December 16, 2005 EBA File: 1200161

Government of Yukon
Department of Community Services
P.O. Box 2703
Whitehorse, Yukon Y1A 2C6

Attention: Mr. Brian Ritchie, Program Manager
Community Development Branch

Subject: Geotechnical Evaluation For Planning and Design
Proposed Grizzly Valley Rural Residential Subdivision

EBA has completed a terrain analysis and geotechnical evaluation of the above captioned study area. The scope of EBA's input on this project was summarized in the proposal dated May 27, 2005. Geotechnical and terrain conditions as well as recommendations for country residential site development are discussed in the following sections.

1.0 EXISTING INFORMATION

Prior to this project, EBA had not completed any site-specific geotechnical work. However, initial information was gathered from air photos and the Southern Lakes Series terrain mapping.

Information collected from these two projects has been incorporated into the terrain analysis and site development recommendations presented in the following sections.

2.0 TERRAIN ANALYSIS

Due to the size of the study area, the terrain mapping component of this project was considered critical. Tasks relating to terrain mapping included the following:

- Airphoto analysis was completed prior to any site reconnaissance work, along with a cursory review of existing surficial geology mapping.
- The initial site reconnaissance was completed in order to ground proof typical polygons delineated during the air photo analysis.

- The subsequent presentation of terrain features and surficial geology, on mapping supplied by Challenger Geomatics was then initiated.
- Finally, revisions to the terrain mapping was completed once the geotechnical data gathered during the testpitting program was available.

Detailed terrain mapping by air photograph interpretation was completed by Jack Dennett, P.Geo.(BC) of EBA's Whitehorse office. Field checking (also completed by Mr. Dennett) of terrain was augmented with 5 shallow hand test pits completed during a site visit on September 28, 2005. While on-site, the following criteria dictated selection of the hand excavated test pit locations

- Adequate representation of specific sites throughout the study area
- Testing of a variety of characterized terrain to enhance confidence of the interpretation of the entire study area
- Testing of areas identified as particular interest for planning purposes
- Site access by existing trails to avoid clearing of new trails
- Access through private property (ie. the Sod Farm) was avoided

Analysis and observations during reconnaissance suggest that the study area is characterized by fairly well drained surficial soils underlain by less pervious dense glacial till. Forest cover is moderately dense to sparse (old burn area) and comprised of mixed mature pine forest and aspen with some spruce. Groundwater was not intersected during the site reconnaissance. Bedrock outcrops were noted on moderately steep slopes of glaciofluvial channels in the southeast corner of the study area (under the power lines). The shallow stratigraphy and terrain features in the study area are characteristic of sub-glacial deposition followed by a period of valley margin deglaciation and outwash. The upland terrain is gently rolling and fringed with deeply incised, ice-margin glaciofluvial meltwater channels. A mid-slope, valley-parallel meltwater channel separates the upland from a wide bench, which grades downslope to moderate slopes and complex, irregular terrain with moderately steep slopes, incised channels, hummocks and ridges.

In general, the dominant soil throughout the study area is highly consolidated, silty, gravelly sand till. This unit is likely greater than 5 m thick in most areas and typically becomes more dense with depth. Throughout much of the study area (upland and mid-slope sections), the till is overlain by a discontinuous veneer (typically less than 1 m thick) of glaciofluvial sands and gravels. The glaciofluvial sands and gravels may be thicker on lower valley slopes. Below the organic root mat, silty sand was also noted throughout most of the study area.

The terrain mapping results are presented on the site plan attached to this letter report.

3.0 TESTPITTING PROGRAM

A testpitting program was completed on November 2nd and 3rd, 2005. EBA's site representative was Mr. Myles Plaunt, C.E.T., of EBA's Whitehorse office. A Komatsu PC 200LC tracked excavator, supplied by Arctic Backhoe Services of Whitehorse, Yukon was utilized to excavate 10 testpits throughout the study area. Testpits were excavated to depths ranging from 2 m (testpit 1200161-TP10 for percolation testing purposes) to 5 m in depth (anticipated cut/fill areas). Testpit locations are shown on the site plan attached to this letter report.

At each testpit location, detailed testpit logs describing geotechnical conditions were prepared and representative grab samples were collected. Upon completion, all testpits were backfilled to grade and flagged for future reference. As well, a hand held GPS unit was utilized to verify the NAD 83 coordinate location of each testpit.

All soil samples were returned to EBA's Whitehorse laboratory for natural moisture content determination on all samples and particle size analysis on select representative samples. Testpit logs, showing detailed soil conditions and presenting laboratory results, are attached.

Percolation testing was performed at a single location (testpit 1200161-TP10) on November 4, 2005. During the testpitting program, three different soil textures were identified. Of the three, one was the discontinuous veneer of sand and gravel, which would definitely be suitable for on-site sewage disposal. Therefore, percolation testing focused on the surficial sandy silt and the silty gravelly sand till soil units encountered throughout the entire study area. The percolation testing was performed in accordance with Environmental Health guidelines, including a four hour pre-soak of each soil type.

Results are presented on the detailed log for testpit 1200161-TP10 and discussed in the on-site sewage disposal section of this report.

4.0 GEOTECHNICAL CONDITIONS

The geomorphology of the area is probably controlled by a depositional environment comprised of glacial deposits (till) and a subsequent ice margin erosional period resulting in scoured glaciofluvial channels, as well as a discontinuous overlying veneer of glaciofluvial gravelly sand that increases in depth at lower elevation. Pockets of shallow glaciolacustrine sediments (silt) may also be present.

The predominant texture of material throughout the site is expected to be a dense sandy till overlain by a discontinuous veneer (up to 1 m) of glaciofluvial gravelly sand with trace silt (greater than 35% sand, 20% to 35% gravel and less than 10% silt) and surficial silty sand.

The attached testpit logs present detailed geotechnical information. To summarize, 0.1 m of organic root mat was encountered in all testpits; between 0.3 m and 1.0 m of silty sand was noted below the organic root mat; between 0.3 m and 0.8 m of glaciofluvial gravelly sand was encountered in testpits –TP01, -TP04, -TP06, and -TP07 below the silty sand soil unit, and all testpit locations were underlain with dense gravelly sand till.

Neither bedrock nor groundwater was encountered during the testpitting program. At the time of investigation, seasonal frost was minimal and although permafrost was not encountered, there is some potential for the presence of local permafrost along steep, east facing slopes (along the west side of the centrally location glaciofluvial channel) or in low-lying wet areas at the far north end of the study area.

5.0 DEVELOPMENT CONSTRAINTS

Development of the study area is considered feasible but topographical constraints will restrict roadway access and lot development. Geotechnical conditions are generally conducive to roadway and foundation construction. On-site sewage disposal system design and construction is also considered feasible; however, the dense till soils underlying the study area will require site specific testing and system design.

Throughout the conceptual and predesign phases of this project, EBA has provided input into the various concepts being developed by Inukshuk Planning & Development. The most recent concept plan (dated November 25, 2005), which provides two access points off the North Klondike Highway, 53 lots, and an average lot size of 5.66 ha has been reviewed and is considered to be acceptable from a geotechnical point of view.

6.0 ROADWAY CONSTRUCTION

The rugged site topography will require considerable earthwork to achieve acceptable grades along roadways. Stripping and grubbing must clear the vegetation and organic root mat from the limits of the roadway embankment. Rough grading along roadway alignments will result in cut/fill construction with four possible subgrade surfaces. Cut areas will expose either glaciofluvial sand and gravel or a silty, gravelly sand till subgrade surface. Either surface is considered acceptable for

roadway construction. Along sections of roadway where very little grading is required, the silty sand subgrade (considered to be moderately frost susceptible and very moisture sensitive) will result in a poorer quality subgrade surface. Embankment fills constructed from material borrowed from bordering cut areas will probably result in a homogeneous blend of the various near surface soils and should be suitable for roadway construction.

All native subgrade surfaces should be scarified, moisture conditioned (to approximately 3% **below** optimum moisture for siltier subgrade soils and ± 2% for clean granular subgrade surfaces) and recompacted. Embankment construction should ensure that fills are constructed in lifts relative to the compaction equipment available (ie smaller equipment should relate to thinner lifts), properly moisture conditioned to facilitate compaction and compacted to 95% of Standard Proctor maximum dry density (SPMDD) for lifts at depth and 98% SPMDD for lifts placed within 1.0 m of surface elevations.

