

October 28, 2008

EBA File: W14101020

Government of Yukon
Department of Community Services
Community Development Division
PO Box 2703
Whitehorse, YT
Y1A 2C6

Attention: Brian Ritchie
Program Manager

**Subject: Geotechnical Evaluation – Dome Road
Subdivision Expansion - Dawson City, Yukon**

At the request of Brian Ritchie, YTG Community Services, EBA has completed a geotechnical evaluation of the proposed Dawson Dome Subdivision expansion area. This geotechnical evaluation report is subsequent to the previously completed Terrain Evaluation report submitted by EBA in April, 2008 along with a review of the conceptual subdivision designs prepared by Inukshuk Planning & Development (unveiled at the Open House in Dawson on August 26, 2008).

Presented below is a summary of the geotechnical fieldwork completed along with recommendations for subdivision development. The April, 2008 Terrain Evaluation report is also included with this submission (see Appendix C of this report).

1.0 TESTPITTING PROGRAM & SITE RECONNAISSANCE

On July 21, 2008, a site reconnaissance of the area surrounding the Dawson City Ski Hill was completed by Mr. Jack Dennett to confirm access into the area with a tracked excavator. A well maintained trail network (utilized as cross country ski trails in the winter) exists throughout the study area and the trails were assessed as being wide enough for vehicle and equipment access.

On August 26, 2008, a testpitting program was completed. A total of six testpits were excavated throughout the portion of the site that is located directly down-gradient of the ski hill. The testpits were excavated with a Hitachi EX 200 tracked excavator subcontracted from Gammie Trucking of Dawson City, Yukon.

Testpits were all excavated to depths of 3.2 m. At each testpit location, detailed testpit logs were prepared describing the geotechnical conditions encountered; representative soil samples were collected at regular intervals; UTM coordinate locations were recorded utilizing a hand held GPS unit and upon completion, all testpits were backfilled to grade and marked for future reference.

The soil samples collected during the testpitting program were returned to the EBA Whitehorse laboratory. The laboratory testing program included natural moisture content determination for all samples collected and particle size distribution testing on select samples for classification purposes.

During the testpitting program, numerous shallow testpits were noted along the existing trail network. It is understood that these testpits were excavated for placer exploration purposes; however, their existence provided additional shallow geotechnical information. On August 27, 2008, an additional site reconnaissance was completed so that the soil conditions could be assessed and used for site evaluation purposes.

Geotechnical conditions are described in the following section. Testpit locations and the locations of four of the exposures used for evaluation purposes are presented on Figure 1. Detailed testpit logs and associated laboratory testing report forms are presented following Figure 1 in Appendix A of this report.

2.0 GEOTECHNICAL CONDITIONS

2.1 General Location

The study area, as identified in the literature presented in the March, 2008 correspondence, extended from the Dawson Ski Hill and existing Dome Road Subdivision east to Thomas Gulch. The south boundary of the study area was presented as the active placer mining area and the approximate north boundary of the study area was the Dome Road alignment up-gradient of the existing subdivision.

Initial terrain evaluation, along with preliminary planning work completed by Inukshuk Planning & Development, resulted in a reduction of the area where the detailed geotechnical work was completed. The grades along the bench located immediately above the active placer area were assessed as being the most conducive to residential development; therefore this phase of detailed geotechnical work was focused in that area.

There is also a decommissioned dump site located at the base of the ski hill area. Along with the debris noted throughout the fenced-in area, the main concern is the existence of a land treatment unit (LTU) located in the north-west corner. During the late August site work, it was noted that the LTU was full of soil and standing water (it is possible that the LTU overflows during the spring thaw).

2.2 Terrain Issues

Terrain issues noted during the terrain evaluation and geotechnical testpitting programs which will affect lot development include:

- Steep slopes above and below the conceptual design area may limit roadway and lot access, as well as building sites and the location of on-site sewage disposal systems. Slopes may also dictate which sewage disposal system is most appropriate (ie. absorption field systems are

generally constructed in flatter areas while wide or deep absorption trench systems can be constructed on slopes, as long as potential for day-lighting of tertiary effluent is non-existent).

- Ensuring slope stability above the placer mining area that defines the south (down gradient side) of the conceptual development area is also a terrain related issue which will have to be addressed. The fine grained sediments overlying the underlying gravels and/or bedrock are showing signs of erosion which will continue if not dealt with.
- Shallow bedrock is known to exist throughout much of the area up-gradient of the proposed development area and will likely be encountered in isolated locations throughout the development area.
- Permafrost is also known to exist in undisturbed areas of the site.

2.3 Soil Conditions

A review of the depositional history of the study area suggests that the study area was not subject to glaciation during the last ice age (Reid). However, the gently sloped terrain along the lower bench which is being considered for residential development is likely attributed to pre-Reid deposition with near surface fine grained soils, which are overlain by a colluvial veneer (mixture of sand, silt and angular gravel, cobble and boulder sized fragments) along the up-gradient edge of the lower bench.

To summarize the soil conditions encountered during the testpitting program:

- Fine grained soils were encountered in Testpits W14101120-TP03, -TP04, -TP05 and -TP06, from surface to the 3.2 m testpit termination depth. These testpits were excavated along the cross country ski trail closest to the crest of the cut-slope overlooking the placer mining area. In addition, permafrost (Nbn – non-visible; not excessively wet when thawed) was encountered at 2.0 m in -TP03; 2.5 m in -TP04 and 2.9 m in -TP05. A percolation test was performed in testpit W14101120-TP05. In the near surface fine grained soils (0.3 m to 0.6 m), a 60 minute per 25 mm percolation rate was measured, suggesting that the fine grained soils along the down gradient portion of the site are not be conducive to on-site sewage disposal system construction.
- Colluvial soils (soil matrix is sandier and has angular rock fragments of various sizes distributed throughout) were noted in Testpits W14101120-TP02 and -TP04, as well as the old exploration testpits (labelled as exposures -EXP01, -EXP02, -EXP03 and -EXP04 on Figure 1). The thickness of the colluvial veneer in the testpits and exposures, where colluvium was noted, was variable (between 1.2 m and greater than 3.0 m). Two percolation tests were performed in the colluvial soils in testpits W14101120-TP01 and -TP02 between 0.3 m and 0.6 m and acceptable percolation rates of 12 minutes per 25 mm and 18 minutes per 25 mm were measured in Testpits W14101120-TP01 and -TP02 respectively.
- Depth to bedrock is quite variable throughout the study area. Bedrock was not encountered in any of the testpits excavated during the current evaluation; however, it was noted in exposure W14101120-EXP04. As mentioned in the April, 2008 Terrain Evaluation report, the transition with the steeper, up-gradient portion of the study area, depth to bedrock could be a development concern.

- Soft, wet surficial soils were noted along the existing trail network with deep ruts noted along the down gradient ski trail (could also be the result of permafrost degradation). Standing water was also noted in some of the ruts (even though there had been no rain for at least two days prior to the testpitting program being completed).

3.0 SITE SUITABILITY & DEVELOPMENT CONSTRAINTS

The terrain and soil conditions throughout the lower bench portion of the study area minimize the amount of developable land but this area is considered to be marginally acceptable for country residential subdivision development. Other site suitability issues that will likely affect development include:

- The presence of the old dump site will likely dictate the need for additional environmental assessment work before setback distances can be established.
- Current use as a recreational area (cross country ski trails which are likely used for hiking trails as well) will affect public perception of the proposed development.
- Land tenure issues associated with the existing placer claims will also affect public perception.
- Proximity to the edge of a steep slope along the north wall of the excavation created by previous placer mining operations is a safety issue as well as having geotechnical implications (safe setback distance).

4.0 SUBDIVISION DEVELOPMENT & CONSTRUCTION CONSIDERATIONS

4.1 Development Considerations

To provide recommendations for specific subdivision design and construction, it is necessary to reference a concept plan. Inukshuk Planning & Development created two concepts (one was a lower density concept plan with 40 lots and one was higher density concept plan with up to 90 lots) in August, 2008. The higher density concept plan reflects lot sizes of approximately 0.15 hectares. This concept would not be conducive to on-site sewage disposal, therefore, the installation of sewage holding tanks would be necessary and since sewage pump-out services are considered expensive, this concept is may not be the compatible with the development plans of Dawson City.

