EAGLE GOLD PROJECT

FROZEN MATERIAL MANAGEMENT PLAN

(INCLUDES ICE-RICH AND NON ICE-RICH PERMAFROST)

Version 2017-01

JULY 2017

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DOCUMENT CONTROL

Submission History

Version Number	Version Date	Document Description and Revisions Made
2013-01	Apr 2013	Submission of Ice-Rich Materials Management Plan to support Stage 1 Construction of the Project. Document included a preliminary design for the Ice Rich Overburden Storage Area.
2013-01	Dec 2013	Revisions made to the original submission to encompass all categories of frozen materials. Submission made to the Yukon Water Board in support of the application to amend Type B Water Use License QZ11-013. The amendment application considered the use of water and deposit of waste associated with preliminary construction activities and included the construction and operation of the Dublin Gulch Diversion Channel.
2015-01	Mar 2015	Revisions made to include commitments made during the applications process for the amendment of the Type B WUL QZ11-013 in support of an application to the Yukon Water Board for a Type A Water Use License for the full Construction, Operation and Closure of the Project. Version 2015-01 was also submitted to the Department of Energy, Mines and Resources in support of an application for a Quartz Mining Licence allowing the full Construction, Operation and Closure of the Project.
2017-01	Jul 2017	Revisions made to reflect the current site general arrangement.

Version 2017-01 of the Frozen Materials Management Plan (the Plan) for the Project has been revised in July 2017 to update Version 2015-01 submitted in March 2015. The table below is intended to identify modifications to the Plan and provide the rationale for such modifications

Version 2017-01 Revisions

Section	Revision/Rationale
3.1 Definitions	▪ Updated definitions to include specific terminology used in the Quartz Mining License QML-0011 and the Type A Water Use License QZ14-041.
Table 3.2-1 Field Identification and Classification of Frozen Soils	▪ Updated field classifications to support management and disposal decision making process.
3.3 Management Strategies	▪ Insertion of license conditions from QZ14-041.
3.4 Material Quantities	▪ Updates to reflect evolution of frozen material classification and estimates.
Table 3.4-1 Functional Area Ice-Rich Material Volume Estimates by Classification Type	▪ Updates to reflect the material volume estimates based on the optimized site layout.
4.4 Specific Considerations	▪ Removal of reference to the Dublin Gulch Diversion Channel.
4.4.3	▪ Updated to text to specify that design criteria for cut slopes, for the purpose of

Section	Revision/Rationale
Cutslope Criteria	the Plan, relates to cut slopes into frozen ground. ▪ Removal of reference to the Dublin Gulch Diversion Channel cut slope geotechnical recommendations.
5.2.3 Design Update	▪ Insertion of new section to explain the update to the design of the IROSA.
5.2.4.2 Fill Materials	▪ Insertion of new section to describe the fill materials required for the construction of the IROSA embankments.
5.2.4.3 Stability Assessment	▪ Insertion of new text to explain stability analyses undertaken as part of the finalization of the IROSA design.
5.2.4.4 Water Management	▪ General updates to describe components grading practices such that rainfall and runoff are adequately managed and does not lead to ponding water in the IROSA.
5.2.5.1 Construction Sequencing	▪ Insertion of new text to provide details on the construction sequencing for the IROSA containment areas.
5.2.5.3 IROSA Volume Management and Contingency	▪ Insertion of new text to reflect license conditions regarding monitoring of remaining volume available in the IROSA.
Appendix A Geotechnical Design Update and IFC Drawings	▪ Insertion of the design and stamped issued for construction drawings of the IROSA.

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1 INTRODUCTION

1.1 OVERVIEW

StrataGold Corporation (SGC), a directly held, wholly owned subsidiary of Victoria Gold Corp., has proposed to construct, operate, close, and reclaim a gold mine in central Yukon. The Eagle Gold Project ("the Project") is located 85 km from Mayo, Yukon on existing highway and access roads (Figure 1.1-1). The Project will involve open pit mining at a production rate of approximately 10 million tonnes per year (Mt/y) ore and an average strip ratio (amount of waste: amount of ore) of 1.45:1.0 over approximately 10 years.

Earthworks construction and some operational activities of the Project will result in the excavation and exposure of frozen overburden soils, identified as either permafrost or from within the active zone that freezes seasonally. Frozen soils at the project site consist of:

- fine and/or coarse-grained colluvial/alluvial soils or weathered bedrock with little or no ice content,
- coarse-grained sands and gravels with zones of variable ice content,
- fine-grained soils with relatively thin zones (lenses) and low proportions of "excess ice", and
- fine-grained silty and clayey soils with relatively thick lenses of highly visible "excess ice".

