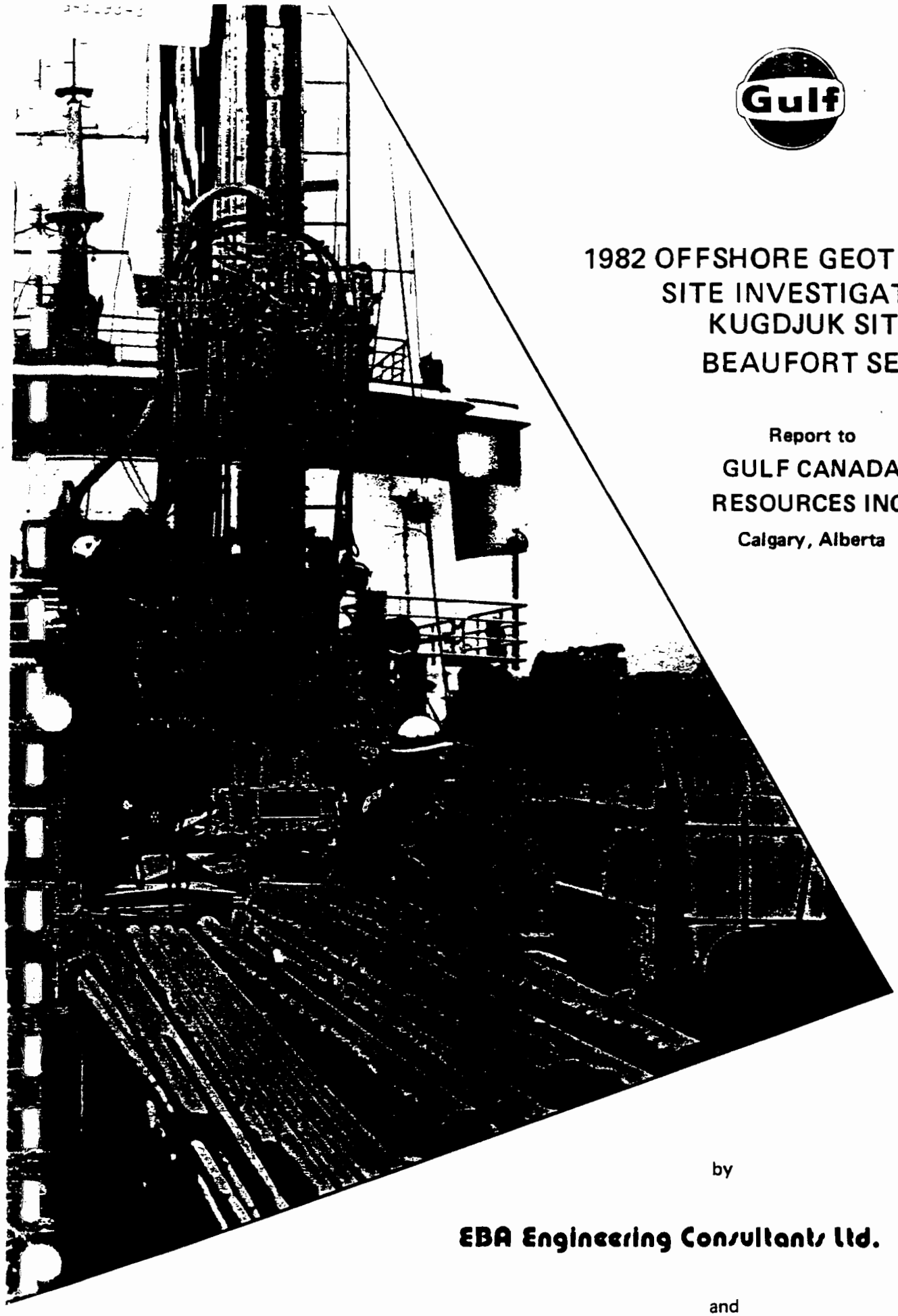

1982 OFFSHORE GEOTECHNICAL SITE INVESTIGATION KUGDJUK SITE BEAUFORT SEA

Report to

GULF CANADA RESOURCES INC.

Calgary, Alberta

by

EBA Engineering Consultants Ltd.

and

McClelland engineers, inc.

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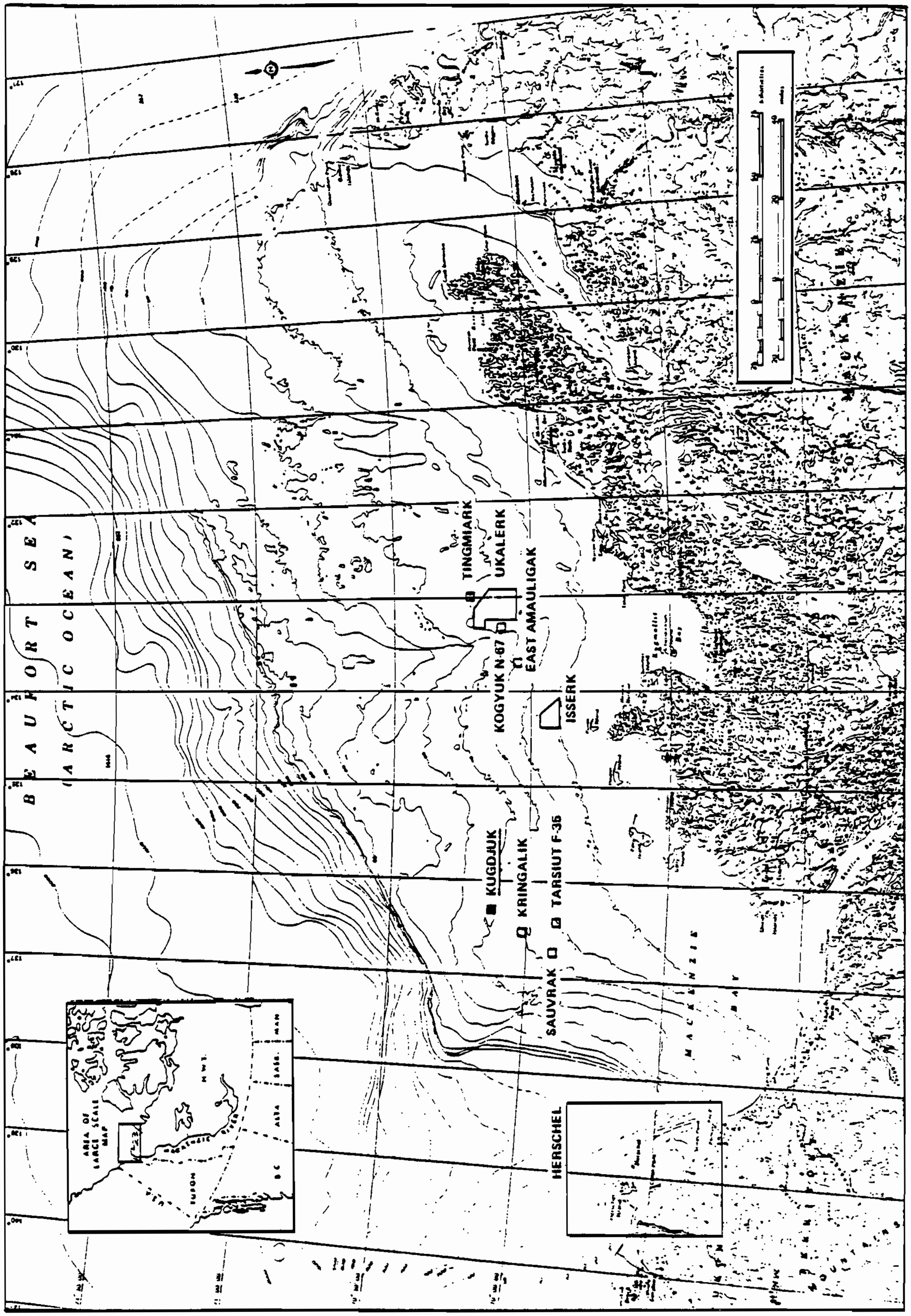
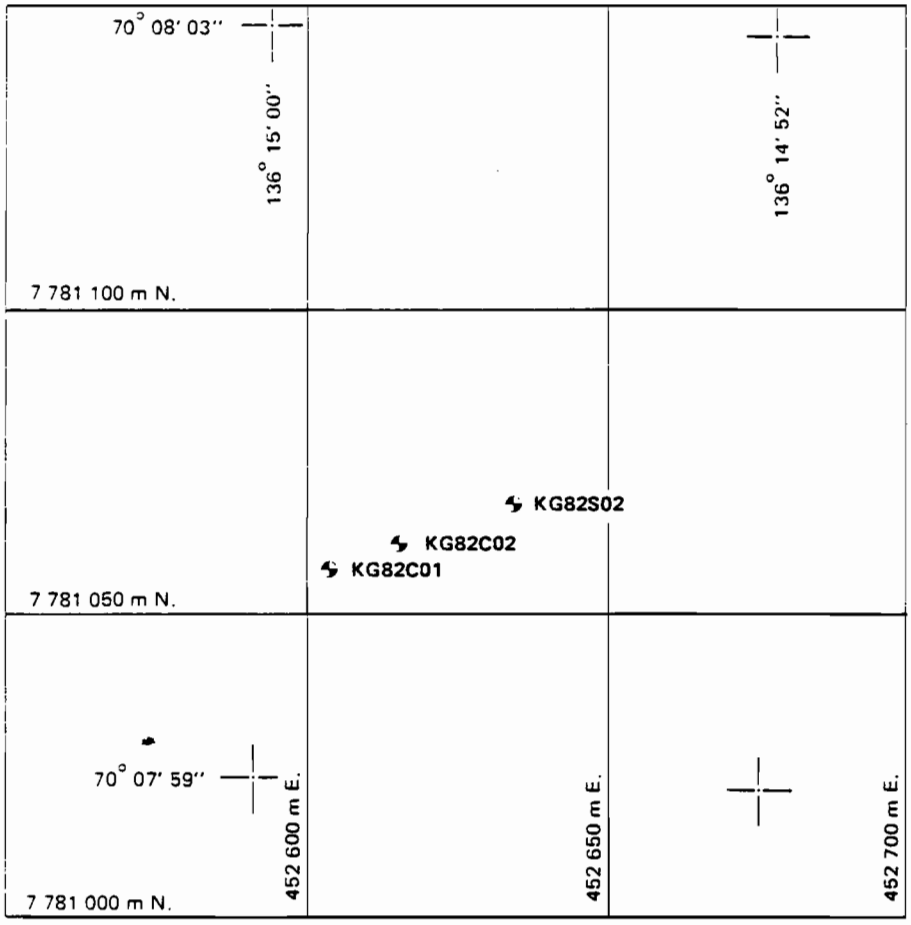


FIGURE 1 GENERAL LOCATION MAP



Note: Locations provided by
Canadian Engineering Surveys Co. Ltd.

FIGURE 2 BOREHOLE LOCATION MAP
KUGDJUK AREA

TABLE 1 SUMMARY OF TEST LOCATIONS

TEST	NO.	LOCATION				DEPTH OF PENETRATION	DATE
		UTM		GEO			
		m.N (UTM ZONE 8)	m.E	LAT. °N	LONG. °W	(m)	(yy-mm-dd)
Cone Test	KG82C01	7 781 060	452 605	70°08'	136°15'	34.0	82-08-06
Cone Test	KG82C02	7 781 060	452 615	70°08'	136°15'	13.0	82-08-06
Sampled Borehole with supplementary Remote Vane tests	KG82S02	7 781 070	452 635	70°08'	136°15'	52.8	82-08-07

Note: 1. All positions supplied by CES Ltd.

2. KG82 denotes a borehole/probehole at the Kudgdjuk site drilled/tested in 1982. "S" refers to "sampled", "R" refers to "Remote Vane", "C" refer to "static cone", and "P" refers to "pressuremeter". The number following the letter designation is the borehole/probehole number.

