Geotechnical Evaluation Whitehorse Copper - Sima Road Area Development

Project No. 0201-01-15236

June, 2003



EBA Engineering Consultants Ltd.

GEOTECHNICAL EVALUATION WHITEHORSE COPPER-SIMA ROAD AREA DEVELOPMENT WHITEHORSE, YUKON

Submitted to:

LORIMER & ASSOCIATES

Prepared by:

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1.0 INTRODUCTION

EBA Engineering Consultants Ltd. has completed a geotechnical evaluation of the proposed Whitehorse Copper/Mt. Sima Road Area development. The site is located in the Sima Road and Wolf Creek Subdivision area of Whitehorse. Development within the 1954 hectare study area is to include the construction of access roads to service 14 industrial lots in the Sima Road area and 132 country residential lots in the area bordered by Wolf Creek and the Alaska highway on the east side; the Copper Haul Road on the west side; the Sima Road Industrial Subdivision on the north side and Foothills Pipeline Easement at the south end of the area.

Authorization to proceed with the geotechnical evaluation phase of site development was received from Mr. Ian Robertson of Inukshuk Planning & Development.

The scope of work for EBA's Geotechnical Evaluation Services was defined in EBA's June 28, 2001 proposal to Inukshuk Planning & Development. Tasks completed include the following:

- A review of the Wolf Creek North and Mt. Sima Industrial Subdivision Geotechnical Evaluations (EBA project number 0201-00-14337) was completed.
- Historic and recent geology maps, air photographs, historic mining plans and existing geotechnical information were utilized to establish a baseline knowledge of pre-existing development prior to conducting a site reconnaissance trip.
- Detailed terrain mapping of the study area on 1:10,000 scale air photographs was completed to delineate polygons of differing surficial materials, texture, landforms, soil thickness and drainage, as well as the terrain stability hazard.
- The Whitehorse Copper mine site was assessed to identify potential hazards and risks associated with development in the vicinity of existing tailings ponds, open pits and location of underground structures associated with mining activity.
- A field investigation program consisting of the excavation of 27 testpits throughout the areas identified as developable was completed.

The findings and recommendations arising from the completed scope of work are contained in the following sections of this report. This report has been prepared in accordance with generally accepted geotechnical practice and engineering judgement has been used in the development of recommendations.

For additional information regarding the use of this report, please refer to the General Conditions, following the signature page, which form a part of this report.



2.0 SITE CHARACTERIZATION

2.1 Review of Existing Geotechnical Information

In March 2000, testpitting programs were completed in the Sima Road Industrial Subdivision area and the Wolf Creek North area. Information from testpits 14337-TP08, -TP09 and -TP10 in the Sima Road Industrial Subdivision area, as well as testpits 14337-TP03, -TP04, and TP05 in the area directly north of the Wolf Creek North Subdivision have been included in this report and have become part of the geotechnical evaluation. Locations of the testpits listed above are presented on Figure 1 in Appendix A of this report, along with the testpit logs and associated laboratory test results.

2.2 Terrain Mapping

Detailed terrain mapping was completed by Mr. Jack Dennett of EBA's Whitehorse office. The December 2001 submission to the design team presented eighty-three terrain polygons throughout the study area. The terrain map also included a legend describing terrain units; soil texture; geomorphological processes; materials; surface expression; and an assessment of terrain risk effecting development potential. In 2002, a second terrain risk map was developed with an additional terrain risk classification and adjustments to polygon locations based on the additional geotechnical data gathered during the testpitting program. The most recent version of the terrain map is presented in Appendix C.

Generally, terrain features associated with deglaciation characterize the proposed development area. Moderately steep to steep rock slopes at the foot of Mt. Sima form the western extent of the study area. Moderate gradient slopes with shallow bedrock and structurally controlled, sheer-sided glaciofluvial channels incised into bedrock characterize the upper slopes, which host the extensive mine workings of Whitehorse Copper, north of the Mt. Sima Road. A north-trending glacial outflow direction has left a complex of gently-sloping to flat outwash terraces separated by random, shallow, often poorly-drained channels or short terrace scarps. Drift thickens from west to east. The irregular surface of underlying bedrock often controls non-planar features of the terrain and shallow bedrock is common. Miles Canyon Basalt underlies much of the lower study area and forms the steep sidewalls of some gullies and depressions in the area.

Texture of the glacial drift is characterized by random channels, fans and plains of glaciofluvial, gravelly sands and gravelly, silty, sand till with rounded cobbles and boulders, assumed to be a basal melt-out till. The area is generally well-drained except on imperfectly to poorly-drained floors of glaciofluvial channels that host both permanent and perennial ponds. Permafrost is expected to be rare to absent in the study area.



2.3 Testpitting Program

Prior to initiating the testpitting program, access routes were identified during a site reconnaissance completed on April 11, 2002. Subsequently, a land use permit application was prepared showing proposed testpit locations and access routes to be utilized for equipment travel. Approval to proceed was received from YTG – Community and Transportation Services, Land Disposition Section on June 12, 2002.

EBA completed a site investigation program comprised of excavating a total of 27 testpits throughout the study area. Testpits 15236-TP01 to -TP18 were excavated during the first phase of testpitting between July 8 and July 10, 2002. Testpits 15236-TP19 to -TP27 were completed on August 1, 2002. All testpits were excavated with a Komatsu PC 95 tracked excavator contracted from Arctic Backhoe Services of Whitehorse, Yukon. The testpitting program was supervised by Mr. Myles Plaunt, C.E.T., of EBA's Whitehorse office.

At each testpit location, detailed logs describing geotechnical conditions were prepared. Grab samples were collected at regular intervals throughout the depth of each testpit and all samples were returned to EBA's Whitehorse laboratory for natural moisture content determination and visual classification.

Testpit locations are presented on Figure 1 in Appendix A of this report. The testpitting program is summarized in Table 1, following:

Table 1
TESTPITTING PROGRAM SUMMARY

TESTPIT NUMBER(s)	GENERAL LOCATION	PROPOSED LAND USE
15236-TP01	South of Whitehorse Copper Mine Site	Industrial Subdivision
15236-TP02 & 15236-TP03	South of Whitehorse Copper Mine Site	Industrial Subdivision
15236-TP04 to 15236-TP08	Old McCrae Military Subdivision	Country Residential Subd'n
15236-TP09 to 15236-EXP12	South End of Study Area	Country Residential Subd'n
15236-TP13 to 15236-TP18	Central Portion of Study Area	Country Residential Subd'n
15236-TP19 to15236-TP27	South of Whitehorse Copper Mine Site	Industrial Subdivision

Access to all testpit locations was along existing trails, with the exception of testpits 15236-TP01; -TP02; and -TP03. Upon completion, all testpits were backfilled to grade and marked with flagging for future reference.

2.4 Geotechnical Conditions

Due to the size of the study area, geotechnical conditions are quite variable. Detailed geotechnical conditions are presented on the testpit logs in Appendix A and summarized in Table 2, below. Generally, conditions encountered reflect the conditions within the polygons shown on the terrain analysis map in Appendix C of this report.



Table 2
SUMMARY of GEOTECHNICAL CONDITIONS

Designated Area & Testpits	General Geotechnical Site Conditions	Development Constraints	Development Potential
Wolf Creek North	On bench where lot development is	Seasonal surface	Good in areas
Phase II — Testpits	proposed, soil conditions vary from	water and poorly	where lot
14337-TP03, -TP04 and	sand till to gravely sand soils. Good	drained soils close to	development is
TP05 (proposed Country	potential for borrow for road	highway as well as	proposed
Residential)	construction but wet soils conditions	moderately steep	ргорозов
Trobladiniar)	will be encountered at the Alaska	slopes overlooking	
	Highway exit	the highway.	
Old McCrae Military	Area is predominantly sand till soils	Old dumpsite should	Good development
Subdivision Area –	overlying siltier, dense tills. Area is	be properly	potential as long as
Testpits 15236-TP04, -	well drained and there is a history of	decommissioned with	lot size is suitable to
TP05, -TP06, -TP07, and	satisfactory soil conditions for on-site	all waste removed	support on-site
TP08 (proposed Country	sewage disposal system installation.	from slope and hauled	
Residential	sewage disposar system histanation.	to landfill.	sewage disposal
Residentiai		to iailuiiii.	system construction
I Controlly I costed	Coil conditions your from yest silty	Yanlatad lavu krima	in till soils.
Large Centrally Located Country Residential	Soil conditions vary from wet silty sand soils in low-lying areas (-TP13	Isolated low lying areas may require	Good throughout
			majority of area
Development Area –	area) to granular in central portion of	additional granular	with isolated areas
Testpits 15236-TP13, -	site to shallow bedrock along west	structure for roadway	that will require additional attention
TP14, -TP15, TP16, TP17	edge of proposed development area	construction and	
& TP18 (proposed	(TP18 area). Large portion of this	shallow bedrock areas	during roadway
country residential)	area was assessed by airphoto analysis	may make on-site	construction and
	with little ground proofing.	sewage disposal construction difficult.	septic field
G. d. E. 1 Of St. J. A.	This mantian and the standard area in	Shallow bedrock	construction.
South End Of Study Area	This portion of the study area is	1	Excellent potential
- Testpits 15236-TP09, -	underlain with coarse granular soils.	would have been the	for future country
TP10, -TP11 & -EXP12	Terrain and geotechnical conditions	only issue on some	residential lot
(initially proposed as	are ideal for roadway construction and	lots along the west	development.
country residential but no	lot development. Shallow bedrock	edge.	
development scheduled	was noted along the west edge of the		
for immediate future)	area.	D 11.1t	O - 1 4 - 4 - 1 C -
Sima Road Industrial	Previously completed geotechnical	Possible wet area may	Good potential for
Subdivision Phase II Area	investigation noted sand till soils	require additional	Industrial
- Testpits 14337-TP08, -	throughout majority of area will	granular structure for	Subdivision
TP09, & -TP10 (proposed	bedrock at east end and possibly west	roadway construction	development.
industrial subdivision	edge as well. Some low lying areas	& shallow bedrock	
development area)	will be wet with significant organic	may effect onsite	
01 7 17 011	soils at surface	sewage disposal.	<u> </u>
Sima Road Infill Areas –	Testpits 15236-TP01 excavated on a	Thick organics, soft	Fair to poor as an
Testpits 15236-TP01 to	small granular terrace; 15236-TP02 &	subgrade conditions	Industrial
TP03 and 15236-TP19 to	03 excavated in a low lying wet area	and shallow bedrock	Subdivision.
-TP27 (proposed	with up to a metre of organic cover	would make this area	Testpit 02 and 03
industrial subdivision in	and underlain by bedrock or saturated	difficult to construct	area has some
vicinity of Whitehorse	soils; 15236-TP19 to –TP27 have	access roads and	potential as a
Copper Mine Site)	varying thicknesses of soil cover over	develop industrial	topsoil source.
	bedrock and moderately steep slopes	lots.	
	accessing this area from Sima Road.		