The term "excess ice" is used to describe ice that occupies a larger pore space in the soil than water in an unfrozen state. When this ice thaws, the resulting water exceeds the water holding capacity of the soil and excess water will be present. Some of the frozen soil with excess ice, hereafter called "ice rich", may become unstable upon thawing, particularly if it is fine-grained and excess pore water pressure cannot drain readily. Some of these materials, which could potentially be useful in closure activities (e.g. as cover for reclamation) while thawing and draining, may require temporary containment during construction and operation of the mine. This plan describes the management of frozen materials, and how some of the ice-rich materials will be managed separately from other frozen overburden soils.

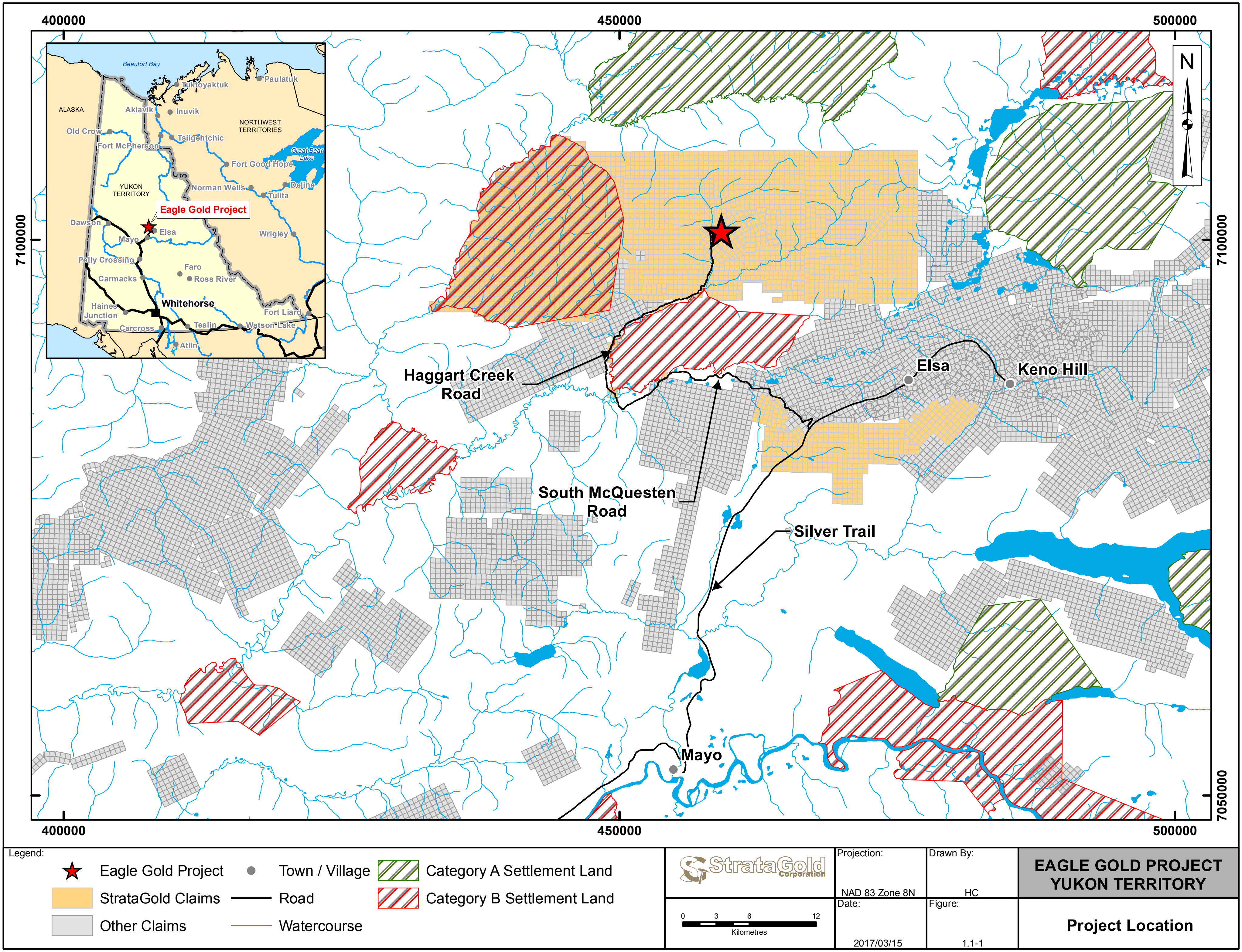
1.2 SCOPE

This frozen materials management plan includes:

- descriptions of existing site conditions pertinent to materials management;
- protocols for characterizing the nature and extent (lateral and vertical) of frozen materials encountered during construction activities including characterizing the presence and extent of excess ice;
- protocols for determining whether encountered frozen material is thaw stable or thaw unstable;
- estimated quantities of frozen materials to be handled during construction distinguishing between material types and different approaches for their management;
- descriptions of appropriate handling requirements for each frozen material type, including protocols for excavation and removal of thaw unstable material from drainage channels, valley walls, etc…

- design criteria and preliminary engineering for an ice rich overburden storage area;
- construction quality assurance and quality control planning for the ice rich overburden storage area;
- protocols for recording and reporting on the characterization and management of frozen soils (including thaw stable and unstable materials), and
- monitoring plans for stability and associated water management.