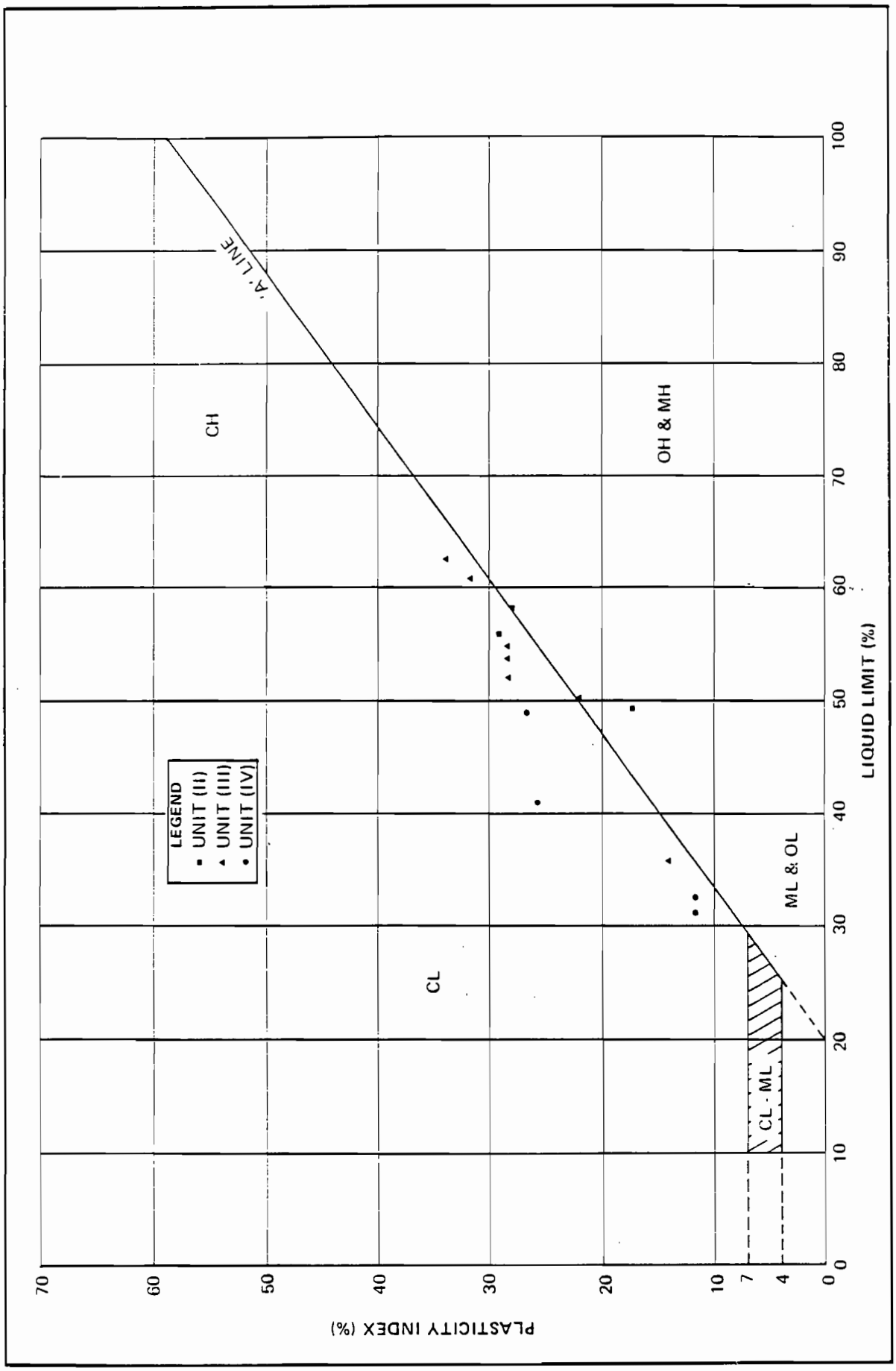


FIGURE 3 PLASTICITY CHART

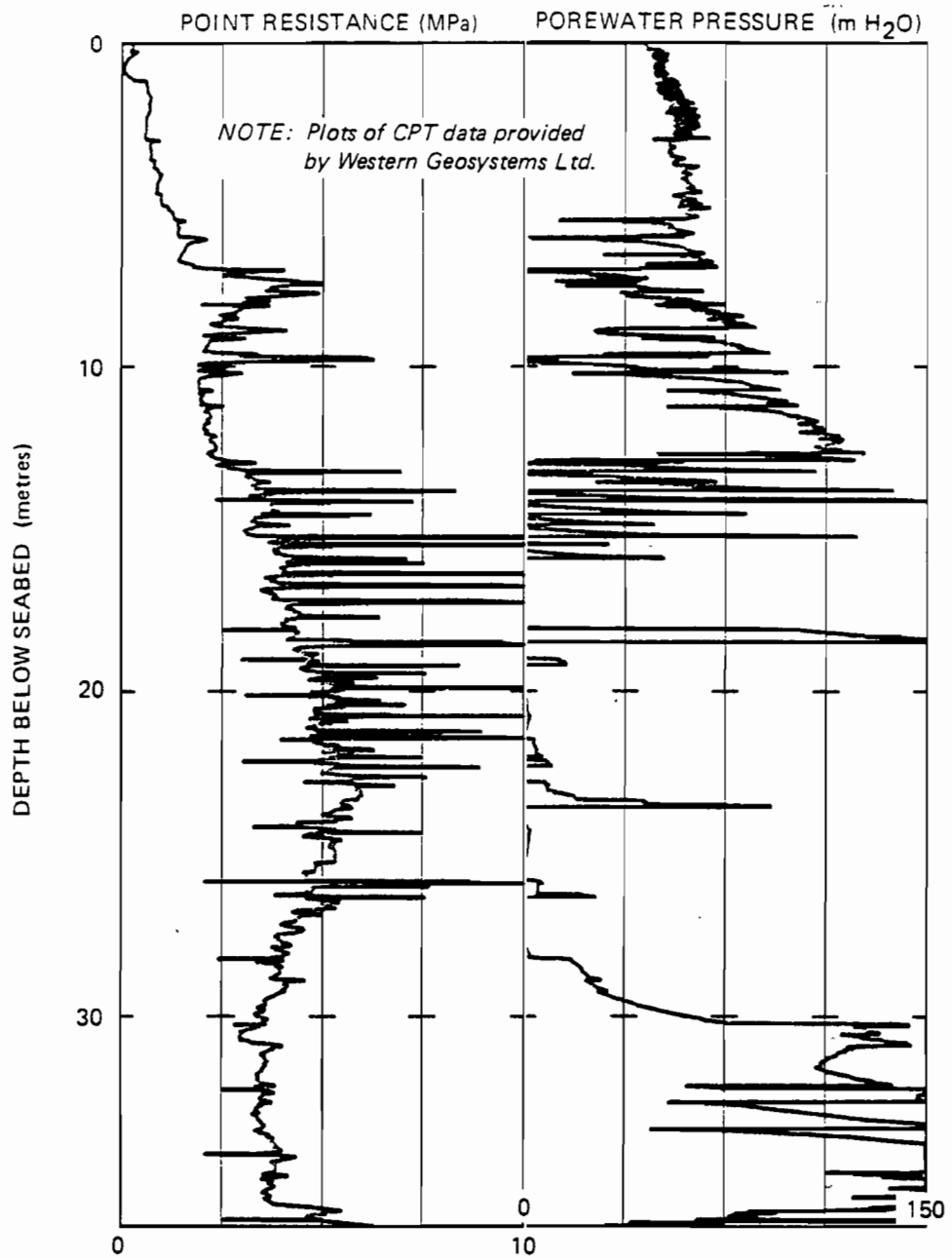


FIGURE 4 CONE PENETRATION TEST PROFILE
TEST KG82C01 - KUGDJUK

APPENDIX A

Borehole Logs

SYSTEM INTERNATIONAL UNITS

QUANTITY	NAME	SYMBOL	EXPRESSED IN TERMS OF OTHER SI UNITS	EXPRESSED IN TERMS OF BASE AND SUPPLEMENTARY UNITS
SI UNITS				
length	metre	m		
mass	kilogram	kg		
time	second	s		
electric current	ampere	A		
thermodynamic temperature	kelvin	K		
amount of substance	mole	mol		
luminous intensity	candela	cd		
SI SUPPLEMENTARY UNITS				
plane angle	radian	rad		
solid angle	steradian	sr		
EXAMPLES OF SI DERIVED UNITS WITH SPECIAL NAMES				
frequency	hertz	Hz	1/s	s^{-1}
force	newton	N	$m \cdot kg/s^2$	$m \cdot kg \cdot s^{-2}$
pressure, stress	pascal	Pa	N/m^2	$m^{-1} \cdot kg \cdot s^{-2}$
energy, work, quantity of heat	joule	J	$N \cdot m$	$m^2 \cdot kg \cdot s^{-2}$
power, radiant flux	watt	W	J/s	$m^2 \cdot kg \cdot s^{-3}$
EXAMPLES OF SI DERIVED UNITS WITHOUT SPECIAL NAMES				
velocity - linear	metre per second		m/s	$m \cdot s^{-1}$
velocity - angular	(radian per second)		rad/s	$rad \cdot s^{-1}$
acceleration - linear	(metre per second) per second		m/s^2	$m \cdot s^{-2}$
acceleration - angular	(radian per second) per second		rad/s^2	$rad \cdot s^{-2}$
concentration (of amount of substance)	mole per cubic metre		mol/m^3	$mol \cdot m^{-3}$
dynamic viscosity	pascal second		$Pa \cdot s$	$m^{-1} \cdot kg \cdot s^{-1}$
moment of force	newton metre		$N \cdot m$	$m^2 \cdot kg \cdot s^{-2}$
surface tension	newton per metre		N/m	$kg \cdot s^{-2}$
heat flux density, irradiance	watt per square metre		W/m^2	$kg \cdot s^{-3}$
heat capacity, entropy	joule per kelvin		J/K	$m^2 \cdot s^{-2} \cdot K^{-1}$
specific heat capacity, specific entropy	joule per kilogram kelvin		$J/(kg \cdot K)$	$m^2 \cdot s^{-2} \cdot K^{-1}$
specific energy	joule per kilogram		J/kg	$m^2 \cdot s^{-2}$
thermal conductivity	watt per metre kelvin		$W/(m \cdot K)$	$m \cdot kg \cdot s^{-3} \cdot K^{-1}$

OTHER UNITS PERMITTED FOR USE WITH SI

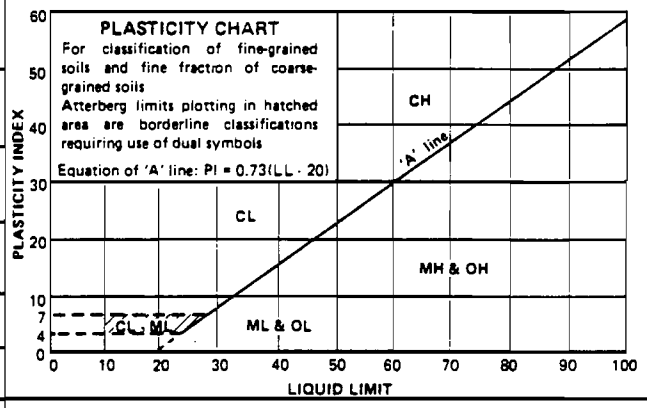
QUANTITY	NAME	SYMBOL	DEFINITION
time	minute	min	1 min = 60 s
	hour	h	1 h = 3,600 s
	day	d	1 d = 86,400 s
	year	a	
plane angle	degree	°	1° = (π/180) rad
	minute	′	1′ = (π/10,800) rad
	second	″	1″ = (π/648,000) rad
area	hectare	ha	1 ha = 10,000 m^2
volume	litre	L	1,000 L = 1 m^3
temperature	degree Celsius	°C	0° C = 273.15° K
			temperature interval 1 C° ≡ 1 K°
mass	tonne	t	1 t = 1,000 kg = 1 Mg

MULTIPLYING FACTOR	PREFIX	SYMBOL	MULTIPLYING FACTOR	PREFIX	SYMBOL
$1,000,000,000,000,000,000 = 10^{18}$	exa	E	$0.1 = 10^{-1}$	deci*	d
$1,000,000,000,000,000 = 10^{15}$	peta	P	$0.01 = 10^{-2}$	centi*	c
$1,000,000,000,000 = 10^{12}$	tera	T	$0.001 = 10^{-3}$	milli	m
$1,000,000,000 = 10^{9}$	giga	G	$0.000,001 = 10^{-6}$	micro	μ
$1,000,000 = 10^{6}$	mega	M	$0.000,000,001 = 10^{-9}$	nano	n
$1,000 = 10^{3}$	kilo	k	$0.000,000,000,001 = 10^{-12}$	pico	p
$100 = 10^{2}$	hecto*	h	$0.000,000,000,000,001 = 10^{-15}$	femto	f
$10 = 10^{1}$	deca*	da	$0.000,000,000,000,000,001 = 10^{-18}$	atto	a

* to be avoided where possible

UNIFIED SOIL CLASSIFICATION†

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve GW, GP, SW, SP More than 12% pass No. 200 sieve GM, GC, SM, SC 5% to 12% pass No. 200 sieve Borderline classification requiring use of dual symbols	$C_U = D_{60}/D_{10}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly-graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below 'A' line or plasticity index less than 4 — Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand clay mixtures		Atterberg limits plot above 'A' line and plasticity index greater than 7
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines		$C_U = D_{60}/D_{10}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			SP	Poorly-graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures		Atterberg limits plot below 'A' line or plasticity index less than 4 — Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above 'A' line and plasticity index greater than 7
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
			CH	Inorganic silts of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity		
HIGHLY ORGANIC SOILS			PT	Peat, muck and other highly organic soils		



*Based on the material passing the 3 in. (75 mm) sieve
†ASTM Designation D 2487, for identification procedure see D 2488

GROUND ICE DESCRIPTION

ICE NOT VISIBLE

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION	
N	Nf	Poorly-bonded or friable	
	Nbn	No excess ice, well-bonded	
	Nbe	Excess ice, well-bonded	

VISIBLE ICE LESS THAN 50% BY VOLUME

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION	
V	Vx	Individual ice crystals or inclusions	
	Vc	Ice coatings on particles	
	Vr	Random or irregularly oriented ice formations	
	Vs	Stratified or distinctly oriented ice formations	

VISIBLE ICE GREATER THAN 50% BY VOLUME

ICE	ICE + Soil Type	Ice with soil inclusions	
	ICE	Ice without soil inclusions (greater than 25 mm (1 in.) thick)	

NOTE:

1. *Dual symbols are used to indicate borderline or mixed ice classifications*
2. *Visual estimates of ice contents indicated on borehole logs ± 5%*
3. *This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes*

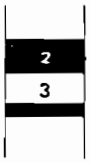
LEGEND

Soil  Ice 

SYMBOLS AND ABBREVIATIONS USED ON BOREHOLE LOGS

SOIL SAMPLE

- represented by sample identification number which increase sequentially from the top of the hole; thickness of block is equivalent to sample recovery



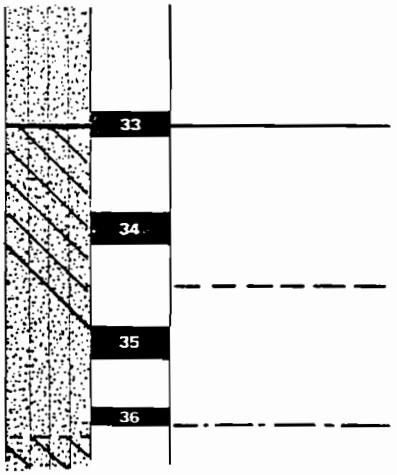
SOIL BOUNDARIES

- have been indicated using the following system

- stratum boundary observed within sample

- stratum boundary assumed to occur within ± 0.5m of the marked level and is probably gradational between the two samples

- stratum boundary assumed to occur within ± 1.0m of the marked level



- stratum boundary notation for both depth below seabed (41.5 metres) and elevation below sealevel (uncorrected for tides) (-64.6 metres El.)

41.5 (-64.6 El.)

SOIL DESCRIPTION

UNIFIED SOIL CLASSIFICATION — **USC**

- determined in accordance with chart on following page

TEXTURAL DESCRIPTION

- determined in accordance with attached sheet and used to augment Unified Soil Classification

Special terms used include:

e.g. - "becoming trace of/with some CLAY" indicating an overall change in a feature of the stratum not sufficient to change the total description

- "trace of/with some CLAY" indicating small feature displayed in that sample only

MUNSELL COLOUR DESIGNATION

- describing wet grey soil, e.g. (5Y 4/2)

- describing dry grey soil, e.g. (10YR 6/1)

GROUND ICE DESCRIPTION

- determined in accordance with chart on following page; extra effort has been made to better describe the degree and extent of soil bonding and also a value of core temperature (°C) at that level
- see also definition of terms in text

e.g. FROZEN · 2.3
- Nf - Nbn
- poorly to slightly bonded

SAND: Nbn · 2.8
CLAY: not frozen

TEST RESULTS

- see legend at bottom of borehole log

CONSISTENCY

Fine-Grained Soils

Major portion passing No. 200 Sieve. Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silt. Consistency is rated according to shear strength, as indicated by penetrometer readings or vane shear readings.

Descriptive Term	Unconfined Compressive Strength kPa	Equivalent Blows per Foot (N)
Very Soft	less than 25	0 - 2
Soft	25 to 50	2 - 4
Firm	50 to 100	4 - 8
Stiff	100 to 200	8 - 16
Very Stiff	200 to 400	15 - 50
Hard	400 and higher	>50

Coarse-Grained Soils

Major portion retained in No. 200 Sieve. Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

Descriptive Term	Relative Density	Equivalent Blows per foot (N)
Very Loose	0 - 20%	0 - 4
Loose	20 - 40%	4 - 10
Compact or Medium	40 - 75%	10 - 30
Dense	75 - 90%	30 - 50
Very Dense	90 - 100%	50 +

The number of blows (N) on a 2" O.D. split spoon sampler by a 140 lbs. weight falling 30" required to drive the sample a distance of 1' (in accordance with ASTM D1586).

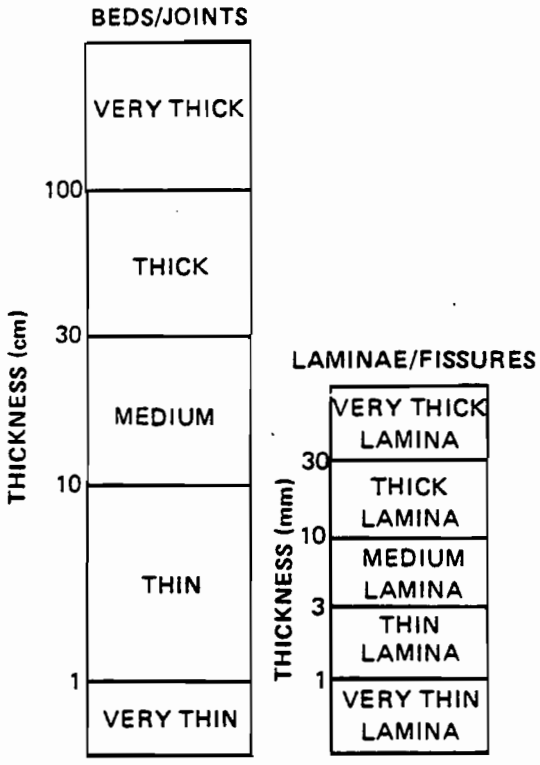
PLASTICITY

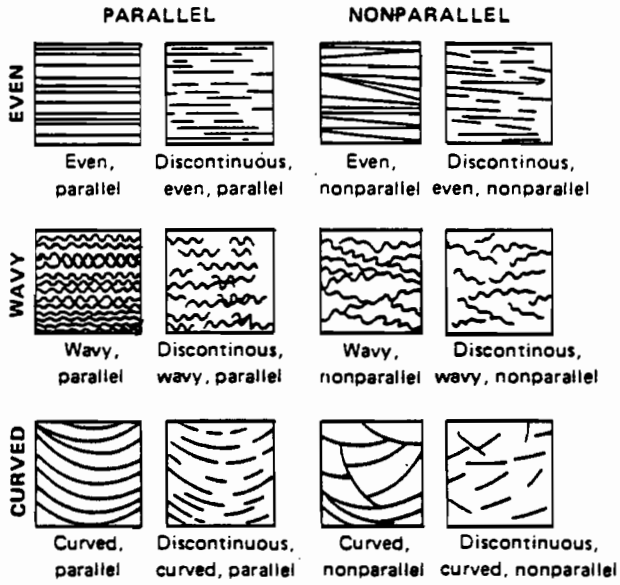
Low - Liquid limit less than 50
High - Liquid limit greater than 50

DESCRIPTION OF SEDIMENTARY STRUCTURES

BEDS SEDIMENTATION UNITS DEPOSITED UNDER ESSENTIALLY CONSTANT PHYSICAL CONDITIONS, SEPARATED BY BEDDING PLANES WHICH ARE RECOGNIZABLE BY TEXTURAL OR COMPOSITIONAL CHANGES RESULTING FROM PERIODS OF NON-DEPOSITION OR EROSION, OR ABRUPT CHANGES IN DEPOSITIONAL CONDITIONS. BEDS MAY BE INTERNALLY HOMOGENEOUS, OR COMPOSED OF SMALLER UNITS-LAMINAE

LAMINAE THE SMALLEST MEGASCOPIC LAYERS IN A SEDIMENTARY SEQUENCE, REPRESENTING MINOR FLUCTUATIONS IN PHYSICAL CONDITIONS DURING THE DEPOSITION OF BEDS. LAMINAE ARE RELATIVELY UNIFORM IN TEXTURE AND COMPOSITION AND GENERALLY LACK MEGASCOPIC INTERNAL LAYERING.





e.g. Thick bed
Thickly spaced joint

e.g. Thin lamina
Thinly spaced fissures

(After Campbell, 1967)

(Modified after Ingram, 1954 and Campbell, 1967)

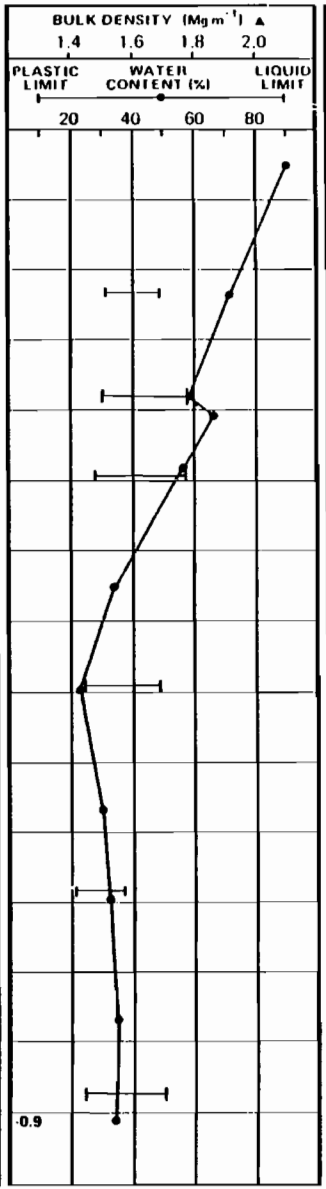
LOCATION: KUGDJUK
UTM COORDINATES: 7 781 070 m. N. 452 635 m. E. WATER DEPTH: 43.6 m

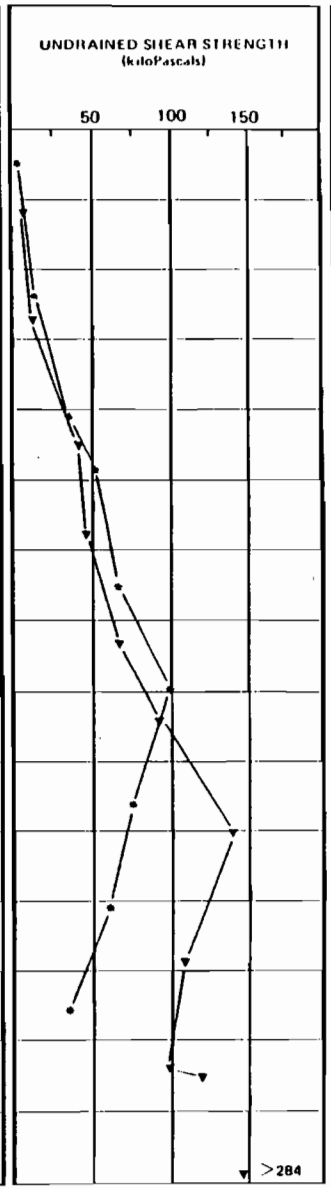
SYM.	NO.	SOIL DESCRIPTION	GROUND ICE
	1	SILTY CLAY (CL) - low plasticity, very soft, probably remoulded, dark grey	NOT FROZEN
		1.3 m (-44.9 m El.)	
	2	CLAY (CL) - occasionally silty, thinly banded at surface, becoming thinly laminated with a trace of silt at 3.9 m depth, low plasticity, soft to firm	
	3	- trace of silt, trace of shell fragments, thinly laminated, dark grey	
	4	- horizontal thin black silt beds; parallel, slightly curved continuous laminations	
	6		
	6	- some silt, firm to stiff, thin parallel silt bands, brown	
	7	- silty, occasional black discontinuous laminations, low plasticity, stiff, dark grey	
		10.0 m (-53.6 m El.)	
	8	CLAYEY SILT (ML) - with straight thin parallel even laminations and darker occasional thin beds c. 10 mm thick, stiff, dark grey to black	
	9	- low plasticity, firm	
		13.2 m (-56.8 m El.)	
	10	SILTY CLAY (CL) - with thin parallel even laminations, high plasticity, stiff to very stiff, dark grey	
			13.7 m (-57.3 m El.) Vs 1% partially frozen 1 mm ice lens at 14.0 m clear 6 mm ice lens at 14.3 m clear

DEPTH BELOW SEABED (metres)

1 2 3 4 5 6 7 8 10 11 12 13 14 15

-1.6 -1.5 -0.8 -1.1 -0.4 -0.4 +1.2 -1.4 -0.5 -0.9





SPECIALIZED TESTS: S S S,G S,TD

JOB No.: 101 - 3657
DRILLING COMPLETED: 82/08/09
BOREHOLE DEPTH: 52.8 (-96.4 m El.)
DRILLING RIG: S5000/MV BRODERICK
LOG COMPILED BY: JPR