3.0 LOT DEVELOPMENT

3.1 Development Considerations

As with all new subdivisions, the main development considerations are suitable geotechnical conditions for roadway construction and adequate lot sizes in areas not serviced by sewer and water infrastructure to ensure that environmental health concerns such as safe water supply and on-site sewage disposal are addressed.

Based on the terrain and geotechnical conditions noted during this site evaluation, development of the proposed country residential and light industrial development areas shown on Figure 1 are considered feasible. Clean granular soils and silty sand till soils encountered during the field investigation are considered suitable for roadway subgrade construction and the 1 hectare minimum lot size chosen for the both the country residential subdivision and light industrial subdivision lots ensures adequate space for the construction of a house or shop structure and the subsequent placing of an on-site sewage disposal system and well for water supply.

However, within each of the four proposed development areas, some geotechnical and or environmental constraints do exist. These constraints are mentioned in Table 1 above and are discussed below:

- The country residential development area located directly north of the Wolf Creek North subdivision (captioned Wolf Creek North Ph. II in Table 2) includes the construction of 12 lots along a cul-de-sac and an access road that intersects with the Alaska Highway directly across from the Meadow Lakes Golf Course. Lot development and roadway construction in the cul-de-sac should not be problematic, however, access road construction at the Alaska Highway intersection will have to include the installation of culverts in soft, saturated soils. The surface water sitting in this area is not very well channelled and is prone to extreme glaciation in the winter. It should also be noted that when EBA and Inukshuk Planning were involved in the preliminary design stages of the Meadow Lakes Golf Club, Water Board input was required for the ponds constructed on the fairways located close to the highway, which are being fed by groundwater from the source that we will be dealing with during access road construction. Additional permitting and hydrogeological work may be required in this area to ensure that ground water flow to the ponds on the golf coarse are not interrupted by structures built during roadway construction.
- Proposed development in the old Military Subdivision across from the McCrae Industrial Subdivision includes the construction of 20 lots along a new access road alignment. Smooth grades and silty sand subgrade soils will make roadway construction simple and the presence of near surface sand till soils are considered suitable for shallow bury absorption fields. Past experience in this area has noted the presence of siltier till soils along the west edge of the proposed development area (proposed Lots 2, 3, 19 & 20), with soil percolation rates significantly higher than those anticipated for Lots 1, and 4 to



- 18. Therefore, identifying an accepting soil unit throughout the till soils on the four lots along the west edge may require careful consideration. As mentioned in Table 2, an old landfill site is located along the slope that defines the west edge of the development area (located southwest of testpit 15236-TP08). EBA did not complete an audit or assessment of the landfill site as part of this project, but it appears that the majority of the debris is metal (tin cans etc.), glass and timbers. The debris along the slope should be removed for environmental and aesthetic reasons, as well as ensuring that regulated setbacks from existing or decommissioned landfills will not reduce the amount of developable land in this area.
- The large proposed country residential development area centrally located within the study area includes the development of 70 lots and a school site along a large loop road with tie-ins to the other two residential site development areas listed above and the Sima Road Light Industrial Subdivision expansion area. Much of this area is located on a terrace located above the White Pass Railroad right-of-way and generally, the site slopes gently upwards towards the west edge of the area. Soil conditions, based on testpit information throughout the east and south sides of the area, as well as terrain analysis for the remainder of the area, are generally granular and considered suitable for roadway construction and lot development, except for along the southwest edge of the development area where shallow bedrock may be a constraint for on-site sewage disposal system construction (refer to testpit logs 15236-TP18 and 15236-TP10). Roadway construction along the sections of access road connecting this area with the other three development areas will cross the White Pass Railway at one location and creeks at two other locations. As well, a section of roadway will have to be constructed in the wet, low-lying area located in the vicinity of testpit 15236-TP13.
- Construction within the Sima Road Light Industrial Subdivision expansion area includes the construction of roadways connecting with Collins Lane and McFadden Way and servicing 24 lots of varying sizes. Conditions for roadway construction will be very similar to the existing Sima Road Industrial area with predominantly silty sand till soils. Shallow bedrock is likely to be encountered at the north end of the site (Lot 1 and possibly 2). From the cul-de-sac at the end of Collins Lane, the new access road runs down slope next to a pond which is in a low lying area where wet subgrade soils may be encountered during construction.

The areas with geotechnical concerns listed above may effect roadway construction, so it is recommended that additional evaluations of the areas with potential concerns be evaluated after the roadway right-of-ways are cleared. This work is usually best completed in spring when wet, soft areas are easiest to delineate.



4.0 ACCESS ROADS

4.1 Roadway Structure and Construction

Subgrade soils along the proposed access road will vary from clean granular soils to silty sand till. The soils are considered appropriate for subgrade construction and the following recommendations apply to roadway construction:

- Ideally, all organics and surficial silts should be stripped and wasted. In all but the Old Military Subdivision Area, this will relate to an average subcut depth of 0.3 m. Up to 0.5 m sand and silt were noted underlying the organics and overlying the till soils in the Military Subdivision area.
- The exposed TILL subgrade soils may be marginally frost susceptible in some areas but are suitable for unpaved roadways as long as they are not excessively wet or unstable. All subgrade surfaces should be scarified (to remove cobbles and boulders and to ensure a homogeneous surface). To ensure maximum stability along the subgrade surface, the moisture content should be moisture conditioned to between 3% 5% below optimum moisture. Once graded, the subgrade should be compacted to 98% of Standard Proctor maximum dry density (SPMDD). In excessively wet or unstable areas, additional subcuts may be required. Subcuts should be a minimum of 600 mm in thickness and backfilled with a clean, well-graded pit run gravel to bridge the wet, unstable soils. A medium weight geotextile can also be utilized to bridge excessively soft areas.
- Sections with clean granular soils will also have to be scarified to remove large cobbles
 and boulders from the subgrade surface and then graded, moisture conditioned (water
 added to achieve moisture contents within 3% of optimum moisture), and compacted to
 98% SPMDD.
- Recommended granular structure for roadways should be at least 300 mm thick. The
 gravel sub-base should be at least 200 mm thick and be comprised of well-graded pit run
 gravel. The sub-base can then be capped with a 100 mm thick traffic course of 20 mm
 crushed basecourse gravel. All proposed imported gravels should be non-frost
 susceptible and must be tested and approved prior to use.
- Imported gravels should be placed in lifts not exceeding 200 mm in thickness; moisture conditioned and compacted to at least 98% of Standard Proctor maximum dry density.
- The minimum thicknesses of the individual roadway structure components are presented in Table 3 and the gradation specifications for imported sub-base and basecourse gravels are presented in Tables 4 and 5, below.
- As mentioned above, specific areas such as creek crossings and other wet areas may require site specific recommendations to be provided once roadways have been cleared, permitting proper access.



Table 3
RECOMMENDED ROADWAY STRUCTURE THICKNESSES

Granular Component	Thickness
Prepared Subgrade	N/A
20 mm Crushed Basecourse	100 mm
Sub-Base Pit Run Gravel	200 mm

Table 4 80 mm PIT RUN SUB-BASE GRAVEL

Sieve Size (mm)	Weight Passing (%)
80.00	100
25.00	55 – 100
12.50	42 - 84
5.00	26 - 65
1.25	11 - 47
0.315	3 – 30
0.080	0 - 8
0.000	0 0

Table 5
20 mm CRUSHED BASECOURSE GRAVEL

Sieve Size (mm)	Weight Passing (%)
20.00	100
12.50	64 - 100
5.00	36 - 72
1.25	12 - 42
0.315	4 - 22
0.080	3-6

5.0 FOUNDATION RECOMMENDATIONS

The soil conditions noted throughout the study area are considered suitable for the design and construction of conventional shallow foundation systems typically utilized for residential and light industrial or commercial structures (strip and spread footing or monolithic slab-on-grade foundation systems). Footings can be designed and constructed to bear onto any of the native soils or, in isolated areas, on bedrock if encountered.

5.1 Footing Depth and Frost Protection

For heated structures in the Whitehorse area, a minimum un-insulated footing depth of 1.8 m is recommended for all exterior footings placed on frost susceptible soils (areas with silty till soils). Shallow footings are particularly appropriate for country residential development where



deep foundations make it difficult to tie into on-site sewage disposal systems. Therefore, a footing depth of 1.2 m with 50 mm of perimeter insulation should be considered. The 50 mm thickness horizontal insulation would have to be placed for a width of 1.2 m around the building perimeter. The horizontal insulation should extend at least 1.2 m beyond any corner of the building.

For foundation systems constructed on non-frost susceptible granular soils, no perimeter insulation will be required and although depth of burial is not as critical, some soil cover is still suggested to resist the effects of seasonal frost penetration.

5.2 Site Drainage Away From Foundation Elements

The main concern with foundation systems constructed in the Yukon is ensuring that the surface water and roof runoff be directed away from the foundation elements in order to minimize the potential for frost heave caused by the freezing of saturated soils next to and beneath the footings. Control of surface water runoff and the use of rain gutters and downspouts onto slash pads are recommended around all buildings

6.0 ON-SITE SEWAGE DISPOSAL

The potential for on-site sewage disposal is not only dependent upon geotechnical (soil and groundwater) conditions, but also the proposed minimum lot size. The soils delineated throughout the majority of the study area where lots are proposed should be suitable as accepting soils for absorption field or shallow absorption trench construction. EBA usually suggests a minimum lot size of 1 ha for country residential development, which reflects the minimum lot sizes proposed for the study area.