This plan addresses the identification, field practices and overall management of all frozen materials, including permafrost and ice-rich soils as defined herein.



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Great Bear Lake
Fort Good Hope
Norman Wells
Deline
Tulita
YUKON TERRITORY
Eagle Gold Project
Dawson
Elsa
Mayo
Wrigley
Pelly Crossing
Faro
Carmacks
Ross River
Whitehorse
Haines Junction
Fort Liard
Carcross
Teslin
Watson Lake
Atlin
Haggart Creek Road
Elsa
Keno Hill
South McQuesten Road
Silver Trail
Mayo
Legend:
Eagle Gold Project
Town / Village
Category A Settlement Land
StrataGold Claims
Road
Category B Settlement Land
Other Claims
Watercourse
StrataGold Corporation
Projection:
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Drawn By:
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YUKON TERRITORY
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Figure:
1.1-1
Project Location

2 SITE DESCRIPTION

The Dublin Gulch site has been described and characterized extensively in other reports. Surficial geological and permafrost conditions are relevant to this plan and so are summarised herein, for ease of reference.

2.1 SURFICIAL GEOLOGY

The surficial geology of the Dublin Gulch area has been mapped by Bond (1998). Pleistocene and Holocene colluvial deposits are abundant in the Project area and generally consist of diamicton, gravel, shattered bedrock, lenses of sand and silt derived from bedrock, and surficial materials derived by a variety of chemical and physical weathering processes. These deposits overlie weathered to fresh bedrock. Transport of surface material occurs as creep and sheetwash; local shallow mass wasting processes occur on certain slopes in the area.

A till blanket was mapped along the east side of Haggart Creek south of its confluence with Dublin Gulch and into the lower Dublin Gulch valley. Glacial till occurred in patches in specific zones within the Dublin Gulch and Haggart Creek valleys due to the main flow directions of regional Cordilleran ice and the area physiography, and in most cases where present, was disturbed by historical placer mining. Remnants of the till deposits occur along the east Haggart Creek valley wall and south Dublin Gulch valley wall. In these locations the till is generally either a clayey or silty sand matrix with some proportion of larger clasts up to cobble size. Although their distribution has not been mapped, large-boulder (> 1 m) sized erratics have been observed in the Dublin Gulch valley including within some of the placer tailings (i.e., alluvial materials reworked by placer mining) upstream of the confluence with Ann Gulch, but not in the Haggart Creek valley.

The Haggart Creek valley in the area of the Project site is filled with a mix of alluvial deposits and placer tailings. At the valley walls, alluvium, where present, grades imperceptibly into colluvium. Bedrock is exposed along the creek bottom or banks in several locations along the length of the placer disturbed area.

2.2 PERMAFROST

The Project is located in a region of widespread discontinuous permafrost (Brown, 1979). On the regional scale, permafrost distribution is typically controlled by mean annual temperature and precipitation, whereas on a local scale it is controlled by vegetation, surface sediments, soil moisture, slope aspect, and snow depth. Within the Project area, frozen ground occurs typically on north- and east-facing slopes at higher elevations, and within poorly drained areas lower in the valleys. Based on site characterization work completed during 2009 to 2012 (BGC 2010, 2011 and 2012a), the distribution and thickness of permafrost is highly variable across the site, sporadic or non-existent in some areas (south-facing slopes) to more prevalent in other areas (north-facing slopes at lower elevations). Within the permafrosted areas, the distribution of excess ice and its lateral and vertical extent is also highly variable. In general, permafrost with zones of excess ice exceeding 1 m in thickness and laterally continuous over 25 m is limited to the lower north-facing slopes within the lower regions of the Eagle Pup and Suttles Gulch valleys, including the interfluvial areas between these valleys.

Frozen ground, when observed, is generally encountered immediately below the organic cover. Ground temperatures have been measured with thermistors installed on site in 1995-1996, and 2009-2012. The measured ground temperatures showed the frozen ground to be relatively warm when observed, typically between 0°C and -1°C.