LEGEND

SOIL SYMBOLS: SAND SILT CLAY

SHEAR STRENGTH
+ Torvane ● Fall Cone
× Min. Vane ▲ UU Triaxial
• Pilcon Vane ■ CU Triaxial
○ Halibut Vane ▼ Remote Insitu Vane

TEST IDENTIFICATION
C - Consolidation I - Triaxial Shear
DS - Direct Shear S - P.W. Salinity
TD - TDR G - Gas Analysis
Ca - Calorimetry

BOREHOLE NUMBER KG 82 S02

PAGE 2 OF 2

BOREHOLE LOG AND LABORATORY TEST RESULTS

LOCATION: KUGDJUK
UTM COORDINATES: 7 781 070 m. N. 462 636 m. E. WATER DEPTH: 43.6 m

SYM	NO.	SOIL DESCRIPTION	GROUND ICE
	1	SILTY CLAY (CL) - low plasticity, very soft to soft, probably remoulded, dark grey — 1.3 m (-44.9 m El.)	NOT FROZEN -1.6
	2	CLAY (CL) - occasionally silty, thinly banded at surface, becoming thinly laminated with a trace of silt at 3.9 m depth, low plasticity, soft to firm - trace of silt, trace of shell fragments, thinly laminated, dark grey - horizontal thin black silt beds, parallel slightly curved continuous laminations	-1.5 -0.8 -1.1
	3		-0.4
	4	- some silt, firm to stiff, thin parallel silt bands, brown	-0.4
	5	- silty, occasional black discontinuous laminations, low plasticity, stiff, dark grey — 10.0 m (-53.6 m El.)	+1.2
	6	CLAYEY SILT (ML) - with straight thin parallel even laminations and darker occasional thin beds c. 10 mm thick, stiff, dark grey to black	1.4
	7	— 13.2 m (-56.8 m El.)	0.6
	8		12.7 m (-57.3 m El.) 0.0
	9		Vr 1% PARTIALLY FROZEN
	10		1 mm ice lens at 14.0 m clear
	11	SILTY CLAY (CH) - with thin parallel even laminations, high plasticity, stiff to very stiff, dark grey *open interval to 10' suspect bad weather*	
	12	SILT and CLAY (CL) - 16.7 m (-60.3 m El.)	5 mm ice lens at 14.3 m clear Ice + 40% soil 15.2 m to 15.4 m
	13	with thin parallel even discontinuous laminations and less distinct thin beds, very stiff, dark grey, low plasticity	+0.4
	14	SILTY CLAY (CL) - with thin parallel even discontinuous laminations of black material, firm to stiff, dark grey to black, low plasticity	Mbn becoming Mbn FROZEN Ice lens at 20.0 m, clear
	15		Vr 6%, becoming Mbn
	16	(CH) - with thin parallel even discontinuous laminations and occasional lenses of black material, stiff, dark grey to black high plasticity *- return to 5' intervals*	3 mm ice lens at 26.4 m clear 0.1
	17		-0.7
	18	SILT and CLAY (CL/ML) - firm, dark grey	Vr trace, including broken ice fragments 1.6
	19	SILTY CLAY (CH) - with thin parallel laminations, stiff, high plasticity, dark grey to black	-1.1
	20	*- driller notes hard layer at 34.9 m*	NOT FROZEN -1.0
	21		37.8 m (-98.0 m El.) 1.2
	22	SANDY SILT (ML) - becoming with some fine sand, some darker thin parallel laminations at 30° to horizontal, dark grey, interbedded with and becoming by 40.0 m (-83.8 m El.)	Mbn FROZEN
	23		
	24	SILTY CLAY (CL) - with trace of fine sand, thinly laminated, dark grey to black, low plasticity, stiff to very stiff	NOT FROZEN
	25	- with black vertical patches	-1.6
	26	Interbedded with: CLAYEY SILT (ML) - with weak horizontal black banding	-2.0
	27		-1.9
	28	*- sample badly damaged during recovery*	
		END OF BOREHOLE — 52.8 m (-96.4 m El.)	

DEPTH BELOW SEABED (metres)

BULK DENSITY (Mg m⁻³) 1.4 1.6 1.8 2.0

PLASTIC LIMIT | WATER CONTENT (%) | LIQUID LIMIT

20 40 60 80

UNDRAINED SHEAR STRENGTH (kPa equiv.)

50 100 150

100 200 300

▲ (THAWED)

▲ (THAWED)

▲ >128

● >128

SPECIALIZED TESTS

S

S

S, G

S, TD

F

S

TD, G

TD

TD, S

TD

S

A, S

S

SLEEVE SKIN FRICTION (MPa)

0 0.4

POINT RESISTANCE (MPa)

0 10

JOB No.: 101-3657
DRILLING COMPLETED: 82/08/09
BOREHOLE DEPTH: 52.8 m (-96.4 m El.)
DRILLING RIG: S5000/MV BRODERICK
LOG COMPILED BY: JPR

LEGEND

SOIL SYMBOLS: SAND, SILT, CLAY

SHEAR STRENGTH: T Torvane; V Mini Vane; P Pocket Vane; H Holmes Vane; ◊ Pat Cone; Δ UU Triaxial; ■ CU Triaxial; ▼ Remote Inside Vane

TEST IDENTIFICATION: C Consolidation; DS Direct Shear; TD TDR; Cc Colorimetry; T Triaxial Shear; E P.W. Salinity; G Gas Analysis