There are some lots founded on areas with shallow bedrock (southwest corner of study area and northeast corner of the Sima Road Industrial Subdivision expansion area. On these lots, an area with at least 1.2 m of soil separation is required between the base of the drain rock and the bedrock surface in order to comply with YTG Environmental Health guidelines. Past experience suggests that the bedrock surface in this area of Whitehorse will be very irregular. Therefore, it is likely that areas with appropriate thickness of soil cover can be delineated.

In Appendix B of this report are figures applicable to on-site sewage disposal system design. The setback requirements for all septic systems are presented on Figure 2 and a typical absorption field design for granular soils with a 5 min/25 mm percolation rate is presented on Figure 3. For soil types noted during current and previous testpitting programs, percolation rates of less than 1 min/25 mm to up to 30 min/25 mm are anticipated. Absorption field sizes will be proportionally larger in areas with percolation rates greater than 5 min/25 mm.



7.0 LIMITATIONS

It should be noted that geological conditions are variable and are seldom spatially uniform. The recommendations prepared and presented in this report are based on the geotechnical data gathered by EBA during this project. The provided data, in the form of testpit information and associated laboratory index property test results has been supplemented by EBA's direct observations of the site.

This report and the recommendations contained within are intended for use by Lorimer and Associates and the Government of Yukon – Community Development, as well as Inukshuk Planning & Development and other members of the design 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 others. Any such unauthorized use of this report is at the sole risk of the user.

8.0 CLOSURE

EBA trusts that this report meets with your approval. Please do not hesitate to contact the undersigned should you have any questions or comments.

Yours truly,

EBA Engineering Consultants Ltd.

Reviewed by:

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EBA Engineering Consultants Ltd. (EBA) 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.

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.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 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.

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

4.0 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.

5.0 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 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.

6.0 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.

7.0 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.



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 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.



APPENDIX A SITE PLAN AND TESTPIT LOGS



Geotechnical Evaluation CLIENT: Lorimer and													BC	REHOL	E N	0:	152	36-T	P01
Whiteh	ors	e Co	ррег/	Mt. Si	ma D	evel. Area	EXCAVATOR: Komatsu	rtsu PC 95 Tracked Excav. PROJECT NO: 0201-01-1523							36				
Whiteh	ors	e, Yī					UTM ZONE: 8 N67218	350 E4	976	00			EL	EVATIO	N:				
SAMP	LE :	TYPE		GRA	3 SAM	IPLE NO RECOVER	y Standard Pen.			ım SP			RREL BA						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	USC	SOIL SYMBOL		SOIL CRIPTION			STÁNI 10 STIC	DARD PE 20 M.C	30	FION = 40	20	● PE 0 ERCE 0	40 RCEN 40 NT SIL 40	GRAVE 60 T SAND 60 T OR F 60 T CLAY	80 80 80 FINES ▲ 80	ELEVATION(ft)
	٠,					·			L.	10	20	30	40	20		40 40	60	80	
- 1.0						SAND AND GRAVEL - 200 mm in size testpit, trace of	light reddish brown cobbles and boulders throughout depth of silt; sand is medium I is subangulor to mp; dark brown	to											-2.0
-						– silt till lens from	n 2.6 to 2.8 m												-8.0
-									•										
- 3.0 - - - -						END OF TESTPIT @ 3 - poplar tree cove spruce - some surface be	er with some small												10.0
- - - - 4.0																			-12.0
-								li ca -											
							LOGGE						COMP						
								REVIE	¥LD	RI: 1	KI			COMP	LETE	: 08,	/07/(
Whitehorse, Yukon											_			<u> </u>				Page	1 of 1

Geotechnical Evaluation CLIENT: Lorimer and														DREHOL				236-		
				Mt. Si	ma [Devel. Area	EXCAVATOR: Komatsu													
Whiteh				_			UTM ZONE: 8 N67221							EVATIO	N:					
SAMPI	LE	TYPE		GRA	B SAM	IPLE NO RECOVER	standard pen.		75 m				CRREL BA							
	щ				_				=	STAN 10	DARD PI 20	ENETRA 30	ATION ■ 40	20		RCENT 40	GRAN 60	VEL.■ 80		
Œ	Ë	皇	2		SYMBOL		SOIL							20		ERCEN	IT SAN	VD ●		N(
Depth(m)	띩	3	SPT(N)	nsc	S					T10						40 Int si	60 LT OR	FINES A		ATIO
ධී	SAM	RUN NO	0,		SOIL	DESC	RIPTION		PLAS)IIC	М.С	<i>'</i> .	LIQUID ———	20		40 ERCEN	60	80		ELEVATION(ft)
1									<u> </u>	10	20	30	40	20		40 40	60	80		
0.0						ORGANIC ROOT MAT														0.0
-																				_
-						SILT — some clay, tr	ace of fine sand:	•												<u>-</u>
						marginally frozen	; wet when exposed;													
						soft; medium oliv	e grey				•	•								0.0
-						BEDROCK - granidior	ite; very competent;												2.0	
-						\difficult to rip wit END OF TESTPIT @ 0.	7 m													<u>.</u> '
·						Refusal in bedrock														:
— 1.0 _						Tree cover - mature												·		_
						Ground cover — mos: Wet in spring; area is														
-						Hot in opining, area is	poonly diditied													-4.0
}																				-
-									<u> </u>	1								-		-
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-																				6.0
2.0									.									.ļļ	[-
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}																				-10.0
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-																				12.0
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4.0																			1	
0																			1	
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-																			F	14.0
-																			F	_
EBA Engineering Consultants Ltd.										MC	<u> </u>		<u></u>	COMPL	ETIC	ON D	EPTH	: 0.7	<u>∷_E</u> m	
Whitehorse, Yukon									VED E	Y: J	RT			COMPL				02		
03/02/13 (01:53	PM (YUK	ON-4)	-	11111	ciioise, Iukoii												Pac	je 1	of 1

								er and Associates BOREHOLE NO: 15236-												
				Mt. S	ima I	Devel. Area	EXCAVATOR: Komatsu				(cav.		PROJECT NO: 0201-01-15236							
Whiteh							UTM ZONE: 8 N67220						LEVATIO	٧:						
SAMP	LE	TYPE		GRA	B SAM	MPLE NO RECOVER	y Standard Pen.		75 mm			CRREL E								
	ليا				یا				■ ST. 10	andari 20		RATION =	20	■ PERCE) 40		VEL.■ 80		⊕		
E	ピ	9	2		SYMBOL		SOIL							PERCI	ent san	√D Φ		E E		
Depth(m)	삗	RUN NO	SPT(N)	nsc	S								20 ▲ Pi	RCENT :		FINES.		4T0		
a	SAMPLE TYP	∞	S		SOIL	DESU	RIPTION		PLASTIC	; 	M.C.	LIQUID	, 20) 40	60	80		ELEVATION(ft)		
	S								10	20	30	40	20	◆ PERC 40		4Y 4 80	0 l			
0.0							IND COVER, ORGANIC R	TOO										0.0		
-						MAT — very thick	(Ē		
-																		Ę		
}																		Ē		
-						– boulders in orga	inic matrix from 0.5 to	,				†				+	- 	Ē		
						1.0 m												-2.0		
																		E		
-																		Ē		
1.0						SIIT - some clay tr	ace of angular gravel;					ļļļ						Ē		
<u> </u>							nottled brown and											Ē		
Ĺ						olive												-4.0		
-	1																	Ē		
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-					1													Ē		
-																		Ē		
		l																-6.0		
2.0		1																Ē.		
-						GRAVEL AND SAND -	trace to some silt;		•									Ē		
}						saturated with w interface with sil	ater running at											Ē		
<u> </u>							•	İ										Ē		
Ĺ				ĺ														E8.0		
					İ	END OF TESTPIT @ 2	.5 m										Ť	Ē		
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3.0				İ				1					1	1		<u> </u>		E10.0		
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																		14.0		
-																		_ 17.0		
-	<u>_</u>		<u> </u>	<u> </u>	<u> </u>	l		10005) DV 1	100			1001							
EDA Engineering Consultants Ltd.							LOGGE! REVIEW						ETION ETE: 0			m				
						tehorse, Yukon				0111			JOUNIT'L	LIL. U	u/ V//		qe 1	of 1		
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Geotechnical Evaluation	CLIENT: Lorimer and A	r and Associates BOREHOLE NO: 15236-7						
Whitehorse Copper/Mt. Sima Devel. Area	EXCAVATOR: Komatsu I	PC 95 Tracked Excav.	PROJECT NO: 0201-01-15236					
Whitehorse, YT	UTM ZONE: 8 N672230	0 E499700	ELEVATION:					
SAMPLE TYPE GRAB SAMPLE N	o recovery Standard Pen.		L BARREL					
		■ STANDARD PENETRATION ■ 10 20 30 40	00 40 00 1					
Depth(m) SAMPLE TYPE RUN NO SPT(N) USC SOIL SYMBOL	SOIL		20 40 60 80 ● PERCENT SAND ● 20 40 60 80 LUID A PERCENT SILT OR FINES A 20 40 60 80 ● PERCENT CLAY ● LUID A PERCENT CLAY ●					
epth(r RUN N SPT(N USC L SYM	DESCRIPTION	PLASTIC M.C. LIQ	UID A PERCENT SILT OR FINES A					
SAMP RU SI SOIL	DEPOSITI LION							
	COVER AND ORGANIC ROOT MAT	10 20 30 40	20 40 60 80					
[black; surface boulders							
	ND - rootlets throughout; fine							
	uniform; damp; medium brown							
			-2.0					
	velly, trace to some silt, nal cobbles and boulders to 200							
T mm dia	meter; damp; compact; no		<u> </u>					
- 1.0 sloughir	ig; dark grey							
-			E4.0					
F								
-		•						
			E6.0					
2.0								
-								
- -			E8.0					
		•						
-								
= 3.0 END OF TES	TPIT @ 3.0 m		10.0					
_	and Lodgepole Pine tree cover							
-								
-								
	•							
-								
-								
-4.0								
'								
-								
			E-14.0					
EBA Engineering Co		OGGED BY: MCP EVIEWED BY: JRT	COMPLETION DEPTH: 3 m					
Whitehorse, Y	10.	LAITACO DI: OK)	COMPLETE: 08/07/02 Page 1 of 1					
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Geote	chni	cal E	value	ation			CLIENT: Lorimer and		BOREHOLE NO: 15236-TP05												
White	nors	e Co	pper/	Mt. S	ima (Devel. Area	EXCAVATOR: Komatsu	PROJECT NO: 0201-01-15236													
White							UTM ZONE: 8 N67220)40 E4	99900				ELEVATION:								
SAMP				GRA	B SAM	APLE NO RECOVER	Y STANDARD PEN.	= 7	'5 mm S	POON	\Box	CRREL	BARREL								
Depth(m)	T	RUN NO	_	OSN	SOIL SYMBOL		SOIL CRIPTION		STA 10	NDARD F 20 M	PENETR 30	ATION = 40		20 20 20 PERC 20	40 PERCEN 40 ENT SII 40 PERCEN	GRAVE 60 T SAND 60 T OR F 60	80 80 80 80 80	ELEVATION(ft)			
0.0	+-				-	BASE OF SMALL EXPO	OSURF		10	20	30	40	+	20	40	60	80	- 0.0			
- 1.0						throughout; dry; SAND (TILL) — grave occasional cobbl	lly, some silt, es and boulders ounded; damp; very											-4.0 -8.0			
3.0						END OF TESTPIT @ 3												E10.0			
- 4.0						- tree cover mix spruce and popl	of Lodgepole Pine, ar											12.0			
	<u>-</u>	D٨		o cir		ring Conquit	anta Itd	LOGGE	D BY: N	ICP			Ico	MPLE	ION D	EPTH:	3 m	<u>-</u>			
	Ľ	ĎΑ	LI	ıgır		ring Consult	ants Lta.		VED BY:							/07/0					
					Whi	tehorse, Yukon							- -			,, 0	Page	1 of 1			
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Geotec							CLIENT: Lorimer and As	nd Associates BOREHOLE NO: 15236—TP(06						
Whiteh	ors	e Co	pper/	Mt. Si	ma [)evel. Area	EXCAVATOR: Komatsu P	PC 95	95 Tracked Excav. PROJECT NO: 0201-01-15236								,					
Whiteh	ors	e, Yl					UTM ZONE: 8 N672175	0 E50	00050			El	LEVA	TION:								
SAMPI	LE	TYPE		GRA	B SAM	PLE NO RECOVER	Y STANDARD PEN.	= 7	5 mm S	POON		CRREL B	ARRE	L								
	ш								■ STAN	NDARD P 20	ENETRA 30	TION ■ 40	20 40 60 80									
Œ	E	9	9		SYMBOL		SOIL							20	PERCI 40	ent sa	ND 🗣		J)N(
Depth(m)	烂	z	PT(nsc	S				DIACTIO								R FINES		ATIC			
2	AM	2	SPT(N)		SOIL	DESC	RIPTION		PLASTIC	M.•	·.	LIQUID ———I	′├	20	40	60 Ent Cl			ELEVATION(ft)			
ı	Ľ				0,				10	20	30	40	1	20	40	60			_			
0.0						MOSS AND TEA GROU } MAT	ND COVER, ORGANIC RO	TO!											- 0.0			
-						SILT AND SAND — tra	ce of gravel, rootlets												- E			
						throughout; dry;													Ē			
L						SAND (TILL) - gravel	ly, some silt, es and boulders to 300								ļļ				_			
-							imp; very compact; olive	•										2.0				
<u> </u>						grey	,,															
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<u> </u>						- siltier and dense	e below 2.5 m								ļļ.	-			-			
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3.0						END OF TESTPIT @ 3	.0 m						1				1		10.0			
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EBA Engineering Consultants Ltd. Whitehorse, Yukon							CVIEN	ED BY:	JKI			-Ico	MPLE	IE: C	8/07		ine 1	of 1				
Whitehorse, Yukon													1				- 10	yv	VI I			

