithm
Viterbi
Algorithm
Baum-Welch
Algorithm
Em
Algorithm
Gradient
Descent
Stochastic
Mini-Batch
Batch
Learning
Rate
Schedule
Warm-Up
Cosine
Annealing
Step
Decay
Exponential
Decay
Polynomial
Decay
Cyclical
Learning
Rate
One-Cycle
Policy
Momentum
Nesterov
Adam
Adamw
Adagrad
Adadelta
Rmsprop
Lamb
Lion
Sophia
Shampoo
Kfac
Natural
Gradient
Fisher
Information
Hessian
Second
Order
Quasi-Newton
Bfgs
L-Bfgs
Conjugate
Gradient
Trust
Region
Line
Search
Armijo
Wolfe
Backtracking
Exact
Inexact
Step
Size
Direction
Search
Coordinate
Descent
Block
Coordinate
Alternating
Minimization
Proximal
Operator
Soft
Thresholding
Hard
Thresholding
Lasso
Ridge
Elastic
Net
Group
Lasso
Sparse
Group
Lasso
Fused
Lasso
Total
Variation
Denoising
Compressed
Sensing
Restricted
Isometry
Property
Null
Space
Property
Coherence
Mutual
Coherence
Recovery
Guarantee
Basis
Pursuit
Matching
Pursuit
Orthogonal
Matching
Pursuit
Cosamp
Iht
Amp
Vamp
Gamp
Message
Passing
Belief
Propagation
Factor
Graph
Sum-Product
Max-Product
Junction
Tree
Clique
Separator
Moralization
Triangulation
Elimination
Ordering
Treewidth
Variable
Elimination
Sampling
Monte
Carlo
Markov
Chain
Metropolis-Hastings
Gibbs
Slice
Hamiltonian
Langevin
Dynamics
Mala
Rwmh
Importance
Sampling
Rejection
Sampling
Adaptive
Rejection
Sampling
Particle
Filter
Sequential
Monte
Carlo
Resampling
Multinomial
Stratified
Systematic
Residual
Effective
Sample
Size
Degeneracy
Rao-Blackwellization
Control
Variate
Antithetic
Variate
Quasi-Monte
Carlo
Sobol
Halton
Faure
Niederreiter
Low-Discrepancy
Sequence
Star
Discrepancy
Koksma-Hlawka
Inequality
Integration
Quadrature
Gauss
Legendre
Gauss-Hermite
Gauss-Laguerre
Clenshaw-Curtis
Fejer
Romberg
Trapezoidal
Simpson
Newton-Cotes
Adaptive
Quadrature
Error
Estimate
Richardson
Extrapolation
Aitken
Delta-Squared
Wynn
Epsilon
Shanks
Transformation
Padé
Approximant
Continued
Fraction
Lentz
Modified
Lentz
Steed
Backward
Recurrence
Miller
Algorithm
Normalization
Condition
Wronskian
Linear
Independence
Fundamental
Set
Solution
Basis
Variation
Of
Parameters
Undetermined
Coefficients
Annihilator
Method
Laplace
Transform
Inverse
Convolution
Theorem
Initial
Value
Final
Value
Partial
Fraction
Expansion
Heaviside
Cover-Up
Residue
Contour
Integration
Cauchy
Integral
Formula
Residue
Theorem
Jordan's
Lemma
Keyhole
Contour
Branch
Cut
Riemann
Surface
Analytic
Continuation
Meromorphic
Pole
Essential
Singularity
Removable
Singularity
Laurent
Series
Taylor
Series
Maclaurin
Series
Radius
Of
Convergence
Ratio
Test
Root
Test
Integral
Test
Comparison
Test
Limit
Comparison
Test
Alternating
Series
Absolute
Convergence
Conditional
Convergence
Power
Series
Fourier
Series
Trigonometric
Orthogonal
Expansion
Sturm-Liouville
Eigenfunction
Eigenvalue
Boundary
Condition
Regular
Singular
Periodic
Separation
Of
Variables
D'Alembert
Solution
Standing
Wave
Traveling
Wave
Dispersion
Relation
Group
Velocity
Phase
Velocity
Wavenumber
Angular
Frequency
Period
Wavelength
Amplitude
Envelope
Modulation
Carrier
Sideband
Bandwidth
Nyquist
Shannon
Sampling
Theorem
Aliasing
Folding
Frequency
Reconstruction
Filter
Ideal
Low-Pass
Sinc
Interpolation
Zero-Order
Hold
First-Order
Hold
Bilinear
Transform
Prewarping
Cutoff
Frequency
Butterworth
Chebyshev
Type
I
Chebyshev
Type
II
Elliptic
Cauer
Bessel
Thomson
Linear
Phase
Group
Delay
Allpass
Minimum
Phase
Maximum
Phase
Mixed
Phase
Spectral
Factorization
Hilbert
Transform
Analytic
Signal
Envelope
Instantaneous
Frequency
Phase
Unwrapping
Wrapped
Phase
Principal
Value