BOREHOLE NUMBER KG 82 502

PAGE 1 OF 2

PENETRATION Test KG82-02

BOREHOLE LOG AND LABORATORY TEST RESULTS

CONE PENETRATION TEST DATA

Geosystems

APPENDIX B

Diagnostic Profiles

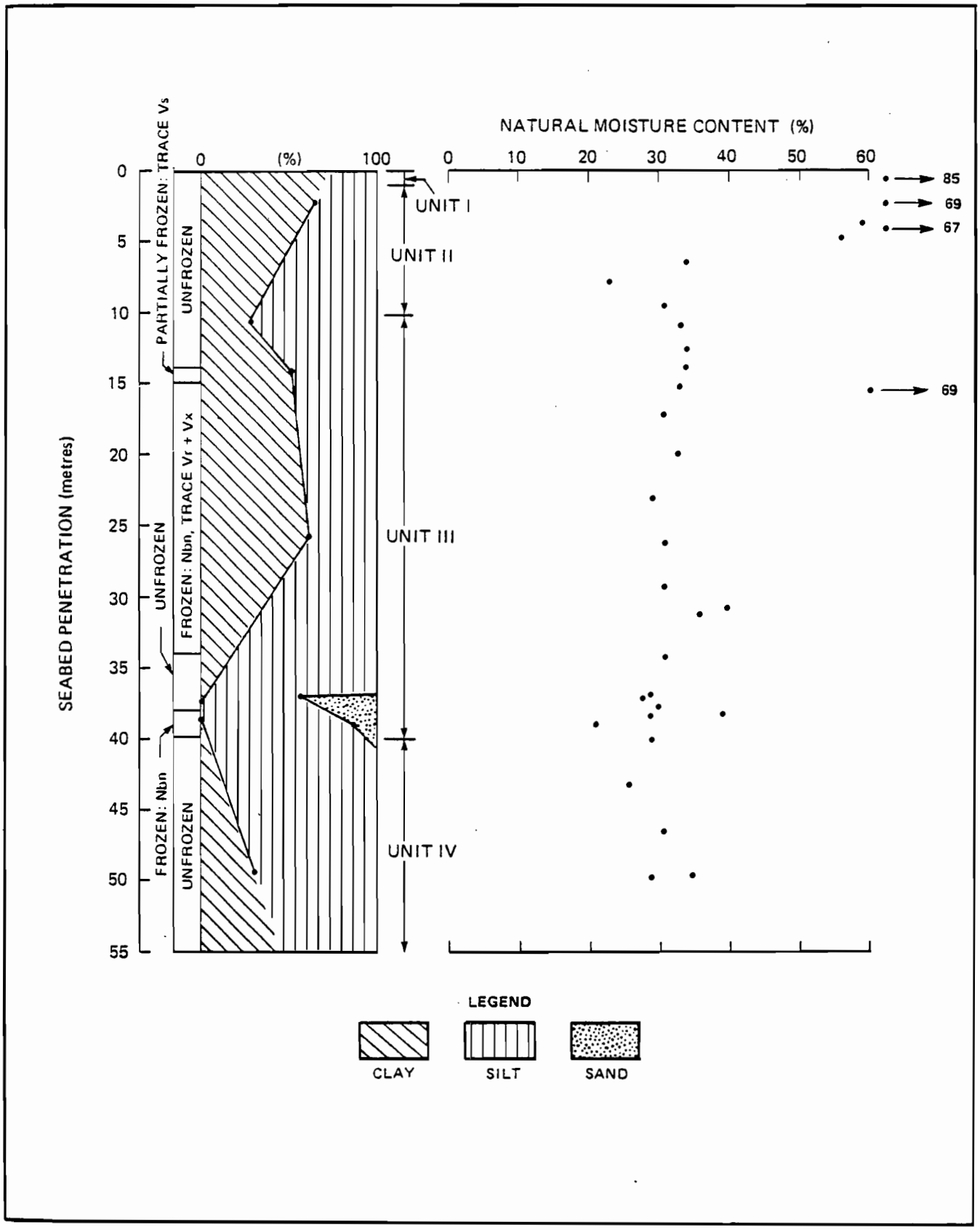


FIGURE B.1 NATURAL MOISTURE CONTENT PROFILE, KUGDJUK AREA

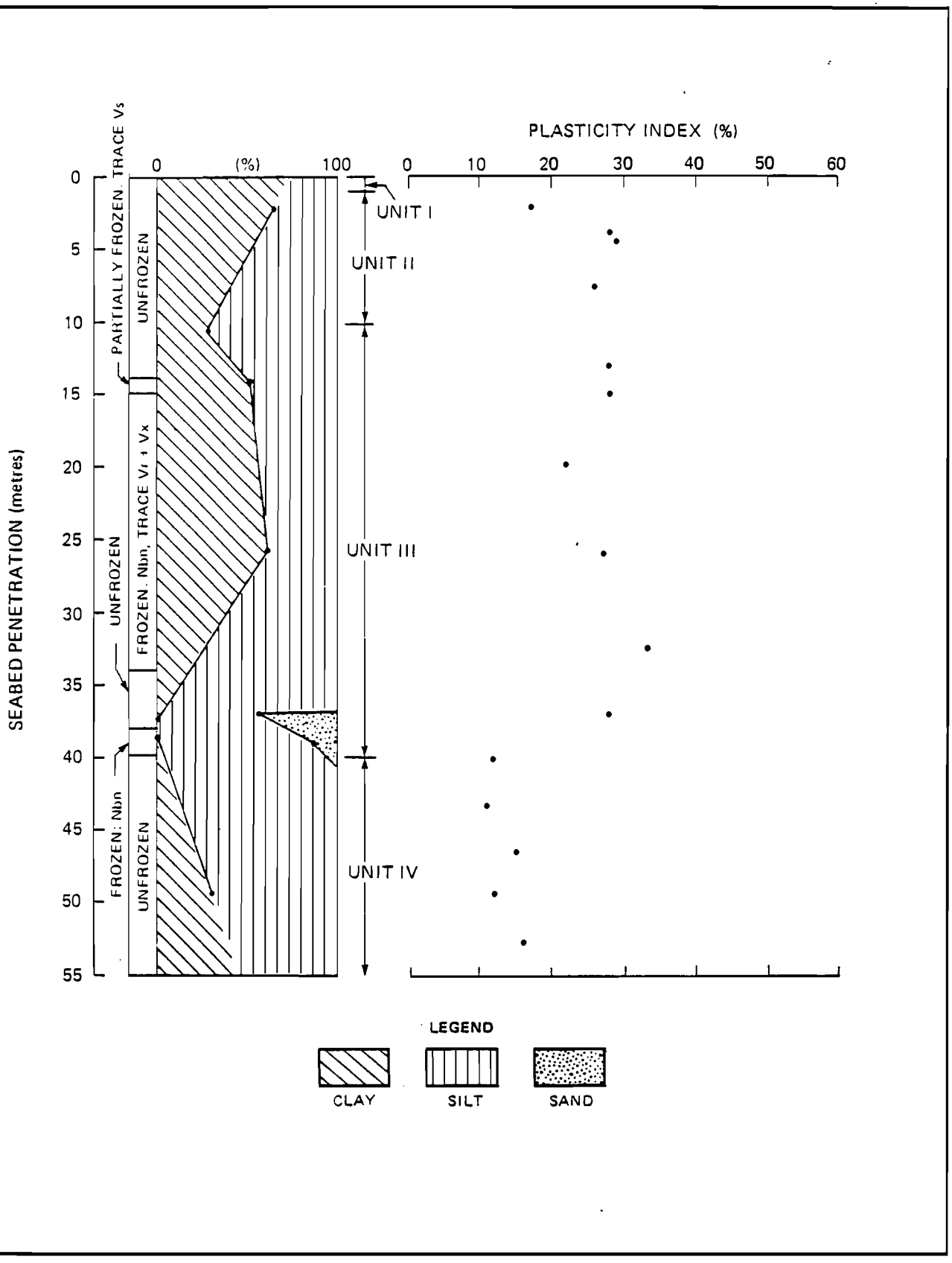


FIGURE B.2 PLASTICITY INDEX PROFILE, KUGDJUK AREA

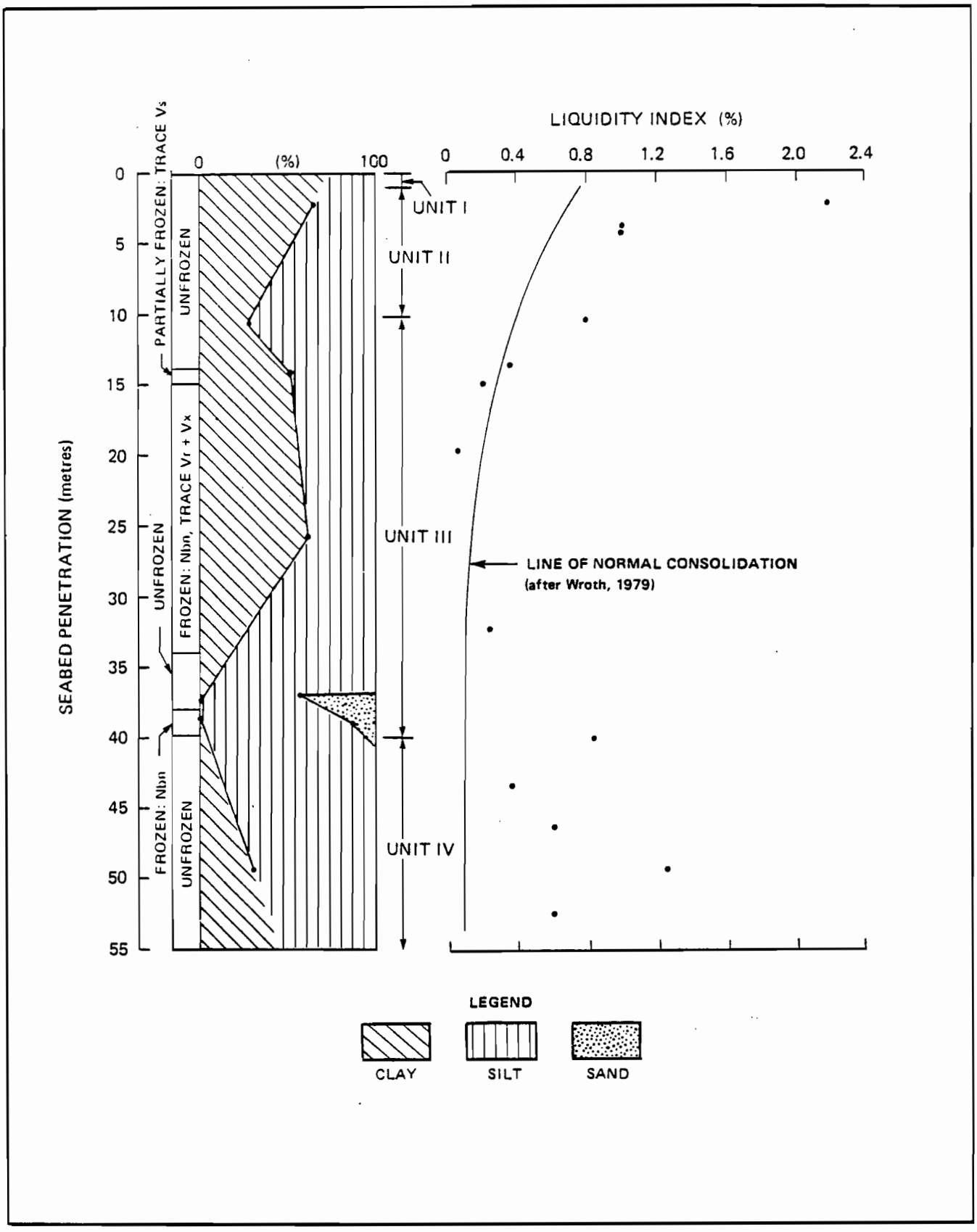


FIGURE B.3 LIQUIDITY INDEX PROFILE, KUGDJUK AREA

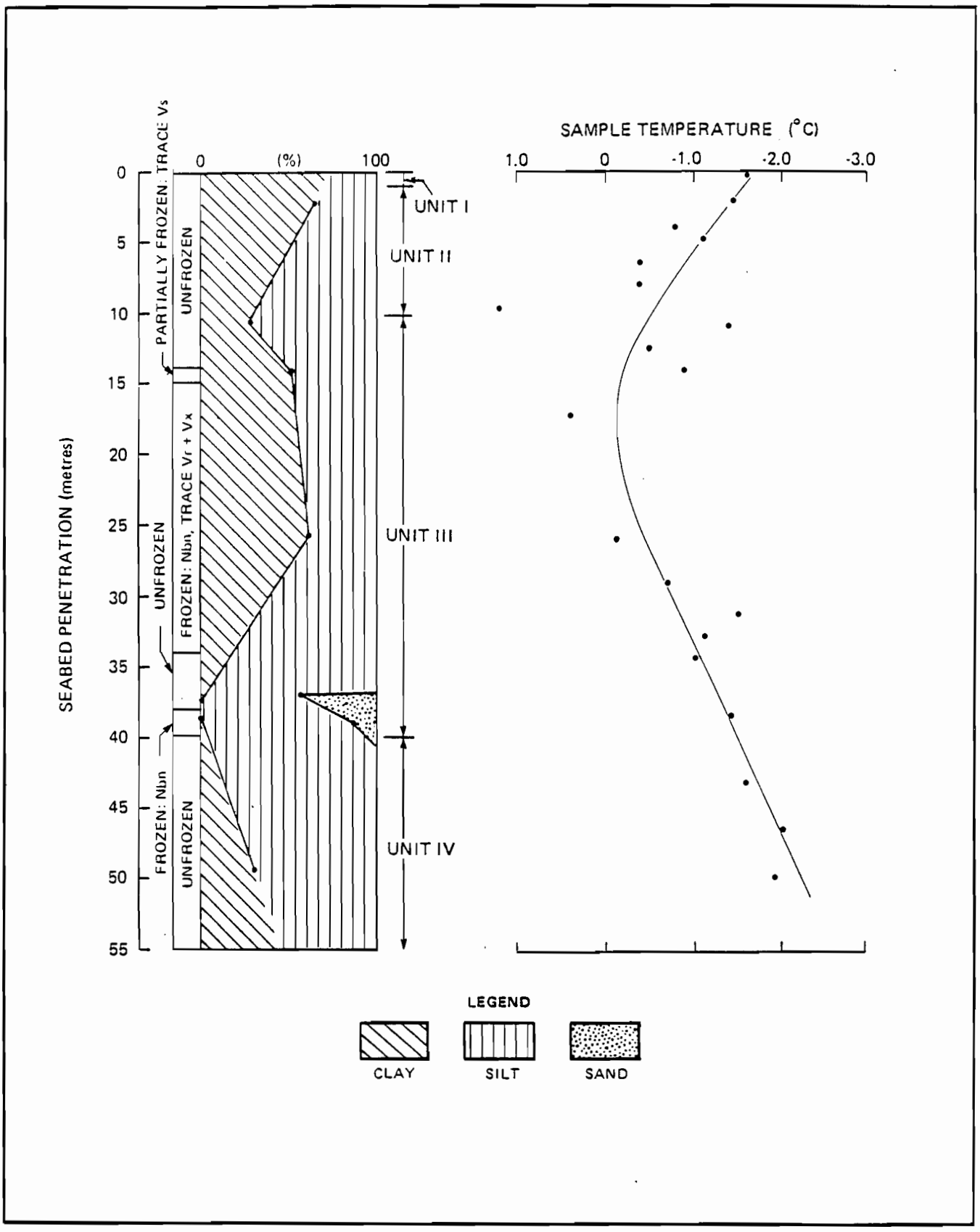


FIGURE B.4 SAMPLE TEMPERATURE PROFILE, KUGDJUK AREA

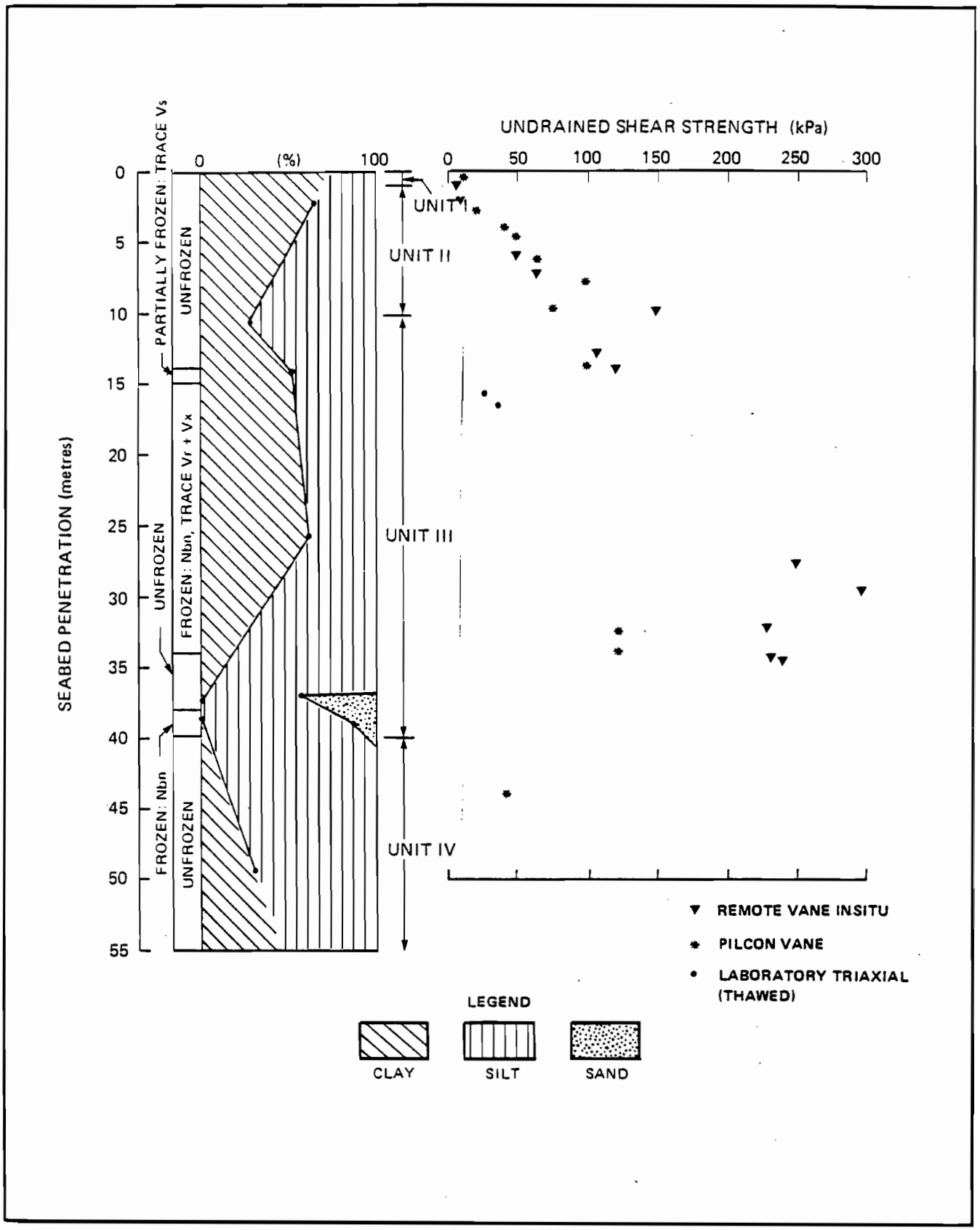


FIGURE B.5 UNDRAINED SHEAR STRENGTH PROFILE, KUGDJUK AREA

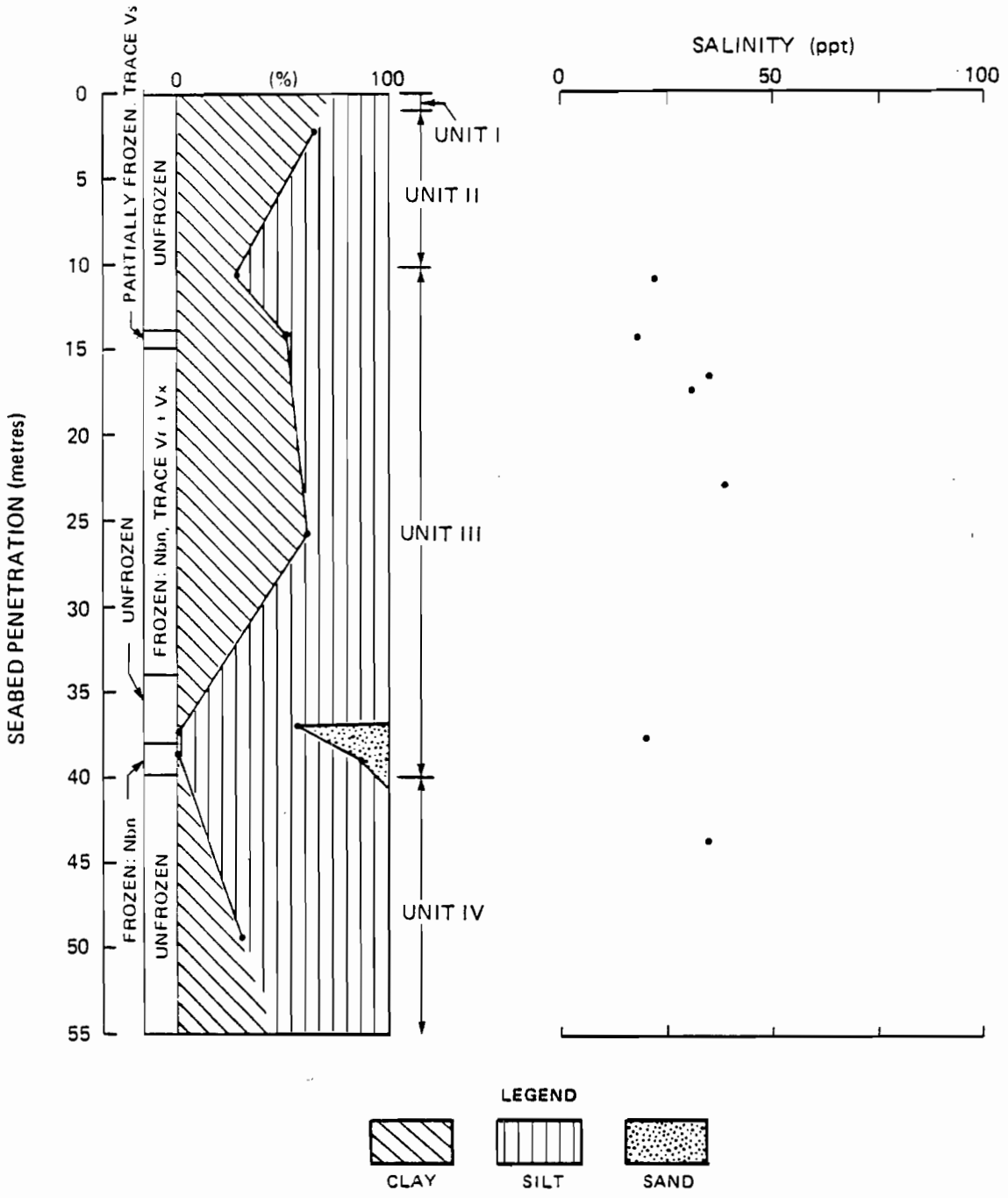


FIGURE B.6 SALINITY PROFILE, KUGDJUK AREA

APPENDIX C

Classification and Index Test Results

SUMMARY OF TEST RESULTS

KG832502

Sample Number	Sample Type	Depth (metres) Sample Interval	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
01A	NS	0.50 - 0.55	CL		-1.6	85																	
01B	B	0.55 - 0.76	CL													PV	14		soft				3.1 S
01C	PF	0.35 - 0.50	CL																				
01D	B	0.00 - 0.35	CL																				
		1.22														RV	6		V.soft				
02A	NS	* 2.34 - 2.42	CL		-1.45	69										PV	12		soft				
02B		* 2.17 - 2.24	CL						49	32	65	35											
		2.74														RV	12		soft				
03A	NS	* 4.06 - 4.11	CL		-0.8	67										PV	34		firm				
03B	B	* 3.89 - 4.06	CL						58	30													
03C	B	* 3.78 - 3.89	CL																				
03D	NS	* 3.72 - 3.78	CL			59																	
		4.27														RV	40+						
04A	NS	4.73 - 4.85	CL		-1.1	56										PV	48		firm				
04B	B	* 4.57 - 4.73	CL						56	27													3.1 S
		5.79														RV	44		firm				
05A	NS	6.48 - 6.53	CL		-0.4	34										PV	65		stiff				
		7.32														RV	66		stiff				
06A	NS	7.95 - 8.00	CL		-0.4	23										PV	96		stiff				
06B	B	* 7.62 - 7.95	CL						49	23													
		8.38														RV	93+						

LEGEND AND NOTES

- B Bag Sample
- G Gas Sample
- L Liner Sample
- P Piston Sample
- NR No Recovery
- NS No Sample Remaining
- PF Permafrost Sample
- PW Porewater Sample
- T Sample Stored in Tube
- W Waxed Sample
- RC Radiocarbon Sample
- MV - Manivane
- FC - Fall Cone
- TV - Torvane
- PV - Pilcon Vane
- RV - Remote Vane
- UD - Unconsolidated Undrained Triaxial
- UUp UU Triaxial with Pore Pressure Measurements
- CU - Consolidated Undrained Triaxial
- CUp CU Triaxial with Pore Pressure Measurements
- CD - Consolidated Drained Triaxial
- O Organic Content
- S - Salinity
- TS - Thaw Strain

Project Number: 101-3657

Reviewed By: _____ P.Eng.

SUMMARY OF TEST RESULTS

KG82S02

Sample Number	Sample Type	Depth (metres) Sample Depth adjusted	Unified Soil Classification	Ground Ice Description (%)	Temp (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
07A	NS	9.61 - 9.70	CL		1.2	31										PV	73		stiff				
07B	B	9.58 - 9.61	CL																				
07C	T	9.14 - 9.58	CL																				
		10.06														RV	143		V.stiff				
08A	NS	10.99 - 11.11	ML		-1.4	33										PV	58		stiff				
08B	G	10.95 - 10.99	ML																				
08C	S	10.83 - 10.95	ML					2.05															22 S
08D	B	* 10.67 - 10.83	ML						36	22	28	72											
		11.89														RV	106		V.stiff				
09A	NS	12.61 - 12.69	ML		-0.5	34										PV	35		firm				
09B	B	12.55 - 12.61	ML																				
09C	T	12.19 - 12.55	ML																				
		13.41														RV	97		stiff				
10A	NS	14.04 - 14.18	CH	Vs 1%	-0.9	34																	
10B		13.93 - 14.00	CH			34	18	1.90															
10C	P,T	14.00 - 14.04	CH																				18 S
10D	B	13.72 - 13.93	CH						52	24	51	49											
		13.56														RV	118		V.stiff				
11A	NS	* 15.39 - 15.43	CH			69																	
11B	NS	* 15.30 - 15.39	CH			33																	
11C	B	15.04 - 15.30	CH						55	27													

LEGEND AND NOTES

- B Bag Sample
- G Gas Sample
- I Liner Sample
- P Piston Sample
- NR No Recovery
- NS No Sample Remaining
- PF Permafrost Sample
- PW Porewater Sample
- T Sample Stored in Tube
- W Waxed Sample
- HC Hydrocarbon Sample
- MV Minivane
- FC Fall Cone
- TV Torvane
- PV Pilcon Vane
- RV Remote Vane
- UU Unconsolidated Undrained Triaxial
- UUp UU Triaxial with Pore Pressure Measurements
- CU Consolidated Undrained Triaxial
- CUp CU Triaxial with Pore Pressure Measurements
- CD Consolidated Drained Triaxial
- O Organic Content
- S Salinity
- TS Thaw Strain

Project Number: 101-3657

Reviewed By: _____ P.Eng.

SUMMARY OF TEST RESULTS

KG82S02

Sample Number	Sample Type	Depth (metres)	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED INTERACTIVELY
																RV	283+						
12A	NS	17.34 - 17.41	CL/ML		0.4	31																	
12B	S	17.24 - 17.34	CL/ML																				3.1 S
12C	T	16.76 - 17.24	CL/ML						56	26	58	40	2			UU	27	15	firm (thawed)				3.5 S
13A	B	20.00 - 20.02	ML			33																	
13B	NS	19.90 - 20.00	ML																				
13C	B	* 19.71 - 19.90	ML						50	28													
14A	NS	23.22 - 23.24	CL	Nbn		29																	
14B	PF	22.86 - 23.22	CL	Vr 5%					57	27	55	39	6			UU	39	15	firm (thawed)				3.8 S
15A	B	* 26.24 - 26.35	ML		-0.12	31		1.95															
15B	B	* 26.35 - 26.43	ML																				
15C	B	* 25.91 - 26.24	ML						61	29	62	38											3.3 S
		26.97														RV	242		hard				
16A	NS	29.19 - 29.34	ML		-0.7	31	3																
16B	S	29.08 - 29.19	ML					1.93															
16C	G	29.03 - 29.08	ML																				
16D	B	* 28.96 - 29.03	ML																				
		29.59														RV	279		hard				
17A	NS	31.25 - 31.32	CL/ML	Vr 5%	-1.5	36	17									PV	85		stiff				
17B	T	30.78 - 31.25	CL/ML																				
		31.70														RV	226		hard				

LEGEND AND NOTES

- B - Bag Sample
- G - Gas Sample
- I - Lime Sample
- P - Piston Sample
- NR - No Recovery
- NS - No Sample Remaining
- PF - Permafrost Sample
- PW - Porewater Sample
- T - Sample Stored in Tube
- W - Waxed Sample
- RC - Radiocarbon Sample
- MV - Minivane
- FC - Fall Cone
- TV - Torvane
- PV - Pilcon Vane
- RV - Remote Vane
- UU - Unconsolidated Undrained Triaxial
- UUp - UU Triaxial with Pore Pressure Measurements
- CU - Consolidated Undrained Triaxial
- CUp - CU Triaxial with Pore Pressure Measurements
- CD - Consolidated Drained Triaxial
- O - Organic Content
- S - Salinity
- TS - Thaw Strain

Project Number: 101-3657

Reviewed By: _____ P.Eng.

SUMMARY OF TEST RESULTS

KG82S02

Sample Number	Sample Type	Depth (metres) Sample Photographed	Unified Soil Classification	Ground Ice Description (%)	Temp (°C)	Moisture Content (%)	Frozen Moisture Content	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (mm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
18A	NS	* 32.77 - 32.84	ML		-1.1	40																	
18B	B	* 32.63 - 32.77	ML																				3.3 S
18C	B	* 32.31 - 32.63	ML				7.5		63	30						PV	120+						
		33.22														RV	237		hard				
19A	NS	34.20 - 34.28	ML		-1.0	31	6									PV	120+						
19B	T	33.83 - 34.20	ML																				
		34.44														RV	252		hard				
20A	NS	* 37.01 - 37.10	ML		-1.2	28						57	43										
20B	NS	* 36.96 - 37.01	ML			29																	
20C	B	* 36.88 - 36.96	ML						53	25													
21A	NS	38.98 - 39.08	ML	Nbn		21																	
21B	PT	37.85 - 37.98	ML																				
21C	B	37.70 - 37.85	ML																				20 S
21D	NS	37.85 - 37.92	ML			35						85	15										
21E	B	37.92 - 38.40	ML																				
22A	NS	38.56 - 38.66	ML			39																	
22B	B	* 38.66 - 38.80	ML																				
22C	NS	38.80 - 38.84	ML			27																	
23A	NS	40.20 - 40.25	ML			29																	
23B	B	40.08 - 40.33	ML						31	19													
24A	G	43.70 - 43.75	ML		-1.6											PV	72		stiff				

LEGEND AND NOTES

B Bag Sample
G Gas Sample
L Liner Sample
P Piston Sample
NR No Recovery
NS No Sample Remaining

PF Permafrost Sample
PW Porewater Sample
T Sample Stored in Tube
W Waxed Sample
RC Radiocarbon Sample

MV Minivane
FC Fall Cone
TV Torvane
PV Pilcon Vane
RV Remote Vane

UU Unconsolidated Undrained Triaxial
UUp UU Triaxial with Pore Pressure Measurements
CU Consolidated Undrained Triaxial
CUp CU Triaxial with Pore Pressure Measurements
CD Consolidated Drained Triaxial

O Organic Content
S Salinity
TS Thaw Strain

Project Number: 101-3657

Reviewed By: _____ P.Eng.