Geotech	nnic	cal E	valua	tion			CLIENT: Lorimer a	nd Associa	ates				BOR	EHOLI	E NO:	15	236-	-TP	07
Whiteho	rse	Cop	per/	Mt. Si	mo D	Jevel. Area	EXCAVATOR: Koma	tsu PC 95	5 Trac	ked E	xcav.		PRC	JECT	NO: 0	201-	01-15	5236	
Whiteho							UTM ZONE: 8 N67		99600)			ELE'	MOITAY	l:				
SAMPLE	ΕT	YPE		GRAE	3 SAM	PLE NO RECOVERY	✓ STANDARD PE	N. 🔲	75 mm		_	CRRE		REL					
L	الد								■ S [*]	Tandar 2 2		TRATION 40	•	20		NT GRA			
E E	SAMPLE IYPE	ا ڥ			SYMBOL	5	SOIL			<u></u>	<u> </u>	<u> </u>	_	-	PERC	ENT SA	ND 👁	—	ELEVATION(ft)
th(4	RUN NO	SPT(N)	nsc	SX								F	20			R FINES.		ET:
Depth(m)	Σ	₽	ß	~	SOIL	DESC	RIPTION		PLASTI	IC	M.C.	LIQ	VID [20	40	60	80		EVA
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0.0	十	一			\neg	THIN VENEER OF GRAV	VEL FILL		- "			1 10	\dashv	10	1 1				- 0.0
	1	ŀ				SILT AND SAND - roo		lry;											<u>-</u>
						light brown	-	,											-
																			=
		İ				SAND (TILL) — gravell													_
_						and boulders thro	oughout to 300 mr	n											
_						diameter; damp;	compact to dense;												
-						medium olive gre	у												_
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Geote							CLIENT: Lorimer and	Associo	ates				BO	REHO)LE I	VO:	152	36-T	P08
Whiteh	ors	e Co	oper/	Mt. Si	ma, D	evel. Area	EXCAVATOR: Komatsu	PC 95	Trac	ked (xcav.		PR	OJEC	TNO): 020	01-1	1-152	36
Whiteh							UTM ZONE: 8 N67225						ELE	EVATI	0N:				
SAMPI	E	TYPE		GRA	3 SAM	PLE NO RECOVERY	✓ STANDARD PEN.		75 mm			CRRE		RREL					
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	nsc	IL SYMBOL		SOIL RIPTION		■ S'	0 2	RD PENI 20 3 M.C.	TRATION I 0 40 LIC	■ QUID	A	20 ● F 20	RCENT 40 PERCEN 40 ENT SIL 40	60 IT SANI 60	80	ELEVATION(ft)
	SA				SOIL	рпоо	1411 11014		⊢ 19) 2	20 3	0 40	1			ERCEN 40			
0.0						THIN VENEER OF GRAV	VEL (OLD BUILDING SIT	E)				TÏ				Ť			0.0
-							otlets throughout; dry;												<u> </u>
_						light brown	ly gama ailt aghhlag												Ē.,
-						and boulders to !	ly, some silt, cobbles 500 mm diameter;												Ē
_						subrounded; dam	p; compact to very				<u> </u>				1				···E
Ļ						compact; olive gr	rey												-2.0 E
_									•										E
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— 1 <i>.</i> 0						- some siltier lens	es throughout depth								1			ļļ	···-Ē
						of testpit													-4.0
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						tehorse, Yukon	arion nod.	REVIEV	VED BY	r: JRT				COM	PLET	E: 08	/07/(1 -5 1
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Geote	chni	ical (valuo	tion			CLIENT: Lorimer and As	soci	ates	;				E	BORE	HOL	E N	0:	152	36-T	P09
Whiteh	ors	e Co	pper/	Mt. Si	ma [)evel. Area	EXCAVATOR: Komatsu P	C 9	5 Tr	ack	ed	Exca	٧.	ŀ	PROJ	ECT	NO:	020	01-0	1-152	36
Whiteh	ors	e, Yl	-				UTM ZONE: 8 N671895	0 E5	800	350					ELEV#	ATIOI	N:				
SAMP	LE	TYPE		GRA	B SAM	IPLE NO RECOVER	ry Standard Pen.							CRREL	Barri						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	OSC	SOIL SYMBOL		SOIL CRIPTION			10 ASTIC		20 М.С	30	40	ID	20 A Pt 20	D PE D PE ERCE D PE	40 RCEN 40 NT SIL 40 RCEN	60 T CLAY	80 80 80 FINES ▲ 80	ELEVATION(ft)
0.0	┝					MOSS AND TEA GROU	JND COVER OVER ORGAN	IC		10		20	30	40	+	20		40	60	80	- 0.0
-						ROOT MAT SILT AND SAND — ro to some gravel; GRAVEL — sandy, tro boulders through very coarse; san	otlets throughout, trace dry; medium brown ace of silt, cobbles and at to 700 mm diameter; ad is medium to coarse; dark greyish brown		•												-2.0
- 1.0 - - -																					-4.0
- - - - - 2.0									•												-6.0 -6.0
-																					-8.0 -8.0
- - 3.0 - - -						END OF TESTPIT @ 3	3.0 m														10.0
- - - - - - 4.0																					12.0
-								0000													14.0
	E	BA	Er	ıgir	ee	ring Consult		OGGI												3 m	
	_			-6**		tehorse, Yukon	E 2001.	EVIE	₩ŁD	BY:	JK	1			10	UMP	LETE	: 09	/07/		1 .6 4
03/02/13	01:54	IPN (YI)	KON-41		LITIT	COLOLDO, LUXUII									\perp					Page	1 of 1

Geote							CLIENT: Lorimer and A						30REHO		_			
Whiteh	ors	e Co	pper/	Mt. Si	ma [evel. Area	EXCAVATOR: Komatsu	PC 95	Track	ed Ex	cav.		ROJEC		: 020	01-0	1-152	36
Whiteh	ors	e, Yī	•				UTM ZONE: 8 N671885	50 E50	0520			E	LEVATIO	:NC				
SAMP	LE	TYPE		GRA	B SAM	IPLE NO RECOVER	Y ⊠standard pen.	□ 7	5 mm \$]crrel i						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	nsc	SOIL SYMBOL		SOIL RIPTION		■ STA 10 PLASTIC	20	PENETR 30 M.C.	ATION ■ 40 LIQUI	2	20 PP P 20 PERCE 20	RCENT 40 ERCEN 40 ENT SIL 40 ERCEN	60 T SANI 60 T OR 1 60	80 80 80 FINES ▲ 80	ELEVATION(ft)
	S								10	20	30	40		20	40	60	80	
0.0							COVER AND ORGANIC RO	TOC										0.0
-						\ <u>MAT</u> SILT AND SAND — some	e aravel, rootlets											E
_						throughout; dry; me	edium brown	/										Ę-
-						GRAVEL — sandy, trace boulders to 300 m	of silt, cobbles and	ļ										E
_						grained sand; dam	p; compact; dark	ĺ	•					i i				-2.0
-						brown		i										F-2.0
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03/02/13	01:54	IPW (YU)	(ON-4)		Whi	tehorse, Yukon												1 of 1