3 FROZEN MATERIAL MANAGEMENT CONCEPTS

3.1 DEFINITIONS

Permafrost is defined as- ground (soil or rock and included ice or organic material, if present) that remains at or below 0°C for at least two consecutive years.

Permafrost Distribution is based on estimated geographic continuity in the landscape:

- Continuous permafrost is land where the underlying 80-100% (as defined by the University of the Arctic) of the landscape is underlain by permafrost.
- Discontinuous permafrost is land where the underlying 30-80% (as defined by the University of the Arctic) of the landscape is underlain by permafrost.
- Sporadic permafrost is land where the underlying 0-30% (as defined by the University of the Arctic) of the landscape is underlain by permafrost.

Warm Permafrost – permafrost at temperatures between -1 C and 0 C.

Frozen material – all frozen soils or rock containing ice including seasonally frozen (within annual thaw zone or active layer) and perennially frozen material (permafrost)

Excess ice – the volume of ice in the soil that exceeds the total pore volume that the soil would have in an unfrozen state.

Ice rich soils – soils comprised of excess ice, where the volumetric ice content is greater than 15% (CAN/BNQ 2017); while ice rich soils can occur in both seasonally frozen and perennially frozen ground, the management strategies described herein generally apply to ice-rich soils within permafrost

A more specific definition of ice-rich soil for this project as it applies to this Frozen Material Management Plan is defined in the water use licence QZ14-041 as follows:

> *"Ice-Rich Soil" means, in the context of Engineered Structures, seasonally frozen or perennially frozen overburden or weathered bedrock that contains sufficient frozen moisture that if thawed the soil or weathered bedrock material would be subject to adverse volumetric changes due to draining of excess pore water or low shear strength due to excess pore pressure generated by the insufficient drainage of the excess pore water. In this definition, what constitutes adverse volumetric changes or low shear strength is to be specifically determined based on the required performance of the materials within the Engineered Structure they are located.*

3.2 IDENTIFICATION AND CLASSIFICATION

Table 3.2-1 provides a classification scheme for frozen soils encountered on the Project site. These guidelines were used when reviewing the database of geotechnical borehole and test pit logs to develop the material management strategies as described in Table 3.3-1 and to estimate the expected volumes provided in Table 3.4-1.

These field identification and classification guidelines will be primarily used in the field when preparing for and during excavation activities to classify frozen materials into the five management types. The classifications will be used to guide the field geologist, engineer or technician responsible for monitoring construction activities. It is expected that the specific criteria in Table 3.2-1 and management strategies provided in Table 3.3-1 will be refined in the field during clearing, grubbing and material segregation activities, as needed, based on the visual inspections of cleared and grubbed areas (including the cut banks and upslope areas), with consideration of the duration of exposure, and based on observations of surface water quality monitoring of meltwater ditches and sediment basins, and the results of excavating, transporting and storing materials selected for disposal in the ice rich overburden storage area (IROSA). More detailed description of field activities and responsibilities are outlined in Section 4 (Excavation Management).

Table 3.2-1: Field Identification and Classification of Frozen Soils

Material Classification Type	Frozen Material Type Guidelines for Field Classification				
	Soil Properties	USCS Soil Types	Lateral Extent of Ice-bearing soils	% of Ice	Ice-Bearing Soil Layer Thickness
I	Fine and/or coarse-grained colluvial or alluvial soils, or weathered bedrock	GW, GP, GM, GC, SW, SP, SM, SC, ML, CL, MH and CH	Limited to isolated zones (<5-10% of exposure), not laterally continuous	Little (< 5%) or no ice content	Soil layers less than 0.5 m thick and separated by > 1.0 m of non-ice-bearing material
II	Coarse-grained sands and gravels (> 50% retained on No. 200 (0.075 mm) sieve)	GW, GP, GM, GC, SW, SP, SM and SC	Limited to isolated zones (< 20% of exposure), not laterally continuous	Zones of variable ice content - up to 10% excess ice	Relatively thin soil layers < 0.5 m thick
III	Fine-grained soils (> 50% silts and clays)	ML, CL, MH and CH	Limited to isolated zones (<5-10% of exposure), not laterally continuous	Low proportions (<5-10%) of "excess ice"	relatively thin (< 0.5 to 1.0 m thick) soil layers
IV	Fine-grained soils (> 50% fines)	ML, CL, MH and CH	Laterally continuous throughout exposure; multiple lenses	Readily visible (>10%) "excess ice"	with relatively thick (> 1 m) soil layers
V	Small quantities of ice-rich soils (fine or coarse)	GW, GP, GM, GC, SW, SP, SM, SC, ML, CL, MH and CH	Overall volume is less than 10% of potential fill area	Variable ice content - up to 20% excess ice	Relatively thin soil layers < 1.0 m thick

Note – organic soils (OH, OL and Pt with or without ice) will be excavated and stockpiled for reclamation purposes; reclamation stockpile will be designed to contain some ice-rich material, which will be allowed to thaw and drain (to sediment basins as per the construction water management plan), and then re-graded.