Recommended roadway structure for light vehicular traffic consists of a total of 300 mm of granular structure comprised of a 200 mm thick sub-base course and a 100 mm thick basecourse gravel surface. To maximize the stability of the granular structure (especially throughout the west end of the site where silty subgrade soils exist), it is recommended that a Granular E pit run (coarse 200 m maximum size pit run) be utilized for sub-base construction. Gradation specifications for sub-base and basecourse gravel are presented in Table 1, below.

TABLE 5.3 RECOMMENDED GRANULAR MATERIALS SPECIFICATIONS

200 mm PIT RUN GRAVEL		20 mm BASECOURSE GRAVEL	
SIEVE SIZE (mm)	% PASSING BY MASS	SIEVE SIZE (mm)	% PASSING BY MASS
200.000	100		
80.000	75 -100		
25.000	55 -100	20.000	100
12.500	42 - 84	12.500	64 - 100
5.000	26 - 65	5.000	36 - 72
1.250	11 - 47	1.250	12 - 42
0.315	3 - 30	0.315	4 - 22
0.080	0 - 8	0.080	3 - 6

If the subgrade is excessively wet and soft, additional subcut and backfill with additional Granular E or the use of a medium weight geotextile over the subgrade is recommended.

Inspection and compaction testing during subgrade, sub-base and basecourse construction is recommended, along with associated laboratory tests to confirm compliance to aggregate specifications and the determination of Standard Proctor maximum dry densities for use during compaction testing. EBA can supply all testing services associated with subdivision development.

7.0 ON-SITE SEWAGE DISPOSAL

As mentioned above, percolation testing was performed in the two predominant soil types. The silty sand found throughout the study area (encountered immediately below the organic root mat) has a percolation rate of 8 minutes/25 mm and is considered acceptable for on-site sewage disposal. The silty, gravelly sand till which was noted underlying the entire study area was tested at a depth of 2.0 m and had a percolation rate of 55 minutes/25 mm, which is marginally acceptable (60 minutes/25mm is the Environmental Health threshold). Please note that the upper till horizon will always have a faster percolation rate than what can be expected at depth. Therefore, systems should be constructed at the interface of the till and the overlying soils (which have percolation rates more conducive to on-site sewage disposal). The third soil texture encountered, glaciofluvial gravel and sand, will definitely have an acceptable percolation rate, dictating the use of a 5 minutes/25 mm percolation rate for system sizing purposes.

Typically, EBA provides a generic system design with predesign level country residential reports. However, due to the wide range of percolation rates and the varying conditions encountered, a generic design is impossible to provide. The Environmental Health Guidelines require site-specific percolation test results at the application stage, therefore, lot owners will be responsible for necessary testing. EBA can provide testing and design services, upon request.

The topography of the site, along with conditions encountered will dictate the type of system most suitable. In reasonably flat areas, absorption fields can be installed and on slopes, shallow absorption trenches constructed parallel to contour lines will be a suitable sewage disposal solution. There is now an alternative option being considered by Environmental Health. Gravelless Chamber systems including products supplied by Beaver Plastics and Infiltrator Systems are very well suited for near surface systems. However, these systems must be designed on a site-specific basis before Envionmental Health will consider them.

8.0 FOUNDATIONS

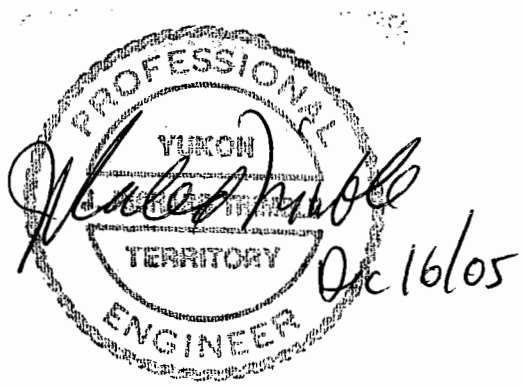
The construction of conventional foundation systems, (strip & spread footings or monolithic thickened slab-on-grade foundations) are considered acceptable for use throughout the study area. All footings may be designed on the basis of an allowable static net bearing pressure of 96 kPa (2000 psf). Shallow foundations throughout the study area will have to consider the potential for frost heave but as long as surface water and roof runoff are controlled, the need for frost protection to minimize the potential for heave should be minimal. Mitigative measures may include the use of perimeter insulation or ensuring 2.5 m of soil cover (houses with full basements).

9.0 CLOSURE

This report and the recommendations contained in it are intended for the sole use of the team working on this project. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than that specified above for any project other than that described in this report. Any such unauthorized use of this report is at the sole risk of the user. Additional information regarding the use of this report is presented in the attached General Conditions, which form a part of this report.

If clarification of information provided in this letter report is required, please contact the undersigned.

Yours truly,
EBA Engineering Consultants Ltd.



Myles C. Plaunt, C.E.T.
Engineering Technologist
(Direct Line: 867-668-2071 Ext. 27)
(Email: mplaunt@eba.ca)

J. Richard Trimble, M.Sc. (Eng.), P.Eng.
Project Director, Yukon Region
(Direct Line: 867-668-2071 Ext. 22)
(Email: rtrimble@eba.ca)

PERMIT TO PRACTICE
Signature
Date Dec 16/05 EBA Engineering
PERMIT NUMBER: PP003
Association of Professional Engineers of Yukon

This report incorporates and is subject to these "General Conditions".

A.1 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

A.2 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

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

Classification and identification of geological 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.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

A.3 LOGS OF TEST HOLES

The test hole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance that requires precise definition of soil or rock zone transition elevations may require further investigation and review.

A.4 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

A.5 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgmental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

A.6 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance that can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

A.7 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

A.8 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer, when the final design and construction techniques are known.

A.9 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as 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 may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

A.10 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems that 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 otherwise specified, it is a condition of this report that effective temporary and permanent 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 or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological 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 and/or rock conditions assumed in this report in fact exist at the site.

A.12 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the client's expense upon written request, otherwise samples will be discarded.

A.13 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

A.14 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

A.15 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP01
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: - N6767133 E487672	ELEVATION: 795 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				ORGANIC ROOT MAT – seasonally frozen, black
				SAND – silty, fine grained, uniform, roots to 0.4 m, damp, loose, medium brown
				– occasional gravel fragments throughout
				SAND AND GRAVEL – trace of silt, fibrous organics throughout, damp, rusty brown
1.0				SAND – some silt to silty, well graded, damp, greyish brown
				GRAVEL – sandy, trace of silt, some cobbles, damp, compact, greyish brown
				SAND (TILL) – gravelly, silty, damp, compact, olive brown
2.0				
				– till becomes very dense with depth
3.0				
4.0				
				END OF TESTPIT 4.2 m
5.0				

PLASTIC M.C. LIQUID
10 20 30 40

■ PERCENT GRAVEL ■
20 40 60 80
● PERCENT SAND ●
20 40 60 80
▲ PERCENT SILT OR FINES ▲
20 40 60 80
◆ PERCENT CLAY ◆
20 40 60 80

