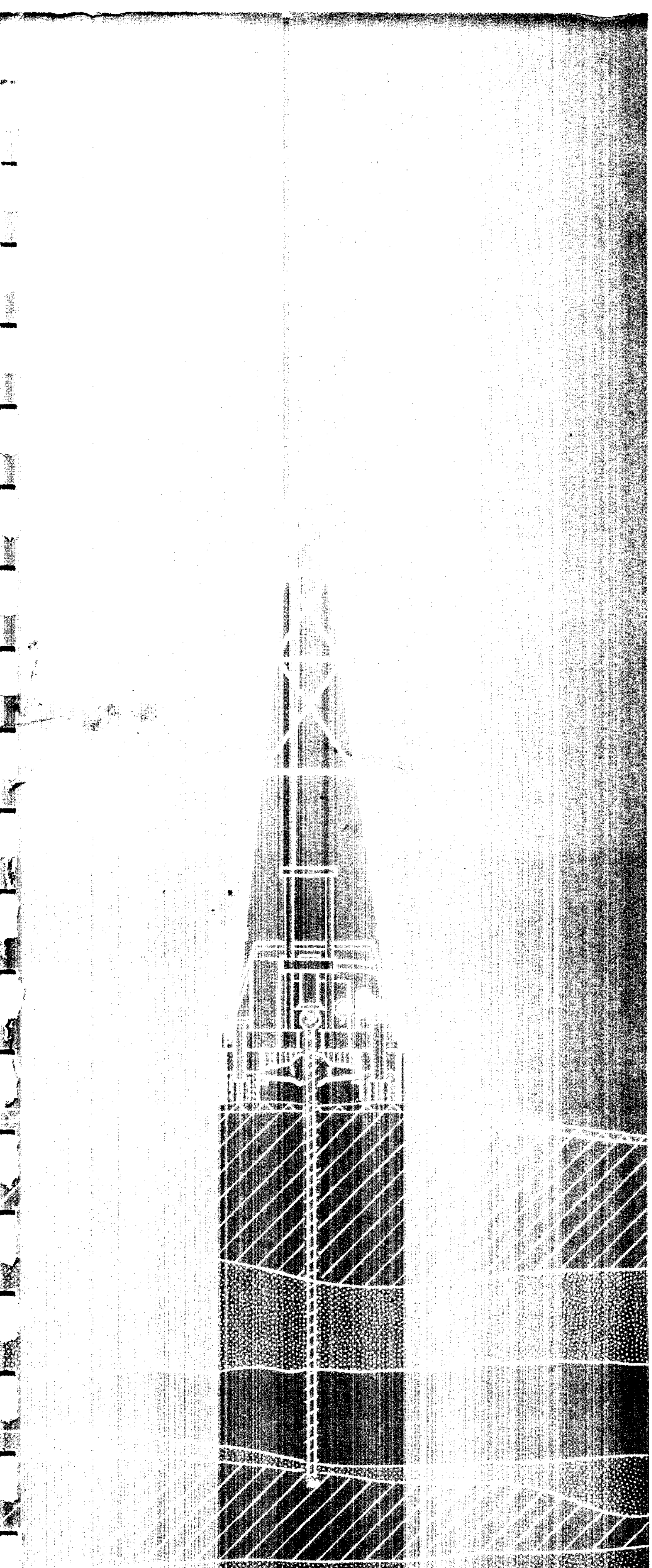

Geotechnical Evaluation

PROPOSED COMMUNITY GRAVEL PIT

DAWSON CITY, YUKON

Submitted to:

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS

JANUARY, 1984

EBA Engineering Consultants Ltd.

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Prepared by:

EBA ENGINEERING CONSULTANTS LTD.

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1.0 INTRODUCTION

The Department of Indian and Northern Affairs Canada (DIAND), Yukon Region is providing assistance to the Government of Yukon in estabilshing a new community gravel pit in Dawson City, Yukon. EBA Engineering Consultants Ltd. (EBA) was retained by DIAND to conduct a granular materials inventory of the area surrounding an existing borrow pit, located on the South side of the Dome access road on Lot 319 (See Figure 1). The site is adjacent to an area previously investigated by EBA in 1982 (EBA Project No. 209-3723, report submitted February, 1983).

This investigation was authorized by Mr. P. Savoie, Department of Indian and Northern Affairs in Whitehorse on September 12, 1983. A pre-drilling site meeting was held with Mr. Neile Wortley of DIAND, Dawson City, to finalize the test pit locations and obtain a Site Plan of the proposed area. This report presents all field and laboratory data, as well as an inventory and quantity estimate of the borrow materials available for use as both engineered backfill and concrete.

1.1 Site Location

The site is located approximately 2.0 km south of Dawson City on the Midnight Dome Road, Lot 319 (see Figure 1). The site is Northeast of the existing pit on the Dome Road, and is situated approximately 100 m above the Klondike River valley.

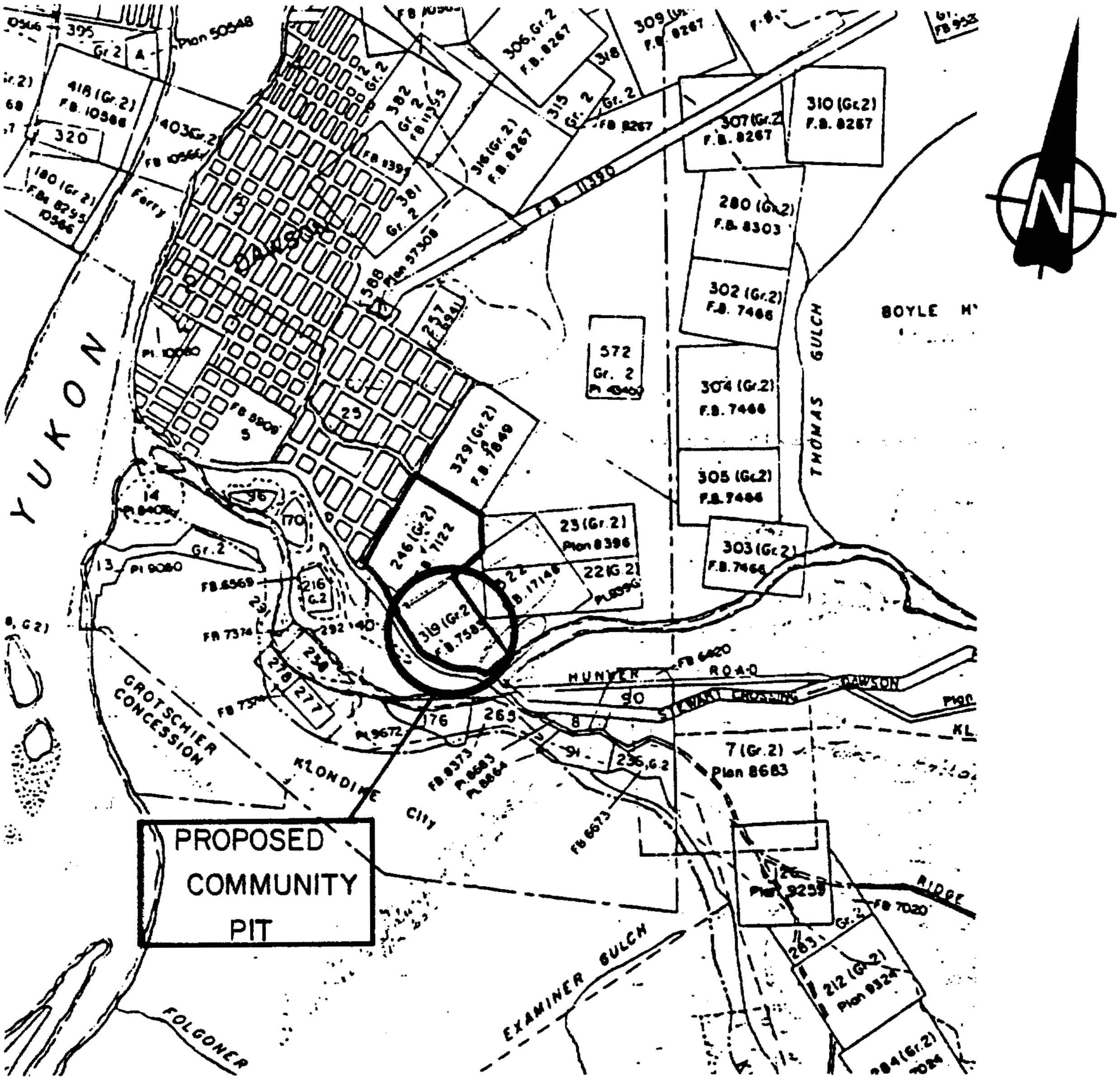


FIGURE 1

LOCATION OF PROPOSED COMMUNITY GRAVEL PIT

DAWSON CITY, YUKON

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1983 10 27
DRAWN BY: NLM	FIGURE: 1
REVIEWED BY: [signature]	

2.0 FIELD WORK

The field work was completed on October 13, 1983. A track-mounted P & H hoe contracted from Arctic Backhoe Services Ltd. was mobilized from Dawson City for the project.

A total of 10 test pits were excavated across the site, each to approximately 6.0 m depth. A site plan showing the approximate locations of the test pits is included as Drawing No. 3939-A-1, Appendix A. Test pit logs are included in Appendix B. Some of the pre-selected test pit locations had to be moved in the field to minimize clearing for the P & H backhoe.

Representative soil samples were taken at various depths in each test pit. All samples were returned to EBA's Whitehorse laboratory for testing.

3.0 LABORATORY TESTING

3.1 General

The natural moisture content was determined for all samples. This data is presented on the borehole logs, where applicable. In addition, representative samples were tested for soil particle gradation. These grain-size distribution curves are included in Appendix B.

3.2 Petrographic Analysis

It was determined that the minerology of the samples collected was similar to that of the test sample used for Petrographic Analysis in the previous study (EBA Report, February, 1983). Therefore, no additional petrographic analyses were completed. The petrographic test results from the previous report are included at the back of Appendix B.

4.0 DISCUSSION OF RESULTS

4.1 Subsurface Conditions

The test pit logs are presented in Appendix B, as previously noted. Four cross-sections of the subsurface stratigraphy have been prepared to illustrate general subsurface conditions at the site (see Drawings No. 3939-A-2 to A-5, inclusive). Although site surveying was not completed, it was noted during the field work that the ground surface is relatively flat.

The locations of the cross sections are shown on Figure 2. In general, based on the borehole data, it appears that approximately 1.5 m of silt and sand overlies at least 4.5 m of gravel. It was noted that the amount of overburden increases toward the West side of the proposed pit. The grain-size of the gravel appears to increase with depth in each hole.

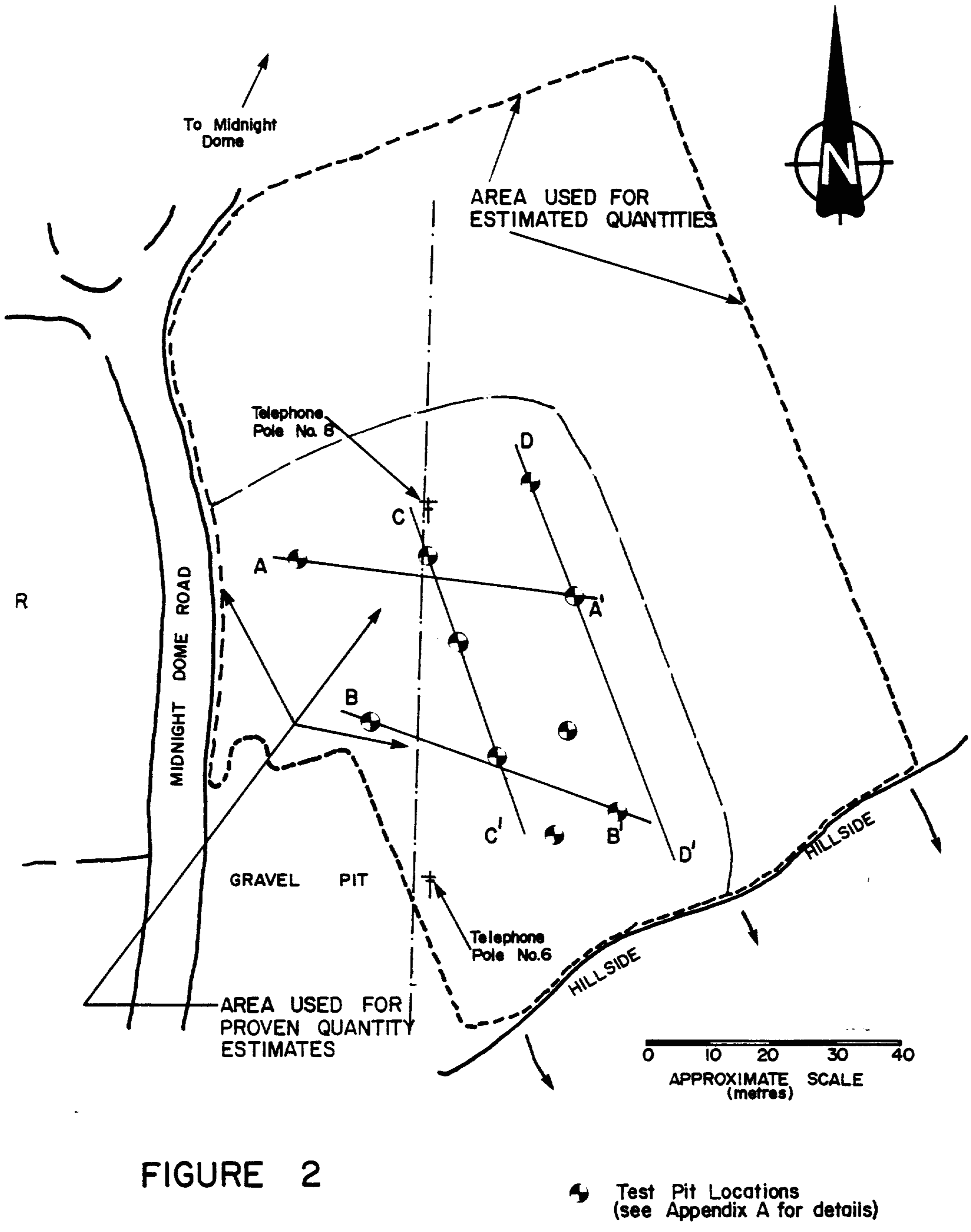


FIGURE 2

LOCATIONS OF STRATIGRAPHIC CROSS SECTIONS & AREA USED FOR QUANTITY ESTIMATES

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1983 10 27
DRAWN BY: NLM	
REVIEWED BY:	FIGURE: 2

5.0 CONCLUSIONS

5.1 Quantities

The quantities of gravel and sand at the proposed site have been estimated for the two areas shown in Figure 2. The proven area is smaller, and basically surrounds the test pits; however, the estimated area uses some data and extrapolation from the previous study (EBA, 1983).

The following Table summarizes quantity estimates for the proposed area:

MATERIAL	DESCRIPTION	QUANTITY ESTIMATES*	
		Proven	Max. for Area Shown
SILT	Overburden and waste materials	4100 m^3	10,400 m^3
SAND	Intermixed with some gravel	5200 m^3	11,400 m^3
GRAVEL	Good for general and backfill purposes	25,300 m^3	52,000 m^3

* Assuming 6.4 m depth for all cases. It is not known how much deeper the gravel deposit extends due to depth limitation of the backhoe. It is believed, however, that the quantity estimates given are on the "conservative" side.

5.2 Material Evaluation

The gravel encountered throughout the proposed pit would fall within EBA's recommended backfill gradation limits (Figure 3). The test results show that the gravel is suitable for general backfill purposes.

The silt content of the sand layer exceeds the recommended backfill gradation limits. The sand and silt layers should both be stripped to expose the underlying good gravel, as was the practice for the adjacent existing pit. The volume of stripping will likely increase as the pit is developed to the North.

5.3 Concrete Aggregate

Previous experience with the use of aggregate from the existing pit for concrete production in Dawson City has shown that an extra bag of cement, above design specification, was needed in each batch to obtain a 28 day compressive strength of 20 to 25 MPa. This is due primarily to the gradation of the soil. The attached curves on Figure 4 show that the gravel material (less than 38 mm diameter only) throughout the site does not comply with the CSA Concrete Aggregate Gradation Specifications. It is likely that a washing and crushing scheme to blend materials for an acceptable concrete aggregate could be developed; however, additional studies would be required in this regard.