3.3 MANAGEMENT STRATEGIES

Frozen ground, where encountered, contains varying amounts of ice, and in some cases can be considered as "excess ice" (as defined above), as described in the detailed records of test pits and cored geotechnical drillholes used to characterize the site by Knight Piésold (1996a and 1996b), Sitka Corp. (1996) and BGC (2010, 2011, 2012a, 2012b and 2016). Based on this previous work, it is apparent that frozen ground will be encountered during construction of a number of proposed project facilities, primarily on north-facing slopes. Frozen soils will be identified as one of five material management types using initially previous data, confirmed in the field during clearing, grubbing and general earthworks activities, and then managed as described in Table 3.3-1.

Table 3.3-1: Management Strategies for Frozen Soils

Material Classification Type	Frozen Material Type	Strategy	Management Description
I	Fine and/or coarse-grained colluvial/alluvial soils or weathered bedrock with little or no ice content	Used as Fill or Stockpiled for Closure	Used as general fill or if excess to a local fill requirement stored for reclamation.
II	Coarse-grained sands and gravels with zones of variable ice content	Used as Fill	Exposed and readily thawed and drained, and then used as general fill within embankments and platforms.
III	Fine-grained soils with relatively thin zones (lenses) of low proportions of "excess ice"	Stockpiled for closure	Separated and co-disposed with other non-frozen soils within stockpiles to be used for reclamation.
IV	Fine-grained silty and clayey soils with relatively thick lenses of highly visible "excess ice"	To IROSA	Segregated at excavation site based on prior field data/information, and additional observations during excavations. Excavated and hauled to the ice-rich overburden storage area located in the Haggart Creek valley.
V	Small quantities of ice-rich soils (fine or coarse)	Locally stored	Disposed of adjacent to excavation sites where thawing and drainage can be managed locally rather than hauled to the

			IROSA.

This FMMP meets the following conditions from the water use licence (QZ14-041):

> *36. The Licensee shall identify and excavate Ice-Rich Soils from beneath the footprint of the HLF* (see also the HLF Foundation Improvement Plan)
>
> *37. Materials excavated during construction shall be managed as described in the Application, including the Frozen Materials Management Plan* (this Plan).
>
> *38. No frozen soils shall be used as fill for construction of Engineered Structures on the site where compaction of those materials is required to ensure appropriate performance.*

The management strategies described in Table 3.3-1 recognize that the excavation of frozen ground, particularly ice-rich frozen ground, requires additional effort and care beyond that required for typical excavation of unfrozen ground, or for ice-poor frozen ground. Well-bonded, ice-rich material will be difficult to excavate and for planning purposes, is assumed to require some degree of ripping. Consideration will be given to the thaw behavior of this material, and allowances made for adequate drainage and associated erosion and sedimentation control, as well as additional time and effort for the work. The general and specific strategies for managing drainage and sedimentation are described in the Water Management Plan. Exposure of ice-rich material, particularly thick soil horizons, and the associated thaw may result in wet, muddy, soft ground, and poor trafficability, along with local slumping and other nuisance effects. Each of these effects related to exposure of ice-rich material has been considered in the planning, design, and construction of mine site infrastructure. When ice-rich fine-grained soils are excavated and stockpiled, they may become unstable while thawing, and may stand at only very gentle slopes of a few degrees. Water draining from the thawing soil will also be managed, along with any associated sediment load.

Effective management of ice-rich material excavated during construction will be supported through prior planning, and will consider: the volume of material excavated, the spatial (lateral and vertical) distribution of material excavated, the schedule for material excavation, locations of sources of ice-rich material, potential locations of temporary or permanent storage facilities, design and operation of storage facilities, potential re-use of suitable thawed and drained materials, and closure of permanent storage facilities.

The excavated ice-rich materials will be derived from several different lithological units, including till, colluvium, alluvium and weathered rock. These materials vary in thickness, lateral distribution, texture, grain size distribution and natural moisture content (or ice content). Difficulties in handling thawing ice-rich materials will vary depending primarily on grain size, ice content and the thickness of the ice-rich unit. Coarser soils, like sand and gravel, will tend to drain more quickly and more freely on thawing, and will thus be less difficult to handle than finer soils. Thick zones of fine-grained ice-rich soils (referred to here as problematic) tend to drain more slowly, retain excess pore pressures, and have lower strength for longer periods than isolated thinner lenses of fine-grained materials, or coarser soils in general. It will be advantageous to segregate problematic ice-rich materials from less or non-problematic ice-rich and other frozen materials during construction on the basis of thickness, lateral extent and grain size. Decisions on potential segregation will be made during site development activities when it becomes more evident whether the materials can be meaningfully separated. The expected proportion of problematic fine-grained ice-rich material has been estimated together with the proportion of other frozen/non-frozen material where other material management practices can be used (i.e., identifying soils that can be readily stockpiled with other closure soils).