ELEVATION(m)
795.0
793.0
791.0

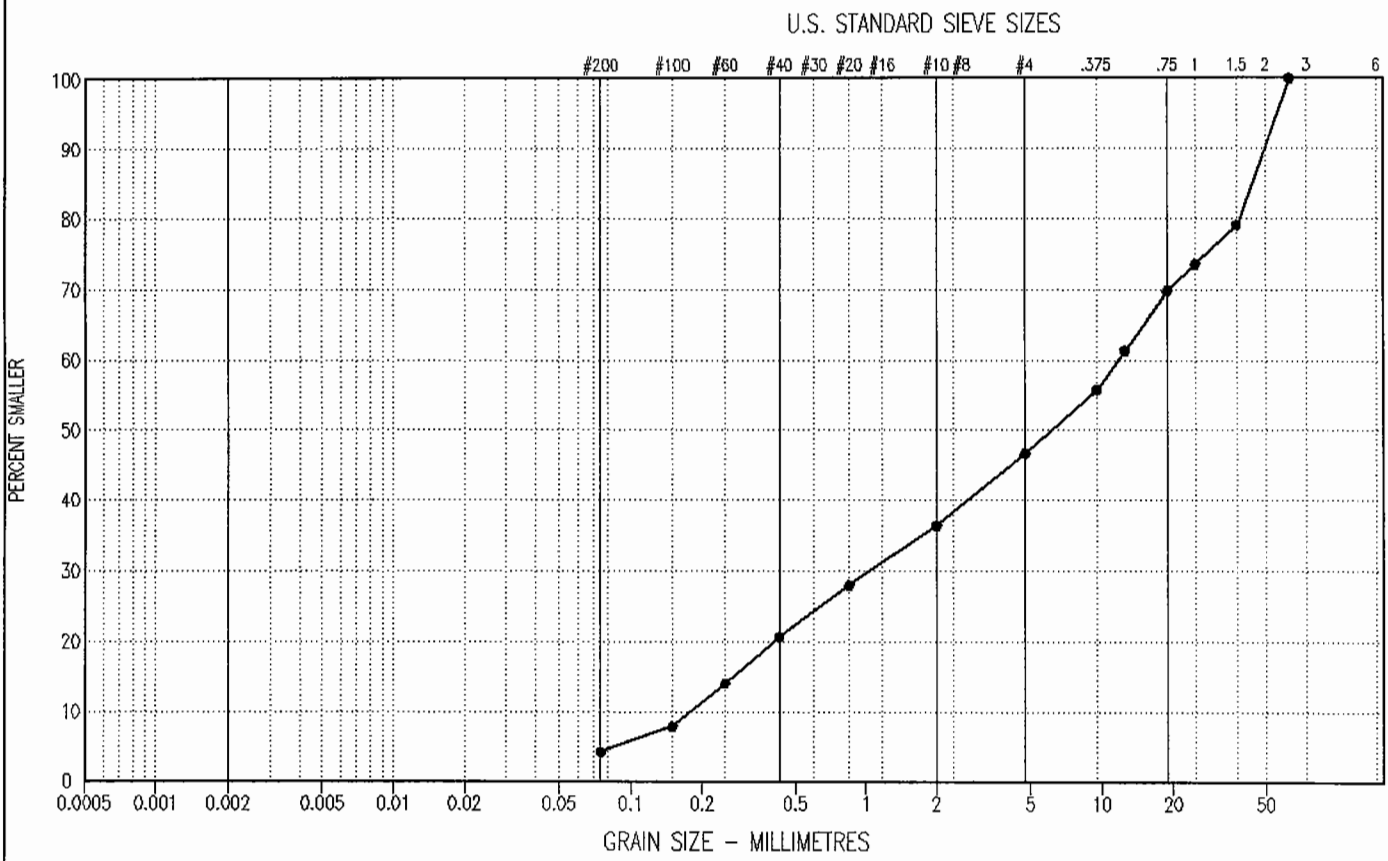
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 4.2 m
	REVIEWED BY: JRT	COMPLETE: 05/11/02
		Page 1 of 1

05/12/07 01:48PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●——●	1200161–TP01	1.00	---	4 ---	42	54	63.8	0.6	GP

Project: 0201–1200161 Date Tested: 05/11/14 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP02
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6766996 E487447	ELEVATION: 836 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				TEA GROUND COVER AND ORGANICS – seasonally frozen, black
				SAND AND SILT – occasional cobbles and and gravel fragments, uniform grained, damp, dark to medium brown
1.0				SAND (TILL) – gravelly, some silt to silty, gravelly, cobbles and boulders to 0.3 m throughout, damp, very compact to dense, medium olive brown
2.0				
3.0				– difficult to excavate
4.0				
				END OF TESTPIT 4.2 m
5.0				

PLASTIC M.C. LIQUID
10 20 30 40

■ PERCENT GRAVEL ■
20 40 60 80

● PERCENT SAND ●
20 40 60 80

▲ PERCENT SILT OR FINES ▲
20 40 60 80

◆ PERCENT CLAY ◆
20 40 60 80

ELEVATION(m)
836.0
834.0
832.0

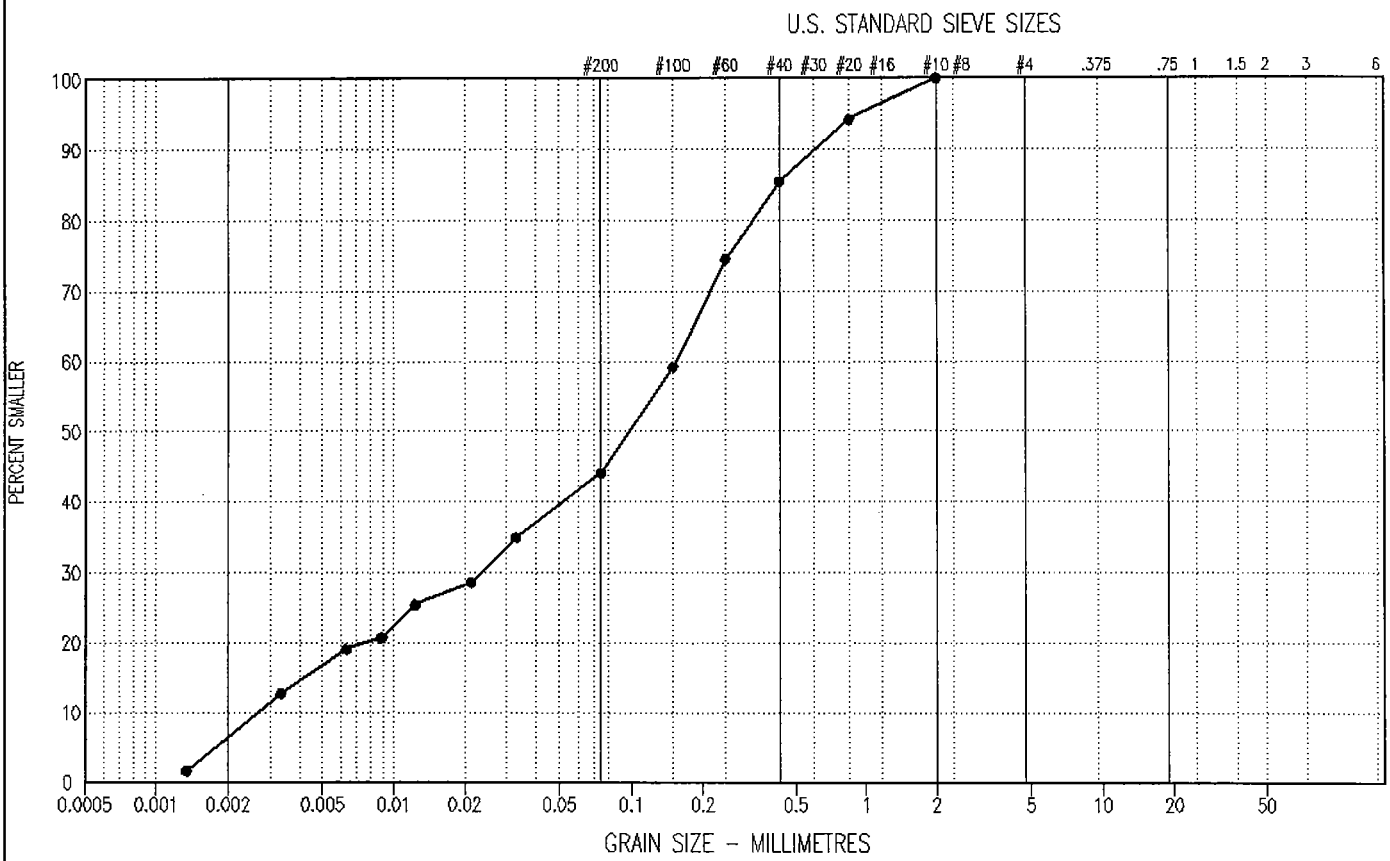
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 4.2 m
	REVIEWED BY: JRT	COMPLETE: 05/11/02
		Page 1 of 1

05/12/07 01:48PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	1200161-TP02	0.30	5.0	39	56	0	54.5	1.3	SM

Project: 0201-1200161 Date Tested: 05/11/17 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP03
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6767290 E487336	ELEVATION: 832 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				TEA GROUND COVER AND ORGANIC ROOT MAT – seasonally frozen, black
				SAND – silty, some gravel and occasional cobbles and boulders up to 700 mm in size, damp, compact, medium brown
1.0				SAND (TILL) – gravelly, some silt to silty, occasional cobbles, damp, very compact to dense, olive brown
2.0				
				– difficult to excavate, very dense
3.0				
4.0				
				END OF TESTPIT 4.2 m
5.0				