The lower density concept is based on an average lot size of 0.5 hectares, with frontages of approximately 50 m. With percolation rates (in the areas with colluvial near surface soils) of around 20 minutes per 25 mm, the lot size may be somewhat restrictive. However, it is understood that water delivery is common and as long as the setback distance from the wells on each lot, as well as the neighbouring lots, isn't an issue, acceptable area will exist for the location of a driveway, a residential structure and an on-site sewage disposal system.

It is the opinion of EBA that the access road traversing the site should be located slightly up-gradient of the ski trail along which testpits W14101120-TP03, -TP04, -TP05 and -TP06 were excavated. Lots should then extend up-gradient of the proposed road. The rationale behind this recommendation is:

- The existing trail and the uncleared area between the proposed road and the crest of the placer mining area would remain intact. This would be a conservative development setback from the crest overlooking the placer area. This doesn't address the safety concerns associated with children playing along the slope, but it allows adequate space for additional placer mining and subsequent reclamation of the area once the Dawson City council decides to develop residential lots throughout the placer area.
- The existing trail could still be used for winter recreational purposes.
- The lots could extend up-slope ensuring that a portion of each lot would have colluvial soils for constructing on-site sewage disposal systems. Along with conceptual recommendation, it will be important for individual lot owners to establish the absorption trench location prior to commencing with foundation construction. The location of the driveway and the residential structure can then be established (it is important that the absorption system be down gradient of the structure it is servicing).

4.2 Roadway Structure Design & Construction

The roadway traversing the lower bench will be constructed on fine grained soils which are prone to excessive rutting when wet. The subgrade soils are also considered to be very frost susceptible. Based on existing conditions, the following recommendations apply:

- The prepared subgrade surface must be scarified (removing all cobbles and boulders greater than 150 mm in size), moisture conditioned (this may mean drying of subgrade soils to at least 3% below optimum moisture) and recompacted to at least 98% of maximum dry density using standard effort (ASTM D698).
- The prepared subgrade surface must be very stable prior to placing sub-base gravel; therefore, it is recommended that the roadway be proof-rolled prior to sub-base construction. Ditching will also be critical in ensuring that surface water runoff is directed away from the roadway embankment.
- A non-frost susceptible sub-base course (80 mm pit run gravel – 400 mm in compacted thickness), is to be placed over the prepared subgrade, moisture conditioned to facilitate the compaction process, and compacted to at least 98% of maximum dry density using standard effort (ASTM D698).
- Basecourse (20 mm crushed gravel – 100 mm in compacted thickness) will also be placed, moisture conditioned and also compacted to at least 98% of maximum dry density using standard effort (ASTM D698).

All imported granular materials to be used must comply with the gradation specifications presented in Table 4.2, below:

TABLE 4.2 IMPORTED GRANULAR MATERIALS SPECIFICATIONS			
80 mm PIT RUN GRAVEL (Sub-Base)		20 mm BASECOURSE GRAVEL	
SIEVE SIZE (mm)	% PASSING BY MASS	SIEVE SIZE (mm)	% PASSING BY MASS
80.000	100	20.000	100
25.000	55 - 100	12.500	64 - 100
12.500	42 - 84	5.000	36 - 72
5.000	26 - 65	1.250	12 - 42
1.250	11 - 47	0.315	4 - 22
0.315	3 - 30	0.080	3 - 6
0.080	0 - 8		

If alternate materials are being considered, EBA will conduct particle size analysis testing and provide an opinion regarding acceptability for use in specific applications. The closest granular borrow source to the subject site is the Dome Road Pit located less than 1 km from the Ski Hill turn-off. Granular materials from the Callison Subdivision area are also acceptable for use.

4.3 On-Site Sewage Disposal System Design

A generic three bedroom on-site sewage disposal system design has been prepared for consideration. The system is based on a 20 minute per 25 mm percolation rate, taking advantage of the colluvial soils found within the top metre throughout much of the site.

System sizing and configuration details are presented below:

- System sizing for a typical three bedroom house would include the installation of a 1000 imperial gallon (4550 Litre) septic tank (two chamber tank complete with siphon chamber). Secondary effluent would flow into a distribution box with three outlets, which in turn direct effluent through solid PVC pipe into three trenches with 20 m of perforated pipe and INFILTRATOR chambers in each trench.
- The trenches will be 600 mm deep and 1 m wide. On slopes similar to the slopes encountered along the lower bench of the study area, it is recommended that the trenches be spaced to ensure a minimum of 3 m between the up-slope edge of one trench and the down-slope edge of the next trench. Prior to placing the INFILTRATOR chambers, it is recommended that the base of the excavation be raked to ensure minimal smearing. The trenches must run parallel to the contours of the lot to ensure proper distribution. Cleanout/monitoring standpipes must be installed at the ends of each of the three runs.
- System details are presented on Figure 2 in Appendix B of this report. All applicable setback distances from lot lines, roadways, driveways, building and sewage disposal system elements apply.

- It is still important to note that each lot would require site specific percolation tests and sizing calculations in order to comply with the Environmental Health application process. EBA would be pleased to provide this service once weather conditions permit.

5.0 FOUNDATIONS

Generally, the construction of conventional foundation systems, (strip & spread footings or monolithic thickened slab-on-grade foundations) is considered acceptable for use throughout the study area. Shallow foundations throughout the study area should consider the potential for frost heave. The use of perimeter insulation may be required, but most importantly, the control of roof runoff and surface water must be considered.

If permafrost is detected, it must be either sub-excavated to a stable base or allowed to thaw prior to constructing building foundations. Alternatively, the buildings must be designed with an adjustable foundation system.

6.0 CLOSURE

The information and analyses contained in this report are based on the results of the current evaluation, previous completed geotechnical evaluations completed throughout the Dome Road area, existing terrain and geology mapping, air photograph interpretation and understanding of regional conditions.

This report and its contents are intended for the sole use of the Government of Yukon, Department of Community Services and their agents. 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 Government of Yukon, Department of Community Services, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's General Conditions presented following this letter report.

EBA Engineering Consultants Ltd.

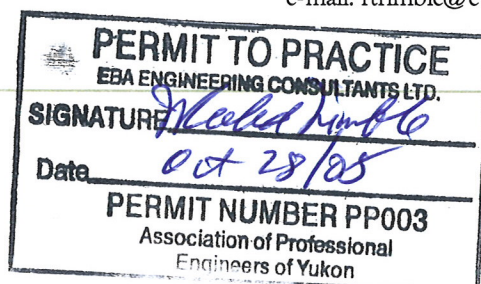
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GEOTECHNICAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

1.0 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.

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2.0 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), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

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. EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

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.

3.0 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.

4.0 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.

5.0 LOGS OF TESTHOLES

The testhole 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 which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 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.

7.0 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 judgemental 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.

8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which 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.

9.0 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.

10.0 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.

11.0 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.

12.0 DRAINAGE SYSTEMS

Where temporary or permanent 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 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.

13.0 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.

14.0 SAMPLES

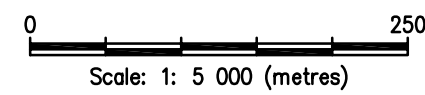
EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

C:\Whitehorse\Drawings\Drawings\City Area\W14101120 Dome Road Res Expansion\E08006.dwg [FIGURE 1] September 18, 2008 - 10:58:17 am (BY: JAMES BU'YCK)



- LEGEND**
- ⊕ TESTPIT LOCATIONS
 - ⊞ EXPOSURE LOCATIONS

- NOTES**
1. BASE PLAN ADAPTED FROM ORIGINAL PROVIDED BY INUKSHUK PLANNING.
 2. IMAGE OBTAINED FROM GOOGLE EARTH



CLIENT

Yukon
 Government
 Community Development Branch

**EBA Engineering
 Consultants Ltd.**

**Dome Road Residential Subdivision Expansion
 Dawson City, Yukon**

**SITE PLAN SHOWING
 TESTPIT AND EXPOSURE LOCATIONS**

PROJECT NO. W14101120	DWN JSB	CKD MCP	REV 0
OFFICE WHSE	DATE September 2008		

Figure 1

Residential Subdivision Expansion	Government of Yukon	TESTPIT NO: W14101120-TP01
Dome Road	Testpit Method: Hitachi EX 200 Tracked Excavator	PROJECT NO: W14101120
Dawson City, YT	7103505N; 578431E; Zone 7	

SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> BULK	<input type="checkbox"/> CRREL CORE	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> GRAB CORE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	Bulk Density (kg/m ³)		PLASTIC M.C. LIQUID		CLAY (%)		SILT (%)		SAND (%)		GRAVEL (%)		Depth (ft)
					500	1000	20	40	60	80	20	40	60	80	20	40	
0	Moss Ground Cover and Organic Root Material			UNFROZEN													0
0.3 - 0.6	SAND - gravelly, some silt, occasional cobbles, rootlets throughout, gravel is angular, damp to moist, medium brown - percolation rate of 12 min / 25 mm measured between 0.3 and 0.6 m		1														
1.0 - 2.0	SILT - some clay, occasional rock fragments throughout silt matrix, moist becoming wet at depth, soft, olive grey		2														
2.0 - 3.0			3														
3.0 - 3.2			4														
3.2	END OF TESTPIT @ 3.2 m NOTE: Percolation test performed on Aug 28/08 with 4 hour presoak and two repetitions																

	LOGGED BY: MCP	COMPLETION DEPTH: 3.2m
	REVIEWED BY: MCP	COMPLETE: 8/26/2008
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE DISTRIBUTION

ASTM C136 & D422

Sieve Size	Percent Passing
50.000	100
37.500	78
25.000	69
19.000	67
12.500	60
9.500	57
4.750	48
2.000	39
0.850	32
0.425	26
0.250	22
0.150	19
0.075	15.6

Project: **Dome Road Subdivision Development**

Project Number: W14101120

Date Tested: 9/17/2008

Borehole Number: W14101120 -TP01

Depth: 0.3 m

Soil Description: GRAVEL - sandy, some silt

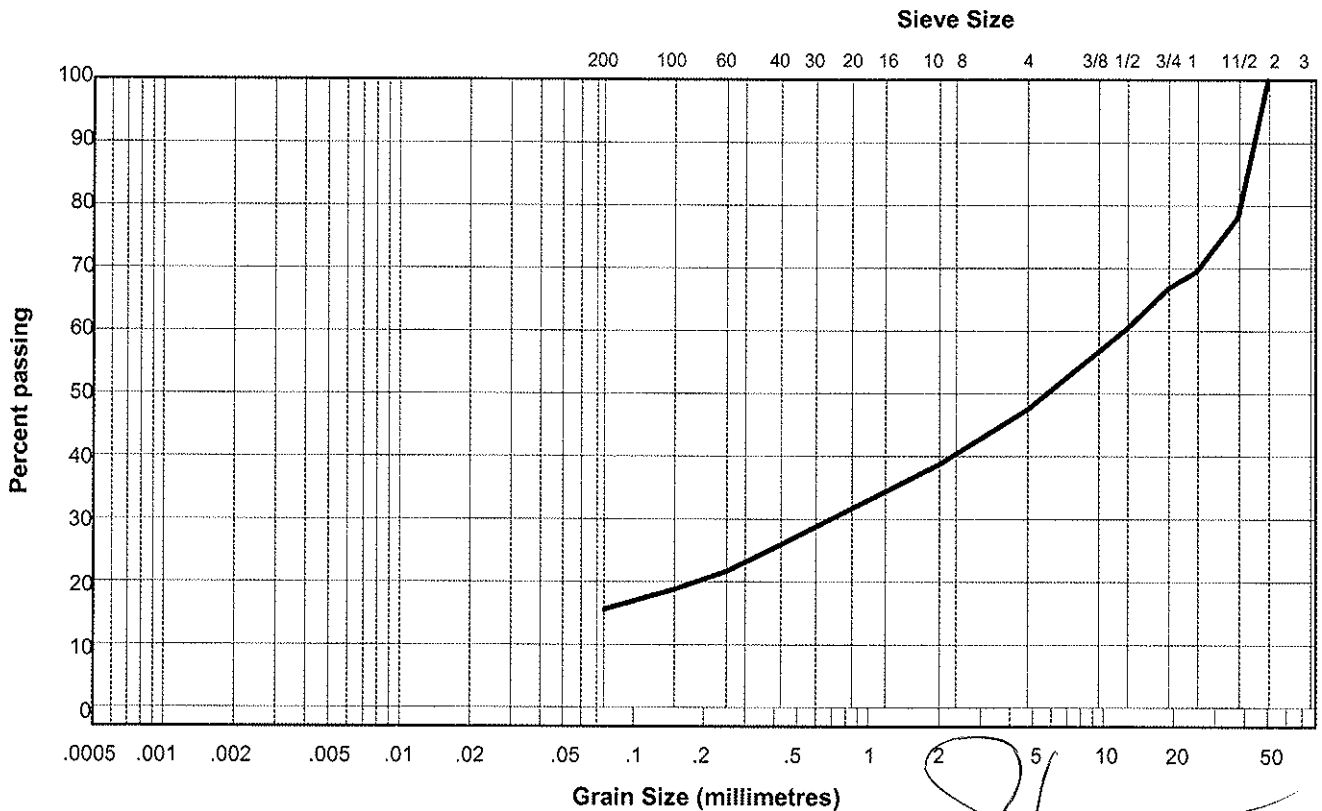
Cu: N/A

Cc: N/A

Natural Moisture Content: 9.4%

Remarks: 0

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse

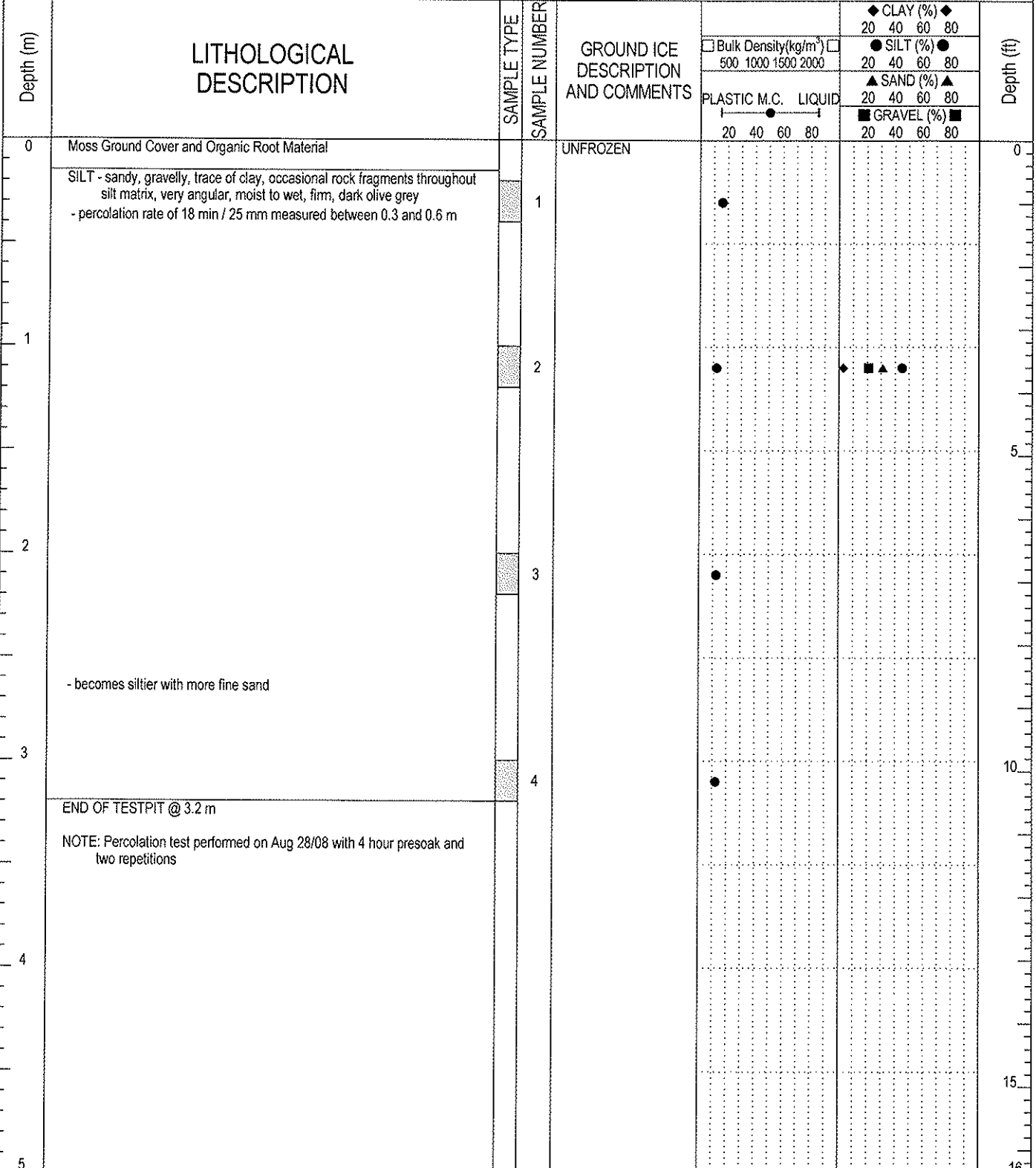



Reviewed By:

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA. The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

Residential Subdivision Expansion	Government of Yukon	TESTPIT NO: W14101120-TP02
Dome Road	Testpit Method: Hitachi EX 200 Tracked Excavator	PROJECT NO: W14101120
Dawson City, YT	7103483N; 578237E; Zone 7	

SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> BULK	<input type="checkbox"/> CRREL CORE	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> GRAB CORE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND



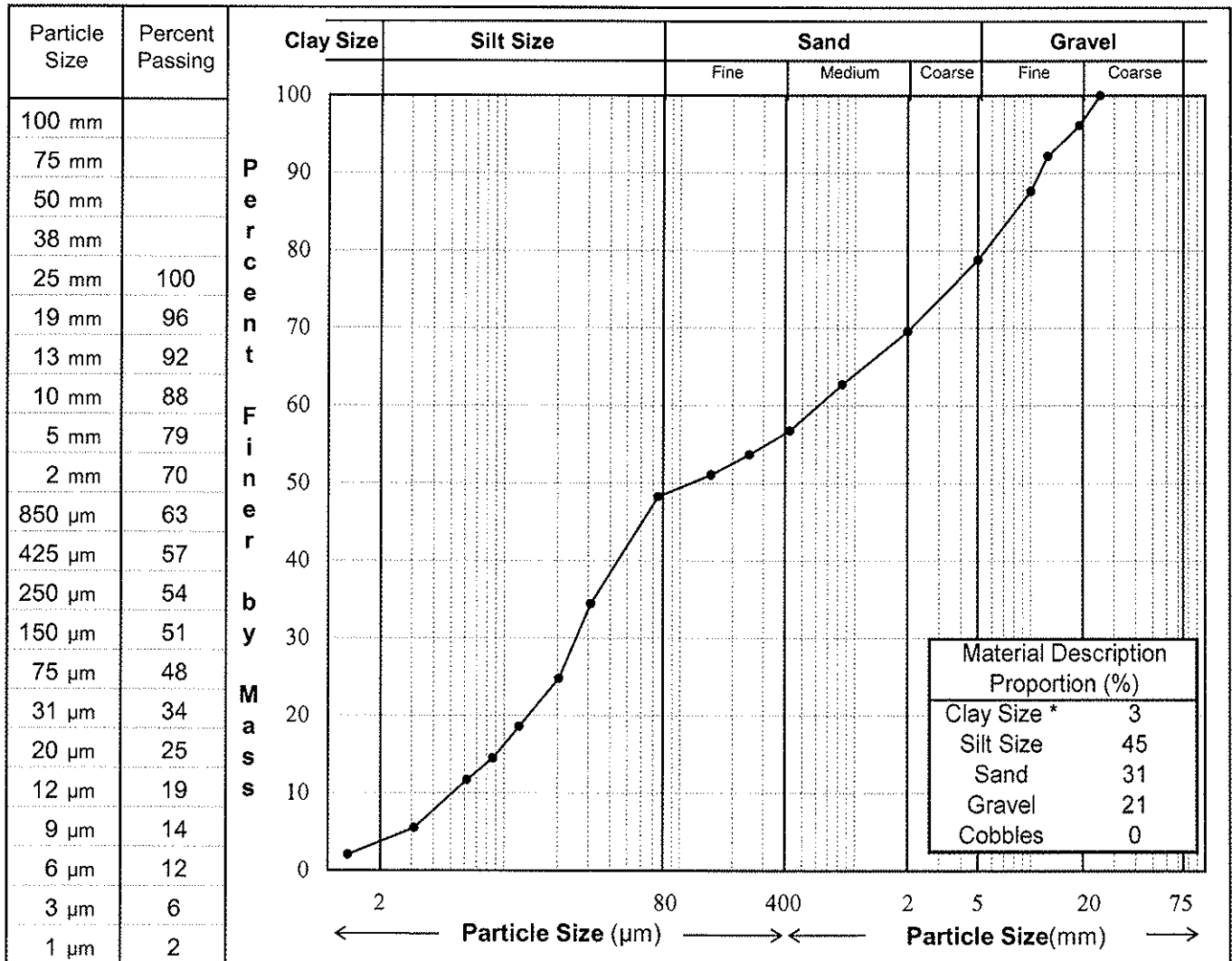
	LOGGED BY: MCP	COMPLETION DEPTH: 3.2m
	REVIEWED BY: MCP	COMPLETE: 8/26/2008
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project: **Dome Road Subdivision Development**
 Client: YTG
 Project No.: W14101120
 Location: Dawson City, YT
 Sample No.: TP02
 Depth: 1.0 m
 Description**: SILT - sandy, gravelly, trace clay

Date Tested: 2008/09/18



Remarks: * The upper clay size of 2 µm, per the Canadian Foundation Engineering Manual.
 ** The description is visually based & subject to EBA description protocols.


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Residential Subdivision Expansion	Government of Yukon	TESTPIT NO: W14101120-TP03
Dome Road	Testpit Method: Hitachi EX 200 Tracked Excavator	PROJECT NO: W14101120
Dawson City, YT	7103425N; 578175E; Zone 7	

SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> BULK	<input type="checkbox"/> CRREL CORE	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> GRAB CORE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	Bulk Density (kg/m ³)		PLASTIC M.C. LIQUID		CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)	Depth (ft)
					500	1000	1500	2000	20	40	60	80	
0	Moss Ground Cover and Organic Root Material			UNFROZEN									0
	SILT - trace clay, trace fine sand, deposited in even, parallel laminations, moist, dark olive brown		1										
1			2										
2	- becomes frozen below 2.0 m, medium olive brown in color		3	Pernmafrost, Nbn									
3			4										
	END OF TESTPIT @ 3.2 m												
4													
5													