SUMMARY OF TEST RESULTS

KG82S02

Sample Number	Sample Type	Depth (metres) *Sample Photographed	Unified Soil Classification	Ground Ice Description (%)	Temp. (°C)	Moisture Content (%)	Frozen Moisture Content (%)	Bulk Density (Mgm^{-3})	ATTERBERG LIMITS: Liquid Limit (%)	ATTERBERG LIMITS: Plastic Limit (%)	GRAIN SIZE DISTRIBUTION: Clay (%)	Silt (%)	Sand (%)	Gravel (%)	D_{50} (μm)	SHEAR STRENGTH: Test	Shear Strength (kPa)	Failure Strain (%)	Consistency	CONSOLIDATION CHARACTERISTICS: P_o (kPa)	P_c (kPa)	C_c	TEST RESULTS TABULATED SEPARATELY
24B	S	43.60 - 43.70	ML																				35 S
24C	NS	43.54 - 43.60	ML			26																	
24D	B	* 43.33 - 43.54	ML						33	22													
25A	NS	46.50 - 46.60	CL		-2.0	31																	
25B	B	* 46.32 - 46.50	CL						37	22													
26A	NS	* 49.72 - 49.82	CL		-1.9	29																	
26B	NS	* 49.66 - 49.72	CL			35																	
26C	B	49.38 - 49.66	CL						32	20	20	80											3.5 S
27A	B	52.43 - 52.75	CL						41	25													

LEGEND AND NOTES

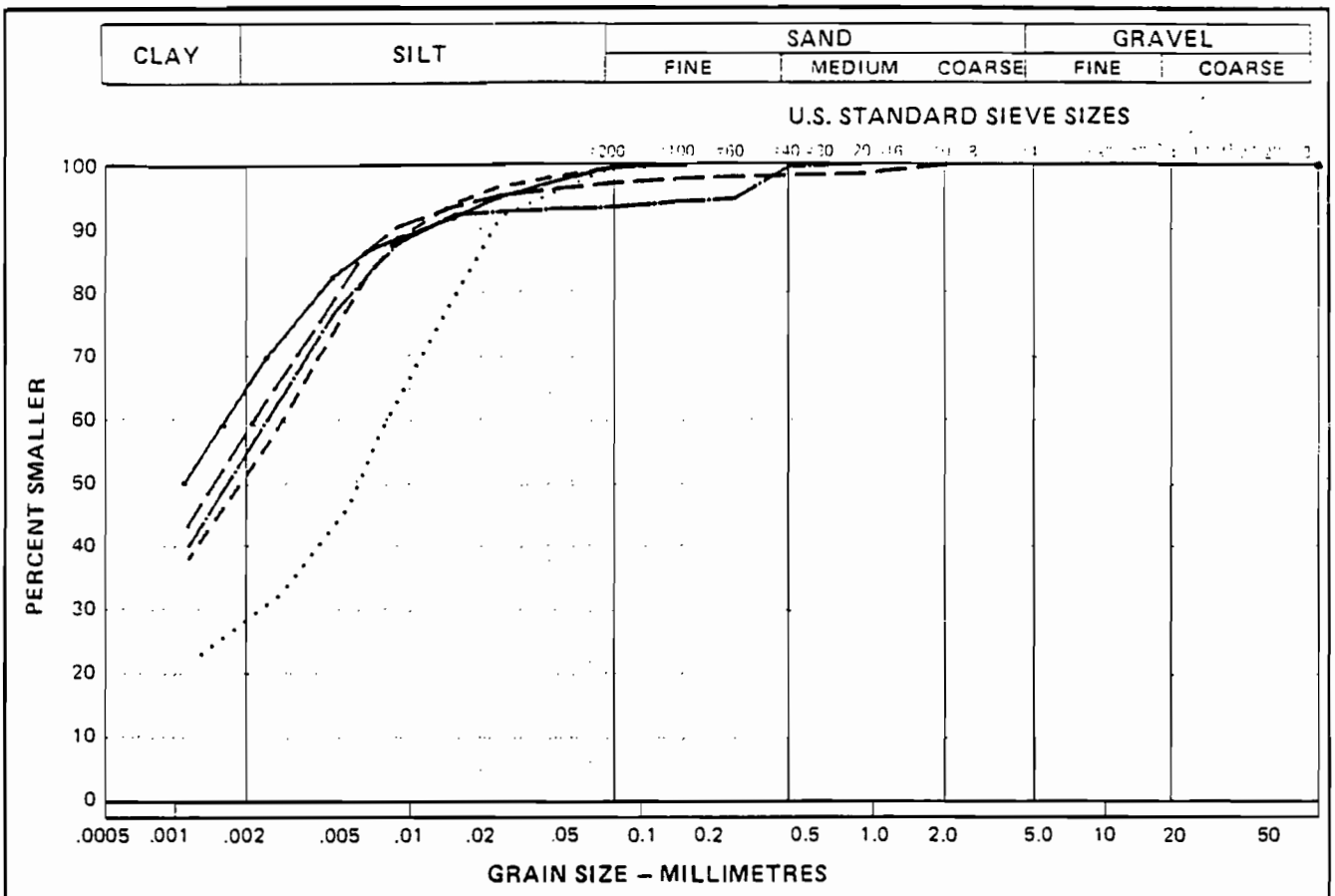
B	Bag Sample	PF	Permafrost Sample	MV	Minivane	UU	Unconsolidated Undrained Triaxial
G	Gas Sample	PW	Porewater Sample	FC	Fall Cone	UUp	UU Triaxial with Pore Pressure Measurements
L	Liner Sample	T	Sample Stored in Tube	TV	Torvane	CU	Consolidated Undrained Triaxial
P	Piston Sample	W	Waxed Sample	PV	Pilcon Vane	CUp	CU Triaxial with Pore Pressure Measurements
NR	No Recovery	RC	Radiocarbon Sample	RV	Remote Vane	CD	Consolidated Drained Triaxial
NS	No Sample Remaining						

O · Organic Content
S · Salinity
TS · Thaw Strain

Project Number: 101-3657

Reviewed By: _____ P.Eng.

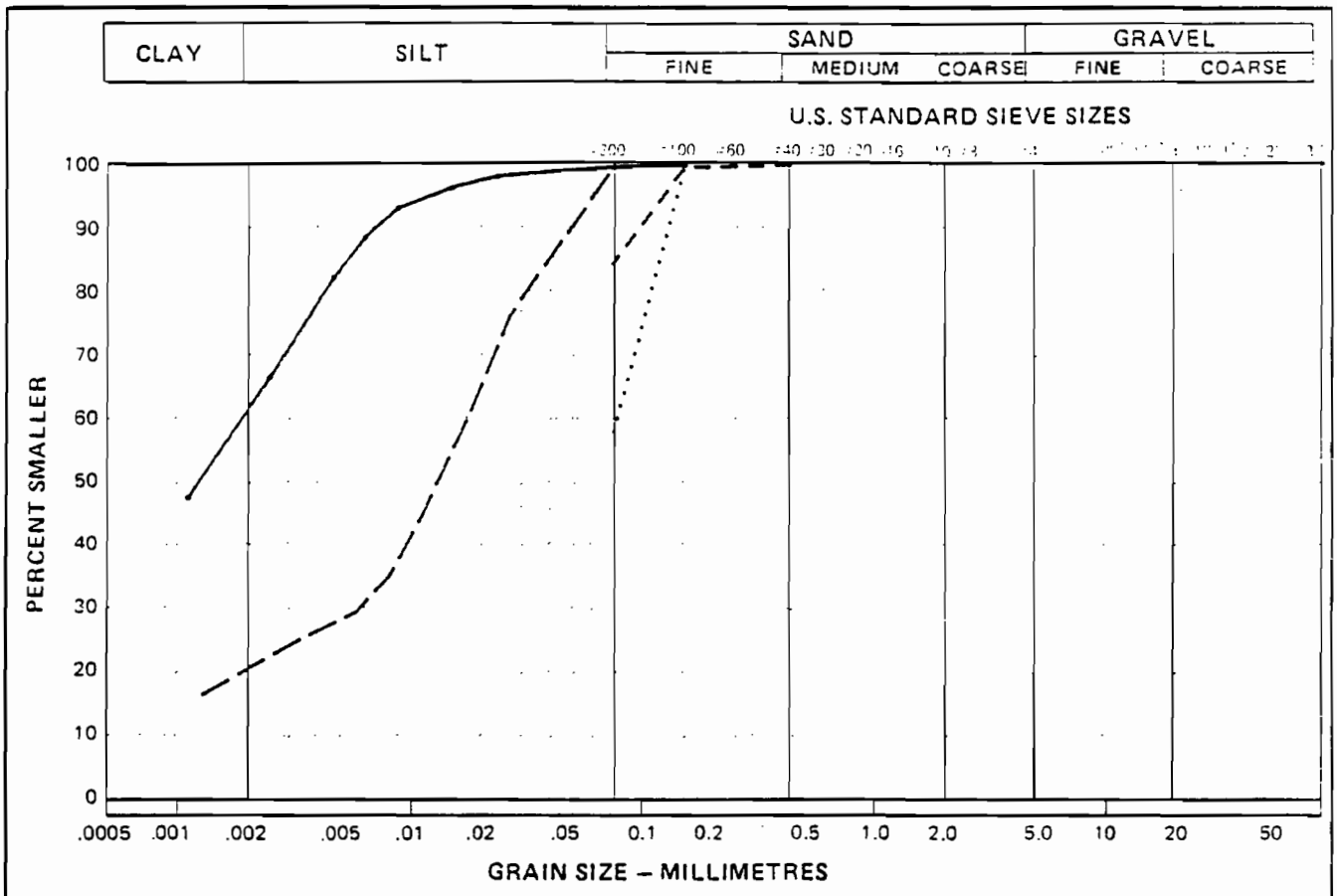
PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)	Cu	Cc	U.S.C.
———	KG82S02	2.17 - 2.34	65.1	34.8	.1	0.0	-	-	
. . . . .	KG82S02	10.67 - 10.83	28.1	71.8	.1	0.0	-	-	
_ _ _	KG82S02	13.72 - 13.93	51.3	48.6	.1	0.0	-	-	
___ ___	KG82S02	16.75 - 17.24	57.9	39.5	2.6	0.0	-	-	
____._	KG82S02	22.86 - 23.22	54.6	39.0	6.4	0.0	-	-	

JOB NO. 101 -3657 DATE 82-09-29

PARTICLE - SIZE ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C.
			CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)			
_____	KG82S02	25.91 - 26.10	61.8	38.1	.1	0.0	-	-	
. . . . .	KG82S02	37.01 - 37.10	-	57.5	42.5	0.0	-	-	
_ _ _	KG82S02	37.85 - 37.92	-	84.6	15.4	0.0	-	-	
___ ___	KG82S02	49.38 - 49.66	20.3	79.6	.1	0.0	-	-	

JOB NO. 101 -3657 DATE 82-10-01

APPENDIX D

Shear Strength Test Results

APPENDIX D

GLOSSARY OF TERMS RELATED TO SHEAR STRENGTH

Axial Stress	:	Vertical stress applied to a sample (Force/X-Sectional Area)
B	:	The ratio of pore pressure response to a change in isotropic pressure. Indicative of the degree of saturation.
Back Pressure	:	An increase in pore pressure applied to a sample for the purpose of increasing saturation.
c'	:	Effective value of cohesion.
Cell Pressure	:	Isotropic confining pressure to which a sample is subjected during triaxial testing.
Consolidation	:	Volumetric change in soil with time resulting from loading under drained condition.
Deviator Stress	:	The net applied axial stress during triaxial testing. Mathematically, the difference between the major and minor principal stresses (sigma $1'$ - sigma $3'$).
Effective Stress	:	The net stress present in a saturated soil after the pore pressure has been subtracted. The stress difference between the total and measured pore pressure.
Epore	:	Computer output heading for excess pore pressure
Excess Pore Pressure	:	The pore pressure generated or developed during shear.
Jacketed	:	A sample is enclosed in a thin, impermeable, latex membrane.
Ko	:	The ratio of the effective horizontal stress to the effective vertical stress. sigma $3'$/ sigma $1'$
ParA	:	Computer output heading for Skempton's pore pressure parameter A. A is the ratio of change in excess pore pressure to change in deviator stress.
Peak Strength	:	The maximum deviator stress that can be applied to a sample.

GLOSSARY (continued)

Ø'	:	Internal angle of friction under effective stress conditions.
Pore Pressure Response:		A change in pore pressure resulting from a change in stress condition.
Reshaped Strength	:	Analogous to remoulded strength. Shear strength measured after soil structure completely removed.
Strain	:	Ratio of deformation over a fixed reference length to the initial reference length. Expressed as a percent.
s1	:	Computer output heading for the effective major principal stress, sigma $_1$'. In triaxial testing this represents the total vertical stress.
s3	:	Computer output heading for the effective minor principal stress, sigma $_3$'. In triaxial testing, this represents the cell pressure.
Tpore	:	Computer output heading for total pore pressure.
VolCh	:	Computer output heading for the volume changes a sample undergoes during loading.
Wet Density	:	Mass of the soil particles and water in a unit volume of soil.
Dry Density	:	Mass of the dry soil particles in a unit volume of soil.

Test No 1

Test Hole No KC82S02 14B

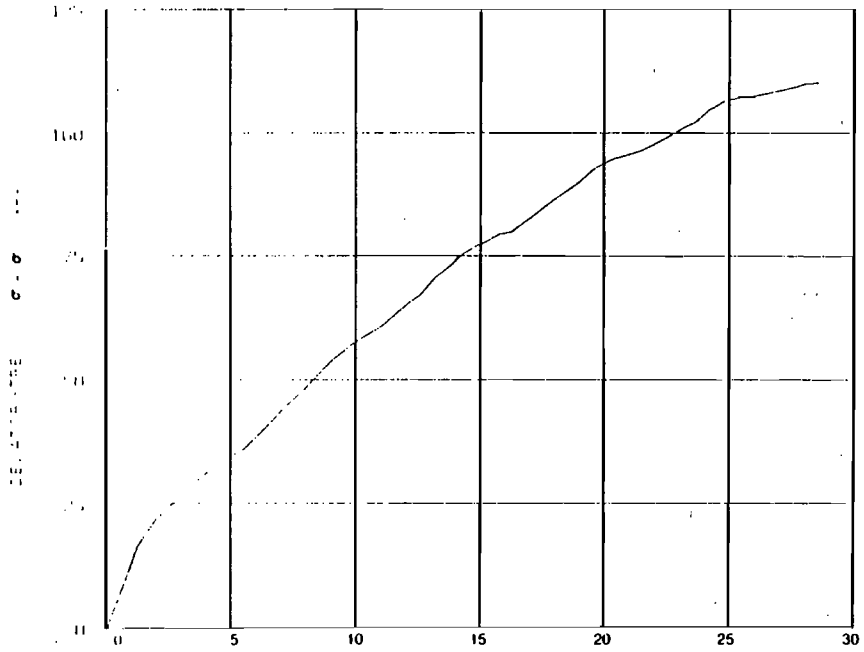
Depth of Sample m 22.86 -23.22

Confining Pressure kPa 484.0

Water Content % 30.32

Wet Density Mg/m³ 1.97

Peak Stress kPa 109.6



Reviewed by _____ P.Eng

Project

Address

Job No

Date Tested By

Client

Attention

Test No

Test Hole No

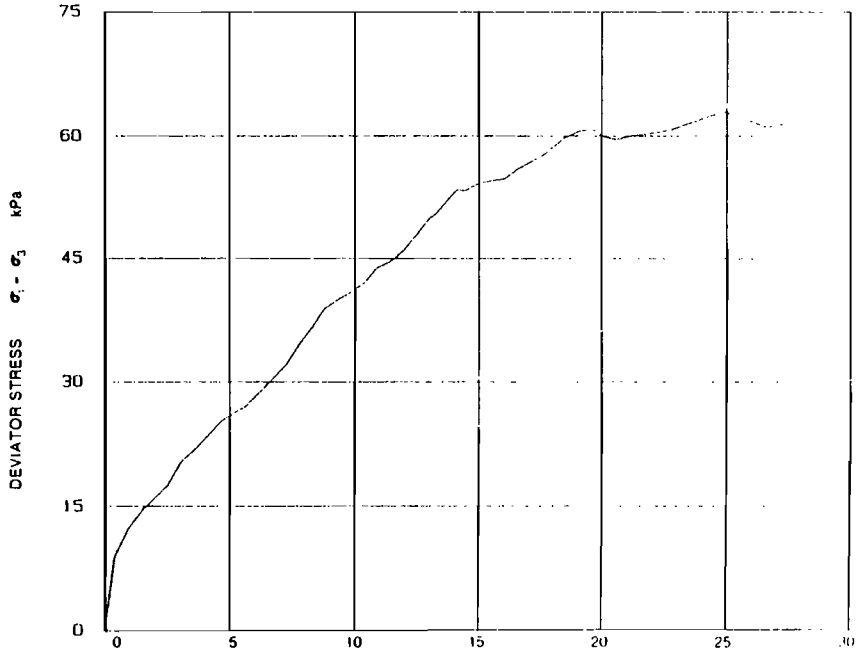
Depth of Sample m

Confining Pressure kPa

Water Content %

Wet Density Mg/m

Peak Stress kPa



Reviewed by

FIGURE D.1 UNCONSOLIDATED – UNDRAINED TRIAXIAL TEST KUGDJUK SITE

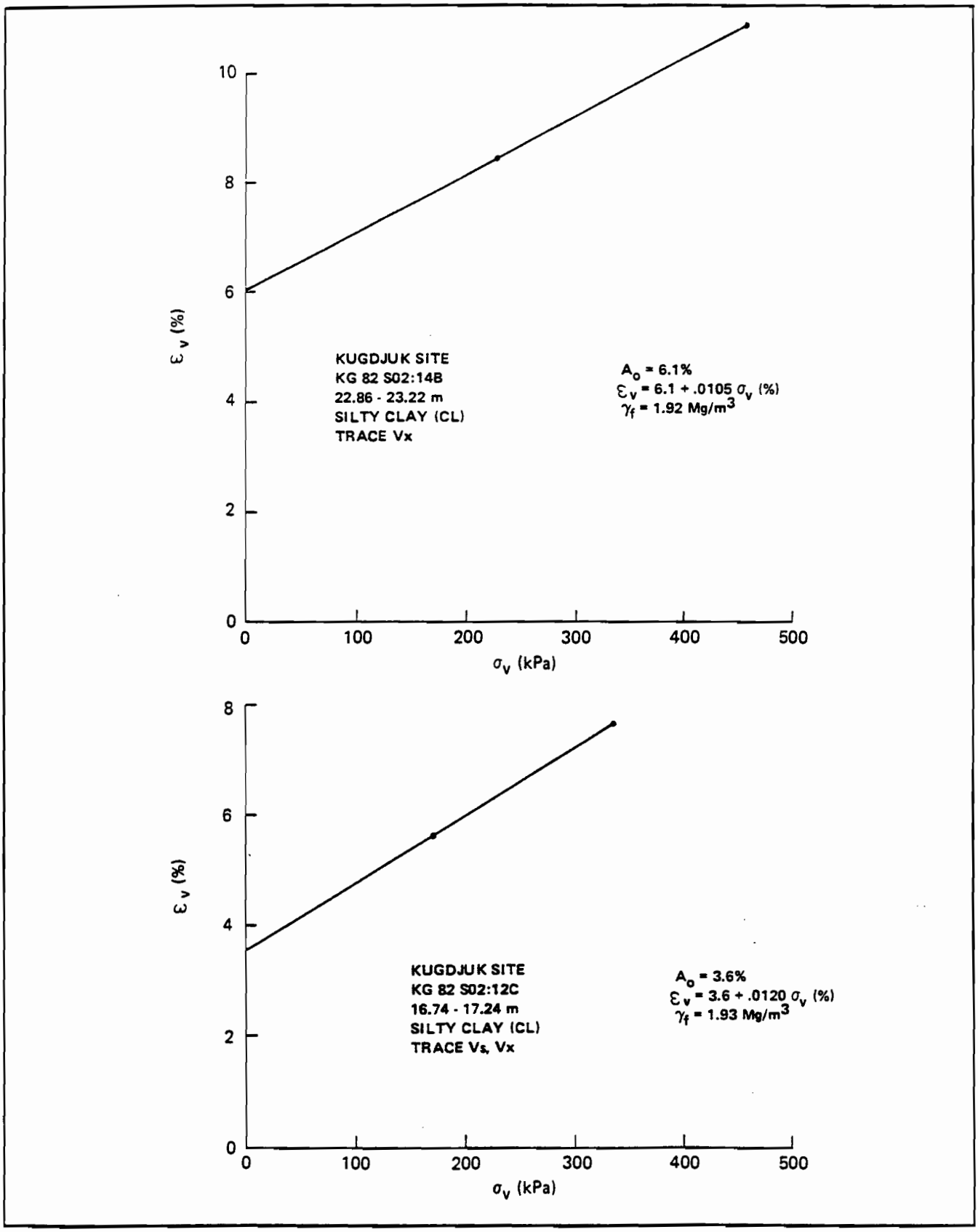


FIGURE D.2 THAW STRAIN TEST RESULTS
KUGDJUK SITE

APPENDIX E

Consolidation Test Results

APPENDIX F

Subconsultants Results

REPORT ON
HYDROCARBON GAS ANALYSES
BOREHOLE KG82502 - Kugdjuk

JOB 101-3657.3

FOR

EBA ENGINEERING CONSULTANTS LTD.
J.P. RUFFELL

PREPARED BY

Dr. J.F. BARKER
DEPARTMENT OF EARTH SCIENCES
UNIVERSITY OF WATERLOO

DECEMBER 2, 1982

METHODS

At the drill site, fresh core material is placed in cans with water so as to eliminate any head space. In the laboratory, 100 cm^3 of helium is added and 100 cm^3 of water withdrawn via gas-tight septa. The sediment/water/helium mixture is vigorously shaken so that hydrocarbon gases will be taken into the helium gas phase. A few microlitres of the gas phase is analyzed by gas chromatography for methane, ethane, ethylene, propane, and propylene. A commercial, analyzed gas mixture is used as standards. The concentration of each component is reported in parts per million (ppm) on a volume basis (v/v). That is, 10^4 ppm, v/v indicates that there is 1 cm^3 of that gas per 100 cm^3 of wet sediment. It is assumed that 100 cm^3 (100 ml) of wet sediment has been canned at the drill site. In addition, the sediment was dried and weighed so that the amount of gas per dry weight of sediment can be reported if the client wishes.