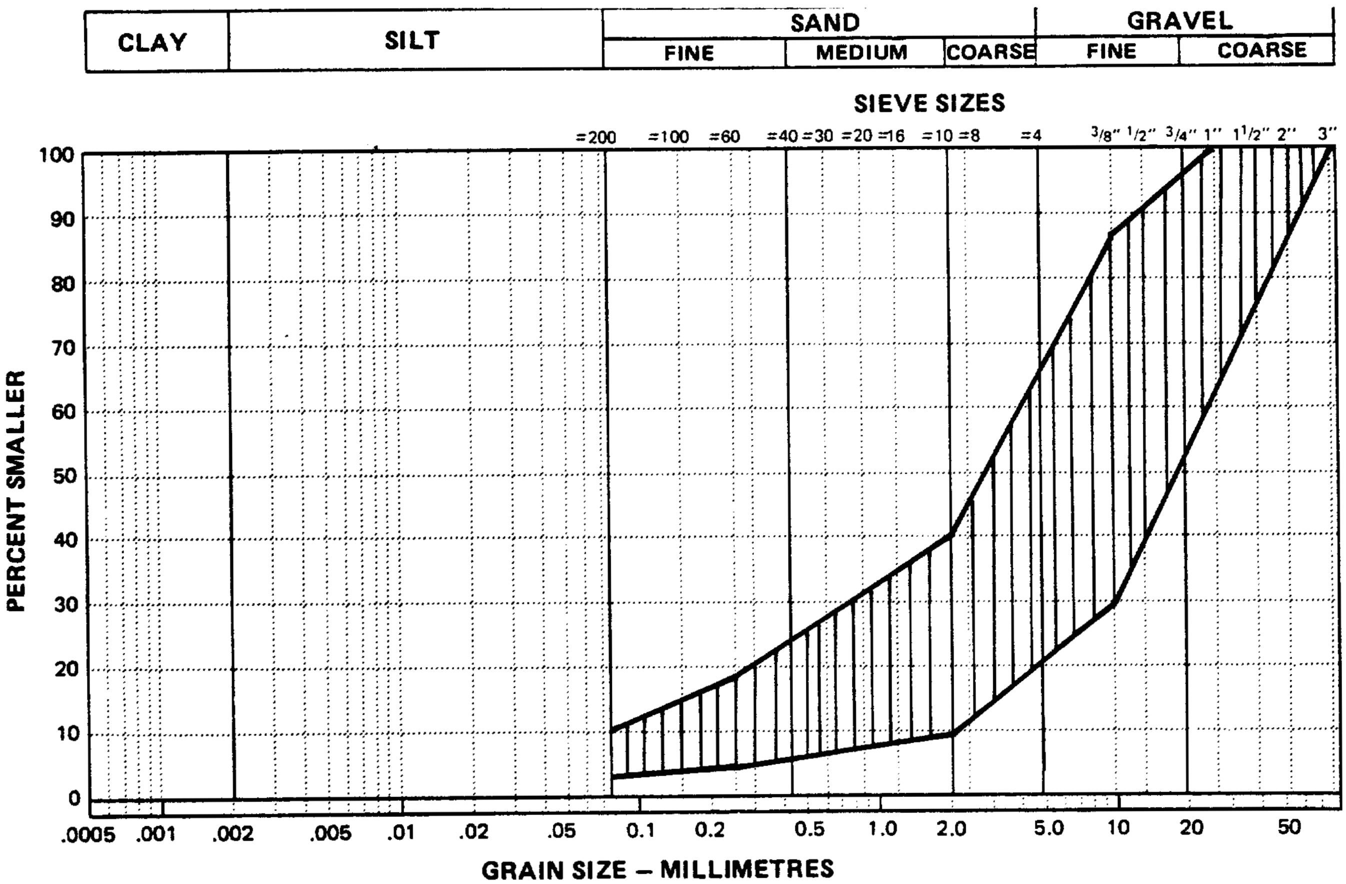
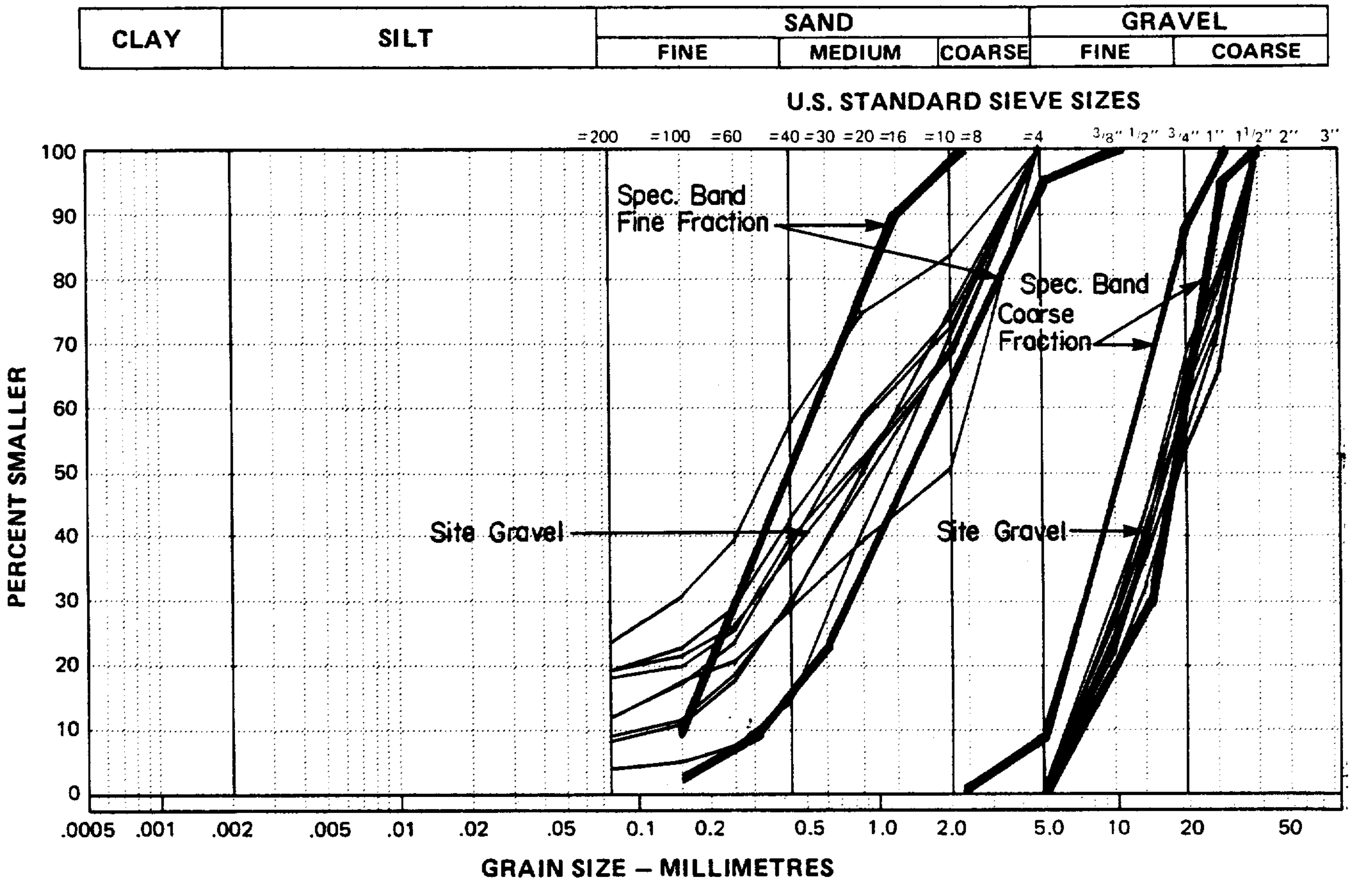


FIGURE 3

RECOMMENDED

BACKFILL GRADATION LIMITS

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1983 10 26
DRAWN BY: NLM	FIGURE: 3
REVIEWED BY: [signature]	



CSA Standard A23.1-M and A23.1

FIGURE 4

COMPARISON OF SITE GRAVEL WITH CONCRETE AGGREGATE SPECIFICATIONS

NOTE: Materials greater than 1 1/2" were eliminated from test samples.

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1984 01 28
DRAWN BY: NLM	
REVIEWED BY: JMT	FIGURE: 4

6.0 CLOSURE

This report has been prepared on the basis of a limited test pitting and laboratory testing program. The proven quantity of gravel at the proposed site is small, however, greater reserves of gravel at depth and in areal extent are probable. The gravel is considered to be of good quality for backfill, and of marginal quality for concrete purposes.

Stripping of silt and sand overburden is required throughout the site. The overburden thickness increases towards the Northwest.

Respectfully Submitted,

EBA Engineering Consultants Ltd.

PROFESSIONAL
YUKON
J. RICHARD TRIMBLE
TERRITORY
ENGINEER

1984-01-30

J.D. McLeod, C.E.T.
MATERIALS TESTING SUPERVISOR

J.R. Trimble, P.Eng.
PROJECT DIRECTOR

REFERENCE

EBA Engineering Consultants Ltd. (1983). Materials Evaluation - Proposed Community Gravel Pit, Dawson City, Yukon. Prepared for DIAND, February, 1983. (EBA Project No. 209-3723).

EBA ENGINEERING CONSULTANTS LTD.

GEOTECHNICAL REPORT
GENERAL CONDITIONS

A.1 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site and development. It is not applicable to adjacent sites nor is it valid for types of development other than that to which it refers. Any variation from the site, or development, necessitates a geotechnical review in order to determine the validity of the design concepts evolved herein.

This report is not to be reproduced in part or in whole without consent in writing from EBA Engineering Consultants Ltd. (EBA). Additional copies of the report, if required, may be obtained upon request. Isolated information, logs of borings, or profiles are not to be reproduced, copied or transferred.

A.2 NATURE AND EXACTNESS OF SOIL DESCRIPTION

Classification and identification of soils are based upon commonly accepted methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system prevail, they are specifically mentioned.

Classification and identification of soil and geologic units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

A.3 LOGS OF BORINGS

The boring logs are a compilation of conditions and classification of soils as obtained from field observations and laboratory testing of selected samples. Soil zones have been interpreted. Change from one geologic zone to the other, indicated on the logs as a distinct line, is in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil zone transition elevations may require special evaluation.

A.4 STRATIGRAPHIC AND GEOLOGIC SECTIONS

The stratigraphic and geologic sections indicated on drawings contained in this report are evolved from logs of borings. Stratigraphy is known precisely only at the locations of the borings. Actual geology and stratigraphy between borings may vary from that shown on these drawings. Natural variations in geologic conditions are inherent and a function of historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of exact locations of geologic units is necessary, it is cautioned that such determination requires special attention.

A.5 GROUNDWATER CONDITIONS

Groundwater conditions represented in this report refer only to those observed at the times recorded on logs of borings, and/or within the text of this report. These conditions vary with geologic detail between borings; annual, seasonal and special meteorologic conditions; and with construction activity. Where instruments have been established to record groundwater variations on an ongoing basis, the records will be specifically referred to. Interpretation of groundwater conditions from observations and records is judgmental and constitutes an evaluation of circumstances as influenced by geology, meteorology and construction activity. Deviations from these observations, may occur. No other warranty, express, or implied, is made by EBA.

A.6 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geologic materials to meteorological elements. Many geologic materials deteriorate rapidly upon exposure to climatic elements. Severe deterioration of materials may be caused by precipitation and/or the action of frost on exposures. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from elements, particularly all forms of moisture, desiccation from arid conditions and frost action.

A.7 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise advised, support of excavation walls, ground adjacent to anticipated construction activity and of structures adjacent to the construction, must be provided. The support of ground and structures adjacent to the anticipated construction, with preservation of adjacent ground and structures from the adverse impact of construction activity, is therefore required.

A.8 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and adjacent structural performance. The influence of all anticipated construction activities should by considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known. EBA provides no warranty in respect to adverse circumstances resulting from construction activity.

A.9 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geologic deposits, the judgmental character of the art of soil and foundation engineering, as well the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations then may serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein to the benefit of the project.

A.10 DRAINAGE SYSTEMS

Where drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwised specified, it is a condition of this report that effective drainage systems are required and that they must be considered in relation to project purpose and function.

A.11 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil type and soil condition. Construction activity and environmental circumstances can materially change a soil condition. The elevation at which a soil type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geologic materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil conditions assumed in this report exist in fact.

A.12 SAMPLES

EBA will retain all soil and rock samples for 30 days. Further storage or transfer of samples can be made at owner expense upon written request.

A.13 STANDARD OF CARE

Services performed by EBA for this report are conducted in a manner consistent with that level and skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty, express or implied, is made.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P 245
E B A ENGINEERING CONSULTANTS LTD.

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	$m \cdot s^{-1}$
- angular	(radian per second)		rad/s	$rad \cdot s^{-1}$
acceleration - linear	(metre per second) per second		m/s^2	$m \cdot s^{-2}$
- 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}	tetra	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

SYSTEM INTERNATIONAL CONVERSIONS

AREA

1 km^2	= 3.861×10^{-1} mi^2	1 km^2 = 100 hectares
1 km^2	= $2.471 \times 10^{+2}$ acre	
1 m^2	= 1.196 yd^2	
1 m^2	= $1.076 \times 10^{+1}$ ft^2	
1 mm^2	= 1.550×10^{-3} in^2	see note 1

DENSITY

1 Mg/m^3	= $6.243 \times 10^{+1}$ lb_m/ft^3	see note 2
1 kg/m^3	= 6.243×10^{-2} lb_m/ft^3	

FORCE

1 N	= 2.248×10^{-1} lb_f	

HEAT

ENERGY (E)		
1 kJ	= 9.478×10^{-1} BTU (IST)	1 BTU = 252 cal
1 J	= 2.388×10^{-1} cal (IST)	
HEAT FLUX (Q)		
1 W/m^2	= 3.170×10^{-1} $BTU/(ft^2 \cdot hr)$	
SPECIFIC HEAT CAPACITY (c)		
1 $kJ/(kg \cdot C^\circ)$	= 2.388×10^{-1} $BTU/(lb_m \cdot F^\circ)$	
THERMAL CONDUCTIVITY (k)		
$W/(m \cdot C^\circ)$	= 5.778×10^{-1} $BTU/(ft \cdot hr \cdot F^\circ)$	
COEFFICIENT OF HEAT TRANSFER (c_s)		
1 $W/(m^2 \cdot C^\circ)$	= 1.761×10^{-1} $BTU/(ft^2 \cdot hr \cdot F^\circ)$	see note 3

LENGTH

1 km	= 6.214×10^{-1} mi (statute)	
1 m	= 1.094 yd	
1 m	= 3.281 ft	
1 mm	= 3.937×10^{-2} in	

MASS

1 Mg	= 1.102 T	1 T = 2000 lb_m
1 Mg	= 2.205×10^3 lb_m	Mg is equivilant to tonne
1 kg	= 2.205 lb_m	

POWER

1 W	= 1.341×10^{-3} HP	1 HP = 550 $ft \cdot lb_f/s$

PRESSURE, STRESS or ELASTIC MODULI

1 MPa	= $1.044 \times 10^{+1}$ T_f/ft^2 [TSF]	see note 4
1 kPa	= 1.044×10^{-2} T_f/ft^2 [TSF]	
1 kPa	= 1.450×10^{-1} lb_f/in^2 [psi]	
1 kPa	= 3.346×10^{-1} ft of water	hydrostatic pressure of water at 1 ft. depth
1 Pa	= 2.089×10^{-2} lb_f/ft^2 [psf]	

TEMPERATURE

°C	= (°F - 32)/1.8	0°C = 273.15° K
C°	= 1.8 F°	1 C° = 1 K°

TIME

1 Ms	= 3.171×10^{-2} yr	for one year equal to 365 days
1 ks	= 1.157×10^{-2} day	
1 s	= 3.171×10^{-8} yr	

VISCOSITY

DYNAMIC (η)		
1 $Pa \cdot s$	= $1.000 \times 10^{+3}$ centipoise	
KINEMATIC (ν)		
1 mm^2/s	= 1.000 cenistoke	

VOLUME

1 m^3	= 8.107×10^{-4} $acre \cdot ft$	
1 m^3	= 1.308 yd^3	
1 m^3	= $3.531 \times 10^{+1}$ ft^3	
1 m^3	= $2.200 \times 10^{+2}$ gal (Imperial)	1 m^3 = 1000 L
1 cm^3	= 3.520×10^{-2} fl oz	see note 1
1 cm^3	= 6.102×10^{-2} in^3	

VOLUME RATE OF FLOW

1 m^3/s	= 1.901×10^{-1} mgpd (Imperial)	
1 m^3/s	= $3.531 \times 10^{+1}$ ft^3/s	

COEFFICIENTS

VOLUME COMPRESSIBILITY OR SWELLING (m_v or m_s)		
1 m^2/MN;	= 9.579×10^{-2} ft^2/T_f	
CONSOLIDATION OR SWELLING (c_v or c_s)		
1 m^2/yr	= $1.076 \times 10^{+1}$ ft^2/yr	
1 m^2/yr	= 2.949×10^{-2} ft^2/day	
1 m^2/yr	= 3.171×10^{-4} cm^2/s	
HYDRAULIC CONDUCTIVITY (k)		
1 m/s	= $2.835 \times 10^{+5}$ ft/day	see note 5

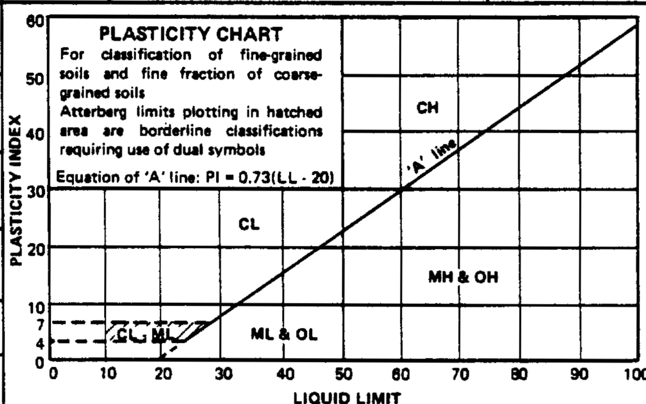
NOTES:

1. *The use of cm^2 and cm^3 for area and volume is permissible.*
2. *To convert mass density (ρ) to weight per unit volume use:*
   $F = ma_g$
   i.e. $\rho Mg/m^3 \times 9.807\ m/s^2 = 9.807\rho \frac{Mg \cdot m}{s^2 \cdot m^3} = 9.807\rho \frac{kN}{m^3}$
   kg_f/m^3 *is not a valid SI density unit.*
3. *The inverse of the 'coefficient of heat transfer' is 'thermal resistance' or the 'R' value.*
4. kg_f/m^2 *is not a valid SI stress unit.*
5. *Hydraulic conductivity is a proportionality coefficient defined in Darcy's Law:* $v = k_w \frac{\partial h}{\partial s}$, *where* v = *velocity of flow*
   $\frac{\partial h}{\partial s}$ = *hydraulic gradient*
6. *All conversion factors have been rounded to four significant figures.*

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	$C_u = D_{60}/D_{10}$ 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		

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



*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

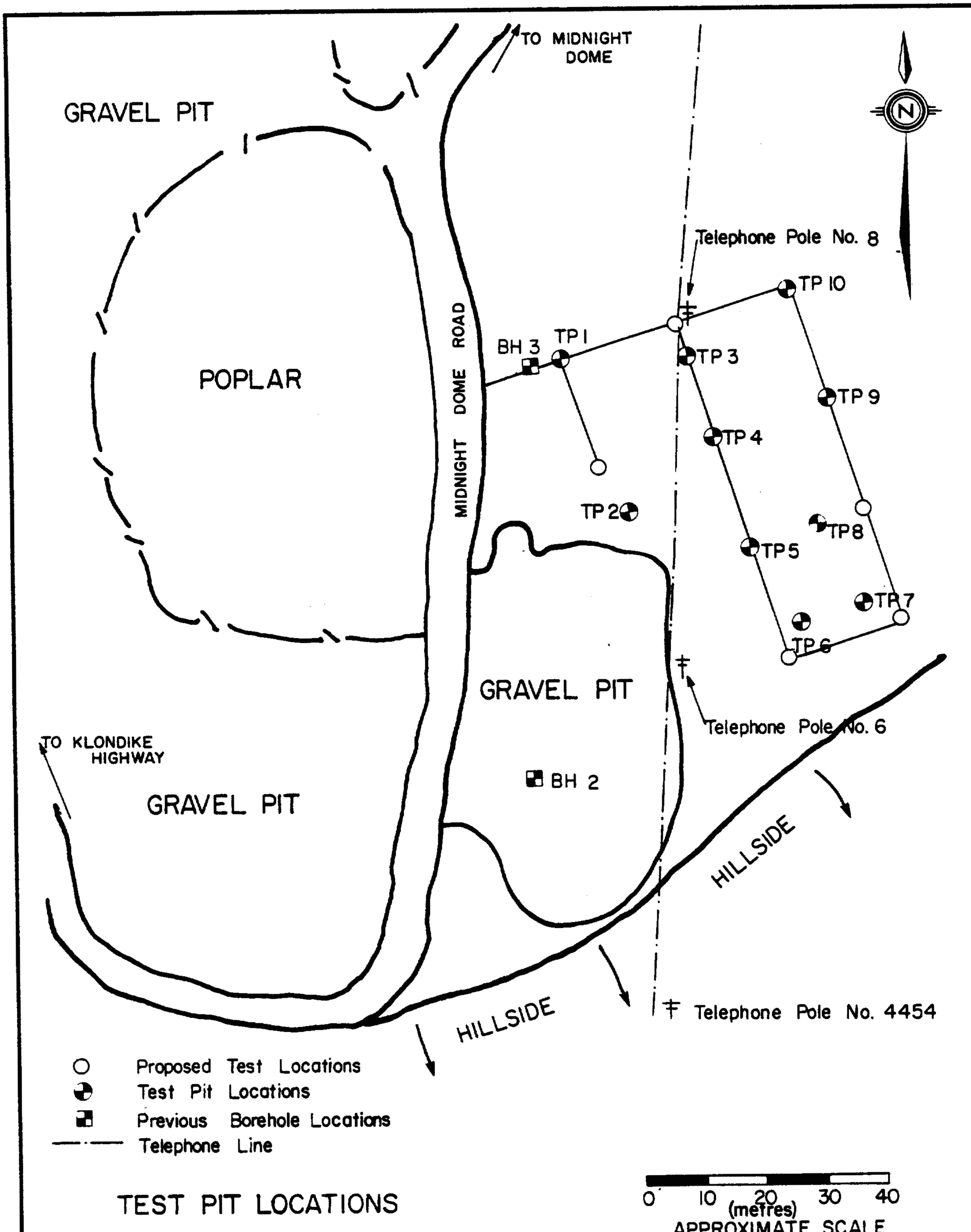
VISIBLE ICE GREATER THAN 50% BY VOLUME

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION
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



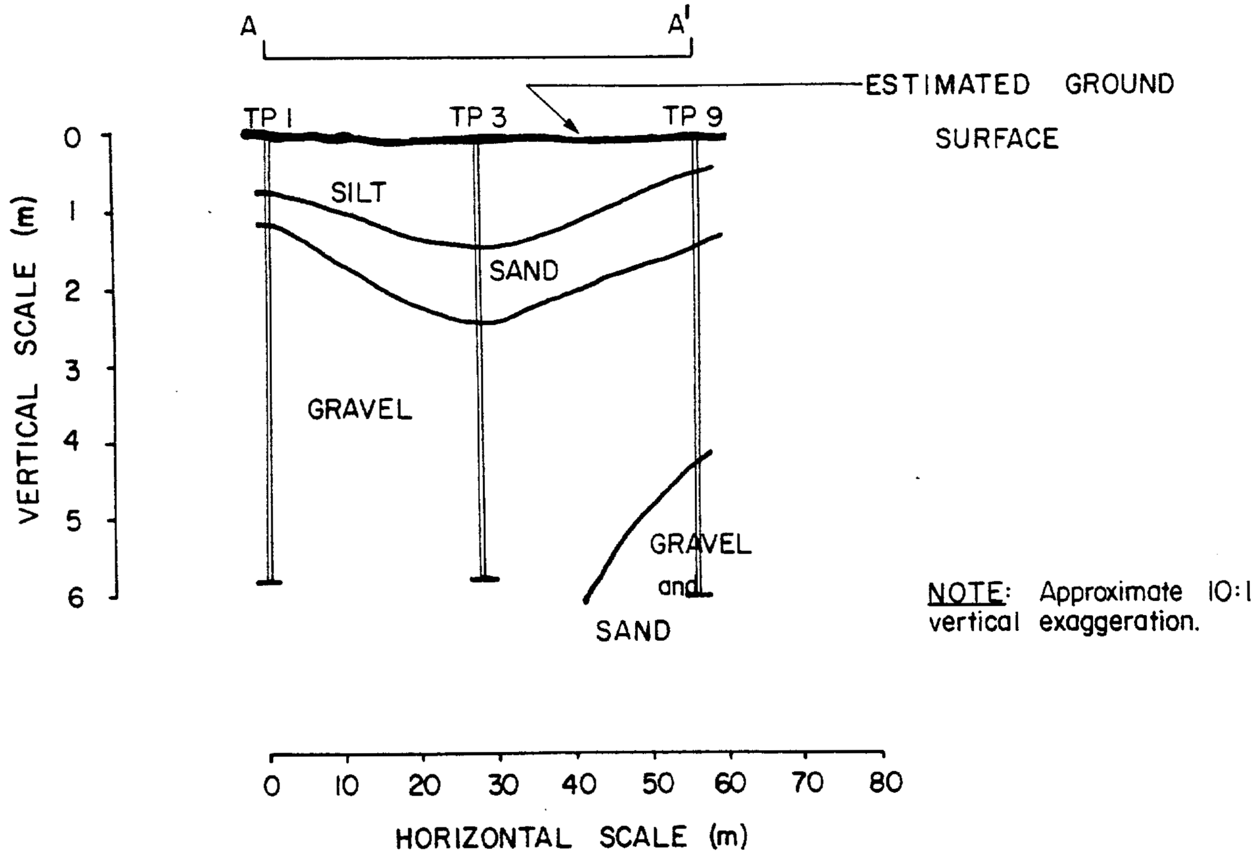
TEST PIT LOCATIONS

COMMUNITY GRAVEL PIT

DAWSON CITY, YUKON

EBA Engineering Consultants Ltd.

JOB NO.: 209-3939	**DATE:** 1983 10 18
DRAWN BY: NLM	**DRAWING NO.:** 3939-A-1
REVIEWED BY:	

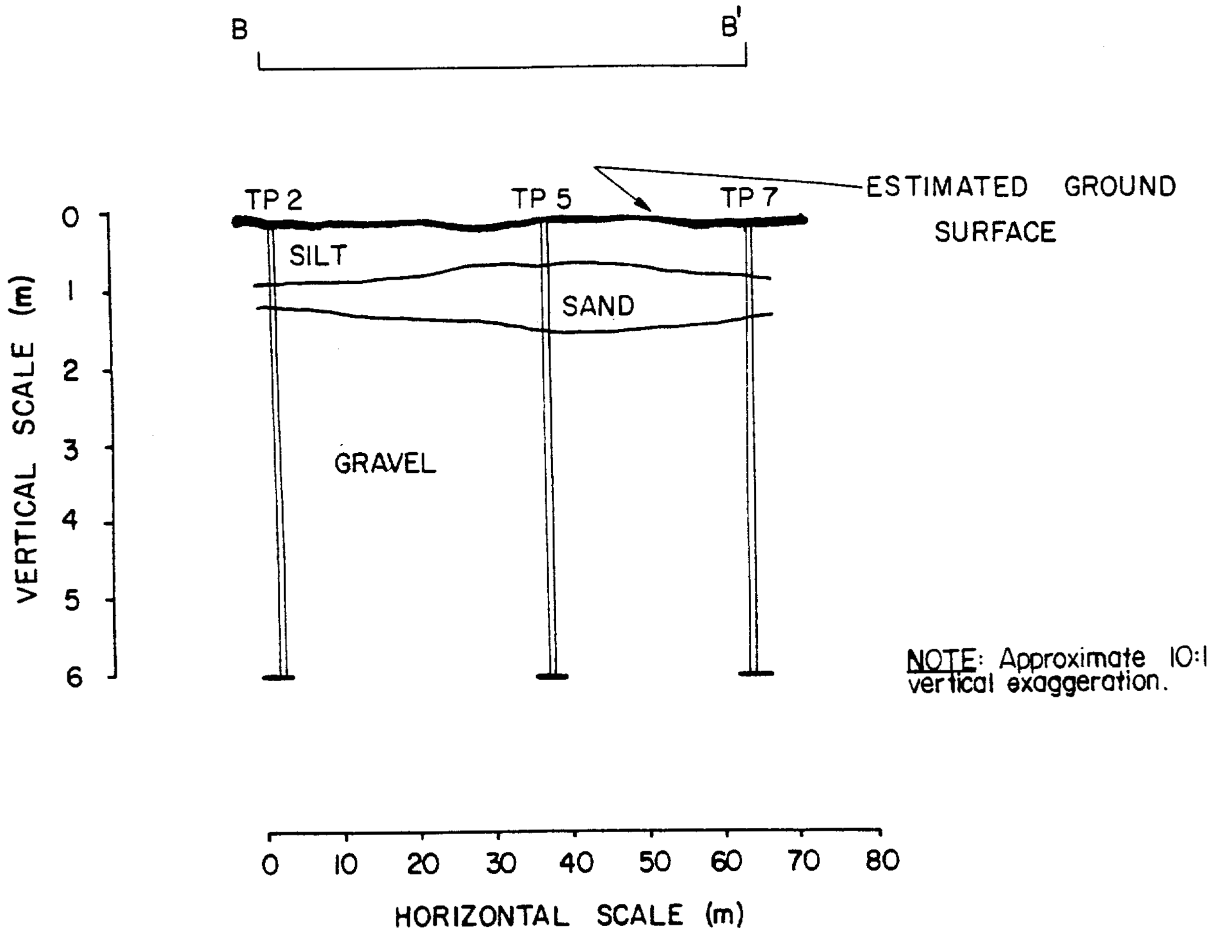


CROSS SECTION A - A'

GENERALIZED SUBSURFACE STRATIGRAPHY FOR PROPOSED GRAVEL PIT DAWSON CITY, YUKON

The geologic and stratigraphic sections shown on this drawing are interpreted from borehole logs. Stratigraphy is known with certainty only at the borehole locations. Actual stratigraphy and geologic conditions between boreholes may vary from that indicated on this drawing.

EBA Engineering Consultants Ltd.	
JOB NO.:209-3939	DATE: 1983 10 26
DRAWN BY: NLM	DRAWING NO.: 3939-A-2
REVIEWED BY: JMT	

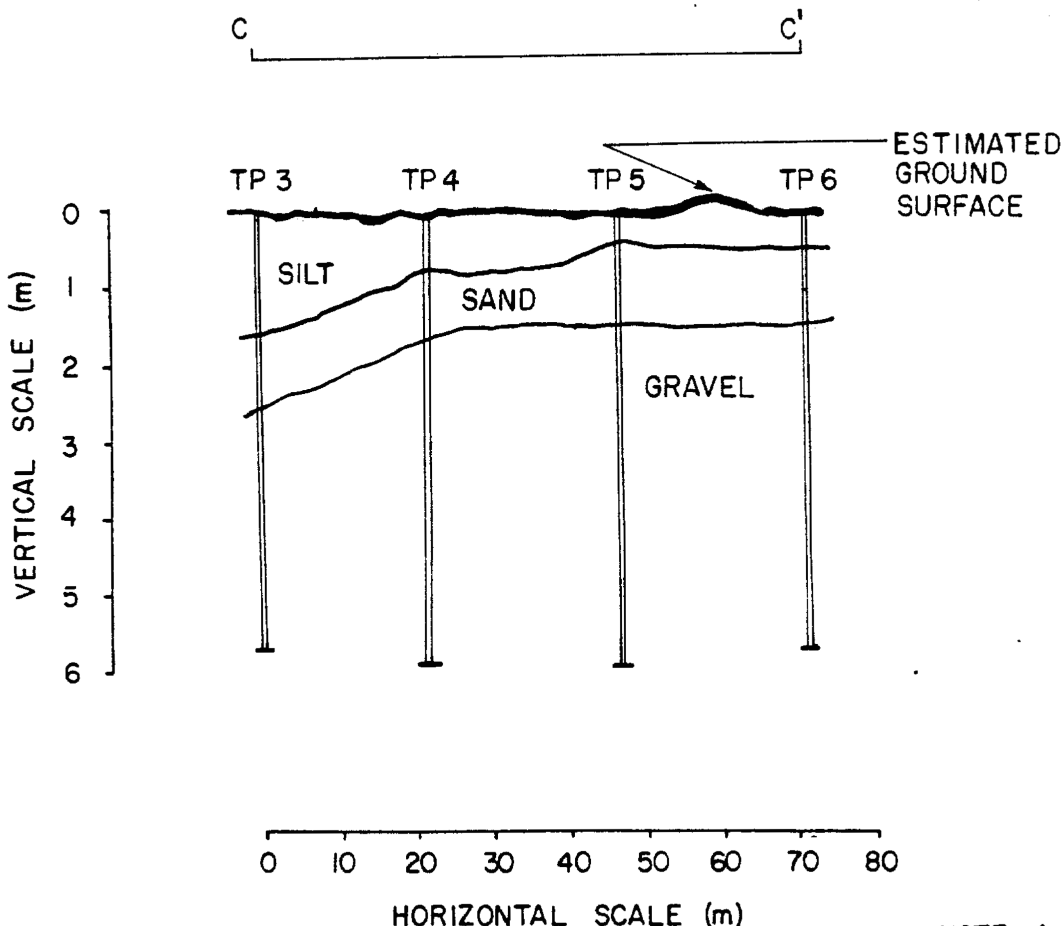


CROSS SECTION B - B'

GENERALIZED SUBSURFACE STRATIGRAPHY FOR PROPOSED GRAVEL PIT DAWSON CITY, YUKON

The geologic and stratigraphic sections shown on this drawing are interpreted from borehole logs. Stratigraphy is known with certainty only at the borehole locations. Actual stratigraphy and geologic conditions between boreholes may vary from that indicated on this drawing.