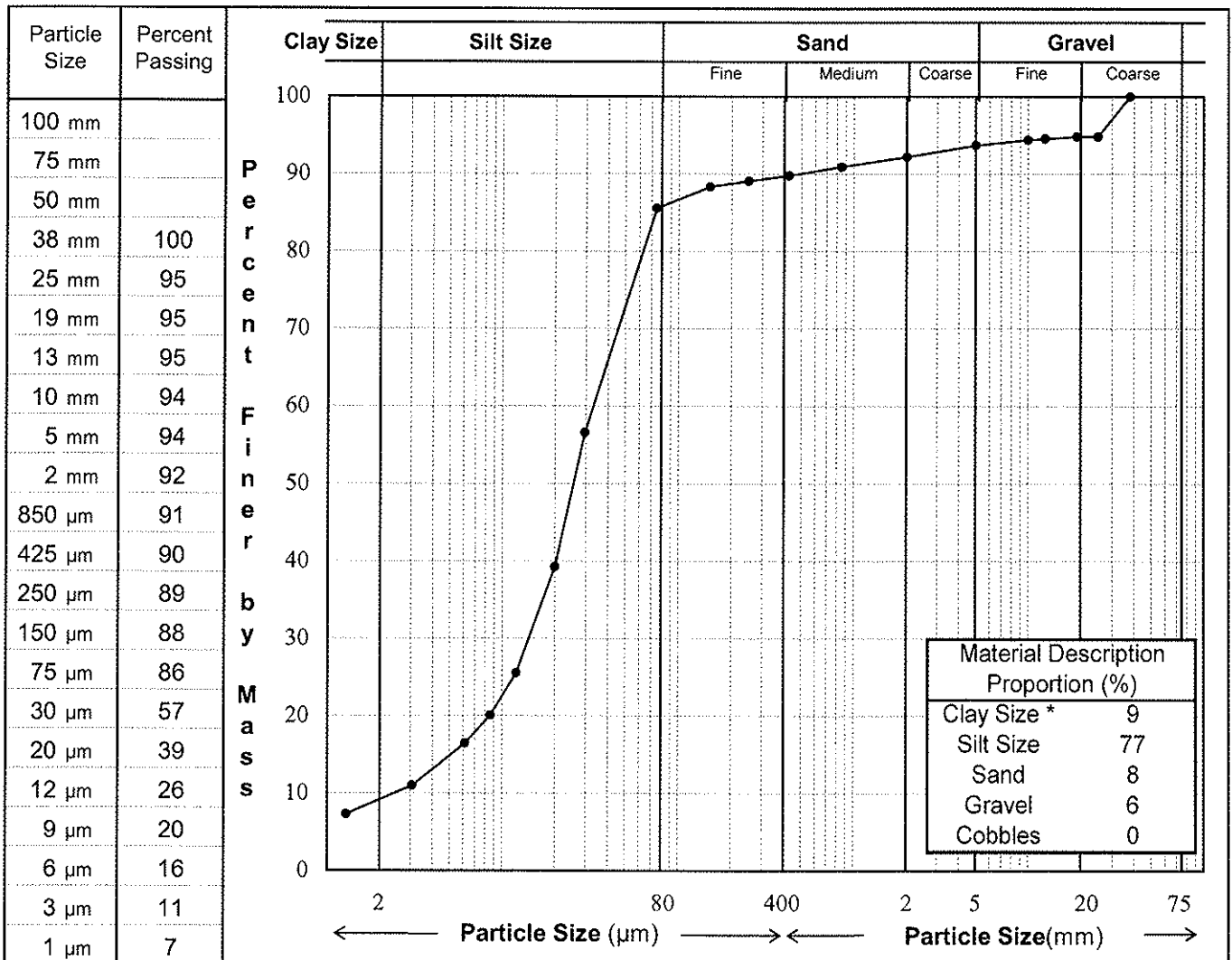
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	REVIEWED BY: MCP	COMPLETE: 8/26/2008
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project: **Dome Road Subdivision Development**
 Client: YTG
 Project No.: W14101120
 Location: Dawson City, YT
 Sample No.: TP03
 Depth: 2.0 m
 Description**: SILT - trace clat, trace sand, trace gravel

Date Tested: 2008/09/17



Remarks: * The upper clay size of 2 µm, per the Canadian Foundation Engineering Manual.
 ** The description is visually based & subject to EBA description protocols.


Reviewed By: *[Signature]*

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Residential Subdivision Expansion	Government of Yukon	TESTPIT NO: W14101120-TP04
Dome Road	Testpit Method: Hitachi EX 200 Tracked Excavator	PROJECT NO: W14101120
Dawson City, YT	7103395N; 577979E; Zone 7	

SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> BULK	<input type="checkbox"/> CRREL CORE	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> GRAB CORE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	Bulk Density (kg/m ³)		PLASTIC M.C.		LIQUID		Depth (ft)
					500	1000	2000	20	40	60	
0	Moss Ground Cover and Organic Root Material			UNFROZEN							0
0	SILT - gravelly, sandy, trace clay, occasional angular gravel fragments throughout silt matrix near surface, deposited in even, parallel laminations, moist, dark olive brown		1								
1			2								
2	- large cobble and boulder sized angular fragments below 2.0 m		3	Permafrost, Nbn							
2	- frozen below 2.5 m, difficult to excavate										
3			4								
3	END OF TESTPIT @ 3.2 m										

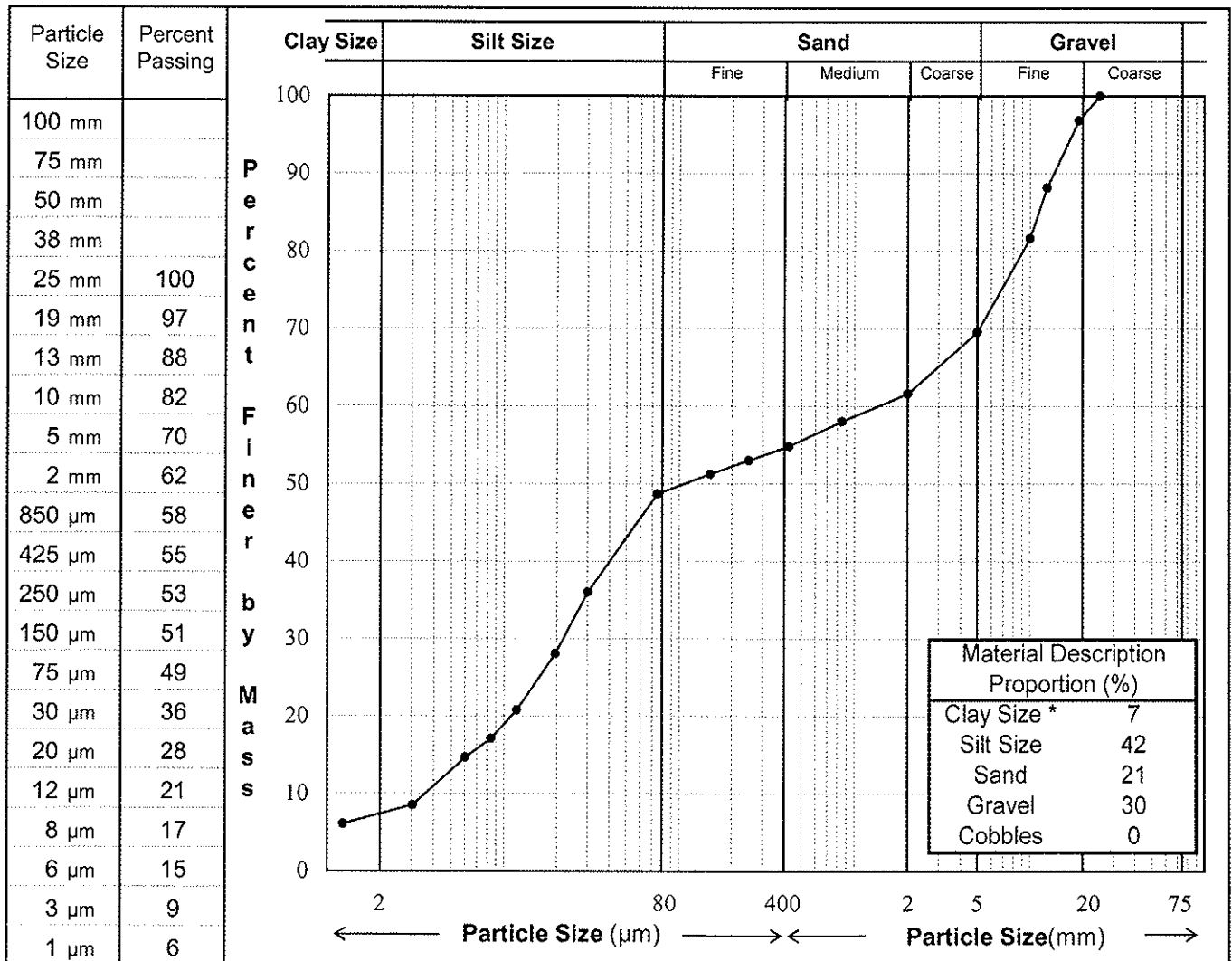
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	REVIEWED BY: MCP	COMPLETE: 8/26/2008
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project: **Dome Road Subdivision Development**
 Client: **YTG**
 Project No.: **W14101120**
 Location: **Dawson City, YT**
 Sample No.: **TP04**
 Depth: **1.0 m**
 Description**: **SILT - gravelly, sandy, trace clay**

Date Tested: 2008/09/18



Remarks: * The upper clay size of 2 µm, per the Canadian Foundation Engineering Manual.
 ** The description is visually based & subject to EBA description protocols.