RESULTS

Results of the hydrocarbon gas analysis for the three core samples are as follows:

SAMPLE	DEPTH (m)	GAS CONTENT (ppm, v/v)		
		Methane	Ethylene	Ethane
8B	10.9	3.4×10^2	—	1
10C	29.0	4.7×10^2	<1	4
24A	43.7	2.5×10^2	—	3

Dashes indicate the component was not detected. Propane and propylene also were not detected. The lack of significant petrogenic components (ethane and propane) and the trace of ethylene, a biogenic gas, suggest that the hydrocarbon gases are dominantly biogenic. Methane is the dominant gas and little variation in methane concentration with depth is noted. These concentrations of methane do not exceed the solubility of methane in porewaters and so the biogenic methane produced at this stage is dissolved in the porewaters (or ice) and does not contribute significantly to pore pressures.

APPENDIX G

Laboratory Test Procedures

LABORATORY TEST PROCEDURES

Procedures Specified

1. Classification and Index Tests
2. Triaxial Shear Tests
3. Direct Shear Tests
4. Laboratory Miniature Vane
5. Swedish Fall Cone Shear Strength Determination
6. Consolidation Tests
7. Porewater Salinity Tests
8. Organic Content Determination
9. Radiography

LABORATORY TEST PROCEDURES

1. CLASSIFICATION AND INDEX TESTS

These tests are quite routine and the standard ASTM procedures employed are listed below:

TEST	ASTM DESIGNATION
Moisture Content	D 2216
Liquid Limit (1)	D 423
Plastic Limit and Plasticity Index	D 424
Grain Size	D 421 & 422
Specific Gravity	D 854
Relative Density	D 2049
Unified Soil Classification	D 2487

NOTE: 1. All liquid limits reported were obtained from 3 point determinations.

2. SHEAR STRENGTH TESTS

Procedure #1 - Unconfined Compression

Procedure #2 - Unconsolidated Undrained Triaxial
With and without pore pressure measurement

Test specimen is mounted in triaxial cell and jacketed. Cell pressure equivalent to estimated in situ total horizontal stress (K_o = 0.7) is applied without sample drainage. A pore pressure response test is carried out prior to shear. If B < 0.95, sample is loaded to failure at rate of 1%/min with no pore pressure measurement. If B > 0.95 specimen loaded to failure at rate of 0.02%/min with pore pressures monitored continuously. Frozen samples are permitted to thaw (undrained condition) prior to measurement of B value.

For quick UU tests, data is presented in the form of stress-strain curves. Where pore pressure is monitored, the following curves are obtained:

1. Stress-strain
2. Effective stress ratio-strain
3. Excess pore pressure-strain
4. P/Q stress path

CONSOLIDATED-UNDRAINED TRIAXIAL TESTS

Procedure 1 - Sample is mounted in triaxial cell and jacketed. A pore pressure response test is carried out prior to shearing. If further saturation is required, back pressure can be applied to the sample. Frozen samples are placed in a pre-chilled triaxial cell, then permitted to thaw before commencing consolidation. Cell pressure equivalent to estimated total horizontal stress is applied with drainage allowed. Once consolidation is complete, drainage is shut off. Samples are sheared by increasing axial stress at controlled rate of strain based on the consolidation characteristics of the material determined during the consolidation phase of the test. Stress-strain curve and other diagnostic plots are produced.

CONSOLIDATED-DRAINED TRIAXIAL TESTS

Procedure 1 - Sample is mounted in triaxial cell and jacketed, then thawed under a nominal pressure of 35 kPa. A pore pressure response test is carried out prior to shearing. If further saturation is required, back pressure can be applied to the sample. Sample is consolidated to cell pressure equivalent to estimated mean horizontal in situ effective stress. With drainage open, sample is sheared by increasing the axial stress at a controlled rate of strain. The rate of strain is selected on the basis of consolidation properties of the soil determined during the consolidation phase of the test. Stress-strain curve and other diagnostic plots are produced.

Procedure 2 - Lack of undisturbed samples of sand from certain strata necessitate reconstituting disturbed samples for strength testing. Relative density test is conducted on the sand and reconstituted samples are then prepared to approximately 70% relative density. A pore pressure response test is carried out prior to shearing. If saturation is required, back pressure is applied to the sample. Sample is consolidated to cell pressure equivalent to the estimated in situ mean horizontal effective stress. With the drainage open, the sample is sheared by increasing the axial stress at a controlled rate of strain as detailed in Procedure 1. Stress-strain curve and other diagnostic plots are produced.

NOTES: 1. Standard UU triaxial procedure ASTM D2850.

2. Standard CU and CD triaxial procedures taken from Bishop & Henkel (1969).

3. Samples reconstituted according to procedures outlined in Bjerrum, Kringstad, and Kummeneje (1961).

3. DIRECT SHEAR TESTS

Procedure 1 - Standard direct shear procedure. Frozen samples are permitted to thaw and consolidate under applied normal pressure before commencing shear. Resheared strength is measured on plane cut after peak strength has been determined. Generally, a minimum of 3 tests are performed on each material type to define effective stress parameters c' and $\emptyset'$. Shear stress - deformation curve and other diagnostic plots produced.

Procedure 2 - If no undisturbed sample is available, an appropriate sample may be reconstituted for testing following the same general procedure indicated above.

NOTES: 1. Standard direct shear procedure ASTM D 3080.

2. Samples reconstituted according to procedures outlined in Bjerrum, Kringstad, and Kummeneje (1961).

4. LABORATORY MINIATURE VANE

Procedure 1 - Sample is either retained in sampling tube or extruded into split ring. Vane is lowered into sample ensuring total submergence of the vane. Vane is rotated at 10 degrees/min. Test is run until steady post-peak value is reached. Stress-strain curves, peak and post-peak shear strengths are produced.

5. FALL-CONE SHEAR STRENGTH DETERMINATION

Procedure 1 - Small portion of sample is extruded into testing cup. Cone is selected with reference to expected shear strength of soil. Cone is lowered to contact the surface of the sample and is then released. Depth of penetration of cone is measured. Shear strength is interpreted from cone strength correlation charts.

6. STANDARD OEDOMETER/CONSOLIDATION TESTS

Procedure 1 - Sample is set up in oedometer with dry stones. Standard incremental loading is applied done to a specified vertical effective stress that exceeds the in situ effective overburden pressure. The oedometer is then flooded with a saline solution similar to that of the soil, unloaded and permitted to rebound. After rebound, the specimen is reloaded in increments of 50% increase until a specified vertical effective stress, is reached. Thereafter, the standard doubling of pressures is resumed to test completion. All load increments are left on for a time interval determined by the root time method. e-log-p' curve, c_v, k, m_v, and Pc' data produced.

Procedure 2 - Sample is set up frozen in oedometer, then moved from cold room to standard apparatus. Stress is applied to seat load cap and sample is then thawed under nominal pressure. Procedure continues as for Procedure 1. e-log-p' curve, c_v, k, m_v, and Pc' data produced.

NOTE: 1. Modifications made to standard procedure (ASTM D 2435) are taken from Andresen et al. (1979) and Broms (1980), as recommended for overconsolidated soils. Procedure is appropriate in view of large reduction in total stress that typically occurs upon sampling.

In addition to the specific procedures described above, all samples programmed for testing may have other basic tests performed as follows:

1. Moisture content
2. Bulk density
3. Core photography (where practical)
4. Detailed description of sedimentological features, and
5. Identification and preservation of discrete organic matter when present.

7. POREWATER SALINITY TESTS

Procedure 1 - Sample is trimmed to remove disturbed material. Porewater is extruded from thawed sample and chloride titration is performed to establish equivalent salinity (NaCl).

NOTES: 1. A silver nitrate titration is performed to determine the chloride ion content (ASTM D 512 Method B).

2. Chloride ion content was converted to an equivalent salinity using the following empirical relationship.

Salinity (o/oo) = 0.03 + (1.805 x Chlorinity (o/oo))

8. ORGANIC CONTENT DETERMINATION

Procedure 1 - Small portion of sample is weighed then oven dried. Dried sample is mixed with hydrogen peroxide solution (HO) and boiled. After reaction ceases sample is oven dried and reweighed. Loss in weight is inferred as organic content.

9. RADIOGRAPHY

Procedure 1 - Samples are transported to be radiographed on subcontractors premises. Samples are returned with processed film negatives.

Procedure 2 - Samples are radiographed at EBA. Samples are removed from storage area and returned immediately. Film is processed on site and results reviewed.

NOTE: 1. For report presentation, radiography subcontractor can prepare high quality B/W prints from film negatives.

APPENDIX H

CONE PENETRATION TEST DATA

Beaufort Sea - Cone Penetration Test Data

1982 Sauvrak
Kugdjuk
Kringalik

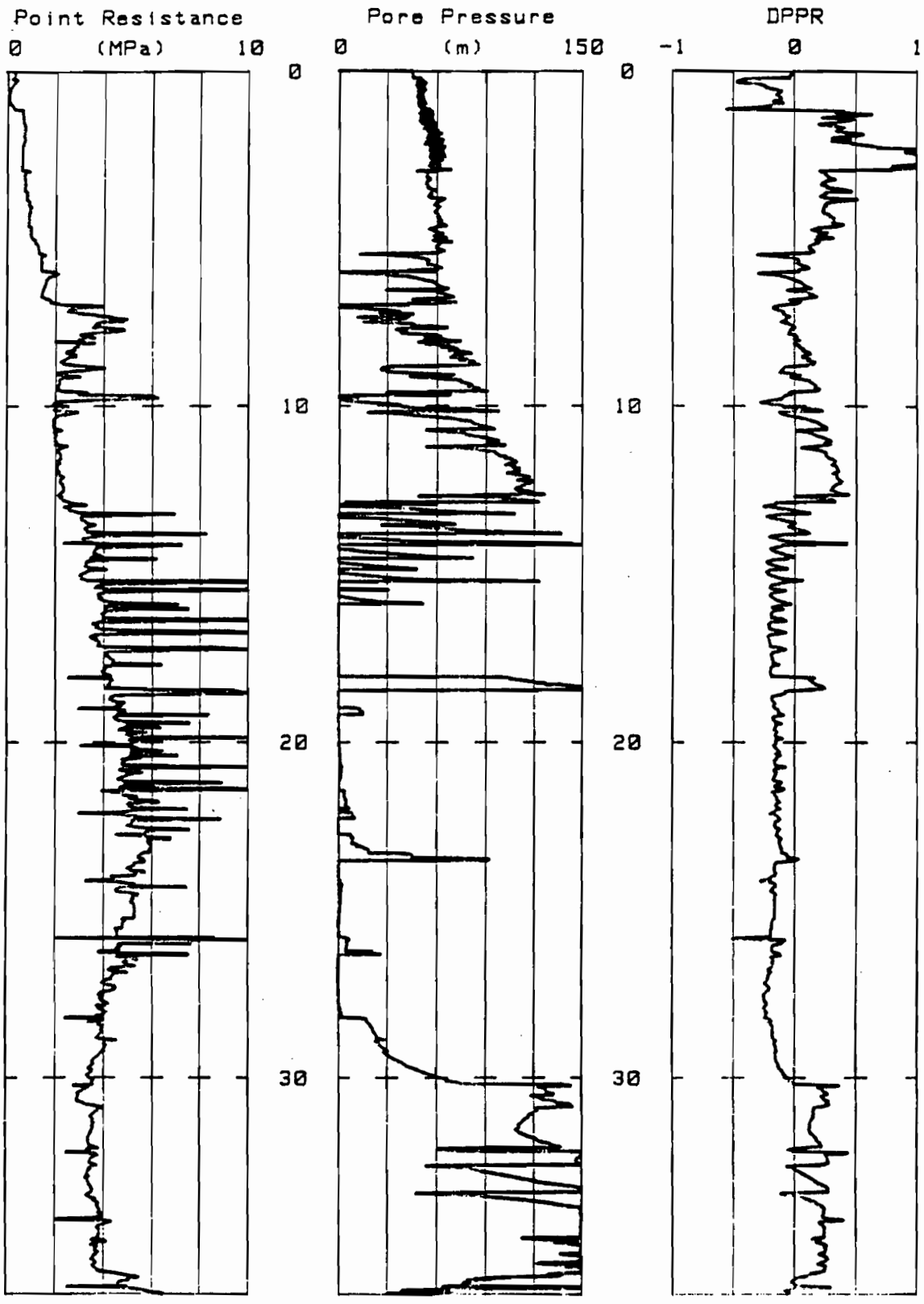
1983 Stokes Point

Frontier Development Division
March 1983

Sauvrak	02	
	04	
	05	
	06	
	07	
	08	
	09	
	10	
	10A	
	12	
	13	
	13A	
	14	
Kugdjuk	01	
	02	
Kringalik	01	(0 - 40 m)
	01	(40 - 71.5 m)
	03	
	05	
	06	
Stokes Point	10A	
	15	
	16	
	17	
	19A	
	21	
	22	
	23	
	25	
	26	
	31	
	32	
	33	

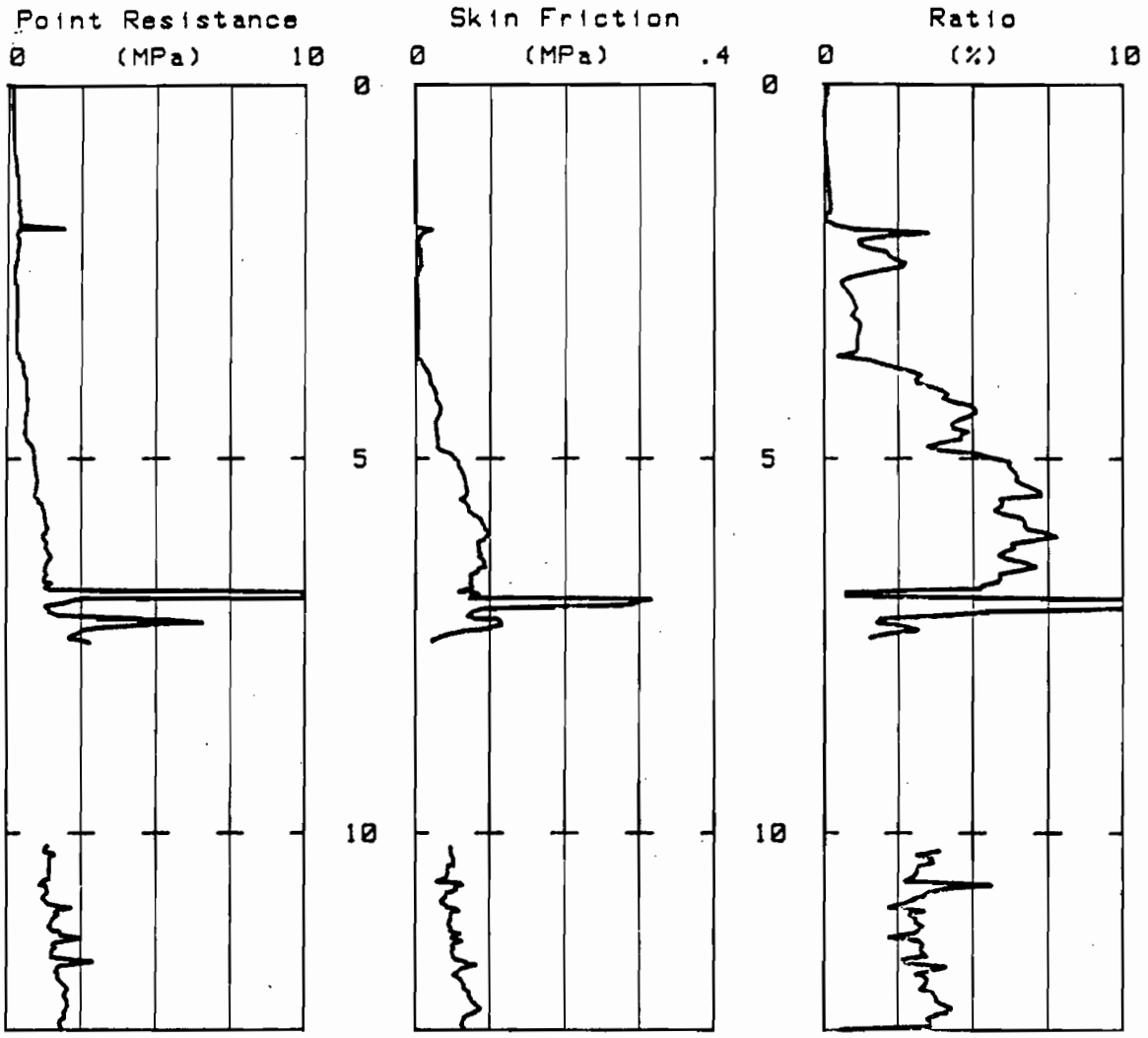
Location: Kugdjuk
Test No. 01
Code: KG82C01