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1983 10 26
DRAWN BY: NLM	DRAWING NO.: 3939-A-3
REVIEWED BY:	



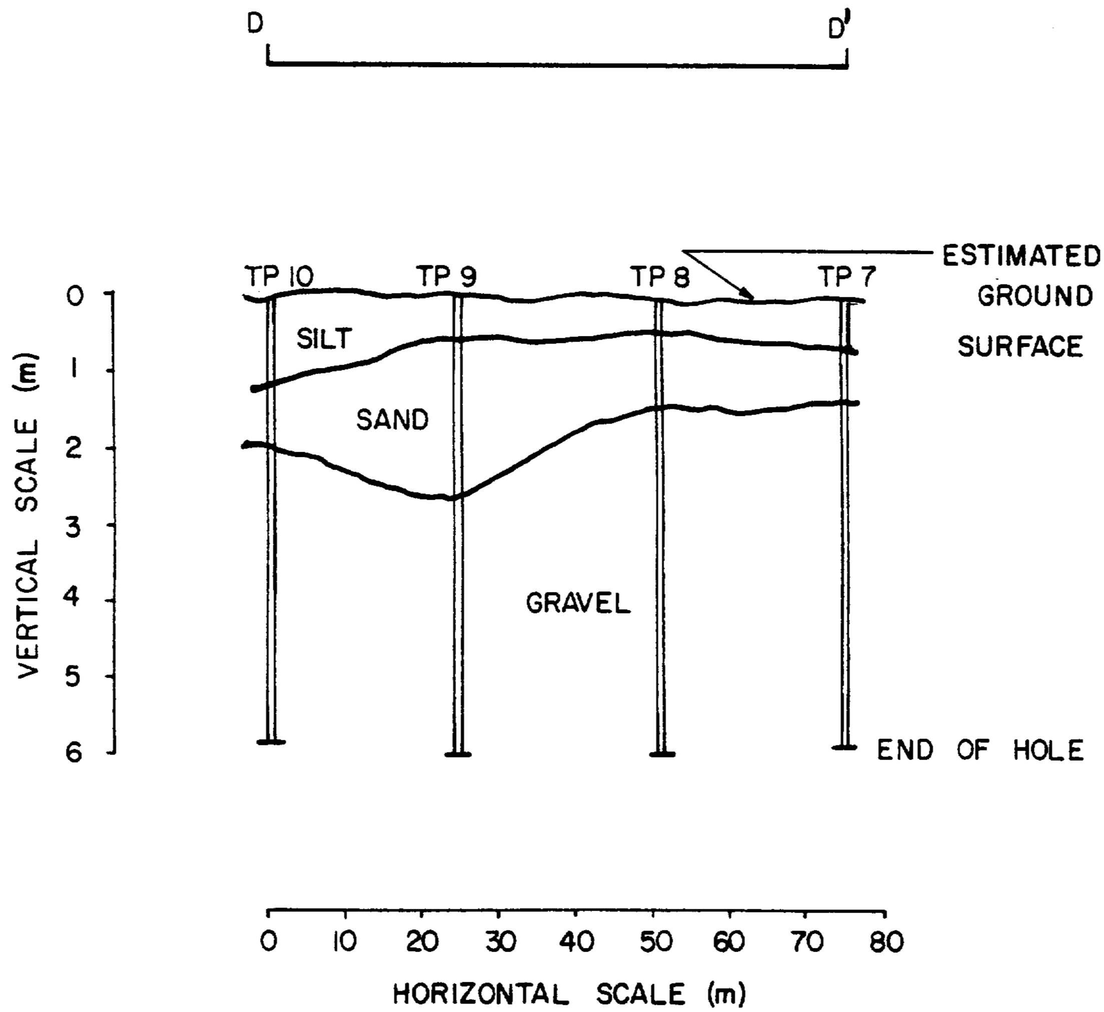
NOTE: Approximate 10:1 vertical exaggeration.

CROSS SECTION C - C'

GENERALIZED SUBSURFACE STRATIGRAPHY FOR PROPOSED GRAVEL PIT DAWSON CITY, YUKON

The geologic and stratigraphic sections shown on this drawing are interpreted from borehole logs. Stratigraphy is known with certainty only at the borehole locations. Actual stratigraphy and geologic conditions between boreholes may vary from that indicated on this drawing.

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1983 10 26
DRAWN BY: NLM	DRAWING NO.: 3939-A-4
REVIEWED BY:	



NOTE: Approximate 10:1 vertical exaggeration.

CROSS SECTION D - D'

GENERALIZED SUBSURFACE STRATIGRAPHY FOR PROPOSED GRAVEL PIT DAWSON CITY, YUKON

The geologic and stratigraphic sections shown on this drawing are interpreted from borehole logs. Stratigraphy is known with certainty only at the borehole locations. Actual stratigraphy and geologic conditions between boreholes may vary from that indicated on this drawing.

EBA Engineering Consultants Ltd.	
JOB NO.: 209-3939	DATE: 1983 10 26
DRAWN BY: NLM	DRAWING NO.: 3939-A-5
REVIEWED BY:	

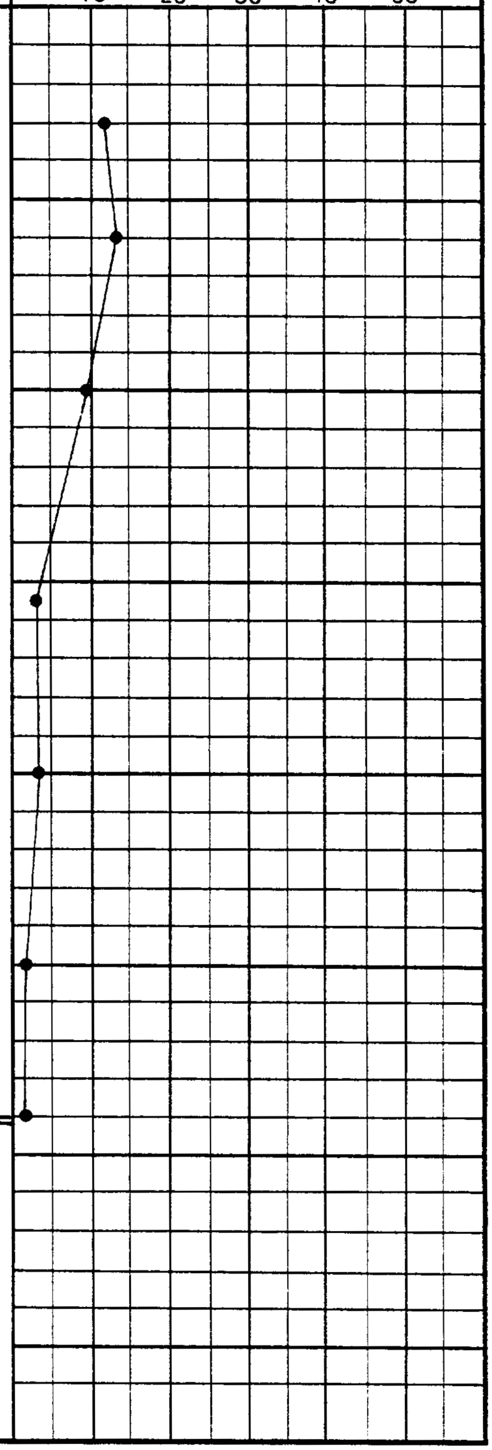
BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
	ORGANICS		NOT FROZEN
	SILT - sandy, fine grained, damp, non-plastic, olive brown	G	
1	SAND - silty, fine grained, damp, olive brown	G	
	GRAVEL - sandy, some silt, cobbles, rounded, fine to coarse grained, damp, brown		
2	COBBLE LAYER	G	
	GRAVEL - sandy, some silt, cobbles, rounded, fine to coarse grained, damp, brown		
3	- sandy, trace of silt, odd cobbles, rounded, fine to coarse grained, damp, brown	G	
4		G	
5		G	
		G	
6	END OF HOLE (5.8 m)		
	Not Refusal		
7			

BULK DENSITY (Mg/m³) ▲
1.4 1.6 1.8 2.0 2.2

MOISTURE CONTENT
10 20 30 40 50



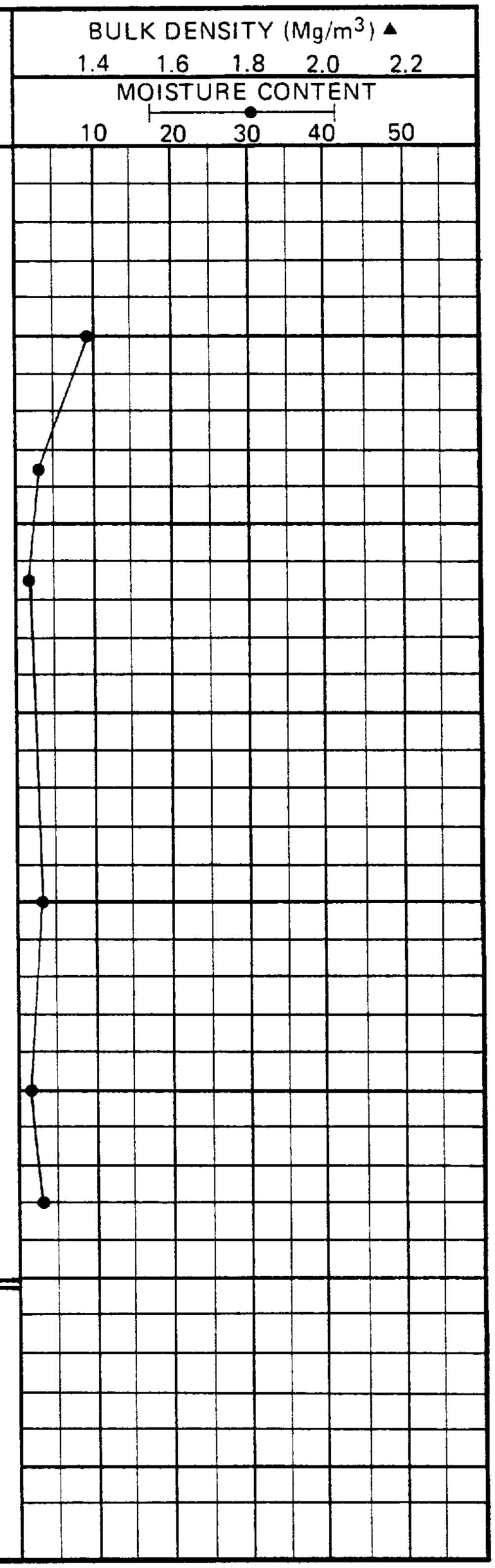
eba	SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No.
	COMPLETION DEPTH (m) 5.8	LOGGED BY JDM	TP 1
	DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
	ORGANICS		NOT FROZEN
	SILT - sandy, fine grained, dry to damp, non-plastic, olive brown		
1	SAND - silty, fine grained, damp, olive brown	G	
	GRAVEL - sandy, silty, odd cobbles, rounded, fine to coarse grained, damp, brown	G	
2	COBBLE LAYER		
	GRAVEL - sandy, trace of silt, cobbles, rounded, fine to coarse grained, damp, brown	G	
3	- odd cobbles		
4		G	
	- sandy, trace of silt		
5		G	
		G	
6	END OF HOLE (6.0 m) Not Refusal		
7			



SFC. ELEVATION (m)		DATE DRILLED	1983 10 13
COMPLETION DEPTH (m)	6.0	LOGGED BY	JDM
DRILLING RIG	P&H Backhoe	LOCATION	Dome Road

BOREHOLE No. TP 2

PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

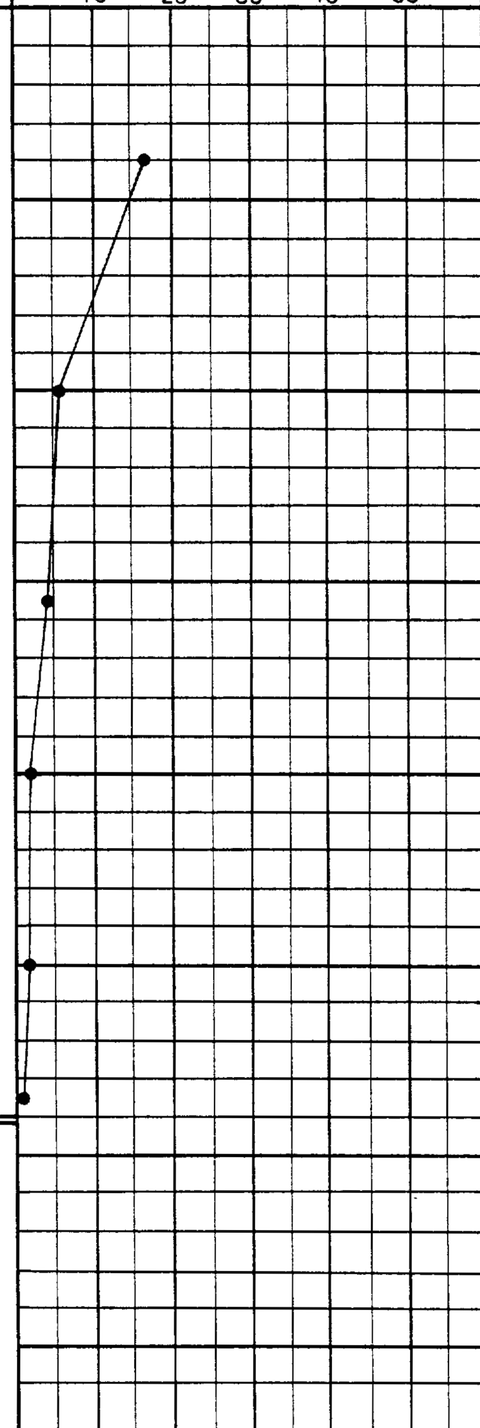
BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
	ORGANICS		NOT FROZEN
	SILT - sandy, fine grained, damp to moist, non-plastic, olive brown	G	
1	- damp		
	SAND - silty, fine grained, damp, olive brown		
2		G	
	GRAVEL - sandy, silty, cobbles, rounded, fine to coarse grained, damp, brown		
3	COBBLE LAYER	G	
	GRAVEL - sandy, some silt, some cobbles, rounded, fine to coarse grained, damp, brown		
4	- sandy, trace of silt, odd cobbles	G	
5	- sloughing in	G	
		G	
6	END OF HOLE (5.8 m) Not Refusal		
7			

BULK DENSITY (Mg/m³) ▲ 1.4 1.6 1.8 2.0 2.2

MOISTURE CONTENT 10 20 30 40 50



SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 3
COMPLETION DEPTH (m) 5.8	LOGGED BY JDM	
DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

2065

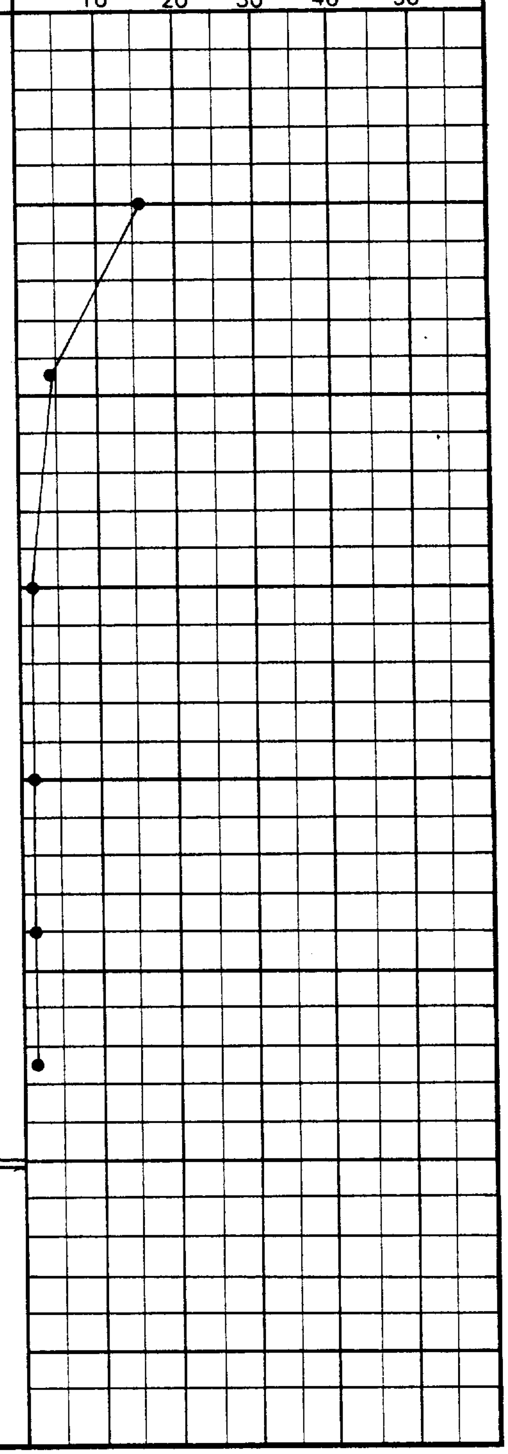
BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
0	ORGANICS		NOT FROZEN
	SILT - sandy, fine grained, non-plastic, damp, olive brown		
1	SAND - silty, fine to medium grained, damp, olive brown	G	
2	GRAVEL - sandy, some silt, cobbles, rounded, fine to coarse grained, damp, brown	G	
	COBBLE LAYER		
3	GRAVEL - sandy, trace of silt, odd cobbles, rounded, fine to coarse grained, damp, brown	G	
4		G	
	- sandy, trace of silt	G	
5	- sloughing	G	
6	END OF HOLE (6.0 m) Not Refusal		
7			