Geotec							CLIENT: Lorimer and Ass						REHOLE				
Whiteh	ors	e Co	pper/	Mt. Si	ma D	evel. Area	EXCAVATOR: Komatsu PC			d Exc	cav.	PF	ROJECT 1	NO: 02	201-0	1-152	36
Whiteh	ors	e, YT					UTM ZONE: 8 N6719750	E5005	000			EL	EVATION	:			
SAMPL	E	TYPE		GRA	B SAM	PLE NO RECOVER	y Standard Pen.	75 r				CRREL BA					
	ш							1	∎ STAN 10	IDARD 20	PENETR 30	ATION ■ 40	20	PERCEN 40	IT GRAV 60	EL ≡ 80	()
준		0			SYMBOL	(SOIL		,,,		- 55		- 6	PERCE	NT SAN) @	ELEVATION(ft)
Depth(m)	Ш	RUN NO	SPT(N)	nsc	SX								20	40 POENT S	60 11 T AP	80 FINES ▲	- 일
Ge	SAMPLE	₽	R	_	SOIL	DESC	RIPTION	PL	ASTIC	k	1.C.	LIQUID	20	40	60	80	
	S				S				10	20	30	I 40	20	PERCE 40	NT CLA	Y ♦ 80	
0.0			\neg			TEA GROUND COVER	AND ORGANIC ROOT MAT	\top	-12		20	70	- 20	- 40			- 0.0
.			i			SAND - silty, rootlets		기									E 1
						dark brown											Ė.
_							ce of silt, cobbles and										E
_			1				mm diameter, sand is			ļļ	ļļ			ļļ	<u> </u>		E
- '						brown	damp; compact; dark	•									2.0
						DIOWII											
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-																	F
- 1. 0								1						*****			···E
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_																	E-4.0
-																	F I
-						SAND — trace of gra	vel, course urained.			ļļ					ļļ	 	
-							dark greyish brown		•								E .
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2.0																	Ē.
-																	E
-						CDAVEL	an of all and bloom be										Εl
						GRAVEL — sandy, tra	er; sand is coarse; damp	.									-
-						greyish brown	or, cana io ocareo, aarrip	' <u> </u>									E8.0
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03/02/13				\sim		tehorse, Yukon							- COIVII LI	- IL. V	1/4/		1 of 1

Geote							CLIENT: Lorimer and A	ssocio	ites									236-		
	_			Mt. Si	ma D	evel. Area											201-	-01-1	523(<u> </u>
Whiteh				_		<u> </u>	UTM ZONE: 8 N67192							LEVA						
SAMP	LE	TYPE		GRA	3 SAM	PLE NO RECOVER	Y ⊠standard pen.						CRREL	BARRE						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	nsc	SOIL SYMBOL	,	SOIL RIPTION		PLAST	O TC	20 M.0	30	ATION = 40	D .	20 20 A PER 20	PERCI 40 CENT :	ENT SA 60 SILT O	AND 80 R FINES 80) •	ELEVATION(ft)
0.0	-				-	MOSS AND TEA AT SU	DEACE		1	0	20	30	40	+-	20	40	- 60		1	- 0.0
-							ne gravel; damp; medi	um												0.0
- - - - - - -							ce of silt, cobbles and out to 500 mm diamet p; greyish brown													2.0
- 1.0 - - -																				
- 2.0						END OF EXPOSURE ® NOTE: Exposure alon														-6.0
-						existing trail		ŀ												-8.0
- - 3.0																				- '
- - -																				10.0
-							•					-								12.0
4.0 - - -																				14.0
	\mathbf{E}	BA	En	gin	eer	ing Consulta		OGGED										1: 2 n	1	
						ehorse, Yukon		REVIEW	בת או	: JK				ICOV	MYLE1	E: 09	9/07,		ge 1	of 1
3/02/13	12-29	M MIK	N_41															- 10	<u>yv '</u>	VI 1

Geote							CLIENT: Lorimer and A	ssoci	ates					BOR	EHOL	ΕN	10:	15:	236-	-TP	13
Whiteh	ors	e Co	pper/	Mt. Si	ma (Devel. Area	EXCAVATOR: Komatsu	PC 95	Tra	cked	Exca	٧.		PRO	JECT	NO	: 02	01-	01-1	523(3
Whiteh	ors	e, Yl					UTM ZONE: 8 N672150	0 E4	9980	10				ELE	/ATIO	N:					
SAMP	LE	TYPE		GRA	B SAM	PLE NO RECOVER	y Standard Pen.		75 mr	n SP(OON		CRREL	BAR	REL						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	nsc	SYMBOL		SOIL			STAND 10	ard Pe 20	NETRA 30	TION ■ 40		20	0 ● Pl 0	40 ERCEI 40	T GRA 60 NT SAI 60	80		ELEVATION(ft)
Dep	SAMP	8	S	_	SOIL	DESC	RIPTION		PLAS	TIC	M.C	;. 	LIQU ——(20	3	40	60 NT CL	80		ELEVA
0.0						MOSS CROTTIND CONED	AND ORGANIC ROOT MAT	-	-	10	20	30	40		20		40	60	80		- 0.0
-						wet; black	AND ORGANIC ROOT MAI	_													E 0.0
<u>-</u>						SAND AND SILT — froz dark grey	en; wet when thawed;				•										
-						SAND — trace of silt; grained; very wet;															-2.0
— 1.0																					
_						m, with water see	avelly from 1.0 to 1.3 ping into testpit														-4.0
-											•										
-																					-6.0
- 2.0																					
-																					
-						END OF TESTPIT @ 2.5	i m				•										-8.0
- -						spruce and small very wet	willow tree cover														
3.0 -																					10.0
-																					
-																					12.0
- - - 4.0																					
- 4.U -							,														
-																					14,0
	\mathbf{E}	BA	En	gin	eei	ring Consulta		OGGE											: 2.5	m	
				\sim		ehorse, Yukon	- 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3	EVIEW	יבט 8	T: Jh	(1			- C	OMPL	ĿIE	: 10	/07/			.F. 4
03/02/13	02:18	PM (YUK	ON-4)		11 111	CHOLDC, LUKUH	<u> </u>												Pa	ge 1	of 1

Geote							CLIENT: Lorimer and A	\ssoci	ites			···		BORE	EHOLI	E NC	: 1	523	6-T	P14
Whiteh	ors	e Co	pper/	Mt. Si	ma l	Devel. Area	EXCAVATOR: Komatsu	PC 95	Trac	ked	Exc	av.		PRO.	IECT	NO:	0201	− 01	-152	36
Whiteh	nors	se, Y					UTM ZONE: 8 N67209	50 E4	99900)				ELEV	ATION	l:				
SAMP	LE	TYPE	: _ _	GRA	B SAN	IPLE NO RECOVER	y Standard Pen.		75 mm				CRREL	BARR						
	YPE				20		SUI		■ S	TANI O	DARD F	ENETR 30	ATION ■ 40	_	20	4	0	ravel 60 Sand	80	(E)
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	nsc	SYMBOL		SOIL							\perp	20	4	0	60	80	LEVATION(ft)
Dept	MP	\$	SP	n	SOIL	DESC	RIPTION		PLAST	TC	M	C.	LIQU	מו	20	4	0	0R FI 60	80	EW.
	S				S			i	10	0	20	30	40		20			CLAY 4	80	
0.0						MOSS AND TEA GROUN ROOT MAT	IND COVER OVER ORGA	NIC /												0.0
-						SAND - some silt to														Ė
-						throughout; dam brown	p to moist; loose; dark													Ē
_		İ							_											···•
-																				E2.0
ŀ																				Ē
- - 1.0																				F
'''																				E
}						GRAVEL — sandy, tro	ce of silt, cobbles to													E4.0
Ė						150 mm through	out; subrounded grave	l;												Ē.
_						medium to coars greyish brown	se sand; damp; loose;						ļļ		ļļ.					Ē
-		ŀ				gregion brown			•											E
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-																				-6.0
— 2.0													ļļ							
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3.0									•											F
F ***						END OF TESTPIT @ 3														···E10.0
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	Ľ	ВĄ	Ľľ.	\sim		ring Consult		REVIEW							OMPL				2	
03/02/13	02:18	BPM (YU)	(ON-4)	·	WNI	tehorse, Yukon													Page	1 of 1

Geote							CLIENT: Lo	rimer and	Associ	ates											6-EX	
Whiteh	ors	e Co	pper/	Mt. Si	ma [Devel. Area													020	1-0	1-152	36
Whiteh							UTM ZONE:										40IT	V :				,
SAMP	LE	TYPE		GRA	B SAM	IPLE NO RECOVER	Y STA	ndard pen.		75 mr			_	CRRI		RRE						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	USC	SOIL SYMBOL		SOIL CRIPTIO	ON		PLAS	TIC	20 M	30 i.c.	Ц	QUID		20 20 • PE 20	PER A RCEN A PEF	CENT IO T SILT IO RCENT	SAND 60 OR F 60 CLAY	80 80 INES ▲ 80	ELEVATION(ft)
l .	┞	-				ORGANIC ROOT MAT	ND SILTY S	AND			10	20	30	40			20	1 4	10	60	80	- 0.0
- 1.0						GRAVEL — sandy, tro throughout to 15 subrounded; med damp; loose; gre (Base of Borrow Pit) NOTE: Exposure loc existing borrow area	ce of silt, communication to coacy ish brown	cobbles neter; rse sand;	64-34 (A			V 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		70 A								-4.0
- - -																						-14.0
	F	D٨	[i'r	ain	00	ring Cangult	anta II		LOGGE							CC)MPL	ETIO	N DE	PTH:	3 m	
	Ľ	DA	Lí.	\sim		ring Consult	ants P	ıu.	REVIE									ETE:				
03/02/13	02:29	PM (YU	(ON-4)		Whi	<u>tehorse, Yukon</u>																1 of 1