PLASTIC M.C. LIQUID (10 20 30 40)

■ PERCENT GRAVEL ■ (20 40 60 80)
● PERCENT SAND ● (20 40 60 80)
▲ PERCENT SILT OR FINES ▲ (20 40 60 80)
◆ PERCENT CLAY ◆ (20 40 60 80)

ELEVATION(m): 832.0, 830.0, 828.0

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

LOGGED BY: MCP
REVIEWED BY: JRT

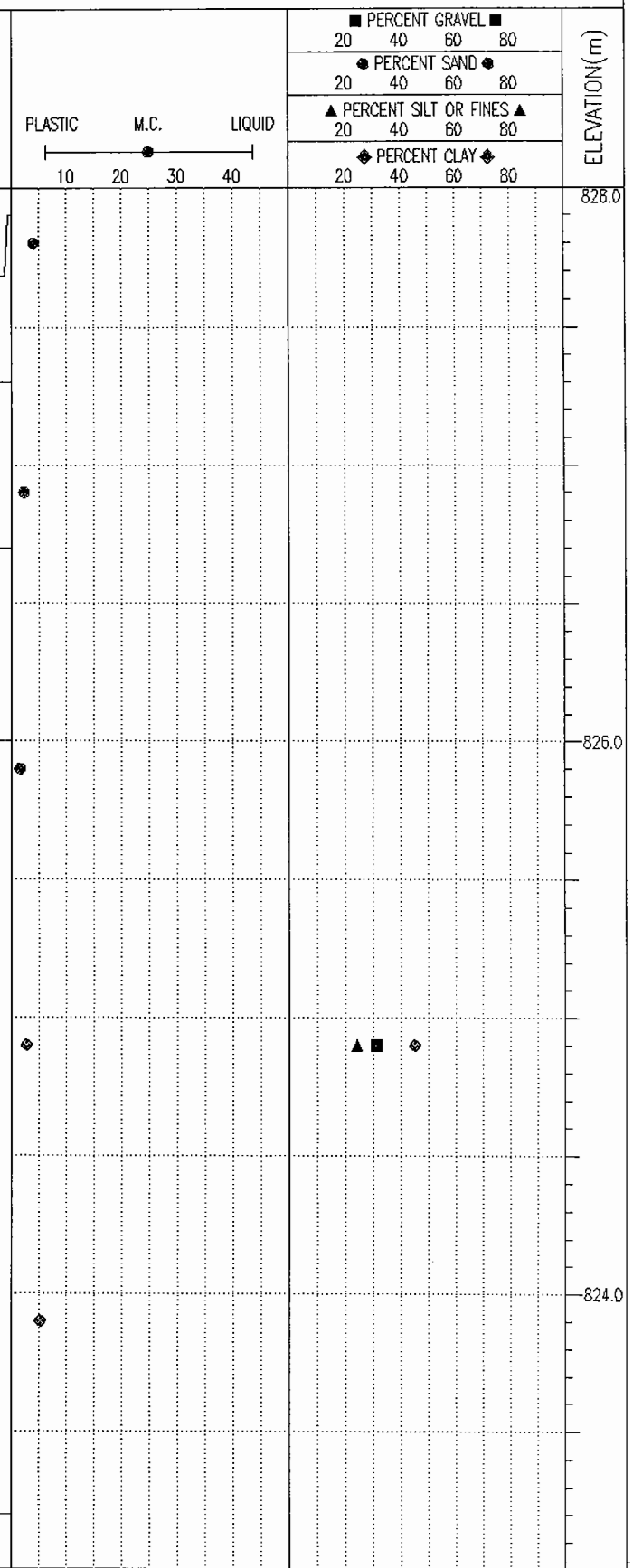
COMPLETION DEPTH: 4.2 m
COMPLETE: 05/11/02

05/12/07 01:48PM (YUKON-T4)

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP04
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6767680 E487083	ELEVATION: 828 m

SAMPLE TYPE ■ GRAB ▨ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				GRASS GROUND COVER AND ORGANIC ROOTMAT – rootlets throughout, seasonally frozen, black
				SAND – silty, fine grained, uniform, siltier from 0.5–0.7 m with rootlets, damp, medium brown
1.0				SILT (TILL) – some sand, trace of gravel and cobbles, damp, dense, light greyish brown
				SAND – gravelly, trace to some silt, well graded, gravel, damp, compact, medium greyish brown
2.0				SAND (TILL) – gravelly, silty, occasional cobbles and boulders, damp, compact to dense, greyish brown
3.0				
4.0				
				END OF TESTPIT 4.8 m
5.0				



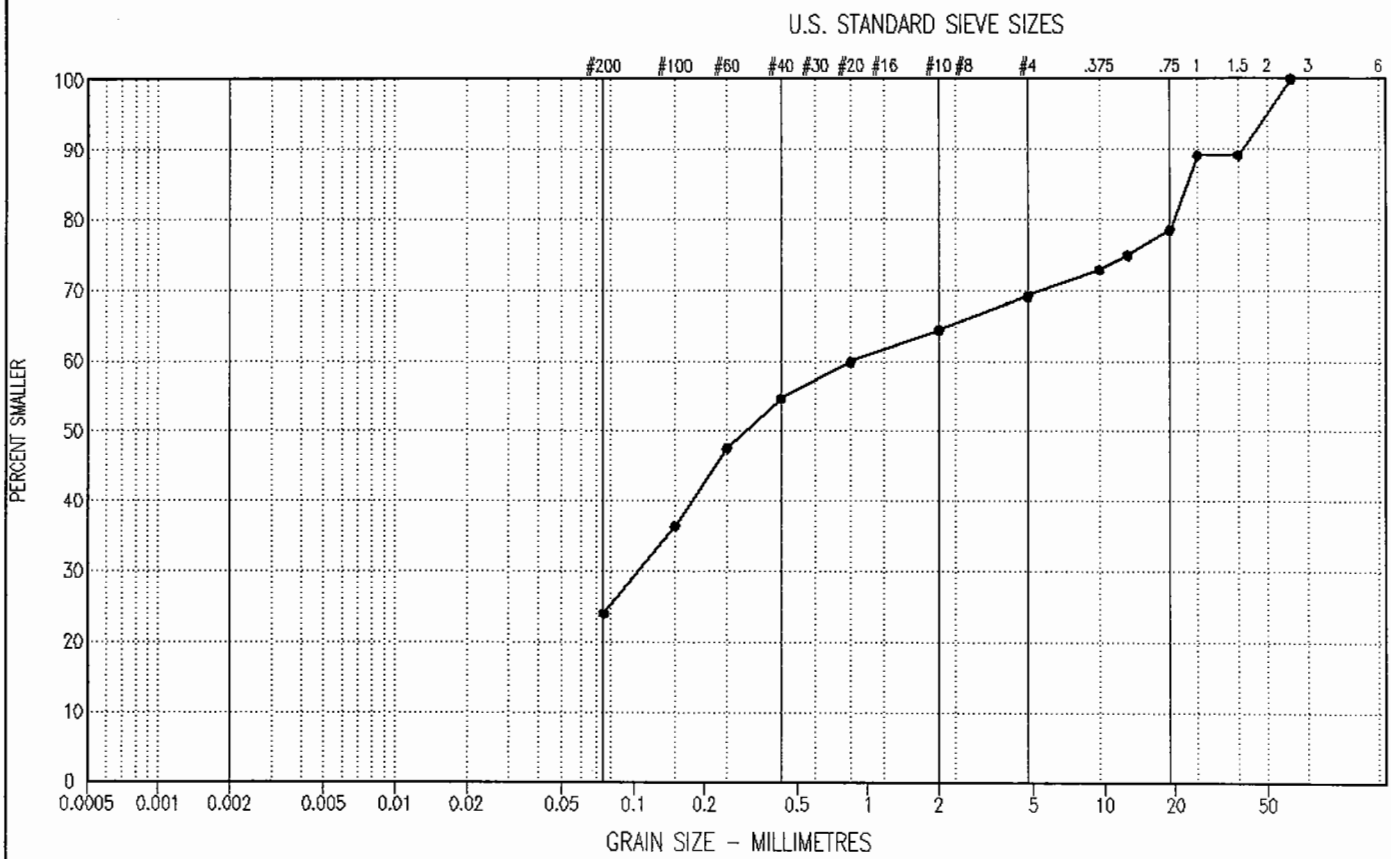
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 4.8 m
	REVIEWED BY: JRT	COMPLETE: 05/11/02
		Page 1 of 1