BULK DENSITY (Mg/m³) ▲ 1.4 1.6 1.8 2.0 2.2

MOISTURE CONTENT 10 20 30 40 50



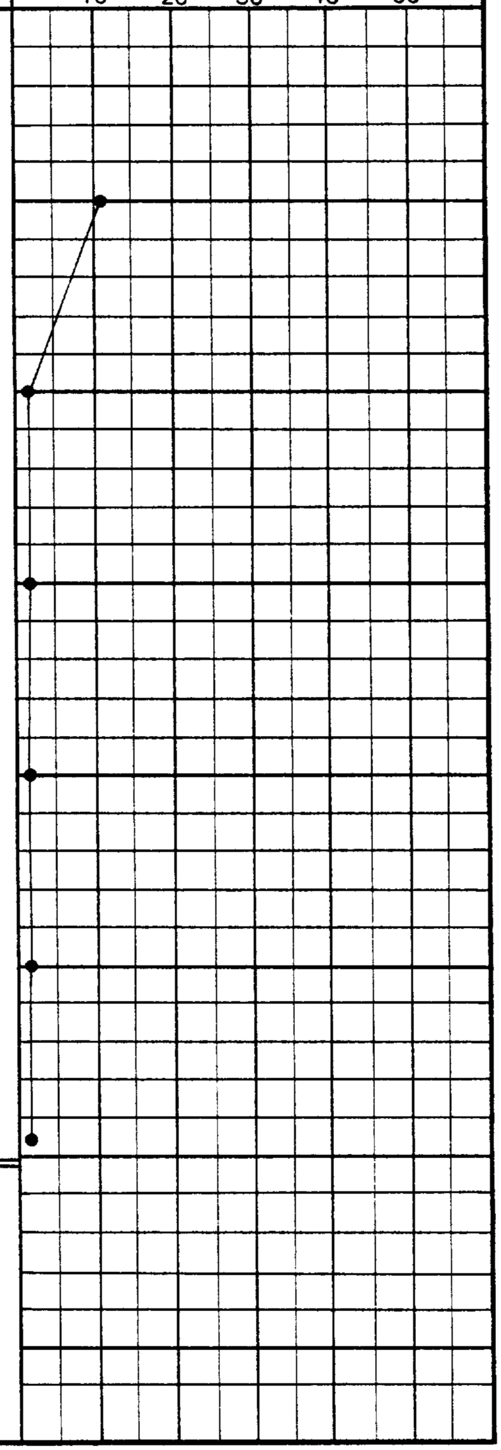
SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 4
COMPLETION DEPTH (m) 6.0	LOGGED BY JDM	
DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m³) ▲ 1.4 1.6 1.8 2.0 2.2 / MOISTURE CONTENT ● 10 20 30 40 50
	ORGANICS		NOT FROZEN	
	SILT - sandy, fine grained, damp, non-plastic, olive brown			
1	SAND - silty, fine to medium grained, damp, olive brown	G		
2	GRAVEL - sandy, some silt, rounded, fine to coarse grained, damp, brown - 1.8 m - sandy, trace of silt, odd cobbles	G		
3	- sandy, trace of silt	G		
4	- sloughing	G		
5		G		
6		G		
	END OF HOLE (6.0 m) Not Refusal			
7				



eba	SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 5
	COMPLETION DEPTH (m) 6.0	LOGGED BY JDM	
	DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

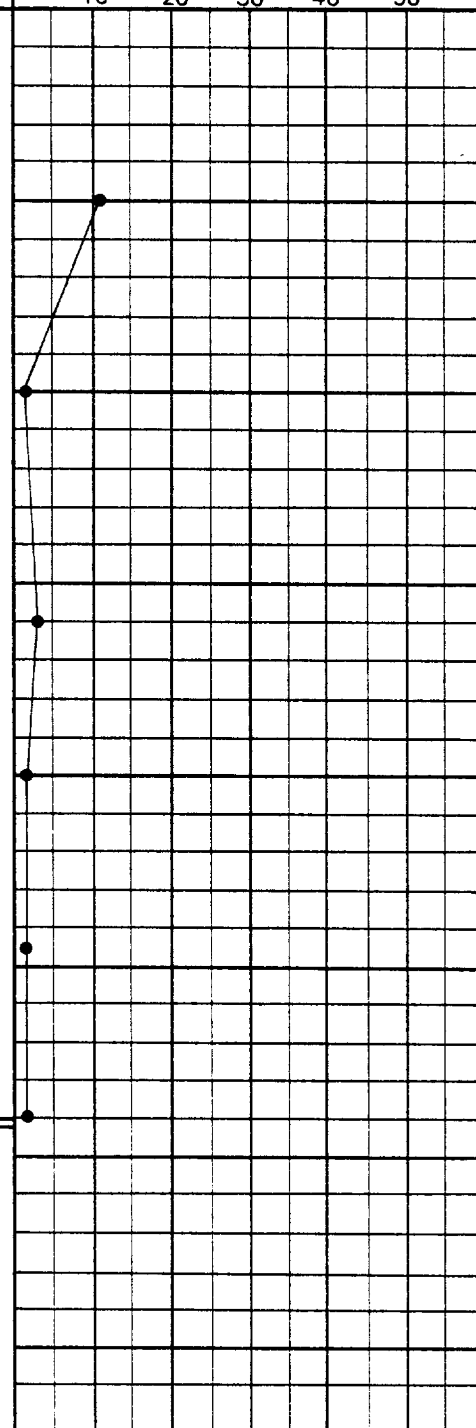
BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
	ORGANICS		NOT FROZEN
	SILT - sandy, fine grained, damp, non-plastic, brown		
1	SAND - silty, fine to medium grained, damp, olive brown	G	
2	GRAVEL - sandy, some silt, cobbles, rounded, fine to coarse grained, damp, brown	G	
	- sandy, trace of silt, odd cobbles		
3		G	
4	- sandy, trace of silt	G	
	- sloughing		
5		G	
		G	
6	END OF HOLE (5.8 m)		
	Not Refusal		
7			

BULK DENSITY (Mg/m^3) ▲ 1.4 1.6 1.8 2.0 2.2

MOISTURE CONTENT 10 20 30 40 50



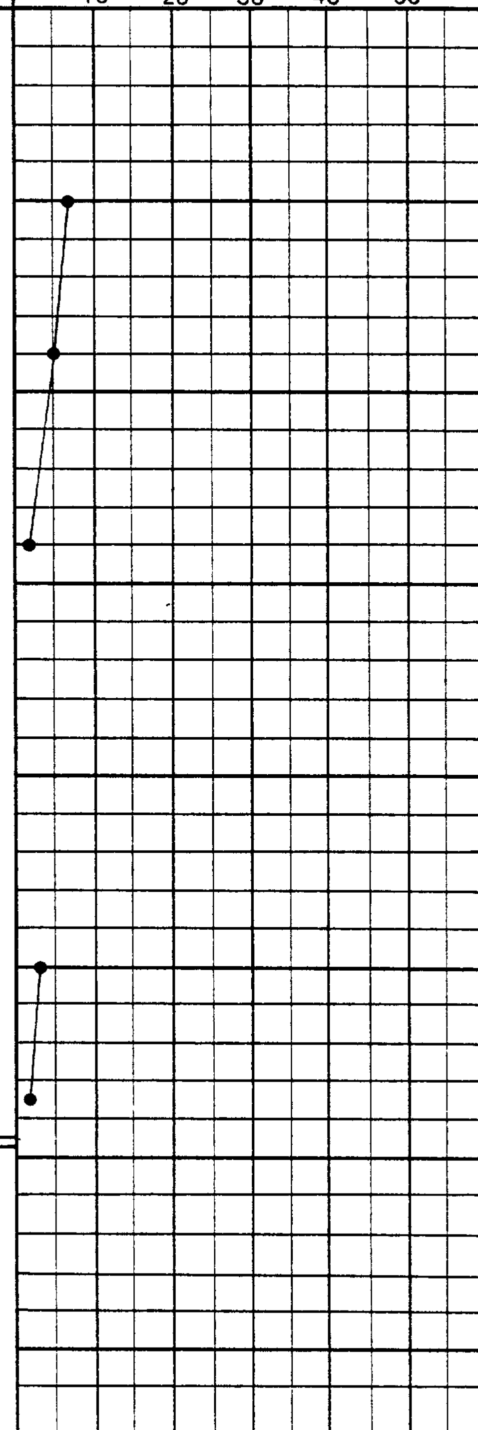
SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 6
COMPLETION DEPTH (m) 5.8	LOGGED BY JDM	
DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

eba

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

BOREHOLE LOG – PERMAFROST 209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m³) ▲ 1.4 1.6 1.8 2.0 2.2 / MOISTURE CONTENT ├─●─┤ 10 20 30 40 50
	ORGANICS		NOT FROZEN	
	SILT - sandy, fine grained, damp, non-plastic, olive brown			
	SAND - silty, fine grained, damp, olive brown			
1		G		
	GRAVEL - sandy, some silt, rounded, fine to coarse grained, damp, brown			
	- sandy, trace of silt	G		
2				
	- cobbles			
	- sandy, trace of silt, odd cobbles	G		
3				
4		G		
	- sandy, trace of silt			
5	- sloughing	G		
		G		
6	END OF HOLE (5.9 m)			
	Not Refusal			
7				



eba	SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No.
	COMPLETION DEPTH (m) 5.9	LOGGED BY JDM	TP 7
	DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

BOREHOLE LOG – PERMAFROST

209-3939

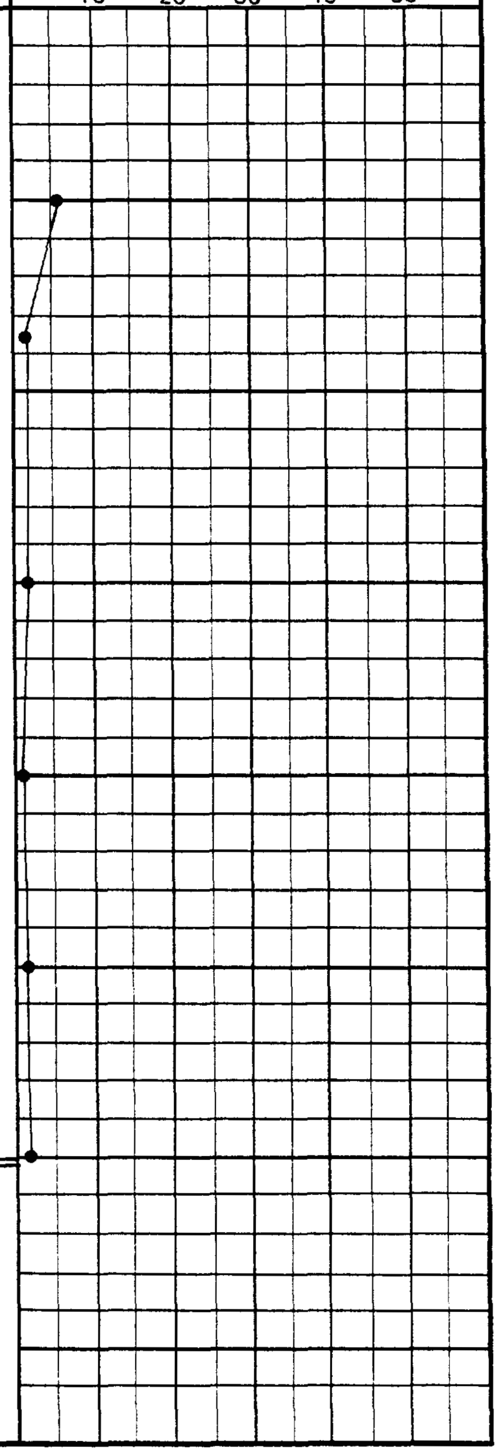
DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
	ORGANICS		NOT FROZEN
	SILT - sandy, fine-grained, dry to damp, non-plastic, olive brown		
1	SAND - silty, fine to medium grained, dry to damp, olive brown - damp	G	
	GRAVEL - sandy, some silt, odd cobbles, rounded, fine to coarse grained, damp, brown	G	
2	- 1.7 m - some sand, some cobbles, trace of silt		
3	- odd cobbles	G	
4		G	
5	- sandy, trace of silt - sloughing	G	
6		G	
	END OF HOLE (6.0 m) Not Refusal		
7			

BULK DENSITY (Mg/m^3) ▲

1.4 1.6 1.8 2.0 2.2

MOISTURE CONTENT

10 20 30 40 50



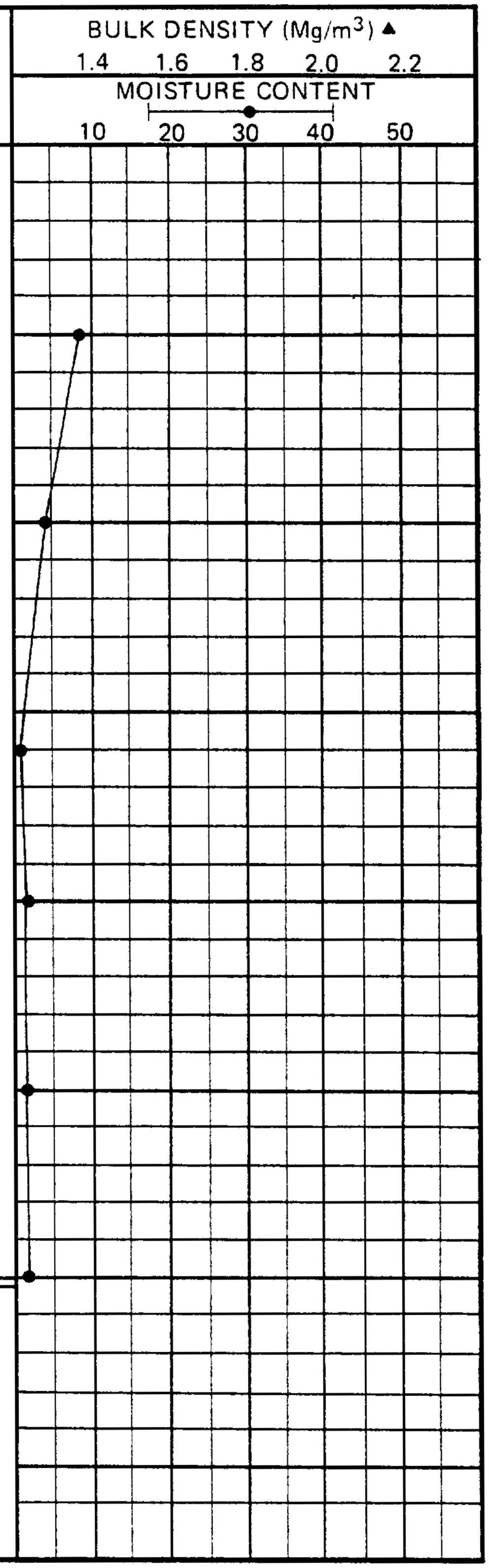
SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 8
COMPLETION DEPTH (m) 6.0	LOGGED BY JDM	
DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
	ORGANICS		NOT FROZEN
	SILT - sandy, fine grained, damp, non-plastic, olive brown		
1	SAND - silty, fine to medium grained, damp to moist, olive brown	G	
2	- some silt, damp	G	
3	GRAVEL - sandy, trace of silt, odd cobbles, rounded, fine to coarse grained, damp, brown - 3.0 m - some sand, trace of silt, odd cobbles	G	
4	- sandy, trace of silt	G	
5	GRAVEL AND SAND - trace of silt, rounded, fine to coarse grained, damp, brown	G	
6		G	
	END OF HOLE (6.0 m) Not Refusal		
7			



SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 9
COMPLETION DEPTH (m) 6.0	LOGGED BY JDM	
DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

eba

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

2065

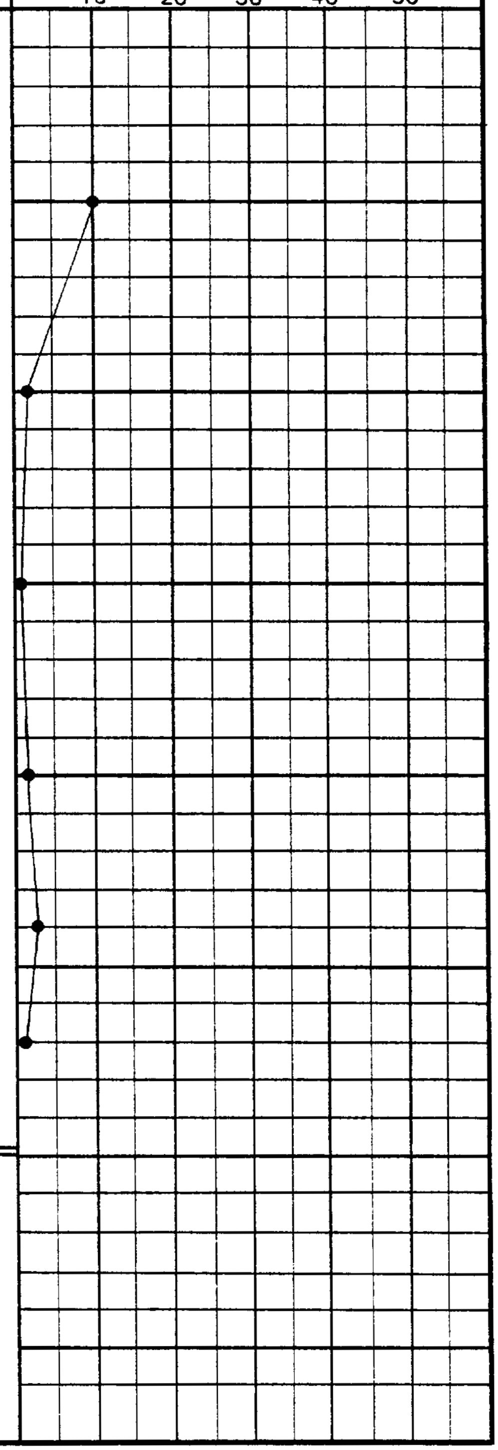
BOREHOLE LOG – PERMAFROST

209-3939

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION
0	ORGANICS		NOT FROZEN
	SILT - sandy, fine-grained, damp, non-plastic, olive brown		
1		G	
	SAND - silty, fine to medium grained, damp, brown		
2	GRAVEL - sandy, some silt, rounded, fine to coarse grained, damp, brown - cobbles	G	
3	GRAVEL AND SAND - trace of silt, rounded, fine to coarse grained, damp, brown	G	
4		G	
		G	
5		G	
6	END OF HOLE (5.9 m) Not Refusal		
7			