Geote	chn	ical I	Evalue	ition			CLIENT: Lorimer and Asso	ciates				В	OREHO)LE 1	10:	152	36-	ΓΡ16
Whiteh	ors	e Co	pper/	Mt. Si	ma ()evel. Area	EXCAVATOR: Komatsu PC	95 Track	ked	Exca	<i>/</i> .	Р	ROJEC	TNC): 020	01-0	1-152	236
White	ors	e, Y	Ī				UTM ZONE: 8 N672050 E4	99750				E	LEVATI	ON:				
SAMP	LE	TYPE		GRA	B SAM	IPLE NO RECOVER	y Standard Pen.	75 mm	SPO	ON	CF	RREL E	ARREL			•		
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	OSU	SOIL SYMBOL		SOIL RIPTION	PLASTIC	C	M.C		ON ■ 40 LIQUIE 40 40	A	20 P P 20 PERCE 20	40 ERCEN 40 ENT SIL 40	GRAVE 60 T SAND 60 T OR I 60 T CLAY	80 80 FINES ▲ 80	ELEVATION(ft)
0.0	 					GRASS GROUND COVE	R OVER ORGANIC ROOT MA			Ī	ŤT	ŤΤ			Ť		- 50	= 0.0
- - - - - - -						<u>medium brown</u> GRAVEL — sandy, tra boulders to 300	d is medium to coarse;											-2.0
-						SAND (TILL) — gravel silty, cobbles thr compact; mediur	oughout; damp;											-4.0
- - - - 2.0																		-6.0
-																		-8.0 -8.0
- - - 3.0 - - -						END OF TESTPIT @ 3 - willows and stan this area indiciat well drained (due	ding dead spruce in ive area is not as	•										10.0
- - - - 4.0																		12.0
F																		E
		<u></u>	1	L	1	. ~		ווייין פע.	HOD	<u> </u>	<u> </u>		10014	ם רדי	ION D	רוסדי י	7	F
	E	BA	Er	ıgin	ee.	ring Consult		SED BY: EWED BY								EPIH: /07/4	3 m	
				\sim		tehorse, Yukon			. טוו	. 1			20181		_, 10	101/		e 1 of 1
03/02/13	02:18	BPM (YU	KON-4)				,											

Geote	chni	ical (value	ition			CLIENT: Lorimer and	Associ	ates					BOR	EHOL	LE î	10:	15.	236-	TP17
Whiteh	ors	e Co	pper/	Mt. Si	ma ()evel. Area	EXCAVATOR: Komatsu	PC 9	5 Tro	cke	d Exc	.vp:		PRO	JECT	NC): 02	201-	01-15	236
Whiteh	ors	e, Y	-				UTM ZONE: 8 N67203	350 E4	997	00				ELEV	/ATIO	N:				-
SAMP	LE	TYPE		GRA	B SAM	IPLE NO RECOVER	y Standard Pen.		75 m	m SF	NOO		CRREL	BARF	REL					
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	OSN	SOIL SYMBOL		SOIL RIPTION		PLA H	10 STIC	20 M	PENETR 30	ATION 40 Liqu		29 A P 29	O PERCI	HOPERCE	60 NT CL	80 80 80 80 80 80	ELEVATION(ft)
0.0						MOSS AND TEA GROU ROOT MAT	ND COVER OVER ORGA	NIC ,		10	20	30	40	1	2	v	40	60	80	0.0
_						SILT AND SAND - roo medium brown	otlets throughout; dam	· [
-						boulders through	ce of silt, cobbles and out to 300 mm diame to coarse; damp; sh grey		•											-2.0
- 1.0						- sloughing during	excavation													
- - -						·														-4.0 E
- - - 2.0									•											-6.0
-																				-8.0
- - - 3.0						END OF TRATE A			•											
-						END OF TESTPIT @ 3. Note: Excavated bes #5309														-10.0
-																				12.0
- 4.0 - -																				
	\mathbf{E}	BA	En	gin	eer	ring Consulta		LOGGE											: 3 m	
			~				LIVE LIVE.	REVIEW	LD E	iY: J	ΚŢ			C	OMPI	LETE	: 10	/07/		
03/02/13 0	02:18F	N TYUK	N-4)		11111	ehorse, Yukon								\perp					Pag	e 1 of 1

				tion		CLIENT: Lorimer and Ass													66-7	
				Mt. S	ima I	Devel, Area EXCAVATOR: Komatsu PC				Exc	av.						020	1-01	-152	23
Whiteh	orse	, YT				UTM ZONE: 8 N6720160	E499	142	0				ELI	EVAT	ION:					
SAMPL	EΤ	YPĒ		GR/	B SAN	µPLE ☑NO RECOVERY ☑STANDARD PEN.	75						el ba	rrel						
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	nsc	SOIL SYMBOL	SOIL DESCRIPTION	P	LAS	10	20_	PENETF 30	40		•	20 20 PER(20	PERO 40 CENT 40	CENT CENT SILT	60	80 80 NES A 80	
	S				SS			<u> </u>	10	20	30	40					CENT	CLAY)	
0.0		\dashv		<u> </u>		MOSS AND TEA GROUND COVER	+	- '	10	ZU	30	1 1	1		20	4(<u>. </u>	60	80	
						SILT AND SAND — rootlets throughout; damp; medium brown														
						GRAVEL — sandy, trace of silt, cobbles and boulders to 700 mm diameter; very coarse; sand is medium to coarse;														
-						damp; medium brown		•												
- - 1.0											ļļ									
- -						DECOMPOSED GRANITE - competent by 2.0 m														
-																				•••
-																				
2.0 																				•••
-						END OF TESTPIT @ 2.2 m Bedrock is at surface at end of survey line														
-																				•••
- - 3.0												ļļ.								
-																				
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— 4,0 - -								 !												
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	EF	3 A	Er	gin	lee:		GED												2.2 m	1
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Geotechnical Evaluation CLIENT: Larimer and Associ									ates				E	BOREHOLE NO: 15236-TP19						
Whitehorse Copper/Mt. Sima Devel. Area EXCAVATOR: Komatsu PC 9											d Exc	.vp:	ţ	PROJECT NO: 0201-01-15236						
Whitehorse, YT UTM ZONE: 8 N6720850 E4										ELEVATION:										
SAMPLE TYPE GRAB SAMPLE NO RECOVERY STANDARD PEN. 75 mm SPOON CRREL BARREL																				
Depth(m)	SAMPLE TYPE	RUN NO	SPT(N)	OSC	SOIL SYMBOL	SOIL DESCRIPTION				STANDARD PENETRATION 10 20 30 40					PERCENT GRAVEL 20 40 60 80					ELEVATION(ft)
0.0	1-					ORGANIC ROOT MAT			\vdash	10	20	30	40	+	20	4\	1 0	0 8	,	E 0.0
- 1.0						to boulders thro larger than 75 n	ie; competent													-2.0 -4.0 -10.0
- 4.0 																				12.0
	77	D.	171	•	-		1 TI 1	OGGE	D RY	: ::: ITI, :')	<u>: :</u>	<u></u>	100	MDI I	: :	I DED	TH: 0.8	m	
	Ę	RA	Ľn	igin	ee:	ring Consult		REVIEV									01/0		т	
						tehorse, Yukon	1	1 4 IL Y	ILU I	٠,١٠) () () () () () () () () () (100	WITL	_1C;	01/0		100 1	of 1
03/02/13	02-18	Dir Mil	ON_4)		17 111	COLOLDO, LUNUII												P	uye I	of 1

Geotechnical Evaluation CLIENT: Lorimer and Ass									ites					BOREHOLE NO: 15236-TP20							
Whitehorse Copper/Mt. Sima Devel. Area EXCAVATOR: Komatsu PC								PC 95	Tra	cked	Exc	JV.	Р	PROJECT NO: 0201-01-15236							
Whitehorse, YT UTM ZONE: 8 N6720850 E								350 E4	E497450 ELEVATION:												
SAMPLE TYPE GRAB SAMPLE NO RECOVERY STANDARD PEN.								75 mn				CRREL B	ARRE	L							
									■ STANDARD PENETRATION ■ 10 20 30 40							PERCEN					
(h	Y	0			BOI	Ç	SOIL		10 20 30 40						20 40 60 80 ● PERCENT SAND ●						
th(r	Depth(m) SAMPLE TYPE RUN NO SPT(N) USC SOIL SYMBOL											20 40 60 80 ▲ PERCENT SILT OR FINES ▲ 20 40 60 80 ◆ PERCENT CLAY◆									
Depth(m)	MPI	8	R	_	SOIL	DESC	RIPTION		PLASTIC M.C. LIQUI								ELEVATION(ft)				
	Ś				S			1-	10	20	30	40		/♦ 80							
0.0			_			ORGANIC ROOT MAT					Ť	- 55	Ϋ́	\top	20	40	60	- BV	= 0.0		
-																			Ę.		
							11.184.7												E		
-	GRAVEL (COLLUVIUM) - some silt, trace of																		E		
-							el and sand; collunviur	n ∦		╟╬				-		ļļ	-		<u>F</u>		
-						becomes sandy.	is very angular becomes sandy, trace of silt;												-2.0		
-							ose; dark olive brown												Ē		
-																			Ė į		
- 1.0																					
-																			-		
-									•										E-4.0		
-						BEDROCK - granitic:	badly weathered; dark	$\overline{}$											E I		
-						green		/											E		
_						END OF TESTPIT @ 1.	4 m												```E		
-																			- 1		
-																			-6.0		
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2.0														1		<u> </u>			<u>E</u>		
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Whitehorse, Yukon Page 1 of 1	Whitehorse, Yukon															551			/ 50/ (1 of 1