05/12/07 01:49PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●——●	1200161-TP04	3.00	--- 24 ---		45	31	–	–	

Project: 0201-1200161 Date Tested: 05/11/14 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP05
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6767260 E487250	ELEVATION: 820 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				ORGANIC ROOTMAT – seasonal frozen, black
				SILT – some fine sand, occasional cobbles, rootlets to 0.8 m, damp, compact, medium brown with some mottling
				– occasional weathered boulder fragments
3.0				SAND – some silt, some gravel, occasional cobbles, damp, compact, medium brown
				END OF TESTPIT 3.0 m
5.0				

PLASTIC M.C. LIQUID (10 20 30 40)

■ PERCENT GRAVEL ■ (20 40 60 80)
● PERCENT SAND ● (20 40 60 80)
▲ PERCENT SILT OR FINES ▲ (20 40 60 80)
◆ PERCENT CLAY ◆ (20 40 60 80)

ELEVATION(m): 820.0, 818.0, 816.0

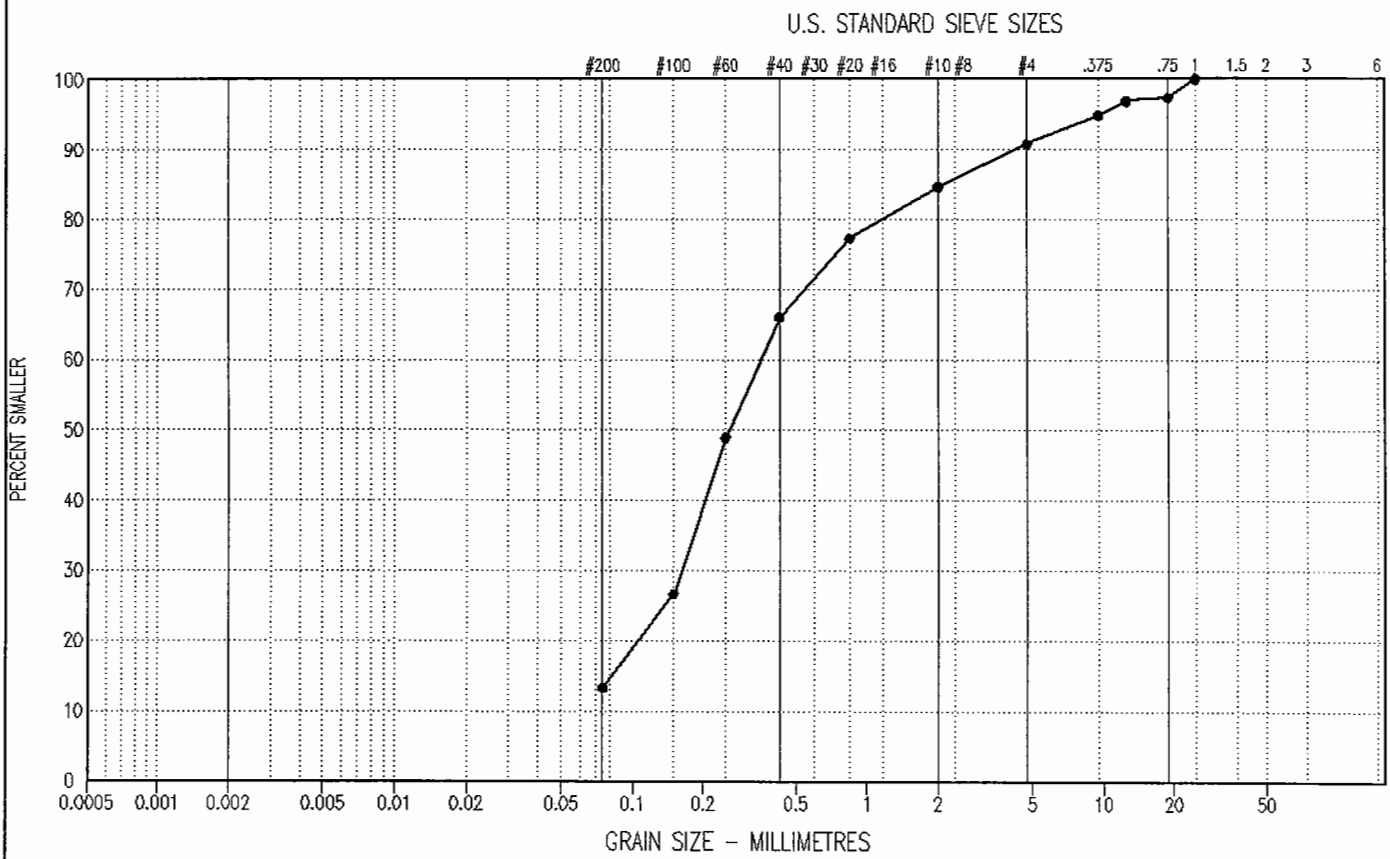
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 3 m
	REVIEWED BY: JRT	COMPLETE: 05/11/03
		Page 1 of 1

05/12/07 01:49PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



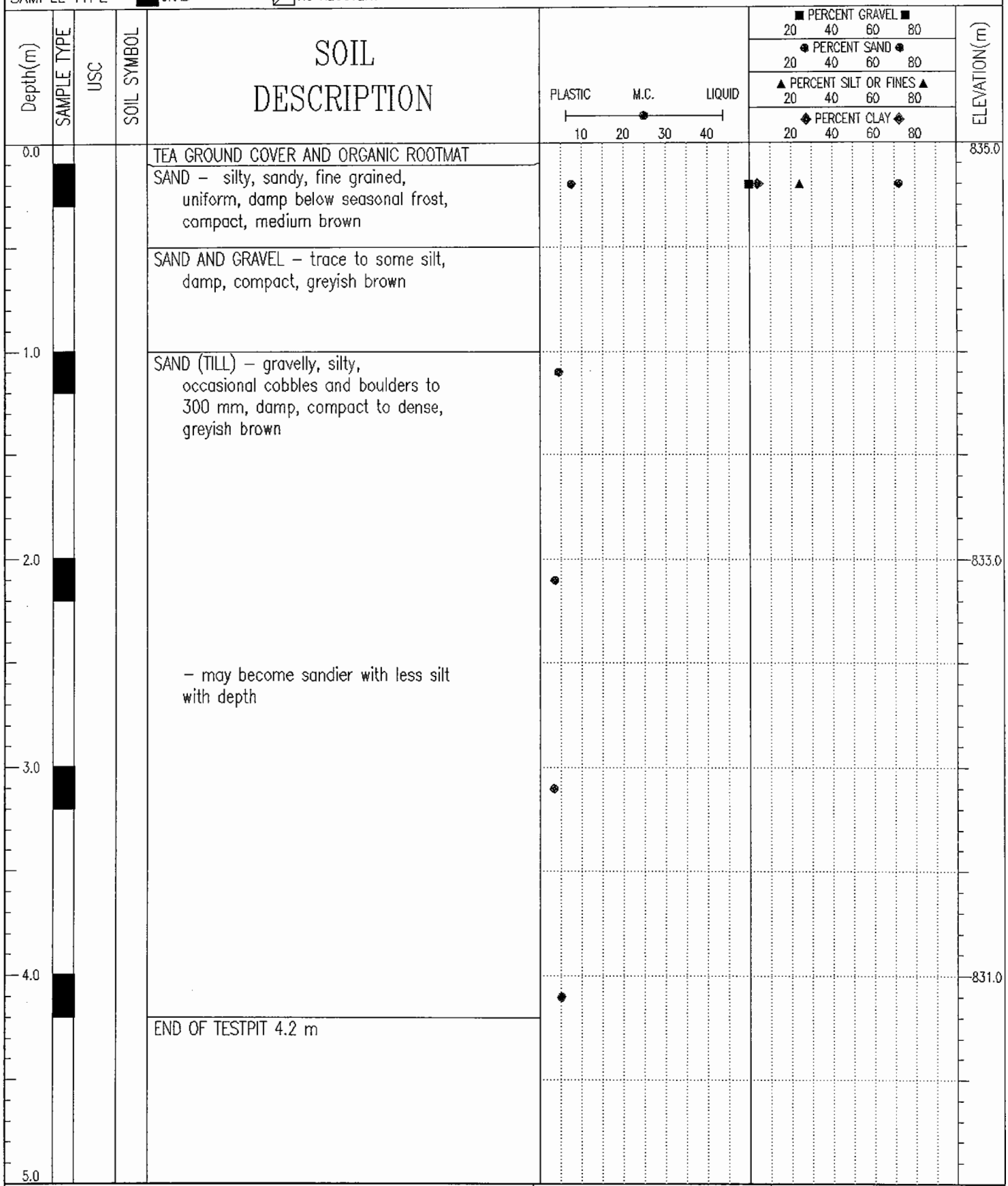
SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	1200161-TP05	3.00	---	13	---	77	10	6.4	1.3	SM