BULK DENSITY (Mg/m³) ▲ 1.4 1.6 1.8 2.0 2.2

MOISTURE CONTENT 10 20 30 40 50



SFC. ELEVATION (m)	DATE DRILLED 1983 10 13	BOREHOLE No. TP 10
COMPLETION DEPTH (m) 5.9	LOGGED BY JDM	
DRILLING RIG P&H Backhoe	LOCATION Dome Road	PAGE 1 OF 1

eba

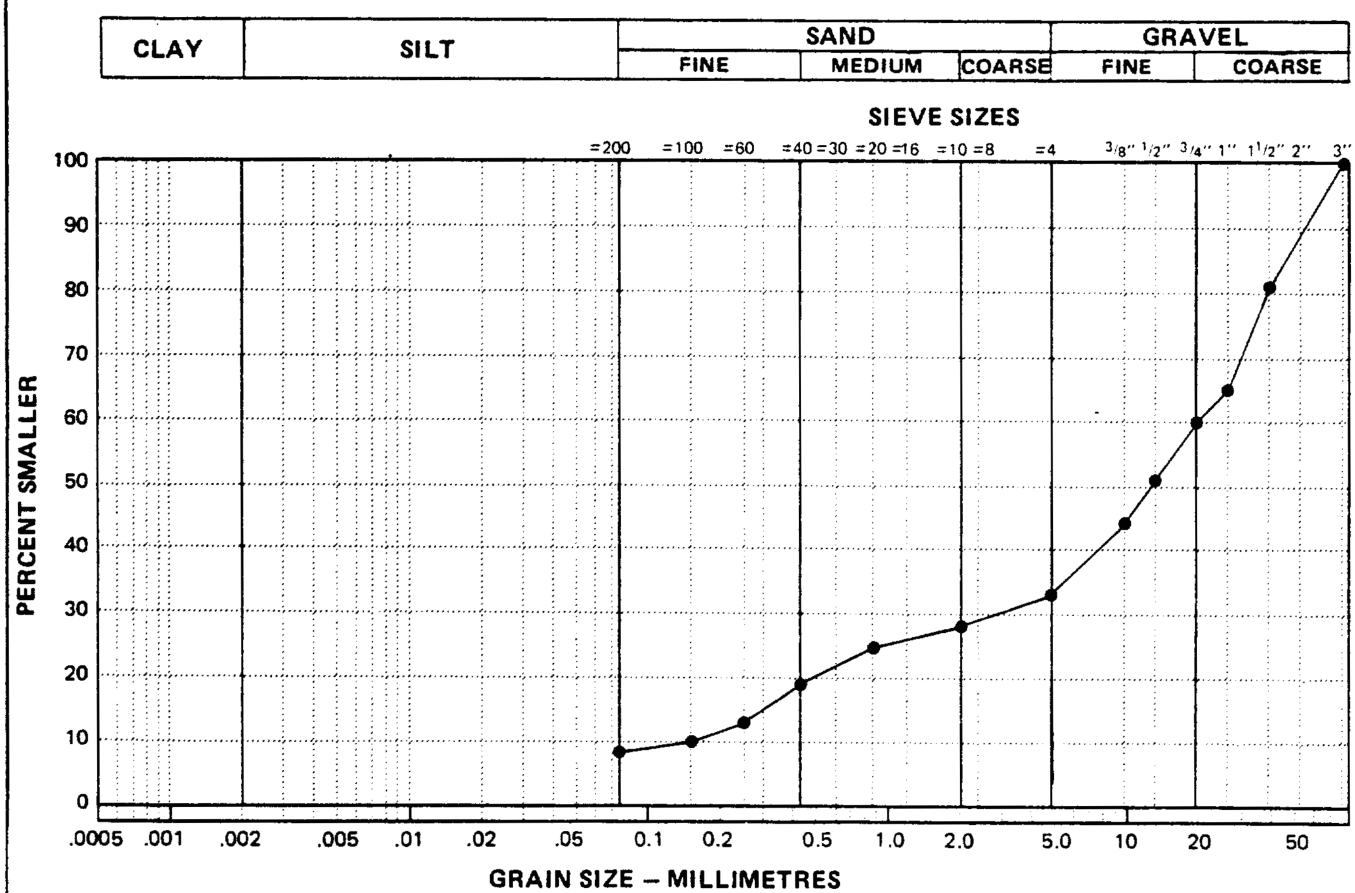
This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon
Project Number: 209-3939
Date Tested: 1983 10 19
Borehole Number: TP 1
Depth: 3.1 m
Soil Description: Gravel, sandy, trace of silt
Cu:
Cc:
Natural Moisture Content: 2.8 %
Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
1 1/2"	81
1"	65
3/4"	60
1/2"	51
3/8"	44
No. 4	33
No. 10	28
No. 20	25
No. 40	19
No. 60	13
No. 100	10
No. 200	8



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

eba

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 2

Depth: 5.6 m

Soil Description: Gravel, sandy, trace of silt

Cu:

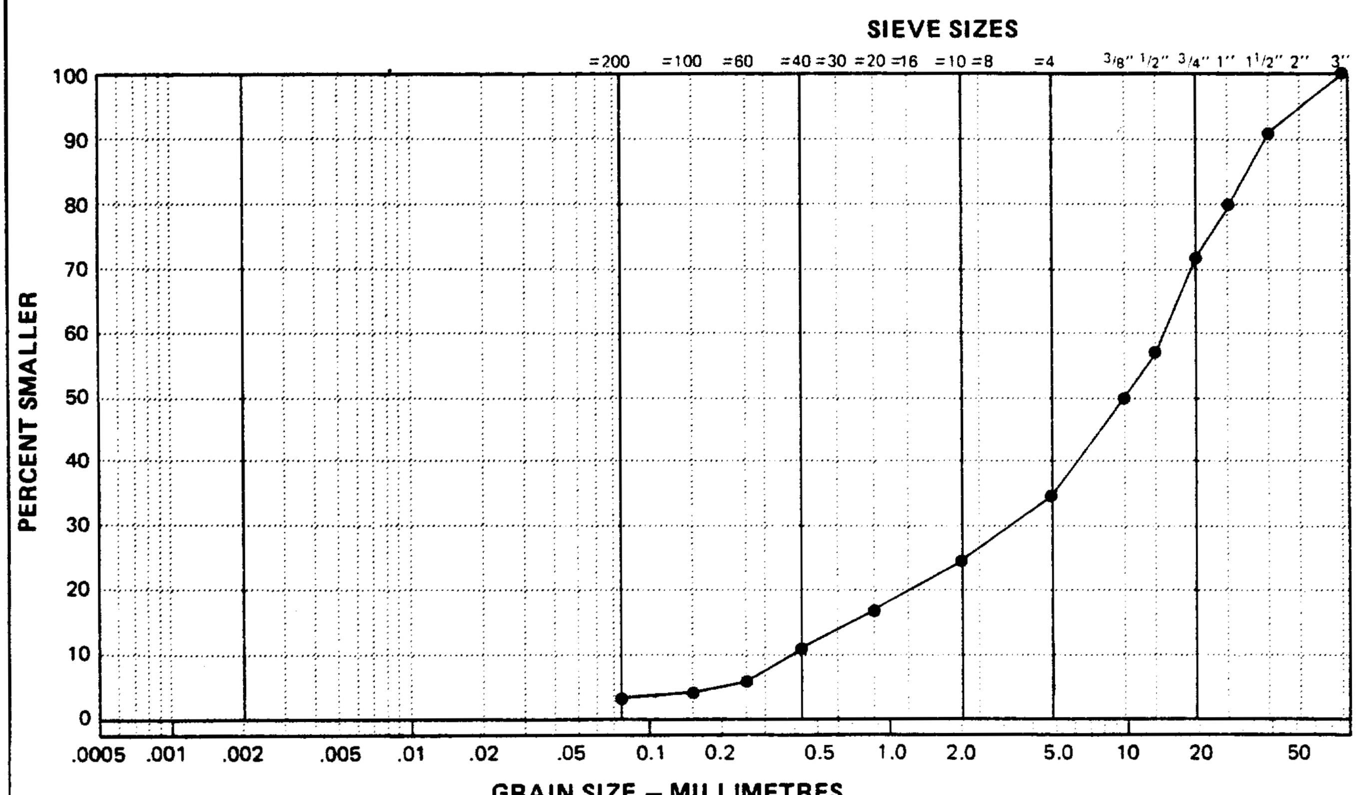
Cc:

Natural Moisture Content: 2.6 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
$1^1/_2$"	91
1"	80
3/4"	72
1/2"	57
3/8"	50
No. 4	35
No. 10	24
No. 20	17
No. 40	11
No. 60	6
No. 100	4
No. 200	3

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 3

Depth: 2.0 m

Soil Description: Sand, some silt, trace of clay

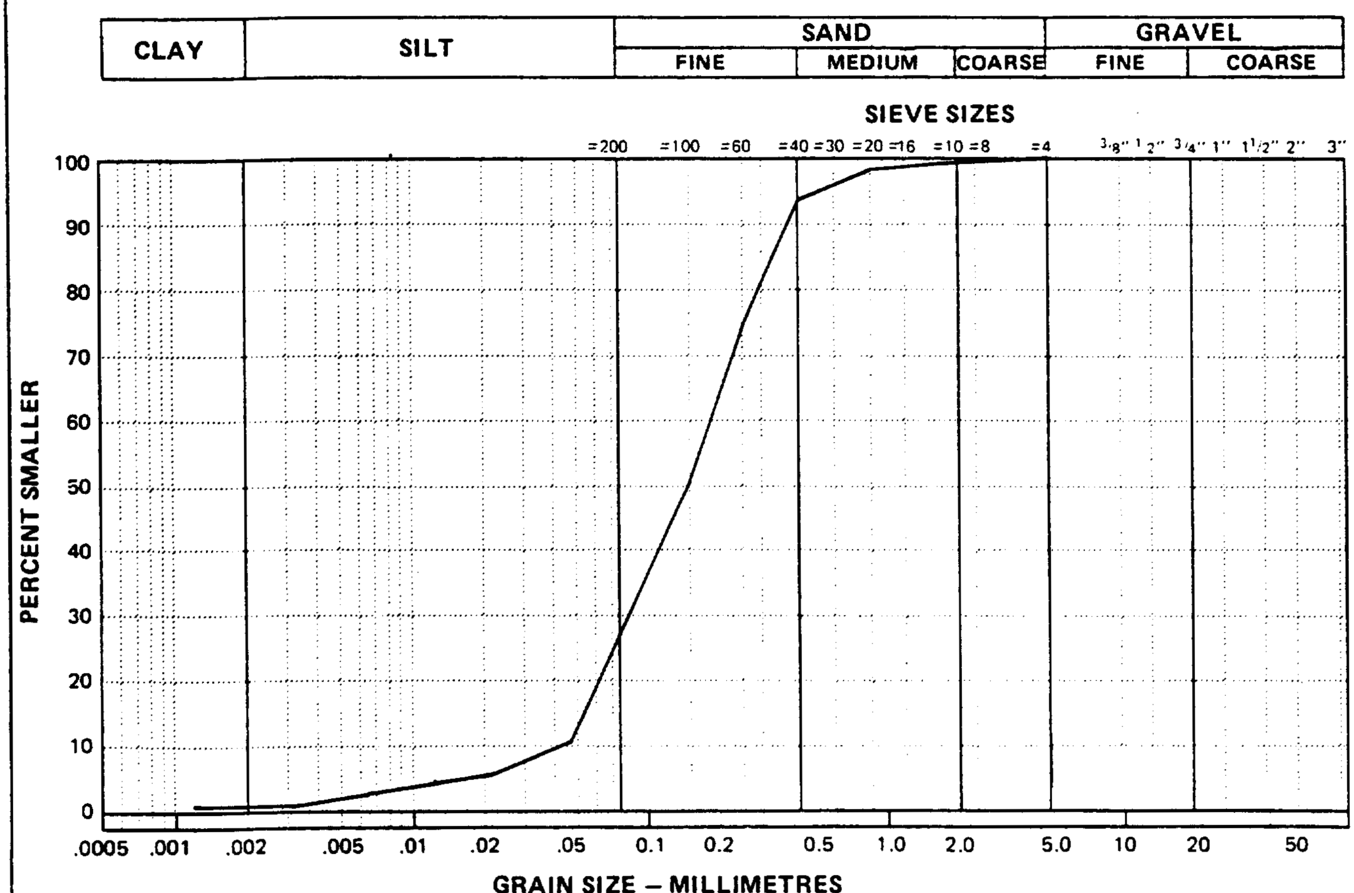
Cu:

Cc:

Natural Moisture Content: 6.1 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	
1 1/2"	
1"	
3/4"	
1/2"	
3/8"	
No. 4	100
No. 10	99
No. 20	97
No. 40	94
No. 60	74
No. 100	51
No. 200	27



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 3

Depth: 4.0 m

Soil Description: Gravel, sandy, trace of silt

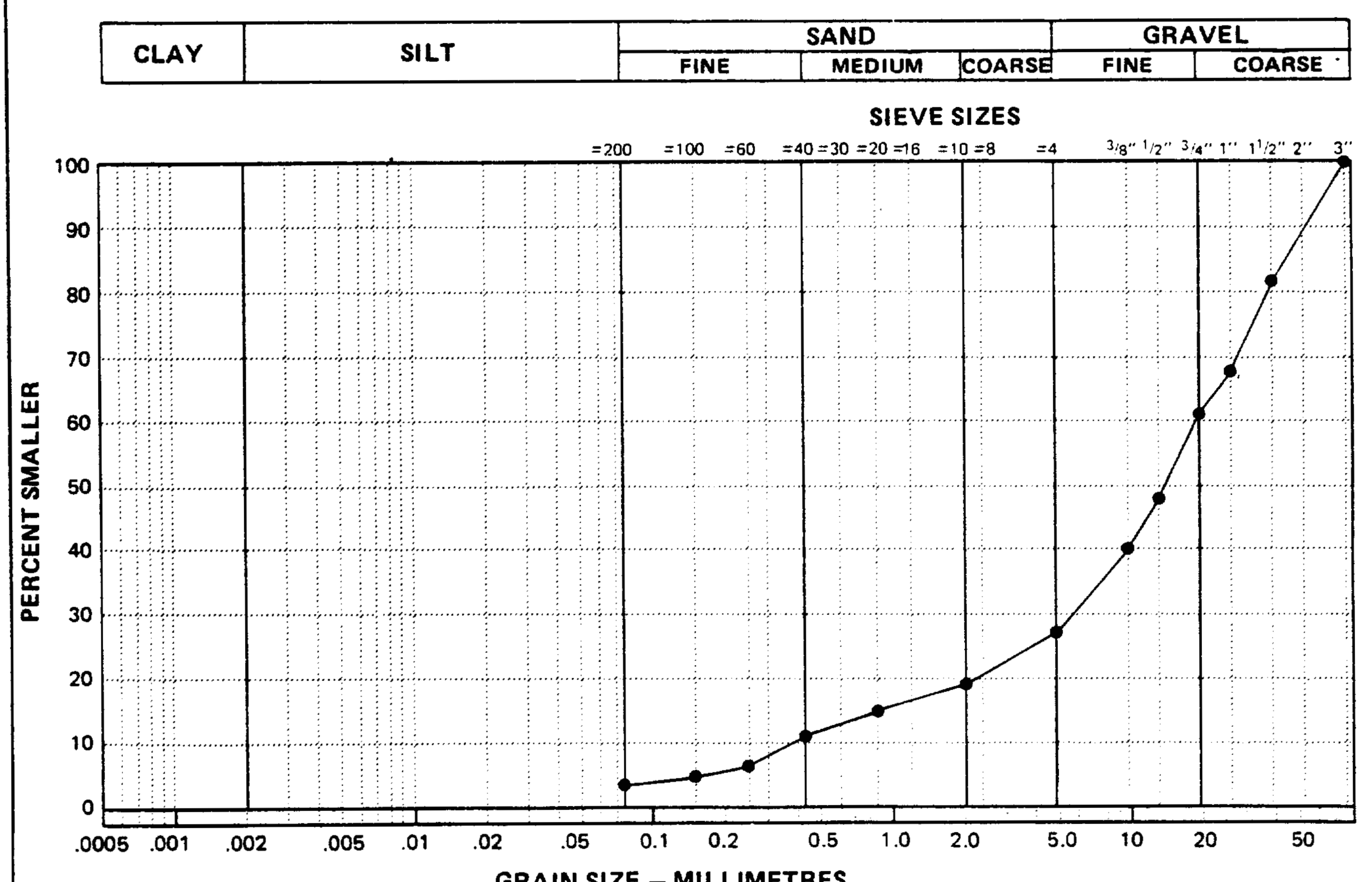
Cu:

Cc:

Natural Moisture Content: 2.0 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
1 1/2"	82
1"	68
3/4"	61
1/2"	48
3/8"	40
No. 4	27
No. 10	19
No. 20	15
No. 40	11
No. 60	7
No. 100	5
No. 200	4