3.4 MATERIALS QUANTITIES

BGC (2012c) provided a preliminary estimate of the volume of ice-rich soils that may be encountered during the construction of Project facilities. This preliminary estimate did not qualify whether the frozen ground met the criteria for ice-rich soils (i.e., all frozen ground was lumped together independent of volumetric ice content) and the estimate did not segregate the ice-rich soils for management strategy. Further, the estimate was derived using an earlier General Arrangement (GA) (i.e., assumed for the 2012 Feasibility Study). Based on additional field work and reconnaissance, the current GA, and a detailed assessment of test pit logs, photos and borehole records the estimate was further refined and segregated based on ice content, and the thickness, lateral extent and grain size of the ice-rich soil horizon/layer into material management strategy types described in Table 3.3-1. This strategy distinguishes between potentially ice-rich fine grained soils which must be fully contained (referred to here as problematic or Type IV soils in Table 3.3-1), other frozen materials that may either be directly utilized for engineered fill (Type II) or which may be directly co-disposed with soils designated for closure stockpiling (Type III). The estimated quantity of problematic ice-rich soils expected to be hauled and stored within the IROSA is approximately 113,100 m^3 (plus 15% for swell and 15% for contingency). Approximately 12% of this material is expected to be generated in the first year of construction.

Table 3.4-1: Functional Area Ice-rich Material Volume Estimates by Classification Type

Functional Area	Area (ha)	Ice-rich Total	Type I or II Used as fill	Type I or III - disposed closure use	Type IV IROSA	Type V Locally stored	Year
HLF - Phase 1	46.1	18.4	0.0	8.4	10.0	0.0	-1
HLF Embankment	5.6	3.2	0.0	0.0	3.2	0.0	-2
HLF - Phase 2	23.6	7.1	0.0	2.1	5.0	0.0	3
HLF - Phase 3	34.0	0.0	0.0	0.0	0.0	0.0	5
Events Pond	12.5	63.9	16.0	23.9	16.0	8.0	-1
ADR Process Plant	3.0	0.0	0.0	0.0	0.0	0.0	-1
Lower Dublin South Pond	3.3	0.0	0.0	0.0	0.0	0.0	-2
Substation and Landfarm Facility	1.9	24.4	9.0	6.0	6.0	3.0	-1
Camp expansion	2.2	0.0	0.0	0.0	0.0	0.0	-2
Truckshop	2.7	31.1	10.0	8.8	7.8	4.6	-1
Crushed Ore Transfer Station	1.9	39.9	14.9	10.0	10.0	5.0	-2
Primary Crusher Site	2.5	0.0	0.0	0.0	0.0	0.0	-2
Secondary and Tertiary Crusher	6.5	0.0	0.0	0.0	0.0	0.0	-2
Ore Stockpile Area	7.8	19.3	2.0	4.1	5.0	8.0	-1
Site access roads - only new ones	15.5	21.7	3.7	12.0	0.0	6.0	-2
ROM Haul Road	23.0	48.1	7.0	6.1	10.0	25.0	-1
Pit	67.3	0.0	0.0	0.0	0.0	0.0	1
Conveyor	3.9	22.2	7.0	8.0	5.2	2.0	-1
EP WRSA - excluding ROM Haul	72.0	104.0	26.0	52.0	26.0	0.0	-1
PG WRSA	31.6	9.0	2.0	5.0	2.0	0.0	-1
Pads explosives storage	1.9	0.0	0.0	0.0	0.0	0.0	-1
Magazine storage pad	0.5	0.0	0.0	0.0	0.0	0.0	-1
Topsoil Stockpiles A (near	3.1	0.0	0.0	0.0	0.0	0.0	-2
Topsoil Stockpiles B (near	2.7	0.0	0.0	0.0	0.0	0.0	-2
Topsoil Stockpiles C (near HLF	3.8	0.0	0.0	0.0	0.0	0.0	-1
Laydown area	2.3	26.7	6.0	6.7	7.0	7.0	-1
Total		**439.0**	**103.6**	**153.1**	**113.1**	**68.6**	
Stage 1 Construction		64.8	18.6	22.0	13.2	11.0	
Stage 2 Construction		367.2	85.0	129.0	94.9	57.6	
Operations							
Add 15% for Swell and then 15% for Contingency							
Total		**580.6**	**137.0**	**202.5**	**149.6**	**90.7**	

NOTE: all values in 1,000 m3; Stage 1 Construction occurs during Year -2 and Stage 2 Construction is during Year -1.