Project: 0201-1200161 Date Tested: 05/11/14 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP06
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6766894 E487022	ELEVATION: 835 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY



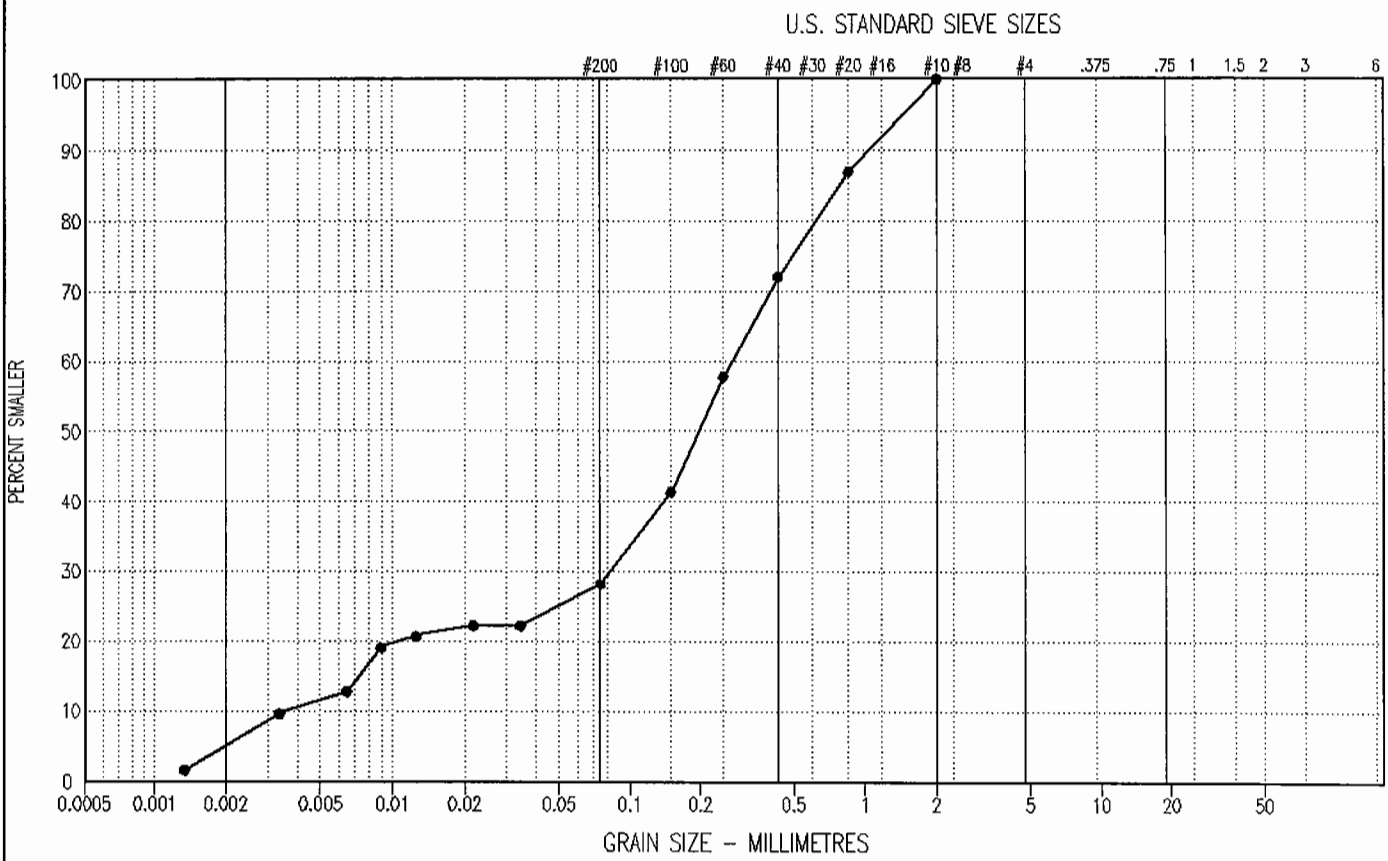
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 4.2 m
	REVIEWED BY: JRT	COMPLETE: 05/11/03
		Page 1 of 1

05/12/07 01:49PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●	1200161-TP06	0.30	4.0	24	72	0	72.6	6.9	SM

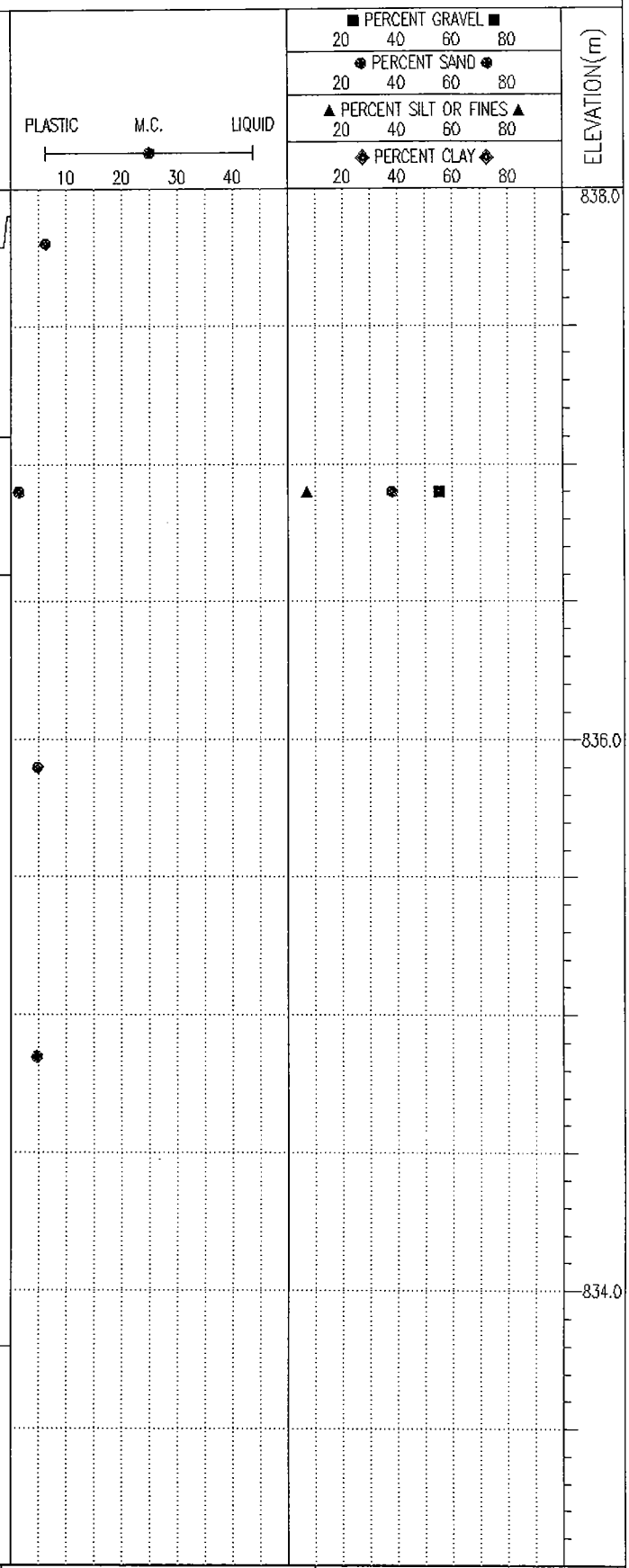
Project: 0201-1200161 Date Tested: 05/11/17 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP07
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6767260 E487136	ELEVATION: 838 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				TEA GROUND COVER AND ORGANIC ROOTMAT – seasonally frozen, black
				SAND – silty, fine grained, uniform, damp below seasonal frost, compact, medium brown
1.0				GRAVEL – sandy, trace of silt, cobbles and boulders to 400 mm, sand is well graded, damp, compact, greyish brown
				SAND (TILL) – gravelly, some silt to silty, occasional cobbles, damp, compact to dense with depth, greyish brown
2.0				
3.0				
4.0				
				END OF TESTPIT 4.2 m
5.0				