Reviewed By:

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Residential Subdivision Expansion	Government of Yukon	TESTPIT NO: W14101120-TP05
Dome Road	Testpit Method: Hitachi EX 200 Tracked Excavator	PROJECT NO: W14101120
Dawson City, YT	7103403N; 577885E; Zone 7	

SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> BULK	<input type="checkbox"/> CRREL CORE	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> GRAB CORE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	Bulk Density (kg/m ³)		PLASTIC M.C. LIQUID		CLAY (%)		SILT (%)		SAND (%)		GRAVEL (%)		Depth (ft)
					500	1000	20	40	60	80	20	40	60	80	20	40	
0	Moss Ground Cover and Organic Root Material			UNFROZEN													0
0	SILT - sandy, trace clay, occasional angular gravel fragments throughout silt matrix, deposited in even parallel laminations, moist, firm, dark olive brown - percolation rate of 60 min / 25 mm measured between 0.3 and 0.6 m		1														0
1			2														5
2			3														10
3	- slightly sandier below 2.6 m, lighter in color - frozen below 2.9 m		4	Permafrost, Nbn													15
4	END OF TESTPIT @ 3.2 m NOTE: Percolation test performed on Aug 28/08 with 4 hour presoak and two repetitions																16

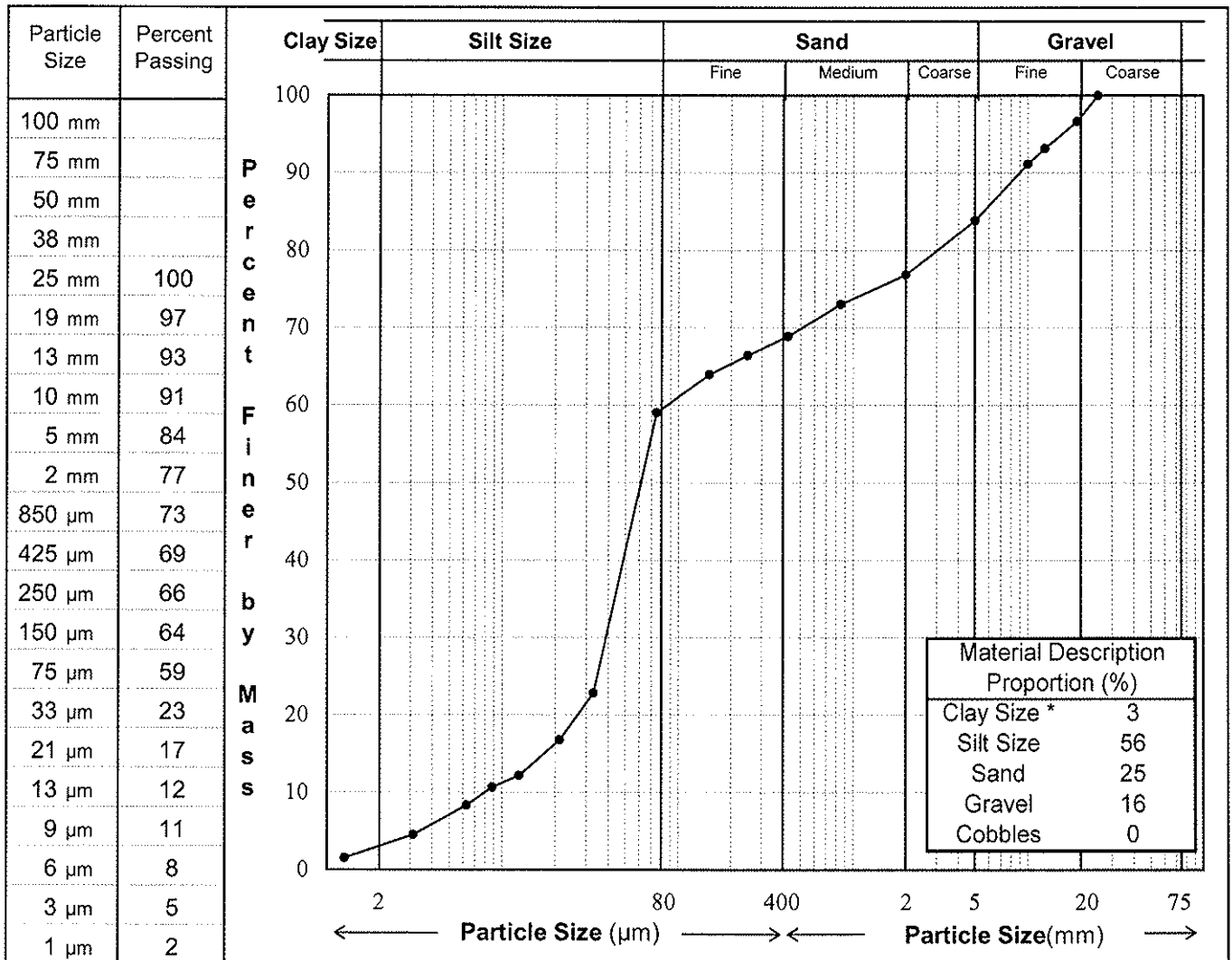
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	REVIEWED BY: MCP	COMPLETE: 8/26/2008
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project: **Dome Road Subdivision Development**
 Client: YTG
 Project No.: W14101120
 Location: Dawson City, YT
 Sample No.: TP05
 Depth: 0.3
 Description**: SILT - sandy, some gravel, trace clay

Date Tested: 2008/09/18

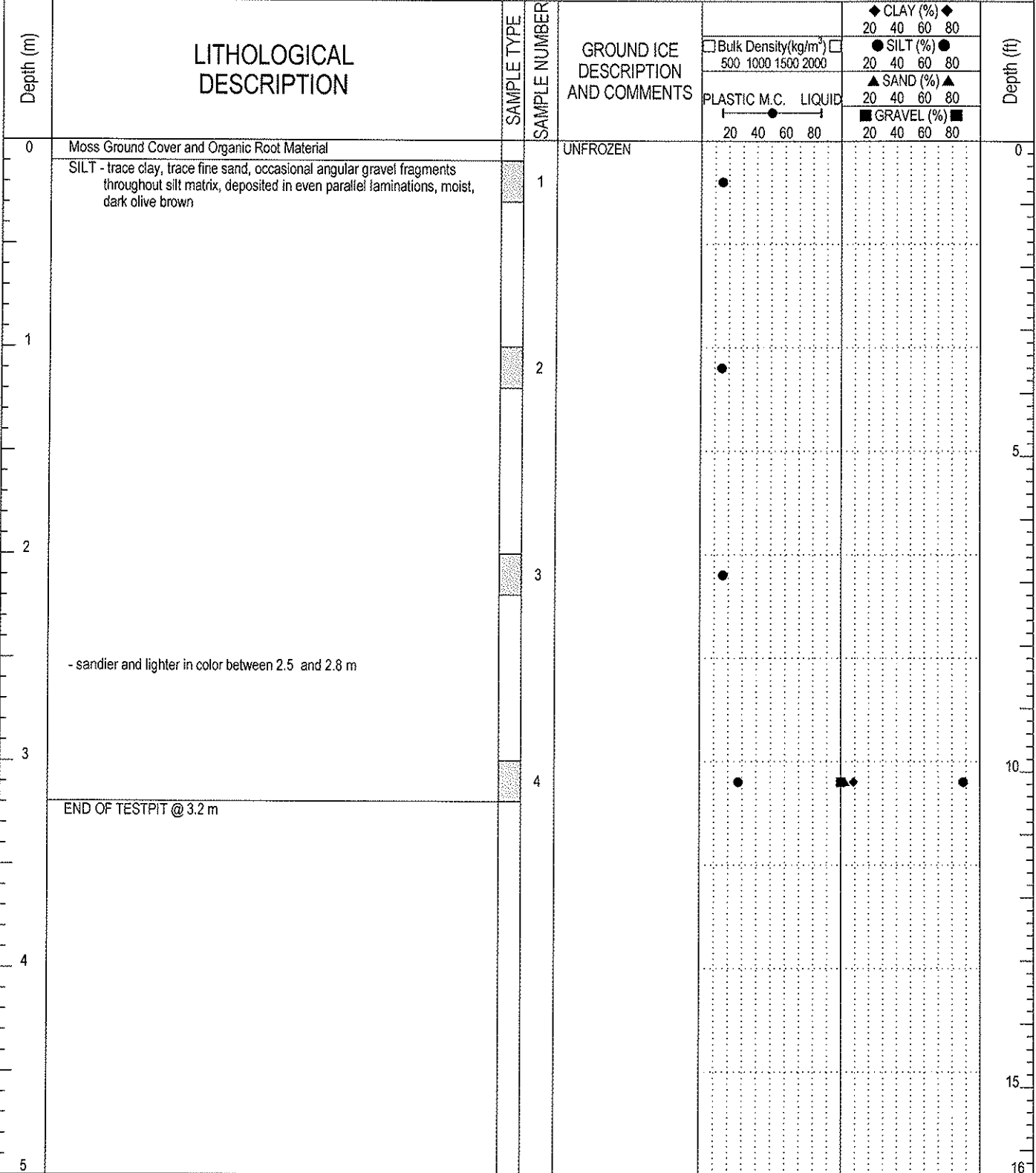


Remarks: * The upper clay size of 2 µm, per the Canadian Foundation Engineering Manual.
 ** The description is visually based & subject to EBA description protocols.