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 4

Depth: 4.0 m

Soil Description: Gravel, sandy, trace of silt

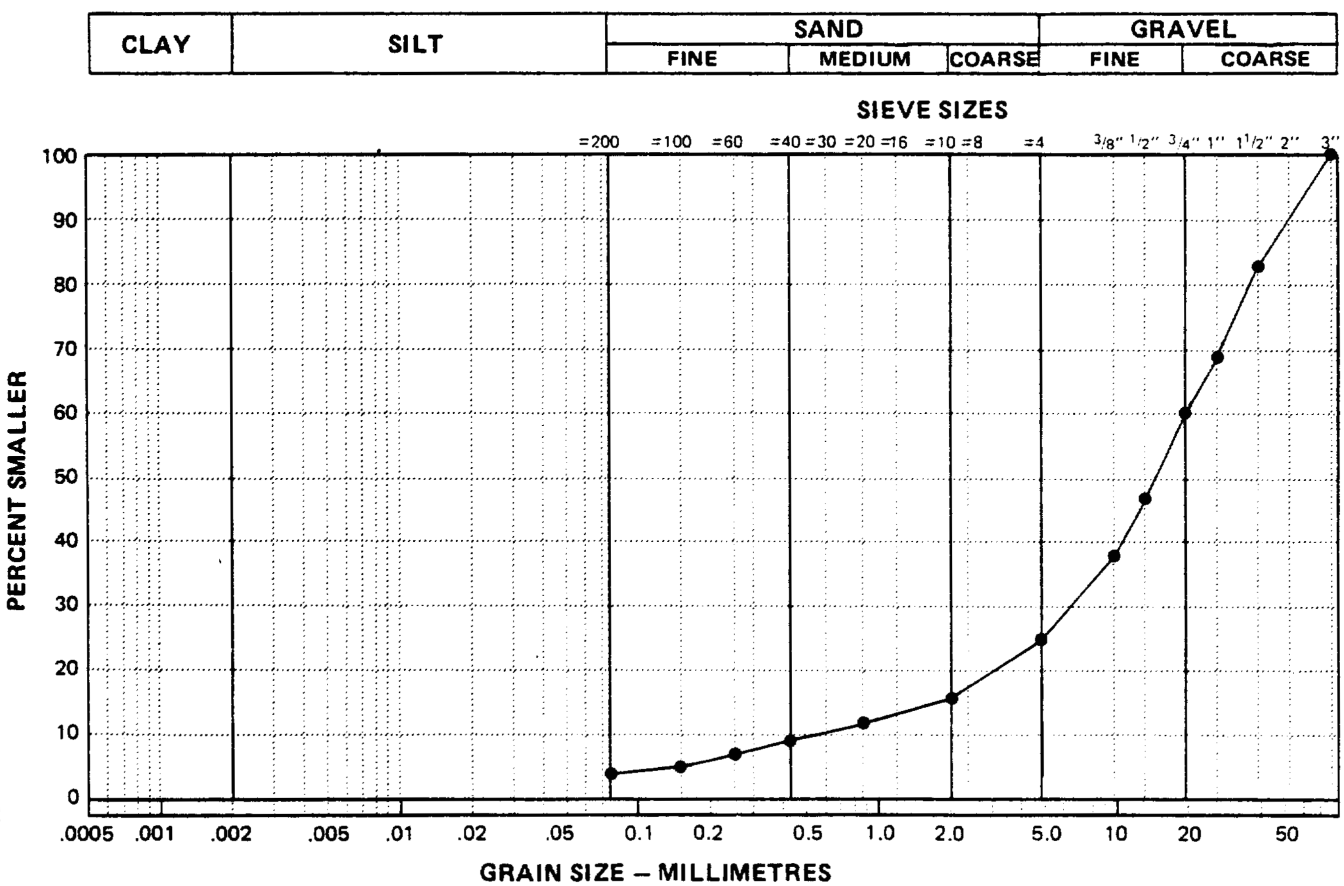
Cu:

Cc:

Natural Moisture Content: 1.7 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
1 1/2"	83
1"	69
3/4"	60
1/2"	47
3/8"	38
No. 4	25
No. 10	16
No. 20	12
No. 40	9
No. 60	7
No. 100	5
No. 200	4



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 4

Depth: 5.5 m

Soil Description: Gravel, sandy, trace of silt

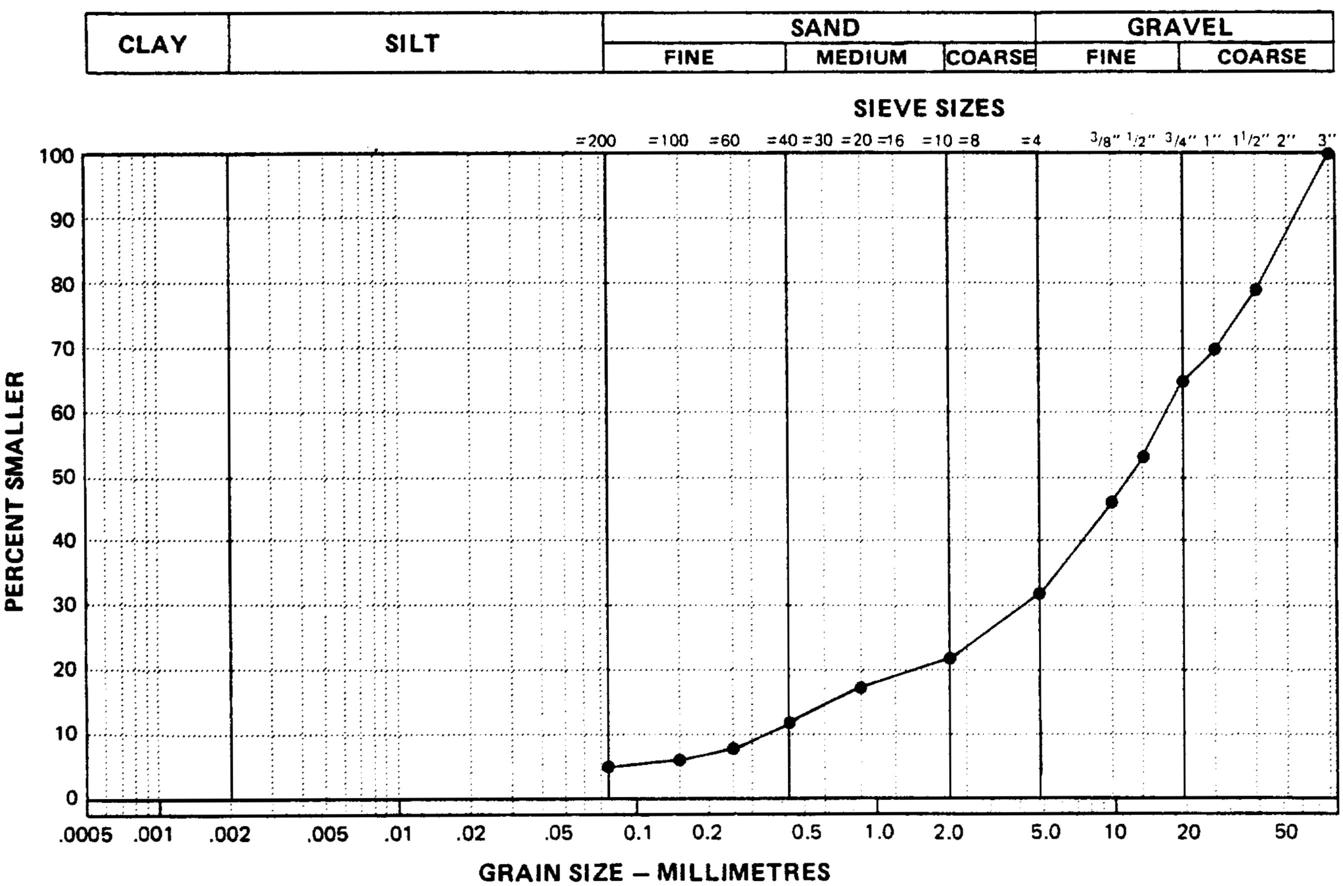
Cu:

Cc:

Natural Moisture Content: 1.8 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
1 1/2"	79
1"	70
3/4"	65
1/2"	53
3/8"	46
No. 4	32
No. 10	22
No. 20	17
No. 40	12
No. 60	8
No. 100	6
No. 200	5



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 20

Borehole Number: TP 5

Depth: 3.0 m

Soil Description: Gravel, sandy, trace of silt

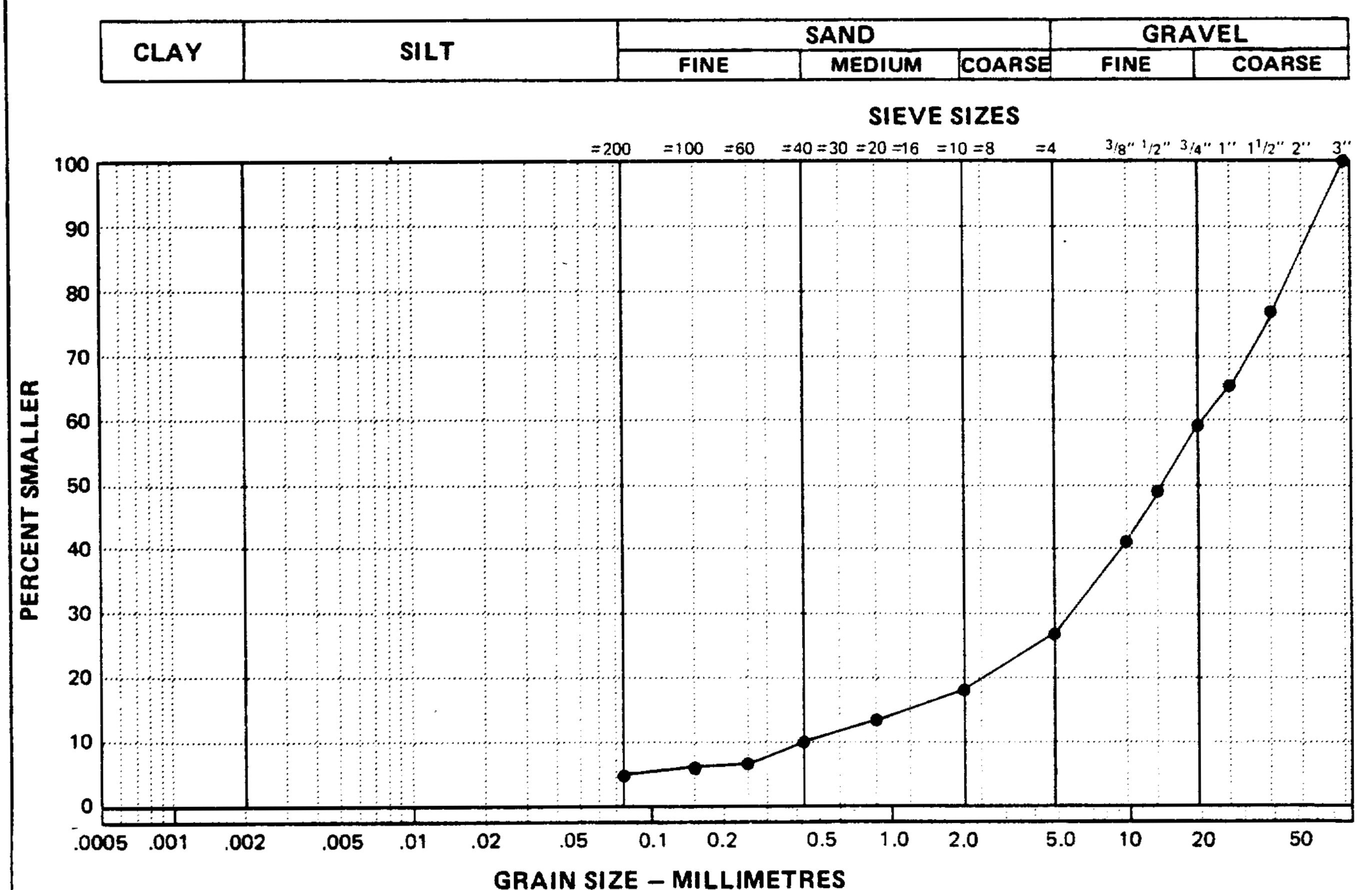
Cu:

Cc:

Natural Moisture Content: 2.0 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
1 1/2"	77
1"	66
3/4"	59
1/2"	49
3/8"	41
No. 4	27
No. 10	18
No. 20	14
No. 40	10
No. 60	7
No. 100	6
No. 200	5



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 6

Depth: 4.0 m

Soil Description: Gravel, sandy, trace of silt

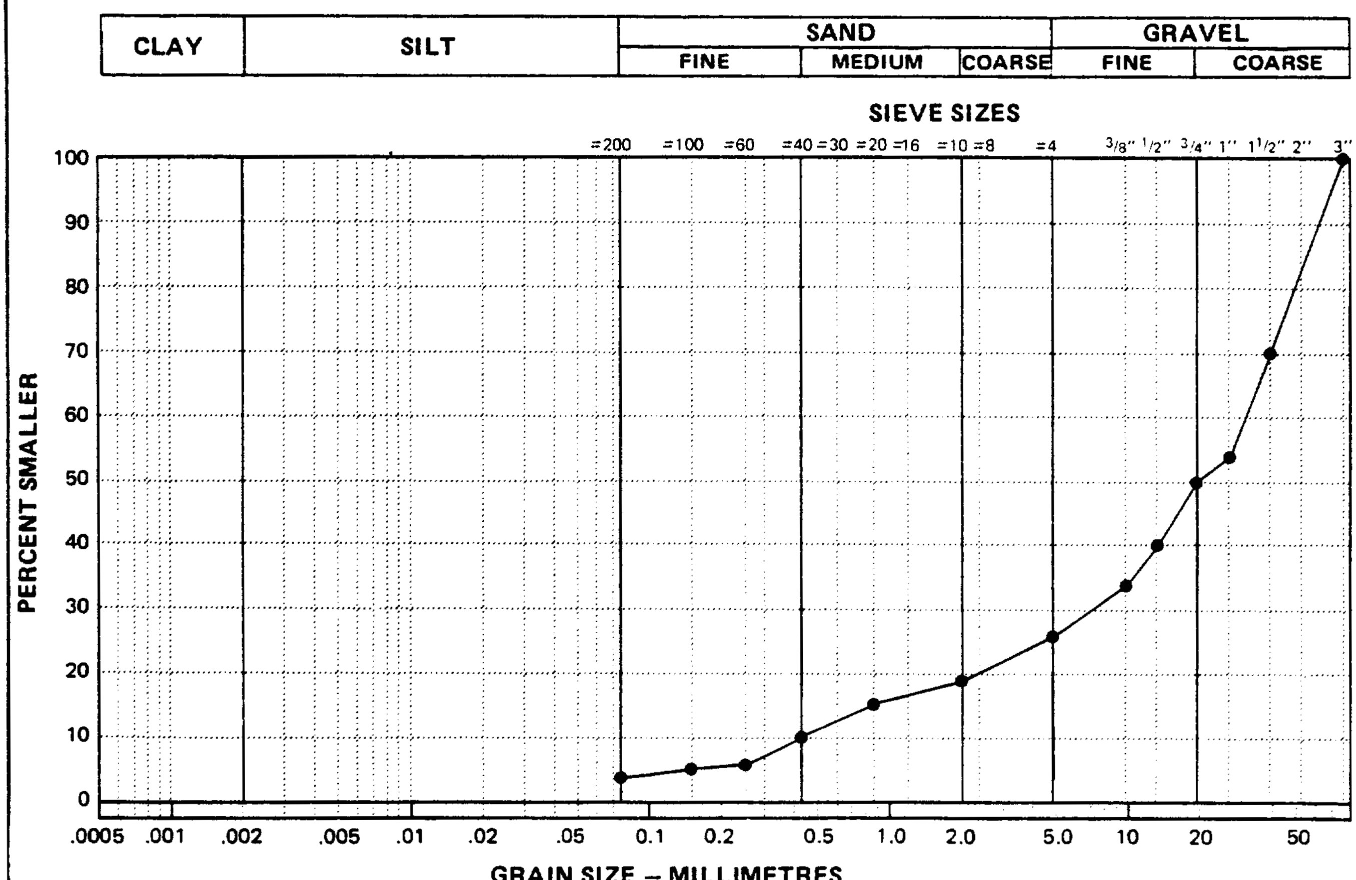
Cu:

Cc:

Natural Moisture Content: 1.6 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
1 1/2"	70
1"	54
3/4"	50
1/2"	40
3/8"	34
No. 4	26
No. 10	19
No. 20	15
No. 40	10
No. 60	6
No. 100	5
No. 200	3