Date: 82 08 08
Operator: Geosystems
Soil Penetration (m): 36.45
Water depth (m): 45.0

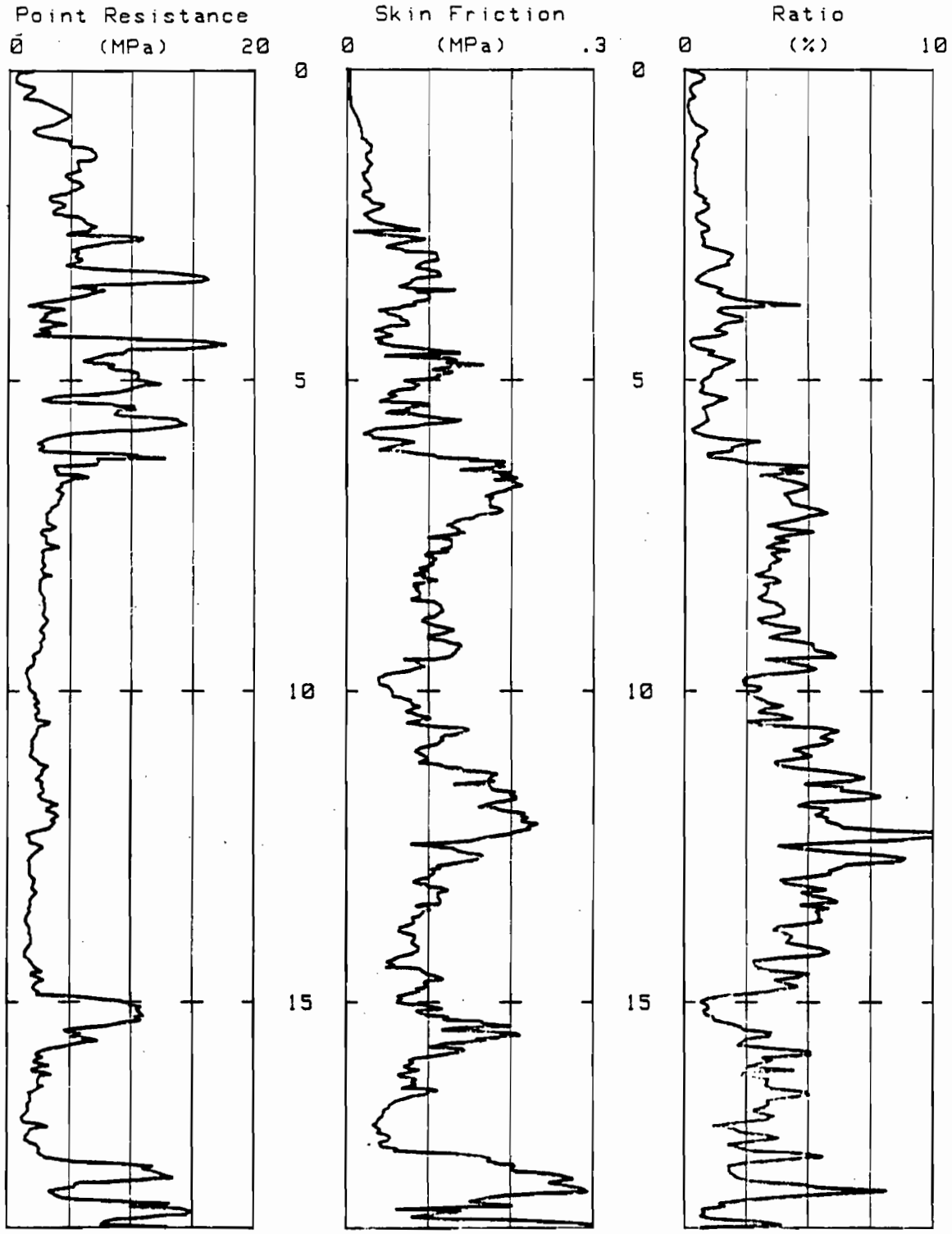


Location: Kugdjuk
Test No. 02
Code: KG82C02

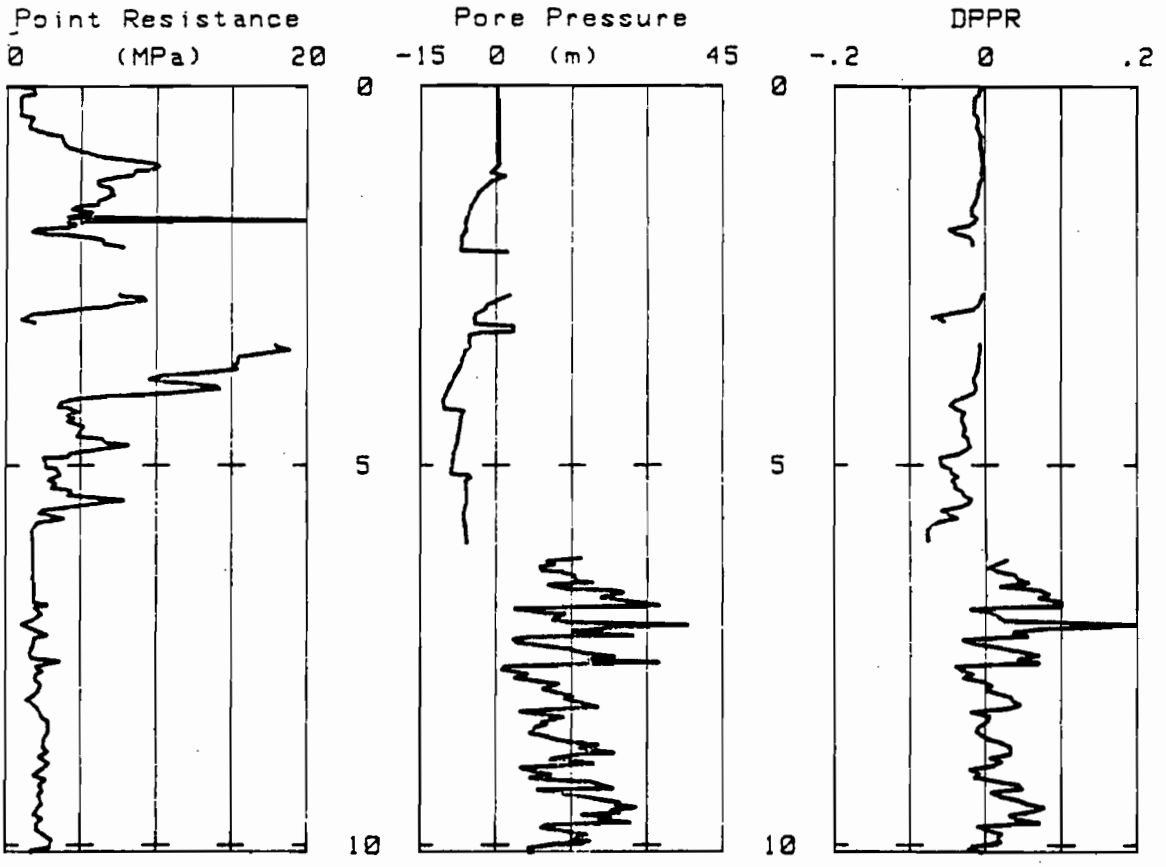
Date: 82 08 08
Operator: Geosystems
Soil Penetration (m): 12.64
Water depth (m):



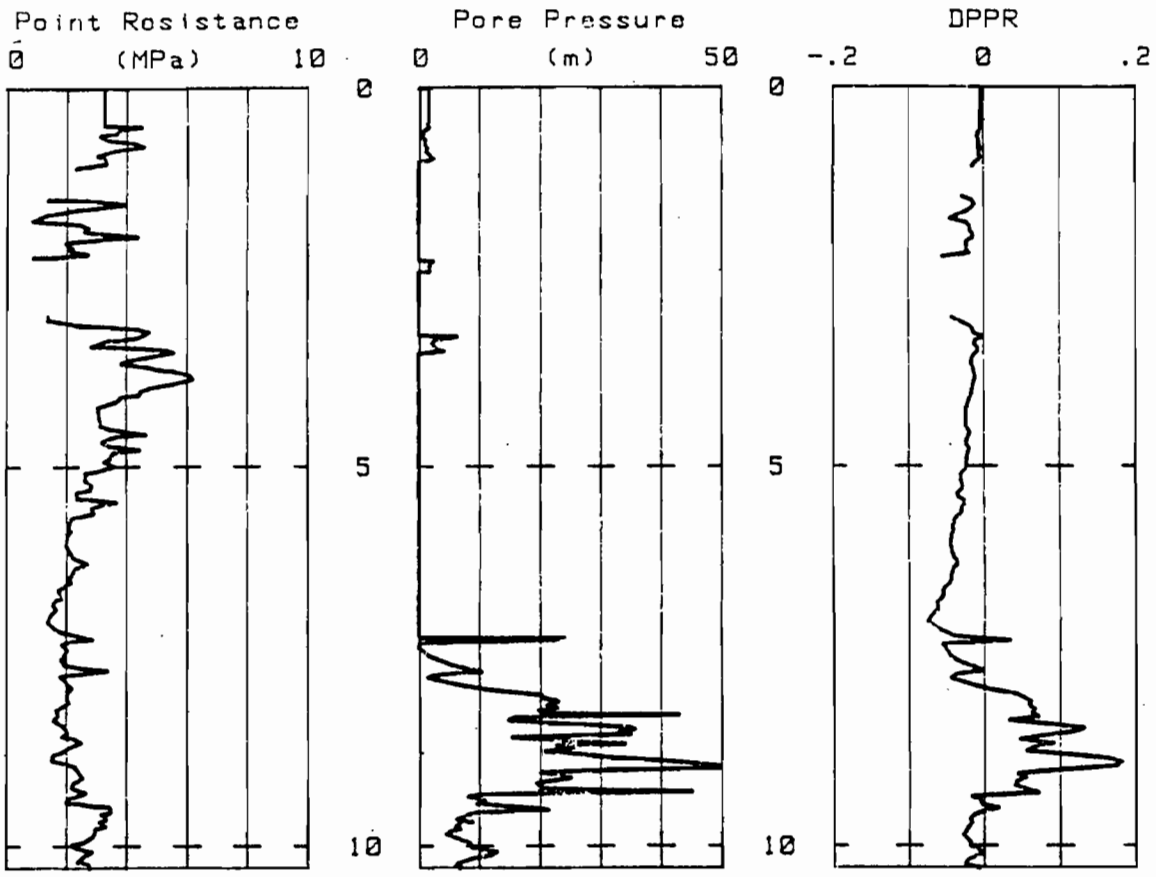
Location: Stokes Point Date: 83 02 09
Test No. 10A Operator: B.Morris
Code: 83SP10A Soil Penetration (m): 18.64
Water depth (m): 1.7



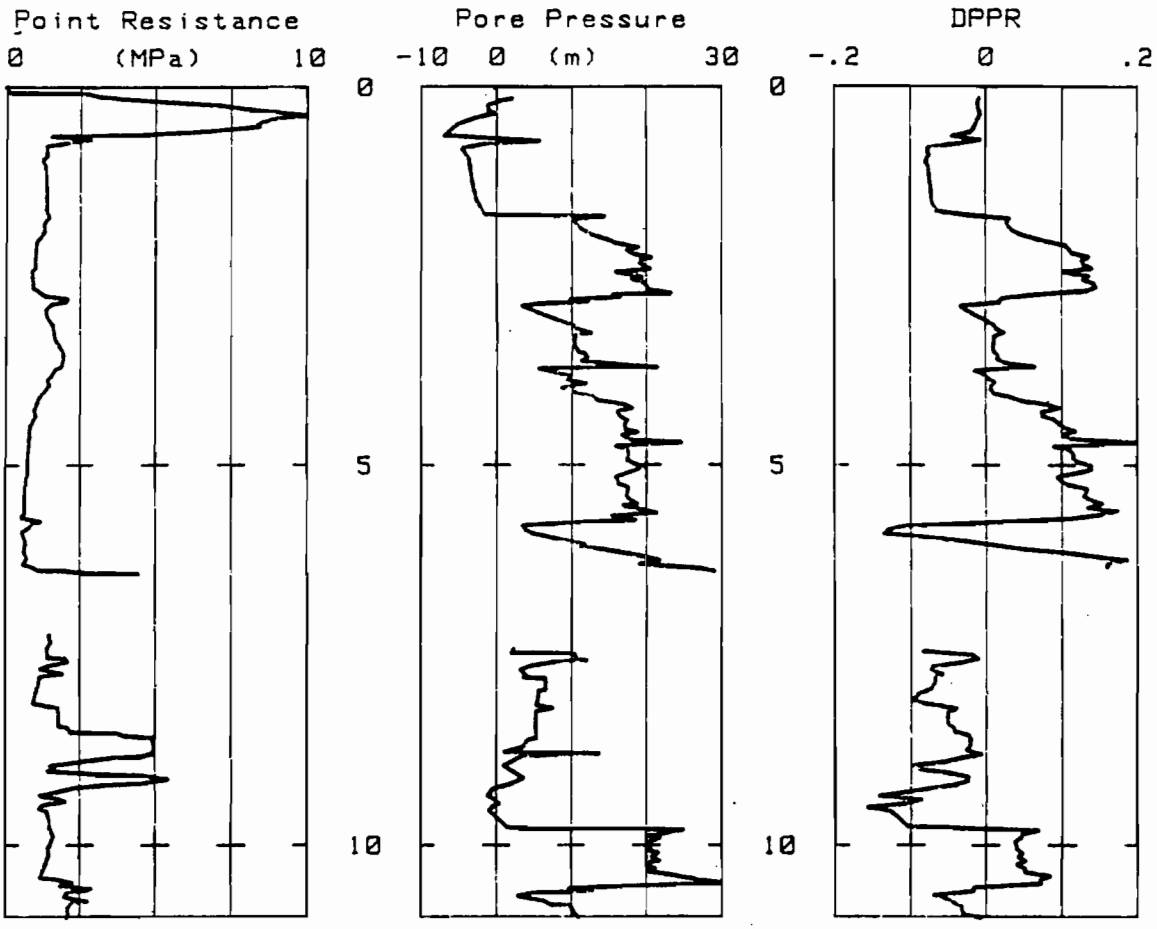
Location: Stokes Point Date: 83 02 08
Test No. 15 Operator: B.Morris
Code: 83SP15 Soil Penetration (m): 10.09
Water depth (m): 1.7



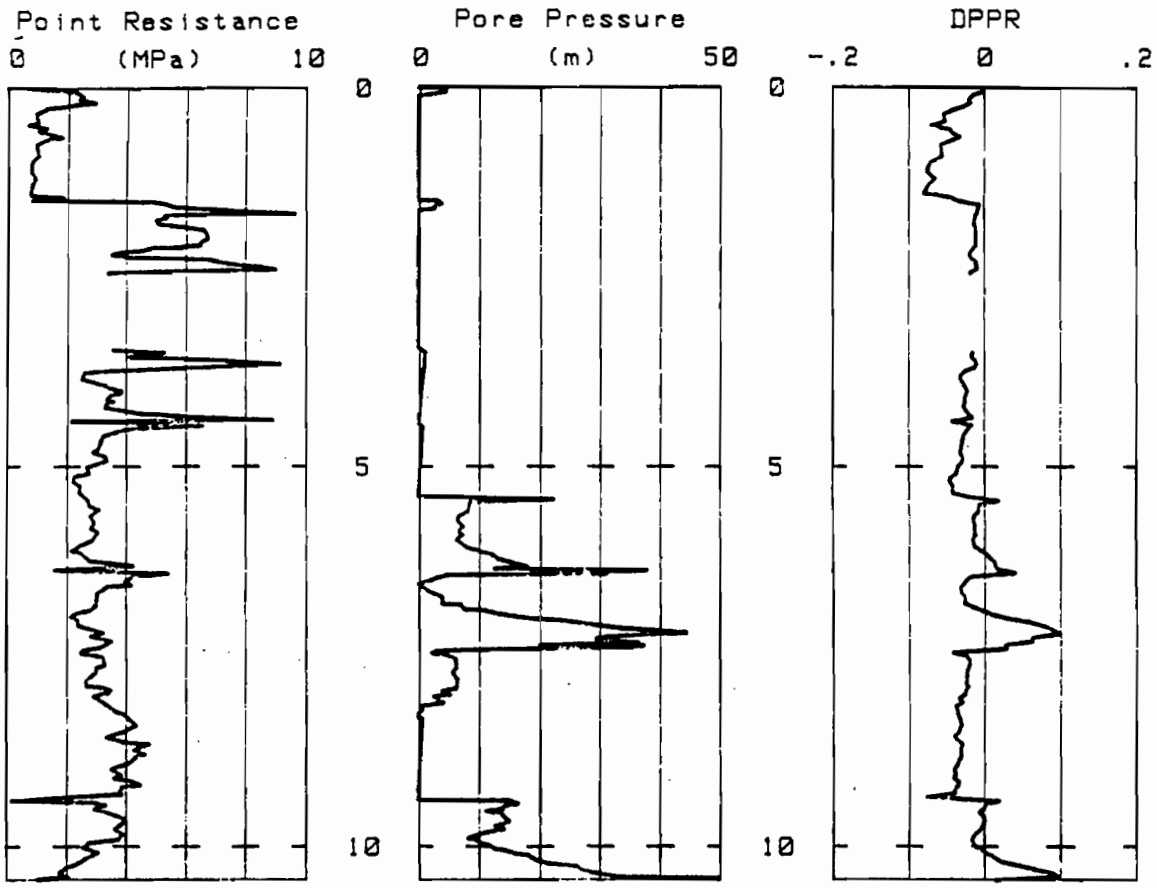
Location: Stokes Point Date: 83 02 08
Test No. 16 Operator: B.Morris
Code: 83SP16 Soil Penetration (m): 10.29
Water depth (m): 2.4



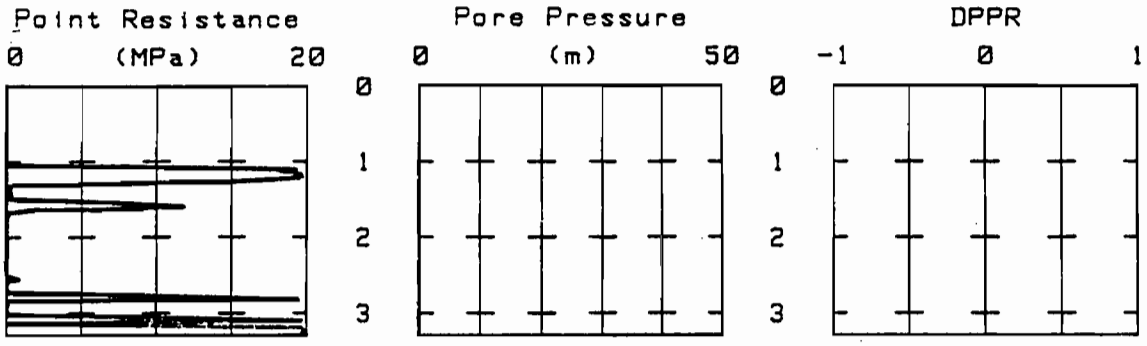
Location: Stokes Point Date: 83 02 08
Test No. 17 Operator: B.Morris
Code: 83SP17 Soil Penetration (m): 10.94
Water depth (m): 5.2