Reviewed By: *[Signature]*

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Residential Subdivision Expansion	Government of Yukon	TESTPIT NO: W14101120-TP06
Dome Road	Testpit Method: Hitachi EX 200 Tracked Excavator	PROJECT NO: W14101120
Dawson City, YT	7103428N; 577813E; Zone 7	
SAMPLE TYPE	<input type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> BULK <input type="checkbox"/> CRREL CORE <input type="checkbox"/> SHELBY TUBE <input type="checkbox"/> GRAB CORE	
BACKFILL TYPE	<input type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND	



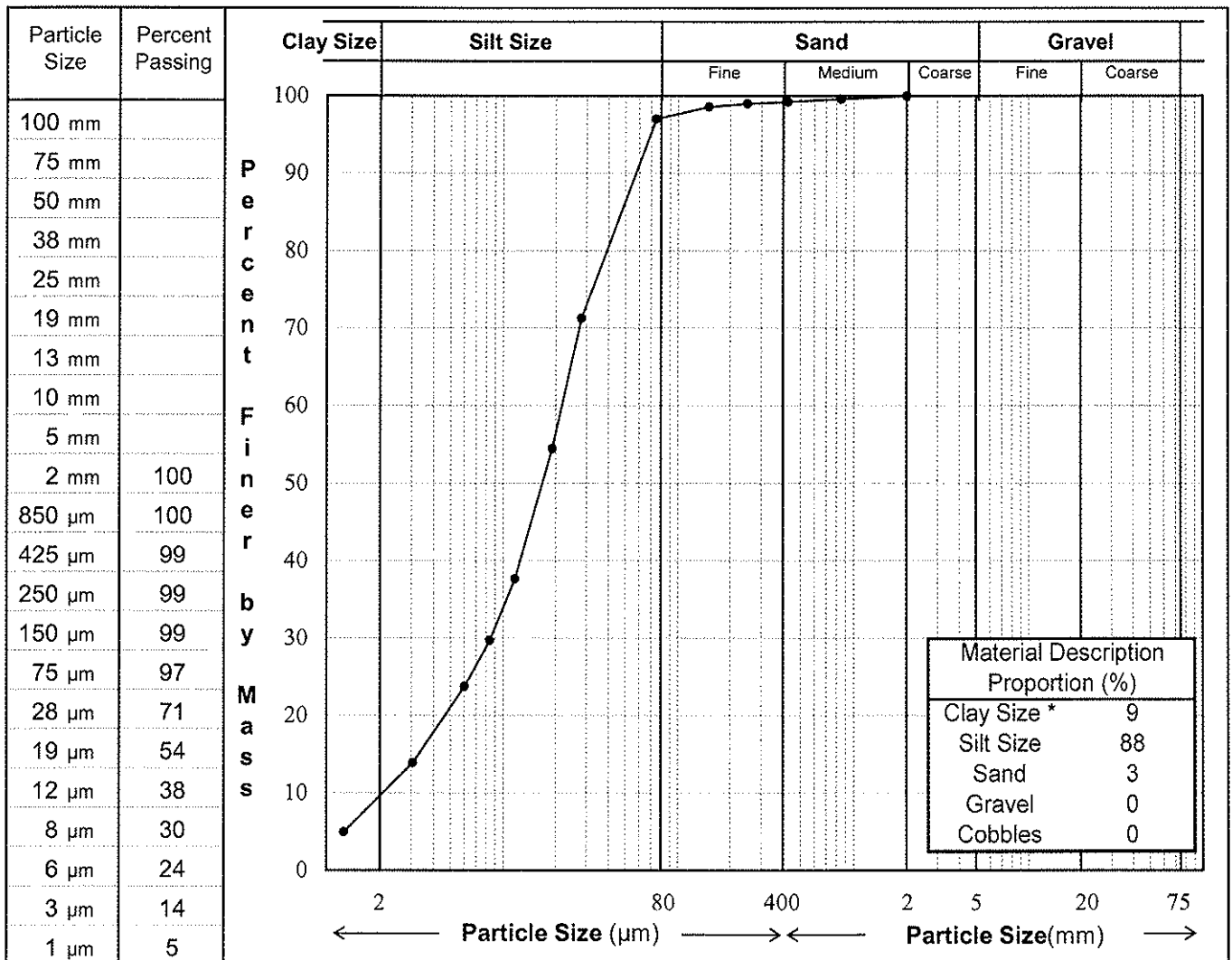
	LOGGED BY: MCP	COMPLETION DEPTH: 3.2m
	REVIEWED BY: MCP	COMPLETE: 8/26/2008
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project: **Dome Road Subdivision Development**
 Client: **YTG**
 Project No.: **W14101120**
 Location: **Dawson City, YT**
 Sample No.: **TP06**
 Depth: **0.3**
 Description**: **SILT - trace clay, trace sand**

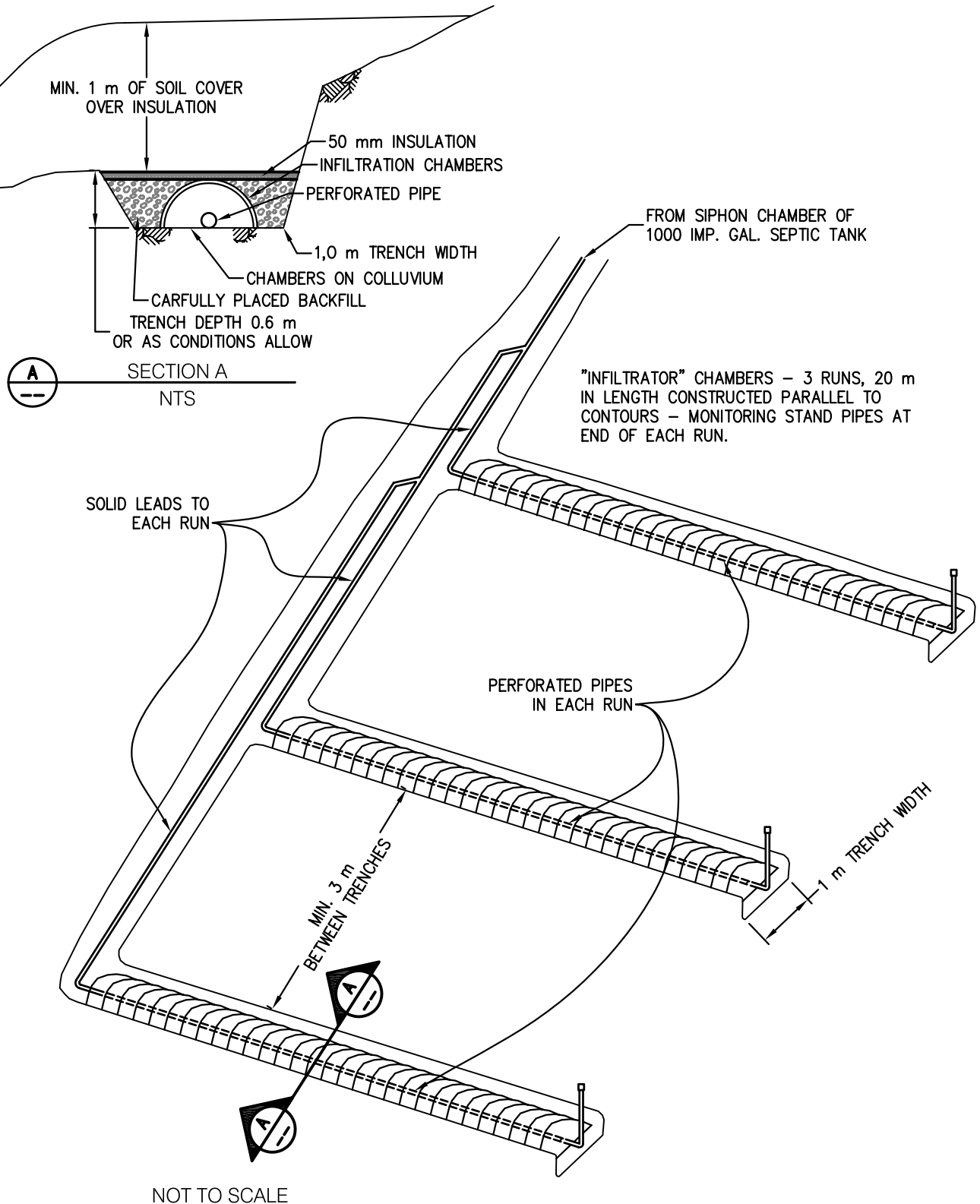
Date Tested: 2008/09/18



Remarks: * The upper clay size of 2 µm, per the Canadian Foundation Engineering Manual.
 ** The description is visually based & subject to EBA description protocols.