4 EXCAVATION MANAGEMENT

4.1 FIELD GUIDELINES FOR SUPERVISING EXCAVATIONS

There is an extensive set of background subsurface geotechnical data for the Dublin Gulch area collected over the past several years, which is in addition to that collected by prior operators during the 1990's. This data was collected and logged by engineering professionals using professional judgment and standard engineering field classification practices. The subsurface data sets were collected for site-specific areas identified for excavation and construction activities.

Following best management practices (BMPs) for construction activities (i.e., using professional geotechnical field staff experienced in identifying soils and rocks in permafrost terrain and construction operators and managers experienced in permafrost field conditions), and adaptive management practices for incorporating site-specific field information collected during the construction process are key factors for the successful execution of this Plan. One of the primary objectives for those supervising excavation will be to segregate frozen materials into the five types as described in the Table 3.2-1.

The purpose of the classification structure presented in Table 3.2-1 is to provide a set of field guidelines to support standard best practices for supervising excavation activities where materials will be classified and sorted for particular uses (e.g., structural fill, road base, top soil, potential reclamation cover material, etc.). A typical sequence for a particular construction area will include:

1) detailed review of construction plans for cutting/filling in a specific area,
2) detailed review of the existing data from air photos, test pits and borings,
3) field assessment of the site-specific terrain to undergo construction including reconnaissance across the terrain to be excavated, along existing road cuts, and to the locations of previous test pits,
4) conducting additional site investigations, if needed, in specific areas,
5) implementing erosion and sediment control measures as stipulated in the Water Management Plan,
6) initiating excavation and material haulage as dictated by cut and fill balances specified in facility designs, while classifying and segregating materials for specific uses or storage,
7) implementing adaptive management practices based on the observed feasibility and/or continuing need of executing the classification guidelines, and
8) modifying the classification system, as needed, to achieve the most efficient, cost effective way and environmentally sound method to manage the excavations and material management at the site; this would include achieving lower environmental impact due to minimizing construction vehicle usage, requiring minimal material movement, and maintaining more local material sources that would be available for future reclamation purposes.

In general, the field supervisor (a geologist, engineer or technician) will record and document their observations prior to and during all excavation activities using standard practices. These would include general descriptions of soil and bedrock type, stratigraphy (lateral and vertical extent) of units exposed or as determined by interpolating between boreholes and test pits, soil properties (USCS Soil Type), lateral and vertical extents of ice-bearing soils, including the percentage of ice of each unit or sub-unit as necessary. Representative samples will be collected from borehole cores, test pits or excavation faces for grain size analyses conducted in the field. In addition, approximate ice volumes or percentages, using a 5 cm diameter core or bulk sample of an approximate volume, will be estimated (following the classification system shown in Figure 4.1-1).

Figure 4.1-1: Classification for Description of Frozen Ground

ICE NOT VISIBLE

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

VISIBLE ICE LESS THAN 2.5cm THICK

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

VISIBLE ICE GREATER THAN 2.5cm THICK

GROUP SYMBOL	SUBGROUP SYMBOLS	SUBGROUP DESCRIPTION	
ICE	ICE + soil type	Ice with soil inclusions	
	ICE	Ice without soil inclusions	

(Modified from Guide to Field Description of Permafrost for Engineering Purposes, NRC. Technical Memorandom 79)

NOTE 1) Dual symbols are used to indicate borderline or mixed ice classifications
2) Visual estimates of ice content as indicated on borehole logs are ± 5%

LEGEND Soil; ■ or Ice

The objective will be to provide estimates of the bulk ice content across an area, including volumetric estimates for the stable and thaw unstable zones (i.e., as classified into the types identified in Table 3.2-1).

The responsibility of the field supervisor also includes monitoring the following areas: any headwall retreat of the cutslope, re-vegetation, channeling and rilling of slope face, type/nature of any failures (slump, drip, crumble or block fail), and rates of sediment accumulation in ditches and sediment basins. The field supervisor, in conjunction with the construction foreman, will attempt to minimize the duration of the disturbance and confirm that slope stabilization and re-vegetation measures based on observed field conditions are implemented as soon as practicable or institute adaptive management measures (e.g., change cutslope angles, add sediment basins, etc.).