F CONSULTANTS LTD.
HNICAL • HYDRAULIC
ARY - WINNIPEG, CANADA

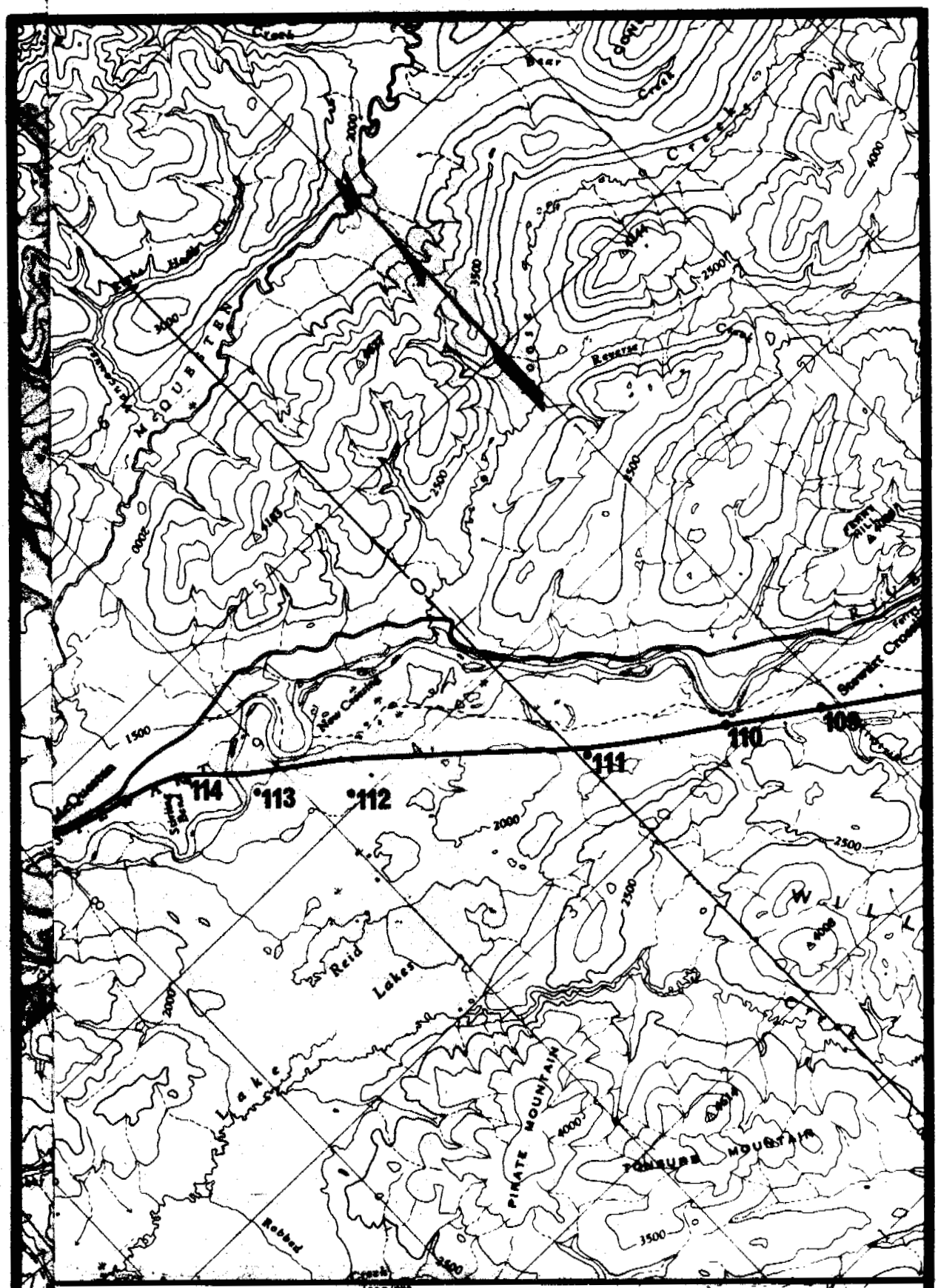
INES (YUKON) LTD

PROJECT
DEMPSTER LATERAL DRILLING PROGRAM

TITLE
TEST HOLE LOCATION PLAN

DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
Oct 1978	AL 1023	2	

APPROVED A Edgeworth



F CONSULTANTS LTD.
HNICAL • HYDRAULIC
ARY - WINNIPEG, CANADA

NES (YUKON) LTD

PROJECT
DEMPSTER LATERAL DRILLING PROGRAM

TITLE
TEST HOLE LOCATION PLAN

DATE OF ISSUE	PROJECT No.	DWG. No.	REV.
Oct 1978	AL 1023	3	
APPROVED A Edgeworth			



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.
Oct 1978	AL 1023	4	
APPROVED A Edgeworth			