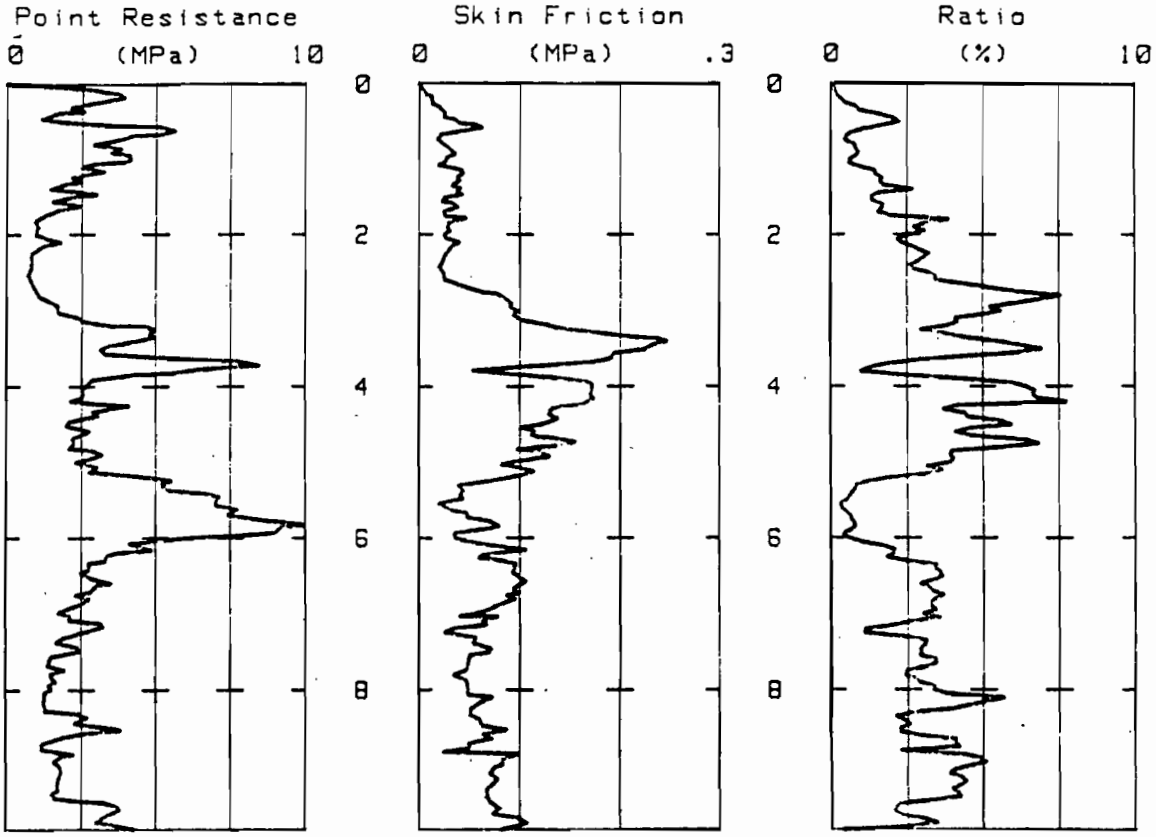
Location: Stokes Point Date: 83 02 07
Test No. 19A Operator: B.Morris
Code: 83SP19A Soil Penetration (m): 10.44
Water depth (m): 4.6



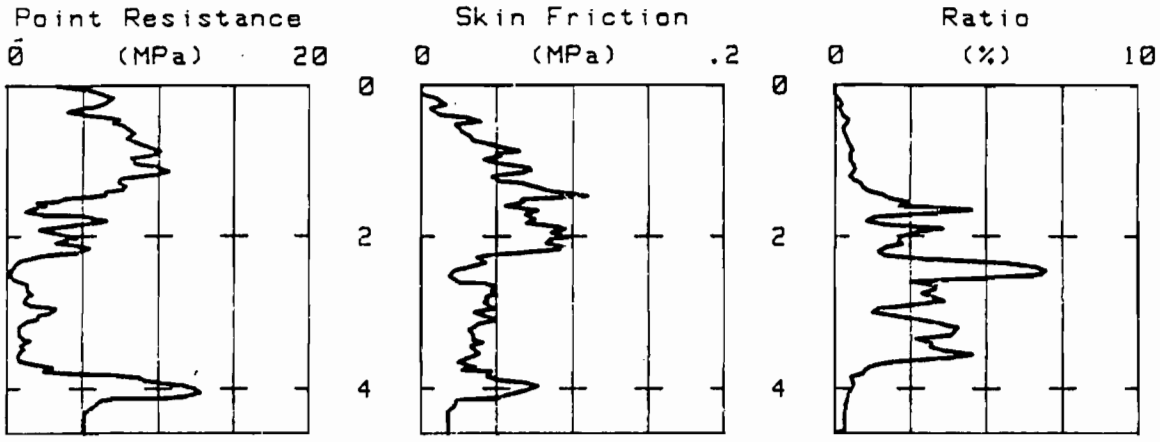
Location: Stokes Point Date: 83 02 02
Test No. 21 Operator: B.Morris
Code: 83SP21 Soil Penetration (m): 3.29
Water depth (m): 1.8



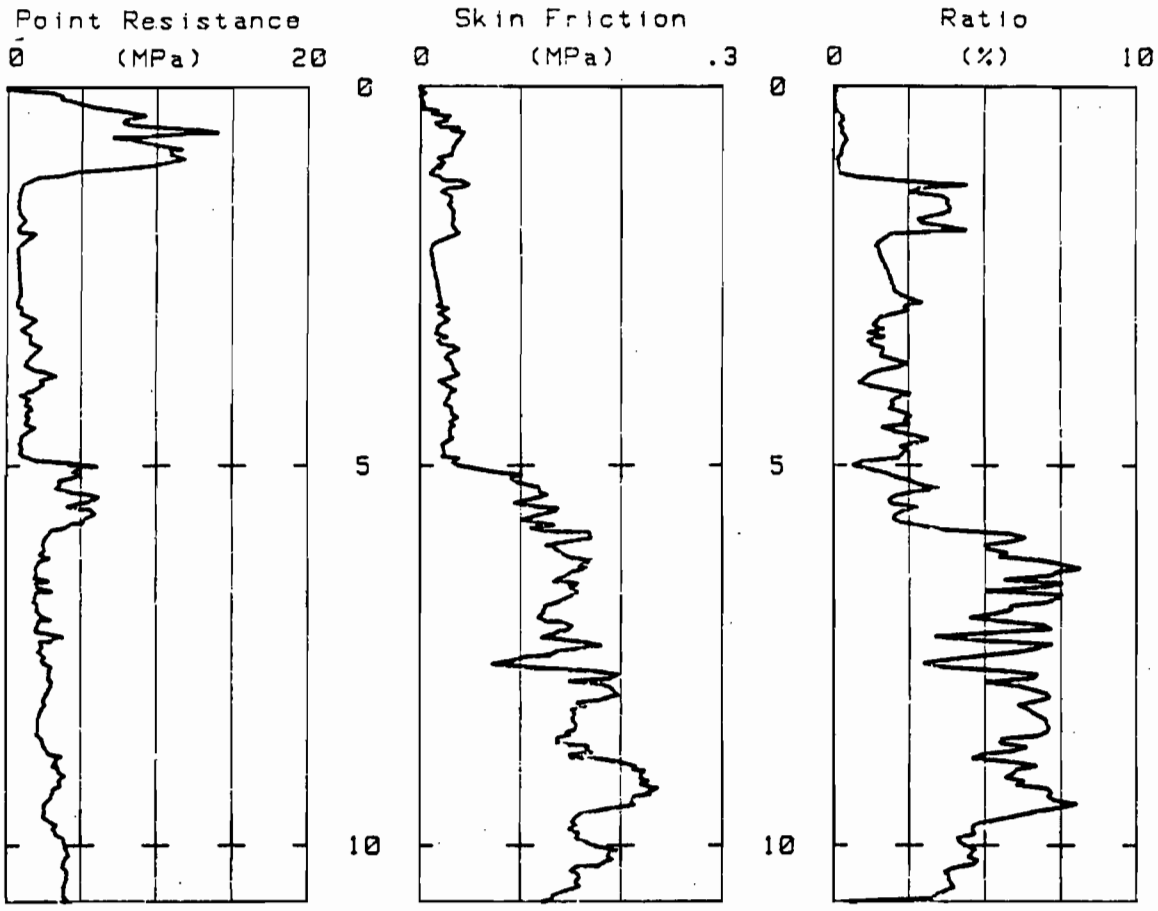
Location: Stokes Point Date: 83 01 30
Test No. 22 Operator: B.Morris
Code: 83SP22 Soil Penetration (m): 9.84
Water depth (m): 5.1



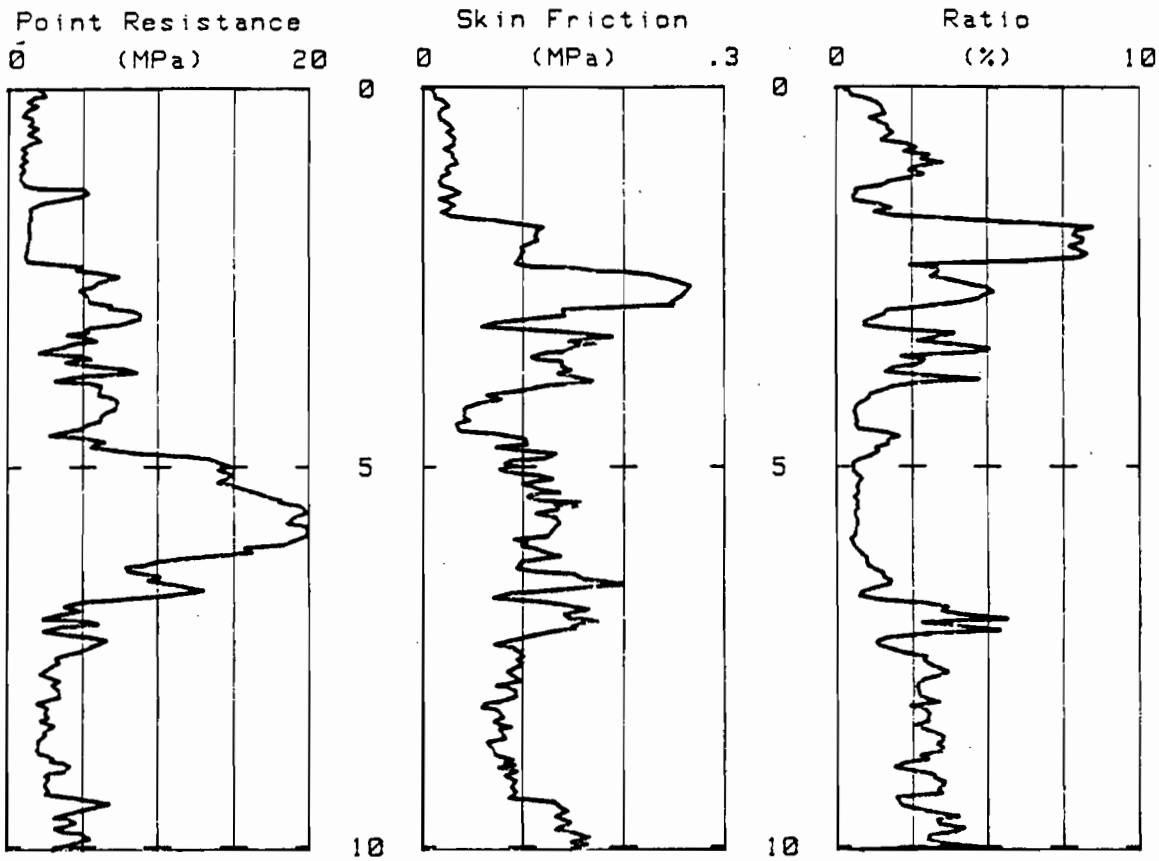
Location: Stokes Point Date: 83 01 30
Test No. 23 Operator: B.Morris
Code: 83SP23 Soil Penetration (m): 4.59
Water depth (m): 7.1



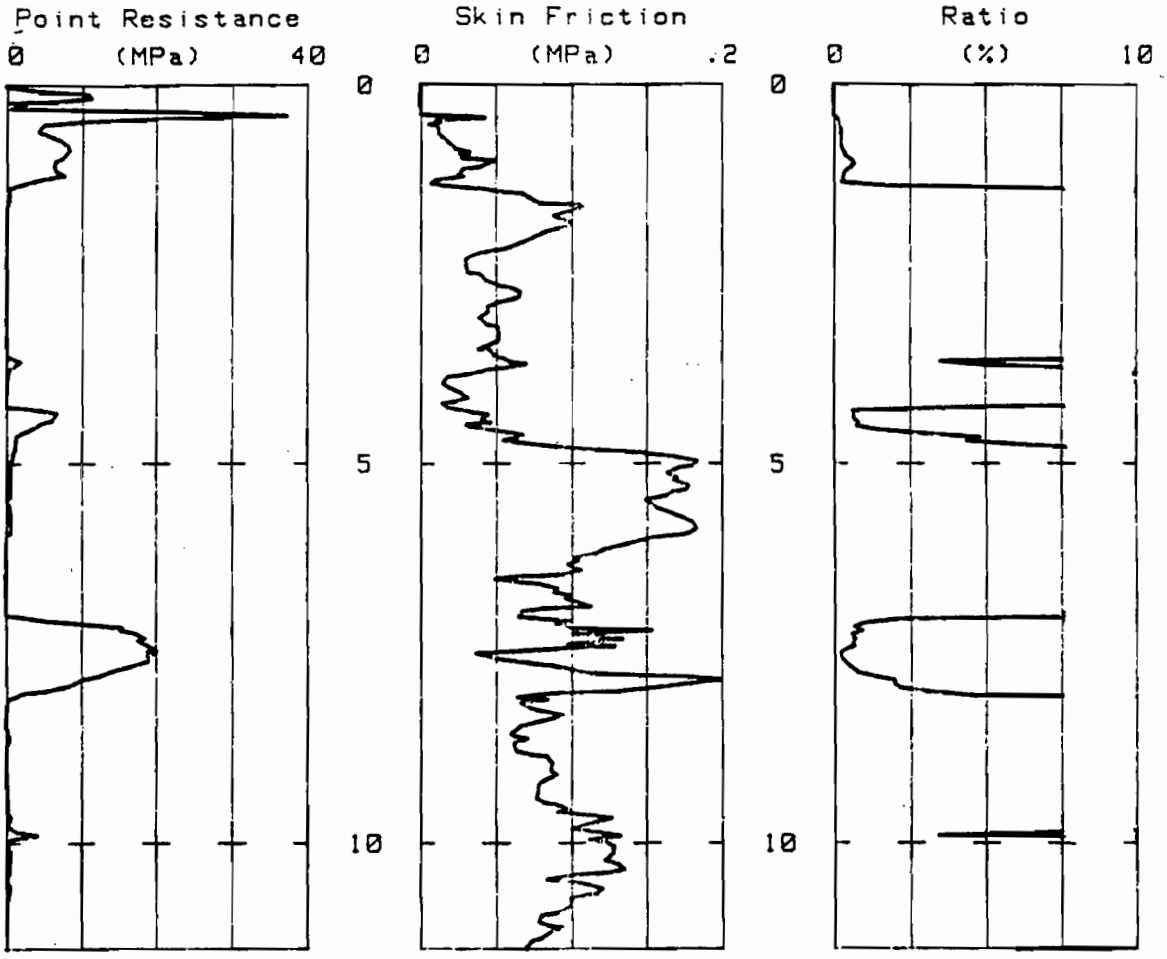
Location: Stokes Point Date: 83 01 28
Test No. 25 Operator: B.Morris
Code: 83SP25 Soil Penetration (m): 10.74
Water depth (m): 1.75



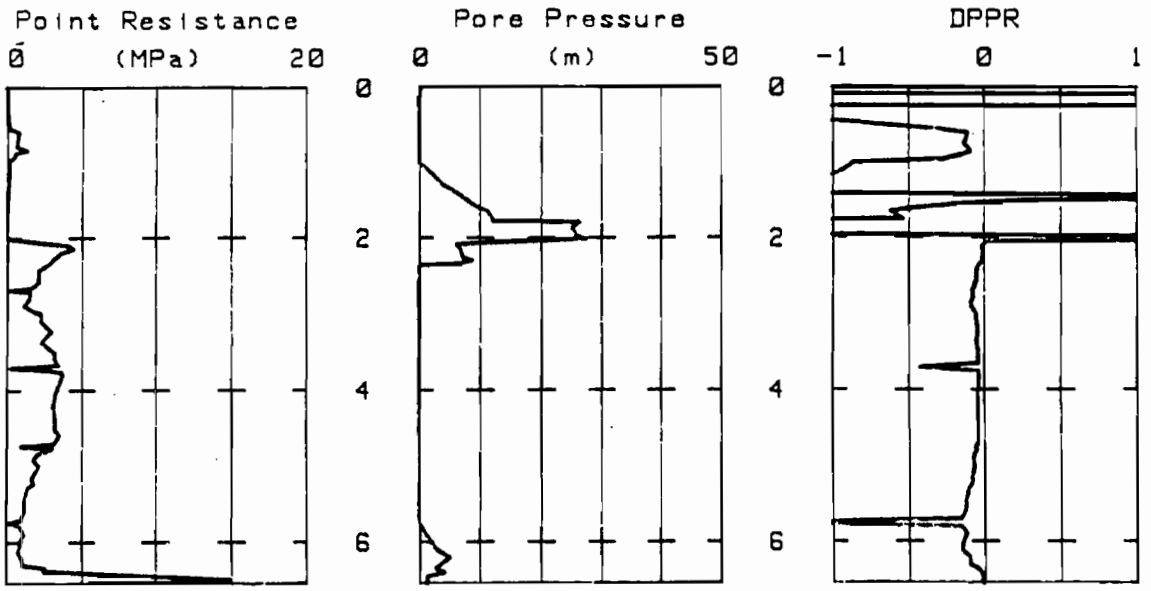
Location: Stokes Point Date: 83 01 28
Test No. 26 Operator: B.Morris
Code: 83SP26 Soil Penetration (m): 10.04
Water depth (m): 6.7



Location: Stokes Point Date: 83 01 25
Test No. 31 Operator: B.Morris
Code: 83SP31 Soil Penetration (m): 11.39
Water depth (m): 1.5



Location:	Stokes Point	Date:	83 01 26
Test No.	32	Operator:	B.Morris
Code:	83SP32	Soil Penetration (m):	6.54
		Water depth (m):	7.0



Location: Stokes Point Date: 83 02 03
Test No. 33 Operator: B.Morris
Code: 83SP33 Soil Penetration (m): 30.44
Water depth (m): 2.9