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

eba

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 20

Borehole Number: TP 8

Depth: 4.0 m

Soil Description: Gravel, sandy, trace of silt

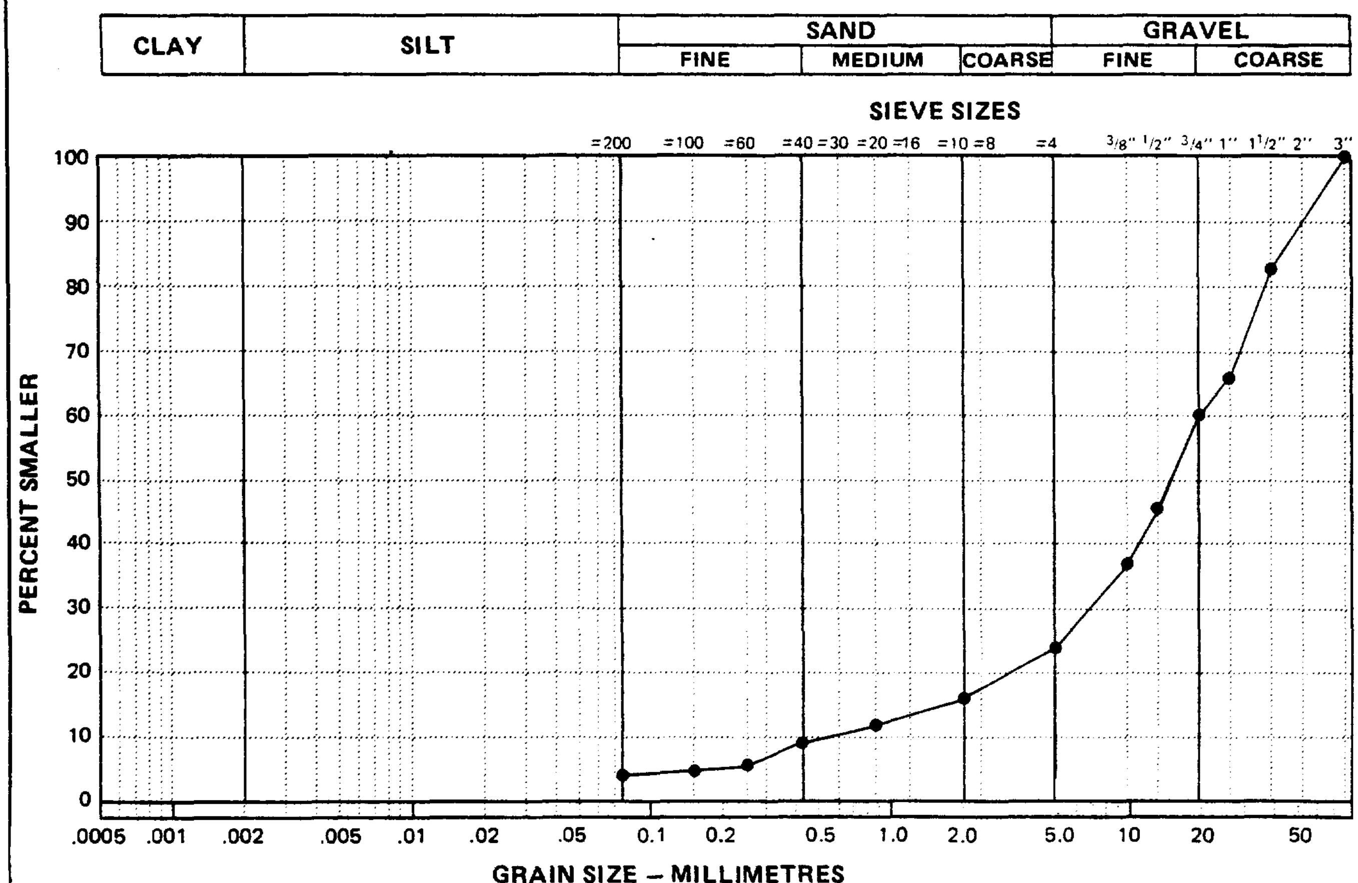
Cu:

Cc:

Natural Moisture Content: 1.4 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
$1^1/_2$"	84
1"	66
$^3/_4$"	60
$^1/_2$"	46
$^3/_8$"	37
No. 4	24
No. 10	16
No. 20	12
No. 40	9
No. 60	6
No. 100	5
No. 200	4



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

eba

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 9

Depth: 5.0 m

Soil Description: Gravel and Sand, trace of silt

Cu:

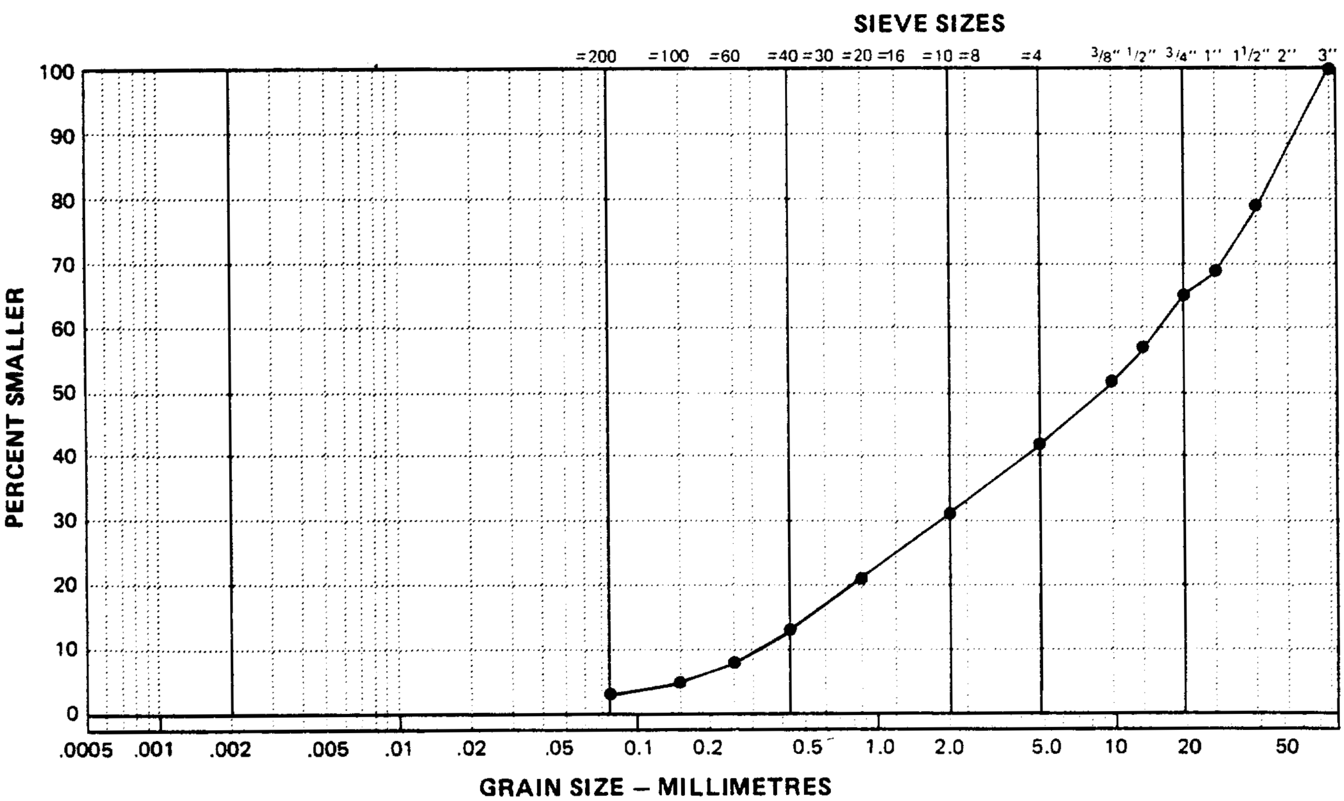
Cc:

Natural Moisture Content: 1.5 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
$1^1/_2$"	79
1"	69
$^3/_4$"	65
$^1/_2$"	57
$^3/_8$"	52
No. 4	42
No. 10	31
No. 20	21
No. 40	13
No. 60	8
No. 100	5
No. 200	4

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Community Gravel Pit
Dawson City, Yukon

Project Number: 209-3939

Date Tested: 1983 10 19

Borehole Number: TP 10

Depth: 3.0 m

Soil Description: Gravel and Sand, trace of silt

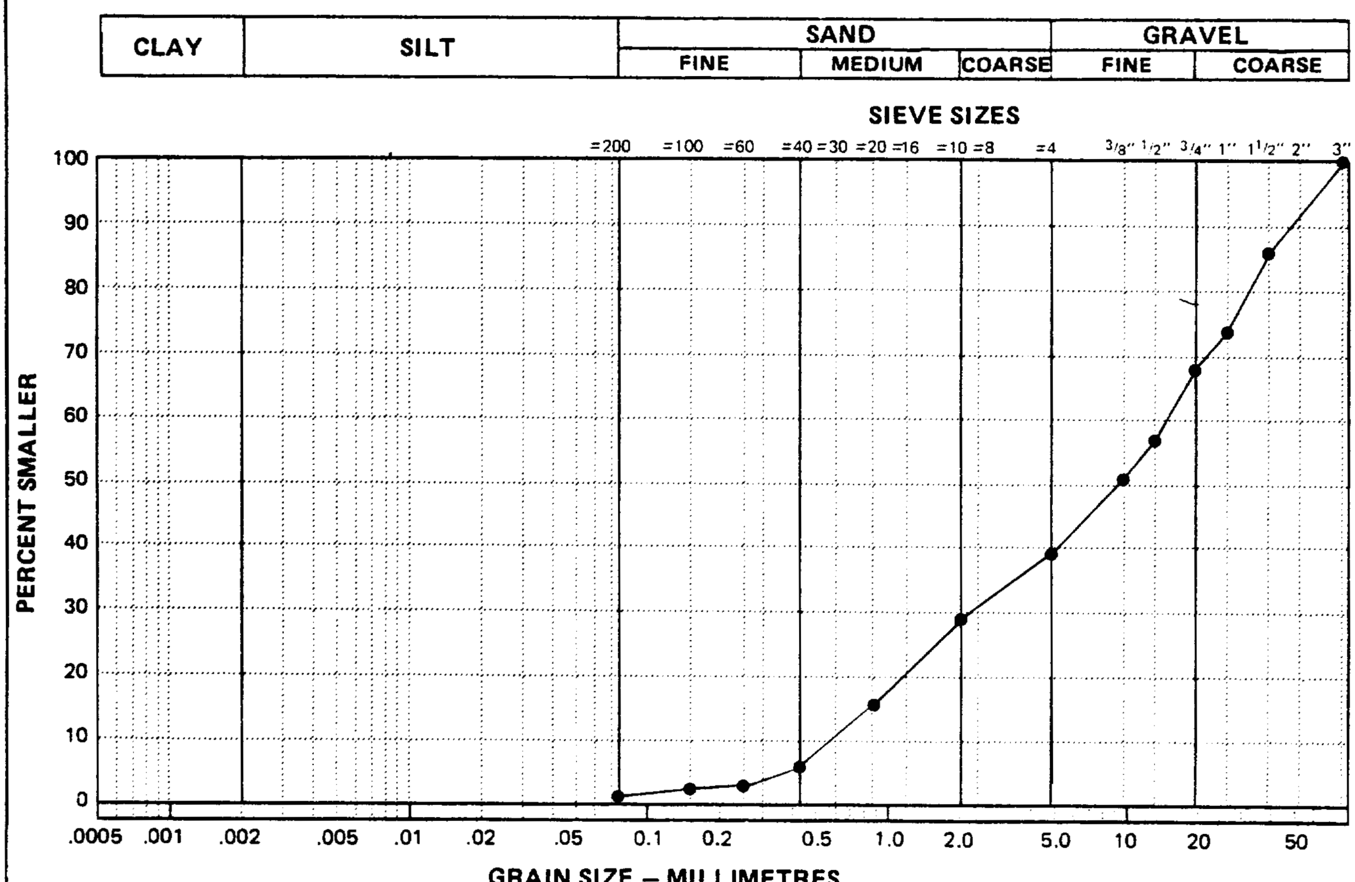
Cu:

Cc:

Natural Moisture Content: 0.7 %

Remarks:

SIEVE	PERCENTAGE PASSING
3"	100
$1^1/_2$"	86
1"	74
$^3/_4$"	68
$^1/_2$"	57
$^3/_8$"	51
No. 4	39
No. 10	29
No. 20	16
No. 40	6
No. 60	3
No. 100	2
No. 200	1



Tested in accordance with ASTM D422 unless otherwise noted.

PROJECT: Community Gravel Pit	HOLE NO.: BH 2	PROJECT NO.: 209-3723
LOCATION: Dome Road, Dawson City, Yukon	SURFACE ELEVATION:	
	DRILL: CME 750 - solid flight augers	

SAMPLE TYPE: THIN WALLED TUBE; SPLIT SPOON; DISTURBED; NO RECOVERY; CORE; OTHER

DEPTH (m.)	SOIL DESCRIPTION	UNIFIED SOIL CLASS.	SAMPLE	DEPTH (ft.)
0	GRAVEL - sandy, trace of silt, fine to coarse grained, damp, brown	GM		
1	- same as above		Disturbed	3
2	GRAVEL AND SAND - trace of silt, fine to coarse grained, damp, brown	GW	Disturbed	7
	SAND - gravelly, some silt, fine to coarse grained, damp, olive brown	SM		
3			Disturbed	10
4	- same as above		Disturbed	13
5	- silty, some gravel, fine to coarse grained, damp, olive brown		Disturbed	16
	- dry		Disturbed	18
5.7	END OF HOLE (5.7 m)			

WATER CONTENT-% : ● PLASTIC LIMIT (W_p) |—| LIQUID LIMIT (W_L) 20 40 60 80

COMPRESSIVE STRENGTH: Unconfined ▲; Pocket Penetrometer △; TSF 1 2 3 4 5; kPa 100 200 300 400

Seasonal Frost

WET UNIT WEIGHT-O $\frac{kN}{m^3}$ 16 18 20 22; P.C.F. 100 110 120 130 140 150

STANDARD PENETRATION: N- ■ 20 40 60 80

eba

DEPTH TO WATER: Dry at Completion

DEPTH TO SLOUGH: —

COMPLETION DEPTH: 5.7 m	DATE DRILLED: 1982 11 30
LOGGED BY: JDM	DRAWING NO.:

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the borehole. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and they may vary with time, geologic conditions, and construction activity.

PROJECT: Community Gravel Pit	HOLE NO.: BH 3	PROJECT NO.: 209-3723
LOCATION: Dome Road Dawson City, Yukon	SURFACE ELEVATION:	
	DRILL: CME 750 - solid flight augers	

SAMPLE TYPE: THIN WALLED TUBE · SPLIT SPOON · DISTURBED · NO RECOVERY · CORE · OTHER

DEPTH (m.)	SOIL DESCRIPTION	UNIFIED SOIL CLASS.	SAMPLE	DEPTH (ft.)	WATER CONTENT-% : ● PLASTIC LIMIT (Wp) — LIQUID LIMIT (W_L) 20 40 60 80	COMPRESSIVE STRENGTH Unconfined ▲ Pocket Penetrometer △ TSF 1 2 3 4 5 kPa 100 200 300 400
	GRAVEL - sandy, trace of silt, fine to coarse grained, damp, olive brown	GW			Seasonal Frost	
	- trace to some sand, trace of silt, damp, brown					
	- cobbles and boulders					
	END OF HOLE (2.1 m) Auger Refusal					
	Note: - could not distinguish whether auger refusal was due to cobbles or bedrock					

DEPTH TO WATER: Dry at Completion

DEPTH TO SLOUGH:

WET UNIT WEIGHT-O kN/m³ 16 18 20 22 P.C.F. 100 110 120 130 140 150

STANDARD PENETRATION: N- ● 20 40 60 80

COMPLETION DEPTH: 2.1 m	DATE DRILLED: 1982 11 30
LOGGED BY: JDM	DRAWING NO.:

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the borehole. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and they may vary with time, geologic conditions, and construction activity.

<u>TABLE 1</u>

CANADIAN STANDARDS ASSOCIATION

CLASSIFICATION TABLE FOR

CONCRETE AGGREGATE MINERALOGY

Rock Type	Classification
Carbonates (hard)	good
Carbonates (sandy, hard)	good
Sandstone (hard)	good
Gneiss (hard)	good
Quartzite (coarse grained)	good
Greywacke—Arkose	good
Volcanic (slightly weathered)	good
Granite—Diorite	good
Trap	good
Magnetite	good
Pyrite (disseminated in trap)	good
Iron Bearing Quartzite	good
Sedimentary Conglomerate (hard)	good
Carbonates (slightly weathered)	fair
Carbonates (sandy, medium hard)	fair
Sandstone (medium hard)	fair
Crystalline Carbonates (hard)	fair
Crystalline Carbonates (slightly weathered)	fair
Gneiss (soft)	fair
Chert and Cherty Carbonates	fair
Granite (friable)	fair
Volcanic (soft)	fair
Pyrite (pure)	fair
Flints and Jaspers	fair
Carbonates (soft, slightly shaly)	poor
Carbonates (soft, sandy)	poor
Carbonates (deeply weathered)	poor
Carbonates (shaly clay)	poor
Carbonates (ochreous)	poor
Chert and Cherty Carbonates (weathered)	poor
Sandstone (soft, friable)	poor
Quartzite (fine-grained)	poor
Crystalline Carbonates (very soft, porous)	poor
Gneiss (friable)	poor
Granite (friable)	poor
Encrustations	poor
Cementations	poor
Schist (soft)	poor
Ochre	deleterious
Shale	deleterious
Clay	deleterious
Decomposed Volcanics	deleterious
Slates	deleterious
Talc-Gypsum	deleterious
Iron Formations (very soft)	deleterious

PETROGRAPHIC ANALYSIS

SUMMARY OF RESULTS

(Size Fraction - passing 20 mm, retained on 10 mm)

MINERALOGY	PERCENTAGE TOTAL SAMPLE	CLASSIFICATION *
Quartzite	38.8	Good
Quartz/Mica Gneiss	16.5	Good
Greenstone (Quartz Banded), and Fine Grained Gneiss (Hornfels)	13.0	Fair
Quartz	11.1	Good
Weathered Quartz/Mica Gneiss	10.2	Poor
Chert	8.3	Fair
Limestone/Dolomite	2.1	Fair
	100 %	

* See Table 1 (next page) from CSA Standard Classification Table.