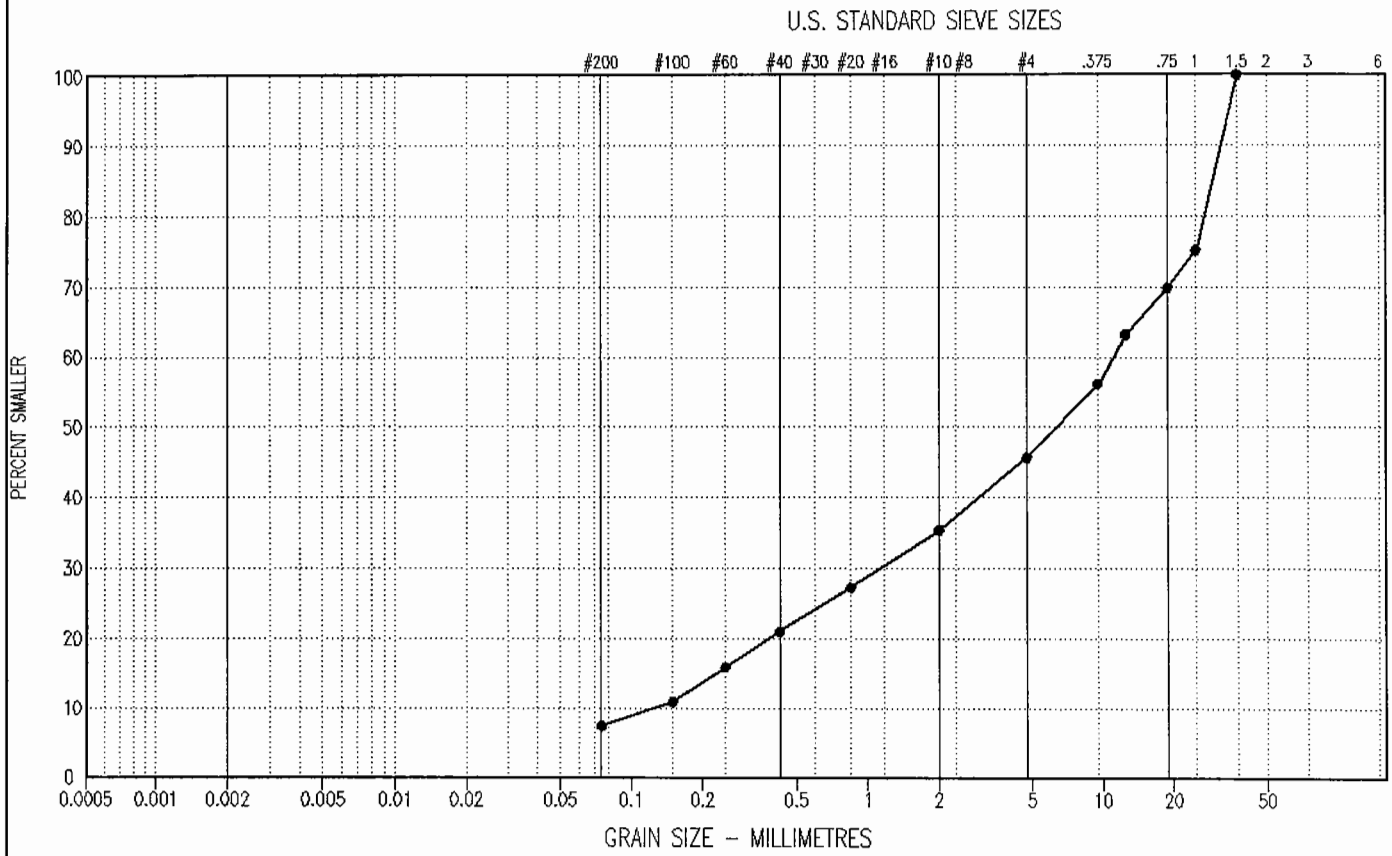
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 4.2 m
	REVIEWED BY: JRT	COMPLETE: 05/11/03
		Page 1 of 1

05/12/07 01:49PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●——●	1200161-TP07	1.00	---	7 ---	38	55	85.0	1.1	GW-GM

Project: 0201-1200161 Date Tested: 05/11/14 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP08
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6767463 E486814	ELEVATION: 850 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION
0.0				TEA AND WILLOW GROUND COVER AND ORGANIC ROOTMAT
				SAND – silty, occasional cobble, rootlets throughout, damp below seasonal frost, compact, medium brown becoming greyish brown at 0.3 m
				SAND (TILL) – gravelly, some silt to silty, occasional cobbles and boulders, damp, compact to dense with depth, greyish brown
1.0				
2.0				
				– till is difficult to excavate
3.0				
4.0				
				END OF TESTPIT 4.5 m
5.0				

PLASTIC M.C. LIQUID (10 20 30 40)

■ PERCENT GRAVEL ■ (20 40 60 80)
● PERCENT SAND ● (20 40 60 80)
▲ PERCENT SILT OR FINES ▲ (20 40 60 80)
◆ PERCENT CLAY ◆ (20 40 60 80)

ELEVATION(m): 850.0, 848.0, 846.0

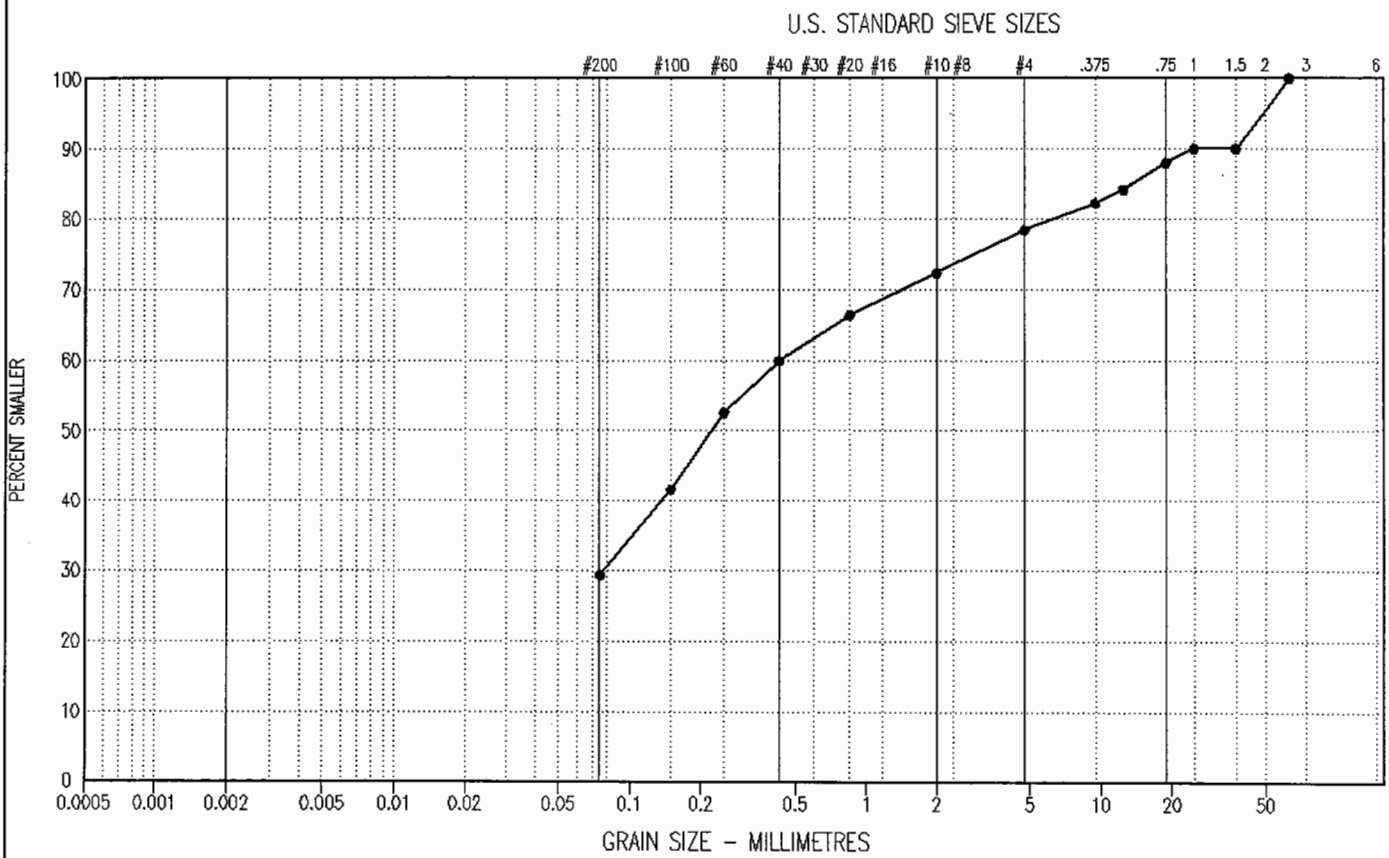
EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: MCP	COMPLETION DEPTH: 4.5 m
	REVIEWED BY: JRT	COMPLETE: 05/11/03
		Page 1 of 1