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Whiteho	orse	e, YT					UTM ZONE: 8 N67204	50 E4	979	40					ELE	TAV	ON:					
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1.0 									•													-4.0
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Geote	chn	ical	Evaluc	tion			CLIENT: Lorimer and							OREHOL					
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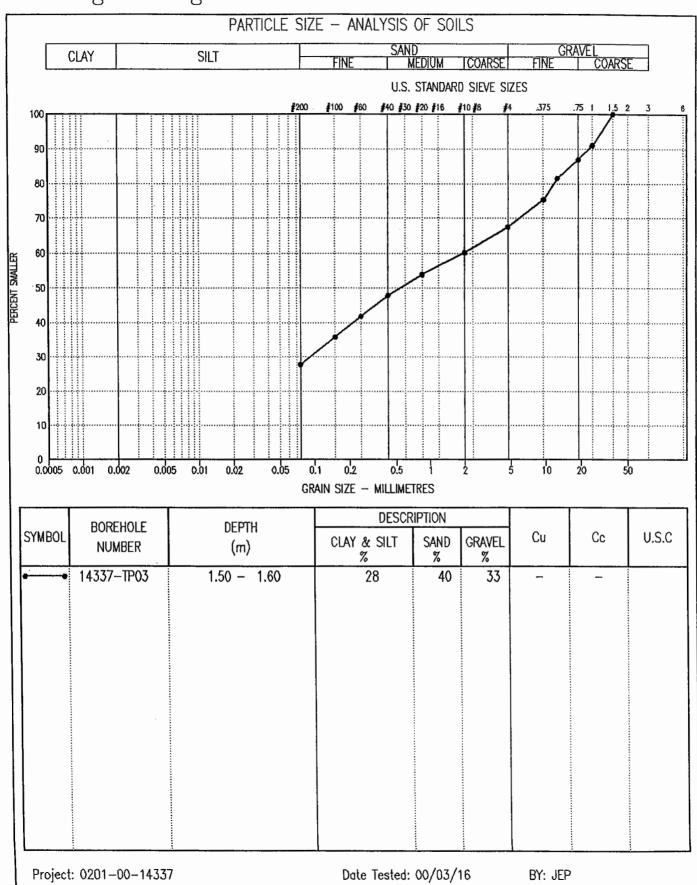
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EBA Engineering Consultants Ltd.									BY:	JRT			CO	MPLE	ETE:	01/	0/80		
03/03/43	Whitehorse, Yukon																	Page	1 of 1

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Whiteh	ors	e, YI	-				UTM ZONE: 8 N6720800	E49	790	0			E	LEVAT	ION:				
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Whitehorse, Yukon																_Page	1 of 1		

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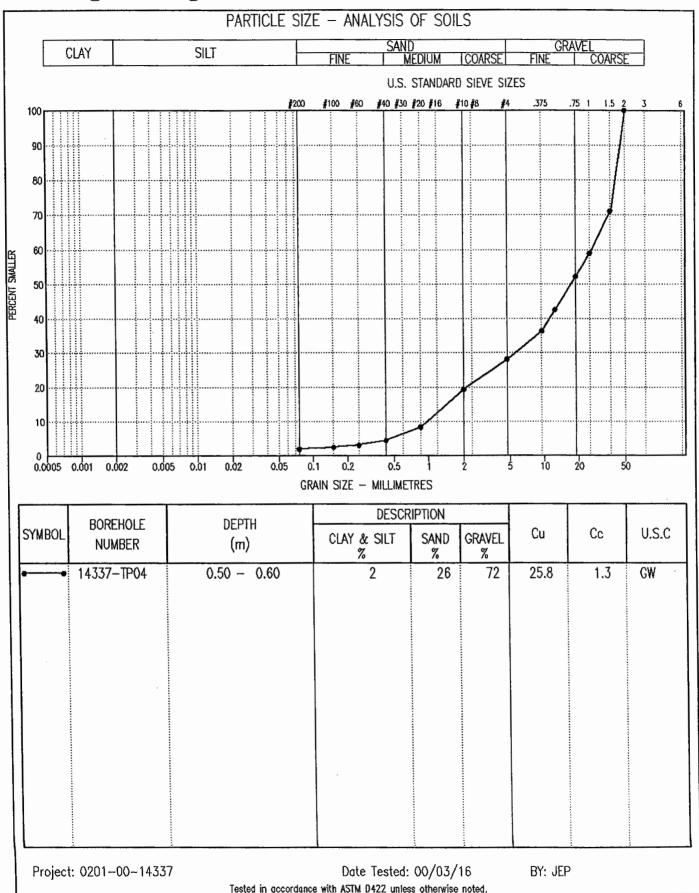
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					SAND AND SILT — rootlets seasonally frozen to		-1												-
· 					medium brown SAND (TILL) - gravelly, si] •												-
-					boulders throughout, frozen, medium brow	seasonally													-
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EBA Engineering Consultants Ltd. Whitehorse, Yukon								RY	: MC	<u> </u>			COM	'LE I	t: 0	0/03		age	1 of 1



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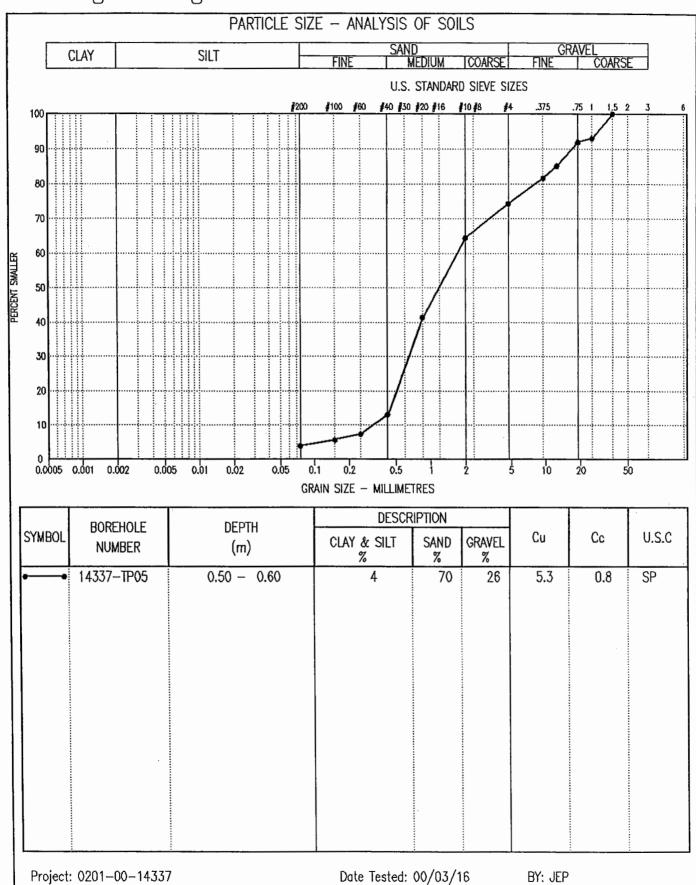
GEOTE					N	CLIENT:INUKSHUK PLANN					-NT		TEST					37-		
WOLF						EXCAVATOR: CAT 225 TR				DE						020	1-0	0-14	337	
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Depth(m)	SAMPLE TYPE F		nsc	IL SYMBOL	B NO RECOVER SO DESCRI	IL		10	TEMF 3	PERATL	0 IRE ♦ 7	N ■ 40 11		20	4 PER 4	O Cent O Silt	GRAVE 60 SAND 60 OR F	80		ELEVATION(π)
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			G₩	0º 0º	Labrador Tea Ground Cove Root Mat SAND AND SILT — gravelly, seasonally frozen to medium brown GRAVEL — sandy, trace of very coarse, cobbles throughout, clast sup subangular, damp, co frost, brownish grey	some cobbles, at least 1 m, silt, sand is and boulders ported,							A							- 0.0
- 2.0 					— gravel stained dar reddish brown below	2.5 m														
- - - - - - - - - -					SAND (TILL) — silty, grave throughout, moist to brown END OF TESTPIT @ 4.0 m	wet, firm, olive														
	Ţ	!RA	Fr	naii	neering Consult		LOGGE											ł: 4 r	n	
EBA Engineering Consultants Ltd.								VED I	3Y: M	ICP				COMF	LETE	: 00	/03/			
Whitehorse, Yukon																		Po	ige	1 of 1