Reviewed By:

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C:\Whitehorse\Drawings\Drawings\City Area\W14101120 Dome Road Res Expansion\W14101120 Flg-2.dwg [FIGURE 2] October 27, 2008 - 4:12:01 pm (BY: KEN TOMCZYK)

SETBACK REQUIREMENTS	
FIELD	- 5 m FROM PROPERTY LINES - 6 m FROM BUILDING - 5 m FROM DRIVEWAY
TANK	- 5 m FROM DRIVEWAY - 1.5 m FROM PROPERTY LINE

CLIENT



Government
Community Development Branch



**DOME ROAD RESIDENTIAL SUBDIVISION EXPANSION
DAWSON CITY, YUKON**

**GENERIC 3 BEDROOM
ON-SITE SEWAGE DISPOSAL
SYSTEM DETAILS**

PROJECT NO. W14101120	DWN KJT	CKD MCP	REV 0
OFFICE EBA-WHSE	DATE OCTOBER 27, 2008		

Figure 2

April 18, 2008

EBA File: W14101020

Government of Yukon
Department of Community Services
Community Development Division
PO Box 2703
Whitehorse, YT
Y1A 2C6

Attention: Brian Ritchie
Program Manager

Subject: Pre-Design Terrain Evaluation
Proposed Dawson Dome Subdivision Expansion, Dawson City, Yukon

At the request of Brian Ritchie, YTG Community Services, EBA has completed a desk-top terrain evaluation of the proposed Dawson Dome Subdivision expansion area. The evaluation is based on geotechnical data on file at EBA, existing bedrock geology and surficial geology mapping and detailed stereographic air photograph interpretation.

1.0 EXISTING INFORMATION

Information collected and reviewed for this evaluation includes:

- GSC. L.H. Green and J.A. Roddick. Geology, Dawson, Yukon Territory. 1:250,000 scale Map 1284A. 1961.
- GSC. Yukon Geology Program. Surficial Geology, Dawson, Yukon Territory. 1:250,000 scale Map. Open File 3288. 1996.
- Air photos (1993) A27857 Nos. 104 and 105, 1:10,000 scale.
- Air photos (1993) A28237 Nos. 230 and 231, 1:20,000 scale.
- EBA Engineering Consultants Ltd. 1988 Site Evaluation – Proposed Country Residential Subdivision, Dome Road, Dawson City, Yukon.

2.0 TERRAIN ANALYSIS

Terrain mapping by air photograph interpretation was completed by Jack Dennett, P.Geo.(BC) of EBA's Whitehorse office. Mr. Dennett has completed numerous terrain risk assessments in the Yukon and in Dawson City specifically. Terrain analysis of the Dome Road Subdivision area was warranted to identify potential unstable areas as well as defining significant terrain features and determining depositional history. Available air photographs provided only partial stereo coverage of the project area and the results of the terrain analysis will also rely on the planned testpitting program to confirm terrain and soil characteristics.

This area was not subject to glaciation in the last ice age (Reid). Unconsolidated material on favourable terrain in the study area is attributed to isolated pre-Reid glacial deposits forming two gently sloped terraces separated by moderate gradient (about 37%) bedrock slopes overlain by colluvium. Undifferentiated Pre-Reid glaciation deposits include well stratified to massive, poorly to well sorted sands and gravels deposited as pro-glacial or ice contact sediment by glacial meltwater.

Bedrock geology in the area is mapped as quartz-mica schist and may include dark weathering greenstone and banded amphibolite gneiss; minor chloritic quartz-mica schist, graphitic quartz-mica schist, quartzite and limestone. Previous geotechnical evaluation in the area (EBA, 1988) identified deep soils derived from bedrock decomposed or disintegrated in situ by processes of mechanical and/or chemical weathering. Soil derived from weathered bedrock may form part of the unconsolidated material at the upper bench and part of the lower bench.

The study area is characterized by moderately well drained soils supporting fairly dense stands of spruce and some aspen. Four distinct types of terrain were identified:

- Moderately steep (> 50%) slopes of colluvium overlying uniform bedrock forming the sideslopes of Thomas Gulch;
- Upper bench with gentle slopes (about 14%) of Pre-Reid glacial drift, including silt till (?) and/or weathered bedrock and pockets of glaciofluvial gravel and sand;
- Lower bench of pre-Reid glaciofluvial gravels overlain by a veneer of colluvium with gentle slopes (about 15%); and,
- A mid-slope area separating the two benches of colluvium overlying bedrock with uniform, moderate slopes (about 37%).

The low relief benched areas provide the most stable terrain in the subject area. Soil thickness in these areas is expected to be greater than one metre and likely greater than two to three metres in some areas. The upper bench is expected to be mostly fine-textured surficial material (silt) with pockets of glaciofluvial gravel and sand. The lower bench is expected to be underlain by glaciofluvial (white channel) gravels, which can be 10's of metres thick in some areas.

The upper and lower benches are truncated on their eastern boundary by moderately steep, bedrock-controlled slopes of Thomas Gulch. These moderately steep slopes also abut the northern edge of the upper bench. Average slope gradient is about 53%. These slopes have a uniform slope configuration and are overlain by a veneer of colluvium. Stereo air photograph coverage was limited in this part of the study area. No active areas of mass movement were noted; however, terrain characteristics in this area indicate a moderate to high probability of landslide if impacted by development.

A wide, moderate gradient, uniform slope separates the upper and lower bench. This slope appears generally stable with and there was no evidence of active mass movement. A gully below a residence on the upper bench should be assessed in the field for any sign of instability. The average slope gradient is about 37% and the surficial material is interpreted as a colluvium veneer overlying schist bedrock.

3.0 SITE SUITABILITY & DEVELOPMENT CONSTRAINTS

The preliminary concept drawing for the Dome Subdivision Expansion prepared by Inukshuk Planning and Development Ltd. indicates that the proposed development expansion would be limited to the upper and lower benches identified as stable terrain in the preliminary terrain analysis.

A moderate setback from the moderately steep, uniform slopes of Thomas Gulch should be incorporated into the development plans and drainage design of building sites and roads should avoid point-concentration of drainage (i.e., culvert outflow) to moderately steep slopes. Conceptual plans of the bench areas should be reviewed prior to entering the final design stage so that potential drainage impacts from proposed development adjacent to the moderately steep slopes can be assessed and recommendations to reduce potential impacts can be provided.

4.0 GEOTECHNICAL EVALUATION

A geotechnical testpitting program is planned after seasonal ground thaw to evaluate the suitability of materials for foundations, roads, septic fields, etc. During the testpitting program, data will be collected to map soil stratigraphy, texture, clast lithology and drainage to field-check the preliminary terrain mapping. Potential indicators of mass movement processes will also be considered during the testpitting program. Following the receipt of terrain data from the testpit program, a terrain map of the subject area will be produced to illustrate the terrain and surficial geology.

5.0 CLOSURE

The information and analyses contained in this report are based on the results of previous reports, air photograph interpretation and on current understanding of regional terrain and geology. Subsurface conditions (e.g., characteristics of subsurface materials and subsurface hydrologic conditions) are interpreted from air photo interpretation and previous reporting without the benefit of field checking. Information on the use of this report is presented in the attached General Conditions, which form a part of the report.

EBA Engineering Consultants Ltd.

Prepared by:



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Reviewed by:



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