05/12/07 01:49PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	1200161-TP08	2.00	--- 29 ---		49	22	–	–	

Project: 0201-1200161 Date Tested: 05/11/14 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP09
Grizzly Valley	Excavator: Tracked Excavator	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6767762 E486377	ELEVATION: 847 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION(m)
0.0				TEA GROUND COVER AND ORGANIC ROOTMAT	847.0
				SAND – silty, rootlets throughout, seasonally frozen to 0.3 m, damp below frost, medium brown	
1.0				SAND (TILL) – gravelly, silty, occasional cobbles and boulders to 400 mm, damp, very dense, greyish brown	
2.0				– till is difficult to excavate	845.0
3.0					
				END OF TESTPIT 3.5 m	
4.0					843.0
5.0					

PLASTIC M.C. LIQUID
10 20 30 40

■ PERCENT GRAVEL ■
20 40 60 80

● PERCENT SAND ●
20 40 60 80

▲ PERCENT SILT OR FINES ▲
20 40 60 80

◆ PERCENT CLAY ◆
20 40 60 80

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

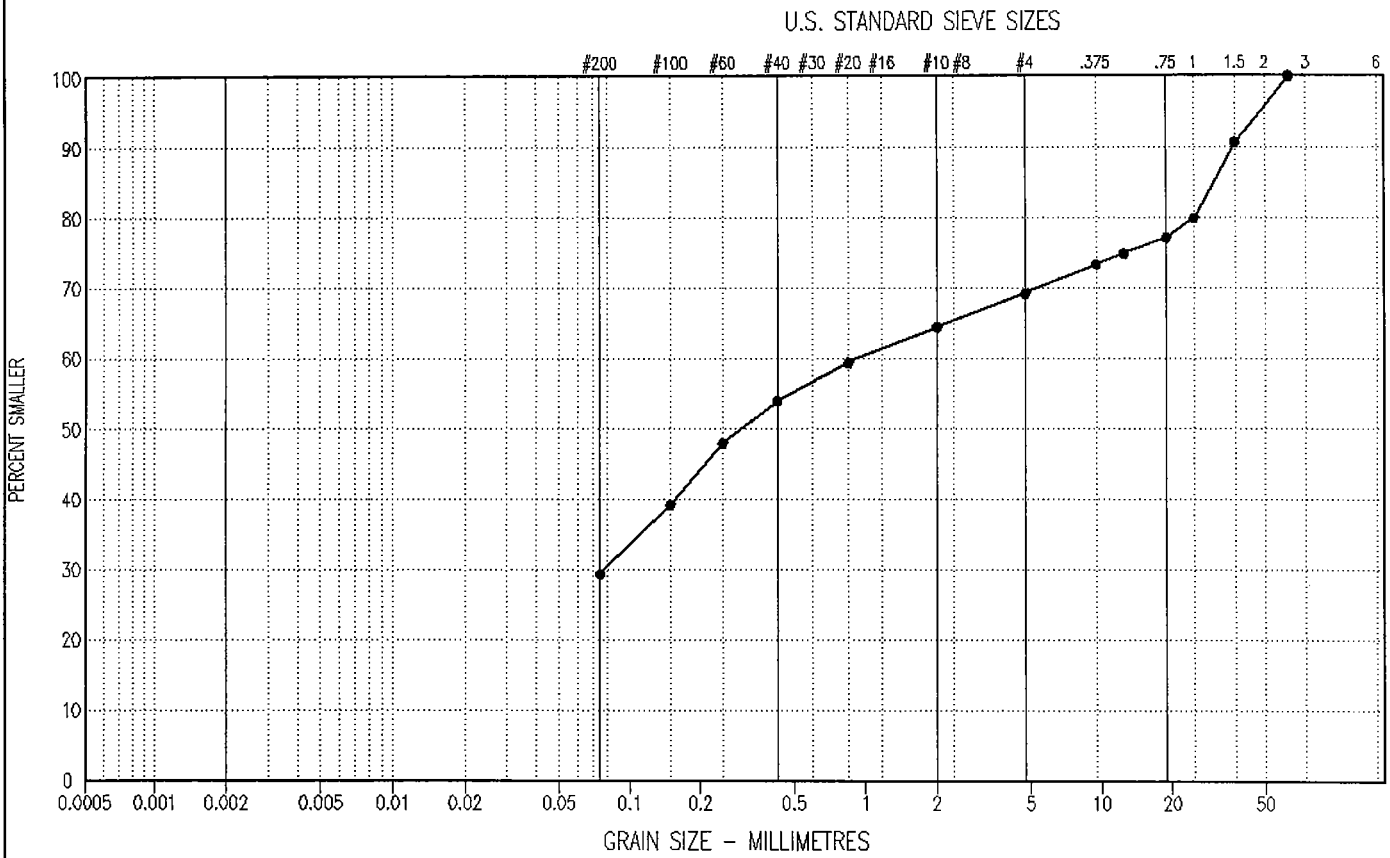
LOGGED BY: MCP	COMPLETION DEPTH: 3.5 m
REVIEWED BY: JRT	COMPLETE: 05/11/03

05/12/07 01:50PM (YUKON-T4)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	1200161-TP09	1.00	--- 29 ---		40	31	–	–	

Project: 0201-1200161 Date Tested: 05/11/08 BY: PO

Tested in accordance with ASTM D422 unless otherwise noted.

Geotechnical Evaluation	Client: Government of Yukon	TEST HOLE NO: 1200161-TP10
Grizzly Valley	Excavator: Tracked Excavator (Komatsu)	PROJECT NO: 1200161
Lake Laberge Area, YT	UTM ZONE: 8 N6766645 E487507	ELEVATION: 826 m

SAMPLE TYPE ■ GRAB ⊘ NO RECOVERY

Depth(m)	SAMPLE TYPE	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION(m)
0.0				TEA GROUND COVER AND ORGANIC ROOTMAT	826.0
				SAND – silty, rootlets throughout, occasional rock fragments, damp (seasonally frozen to 0.1 m), medium brown	
				– percolation rate between 0.3 and 0.5 m 8 min/25 mm	
				SAND (TILL) – gravelly, some silt to silty, occasional cobbles and boulders throughout, damp, very dense, greyish brown	
1.0					
				– percolation rate between 1.8 and 2.0 m 55 mm/25 mm	
2.0				END OF TESTPIT 2.0 m	824.0
3.0					
4.0					822.0
5.0					

PLASTIC M.C. LIQUID
10 20 30 40

■ PERCENT GRAVEL ■
20 40 60 80

● PERCENT SAND ●
20 40 60 80

▲ PERCENT SILT OR FINES ▲
20 40 60 80

◆ PERCENT CLAY ◆
20 40 60 80

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

LOGGED BY: MCP	COMPLETION DEPTH: 2 m
REVIEWED BY: JRT	COMPLETE: 05/11/03

05/12/07 01:50PM (YUKON-T4)