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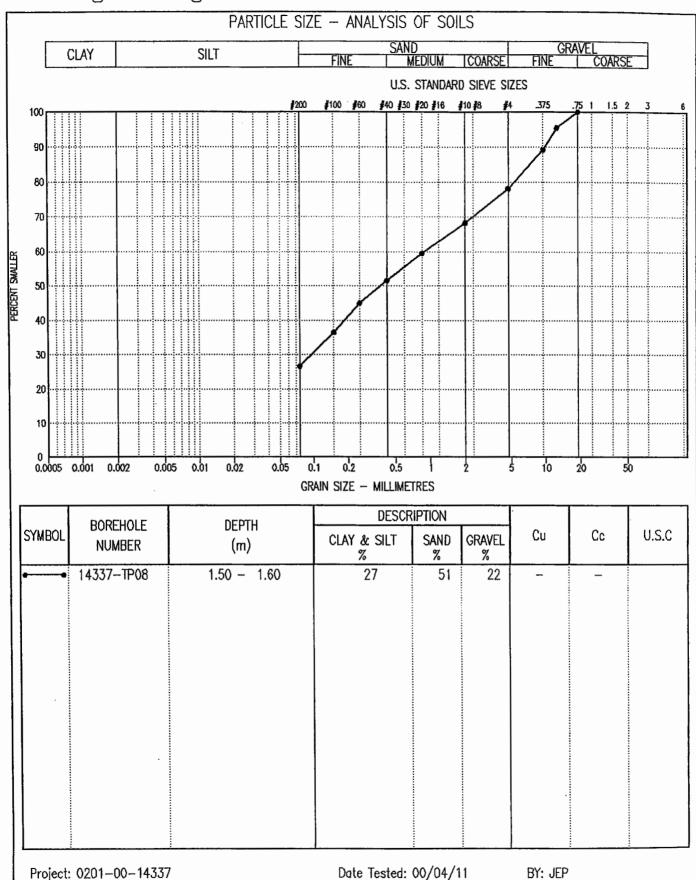
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WOLF						EXCAVATOR: CAT 22							-			: 02		00-1		
~					JBDIVISION	UTM ZONE: 8 N672	0440 E	5007	700				ELE	VATIO	ON:					
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	SAM	2		SOIL	DESCRI	PTION		LASTI 10		M. ——• 20	C. ▶——— 30	LIQUI 	P	20	◆ PE	40	60 IT CLA	80		ELEVA
- 1.0			SP	50.00 50.00 50.00	Labrador Tea Ground Cover Root Mat SAND AND SILT — rootlets seasonally frazen, me SAND — gravelly, trace of cobbles and boulders to coarse, gravel is a seasonally frazen to below frost, compact — consistent throughoutestpit	throughout, edium brown silt, some sand is medium clast supported, 2.0 m, damp , greyish brown														2.0
- 3.0					END OF TESTPIT @ 4.0 m															4.0
	E	BA	En	gir	neering Consult	ants Ltd.	LOGG											H: 4 r	n	
				0**	Whitehorse, Yukon	alloo noa.	REVIE	.WED	BY:	: MCP			(COMF	LETE	: 00)/03			1 .5 .
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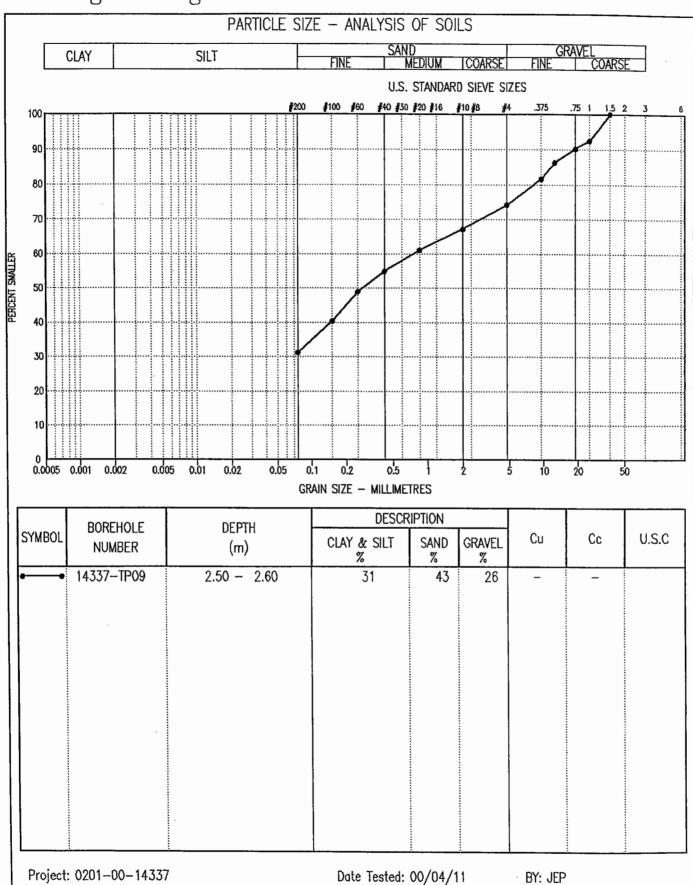


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Whitehorse, Yukon													\perp					Pa	ge 1	of 1



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GEOTE	CHI	VICAL	EVAL	UATIC	DN	CLIENT:INUKSHUK PLANI				_	τ	TEST	PIT	NO:	14	-337	7-TF	09
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ă	SAMPLE TYPE	~		SOIL	DESCRI	PHON	PLA	5110	₩	l.C. ◆	LIQUID I	' 	20	40	60	8	0	ELEVATION(m)
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-					SAND (TILL) - silty, grave	lly cobbles and	4											-
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-					 percometer installe Percolation rate of 9 	d to 1.8 m. min/25 mm												
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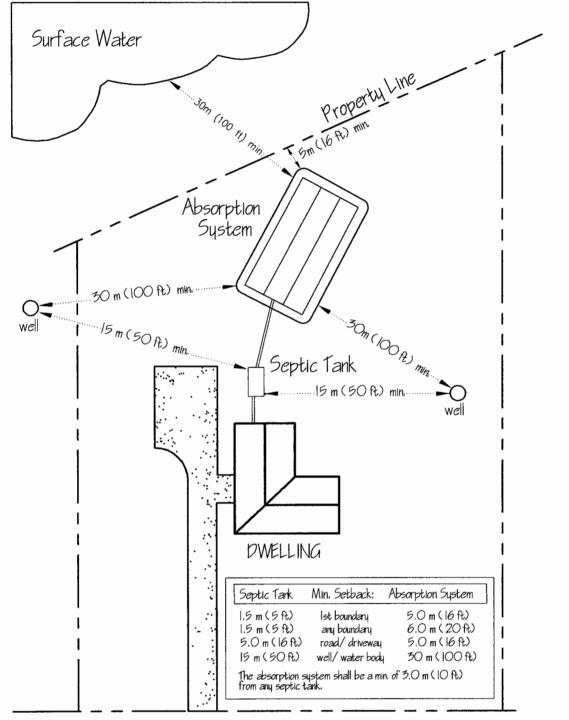


GEÖTECHNICAL EVALUATION CLIENT:INUKSHUK PLA									D C)EVE	LOP	۱ ۱		TE:	ST P	IT!	NO:	-	14	337	, T	P10
SIMA ROAD LIGHT INDUSTRIAL SUBDIVISION EXCAVATOR: CAT 225															PROJECT NO: 0201-00-14337							
WHITEHORSE, YUKON UTM ZONE: 8 N6722									2850 E499160 ELEVATION:													
SAMPI	LE	TYPE		GR	AB NO RECOVER	Y									-							
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-					SAND (TILL) - silty, grave	lly, cobbles	/															-
					ond boulders through frozen, olive brown	out, seasonally																-
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-					BEDROCK (BASALT) - con	npetent by 0.9 m;	\dashv															ŀ
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Whitehorse, Yukon															2014				<u> </u>		age	1 of 1

APPENDIX B ON-SITE SEWAGE DISPOSAL INFORMATION



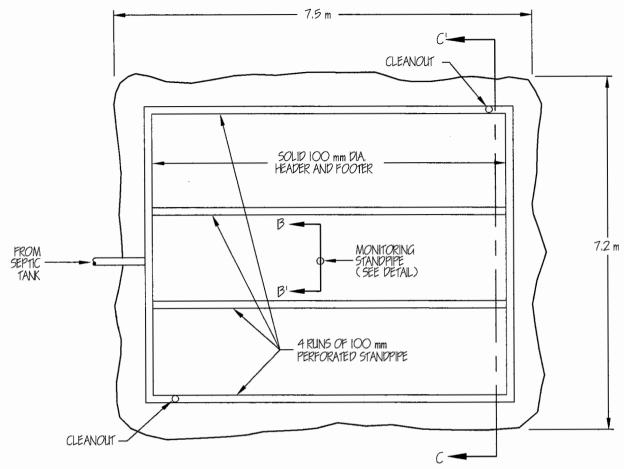




EBA Engineering Consultants Ltd.	PROJECT WHITEHORSE COPPER - SIMA ROAD AREA DEVELOPMENT - WHITEHORSE, YUKON
CLIENT CORIMER Associates Contains Brokes	MINIMUM SETBACK REQUIREMENTS FOR ON-SITE SEWAGE DISPOSAL SYSTEMS
DATE FEB. 2003 DWN. JSB CHKD. MCP	FILE NO. 0201-01-15236 DRWG. FIGURE 2

APPENDIX C TERRAIN RISK MAP

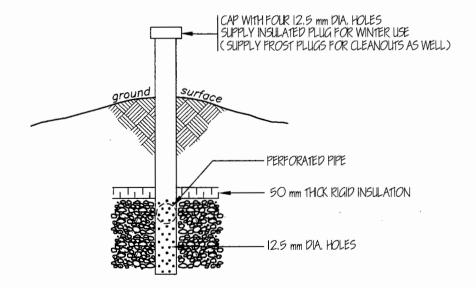




PLAN VIEW

ABSORPTION BED SYSTEM

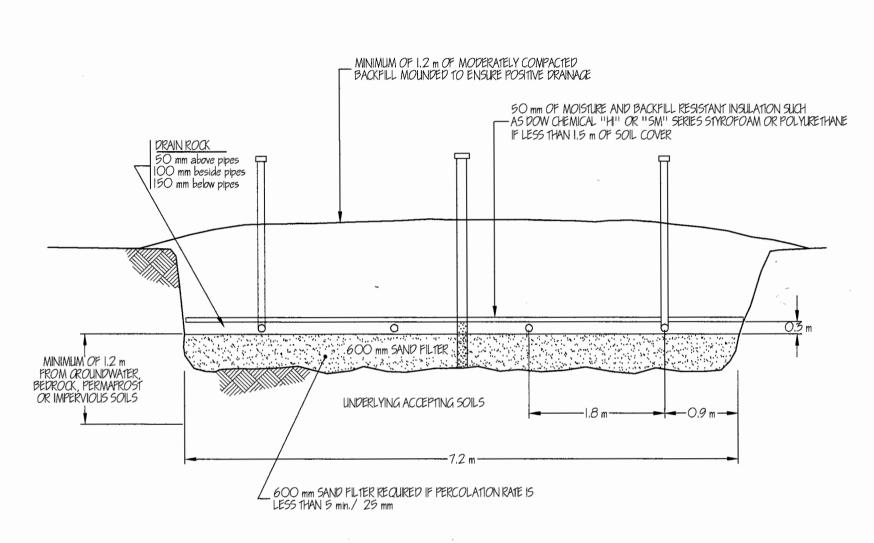
(not to scale)



SECTION B'-B

MONITORING STANDPIPE DETAILS

(not to scale)



SECTION C-C'
ABSORPTION BED SYSTEM
(not to scale)

*DESIGN IS BASED UPON A THREE BEDROOM RESIDENCE AND A SOIL PERCOLATION RATE OF 5 min. / 25 mm. OR LESS

	EBA En	ginec	ring Go	nsultant	PROJECT		OPPER - SIMA ROAD - WHITEHORSE, YUKON						
CLIENT		L.	ORIME Associat	R	TITLE	TYPICAL ABSORPTION BED SYSTEM INSTALLATION DETAILS							
DATE	FEB. 2003	DWN.	JSB	CHKD.	MCP	FILE NO.	0201- 01-1523 6	FIGURE 3					