4.2 EXCAVATION METHODS

Generally, drilling and blasting of frozen materials will not be required. Where site-specific conditions indicate that the BMP for ice-rich material will be excavation and removal to the IROSA a shovel, equipped with a ripper tooth, as necessary, will be employed with transport of any excavated material to the IROSA via a haul truck. Based on-site experience in building exploration roads and excavating trenches and test pits, thinner pocket layers of poorly to moderately bonded coarse-grained ice-rich material can be excavated with a shovel; thicker layers of well-bonded fine-grained ice-rich material will require ripping with a shovel tooth.

4.3 SEDIMENT AND EROSION CONTROL

Sediment and erosion control measures will be implemented and maintained to ensure that excavations do not results in discharge of sediment-laden water to the receiving environment without adequate controls. Sediment mobilizations and erosion will be minimized by using the following measures.

- Limiting the extent of land disturbances to the practical minimum.
- Reducing water velocities across the ground using soil bioengineering, surface roughening, sediment logs, and recontouring.
- Reseeding disturbed land and constructing drainage controls to improve stability.
- Constructing sediment control devices, such as collection and diversion ditches, sediment traps, in-channel energy dissipaters, and sediment basins.
- Installing rock riprap, channel lining, sediment filters, or other suitable measures in ditches on steep gradients as required.
- Restricting access to re-vegetated and stabilized areas.
- Directing all sediment-laden runoff to the appropriate sediment control measure.
- Constructing appropriate temporary BMPs (e.g., silt fences, hay bales) downslope of disturbed sites where more permanent sediment control measures are not appropriate or in combination with permanent measures.

A description of these measures, their construction considerations, and follow up monitoring are provided in the Water Management Plan (WMP) and must be followed for all excavations.

4.4 SPECIFIC CONSIDERATIONS

4.4.1 Management Approach

The management of frozen ground during construction and the effects of that construction are approached on a site-wide basis, as described herein, and by related plans (for example, the Water Management Plan and the Environmental Monitoring, Surveillance and Adaptive Management Plan). The management of ice-rich soils during preparation of the HLF is dealt with in more detail in the HLF Foundation Improvement Plan due to specific conditions in both the water use and quartz mine licences.

4.4.2 Excavation Procedures

With respect to excavations in permafrost, and while keeping in mind criteria for cut slope gradients, the vertical face of the top of the cutslope, could be steepened so that natural stabilization using in-situ vegetation can take place. In this case, it is preferable to allow the vegetative mat to drape over the top edge to shade the interface between the slope and the original ground, so this part of the area should not be stripped. Also, in many cases, larger trees on the edge should be hand cut, to minimize the collapse of the tree onto the exposed slope face so that the organic mat is not torn and more permafrost is exposed. On flatter cut slopes, a windrow of vegetative mat could be stripped and conserved for later machine spreading onto the stripped area. If frozen gravels (coarser materials in general) are exposed in the cutslope, the slope can be re-graded and stabilized to allow natural re-vegetation processes to reclaim the cut.

In a few locations, an excavation may also expose permafrost with excess ice. In these cases, the zone will be over-excavated, as needed, to a depth where the thickness of backfill (coarse sand and gravels) will provide sufficient insulation to minimize any effect from the potential thawing of permafrost.

4.4.3 Cutslope Criteria

Field investigations in support of geotechnical recommendations for design of Project infrastructure were undertaken in 2009, 2010, 2011 and 2012. Based on the observed subsurface conditions for the Project site and generally accepted engineering practices, recommended slope geometry was developed for permanent cut slopes and engineered fill slopes for various Project components.

The recommended slope geometry developed for certain permanent cut slopes into frozen ground indicated that a steepest cut slope angle of 2.5H:1V in overburden and 2H:1V in till should be used . The geotechnical recommendations also suggested that engineered fill slopes constructed of structural fill or rock fill should be at angles of 2H:1V or flatter.

5 STORAGE MANAGEMENT

5.1 GENERAL FROZEN MATERIALS

5.1.1 Design Assumptions

This section describes the management strategies for material types I, II, III and V. Management strategy for Type IV (problematic) soils is described in Section 5.2.

The reclamation stockpile areas will be managed in the same manner as all other construction areas by means of interception and diversion of runoff around and away from the disturbance areas. Stockpile areas will be set out so that sediment from erosion is trapped and contained locally in swales and depressions, making use of more competent soils to form containment berms. The drainage management of the stockpile areas will be integral with general construction water management measures across the site and is described in more detail in the Water Management Plan.

5.1.2 Management Approach

The Mined Rock and Overburden Piles Investigation and Design Manual Interim Guidelines (Design Manual) (Piteau 1991). provides the general criteria that will be used for each soils stockpile constructed on site. Relatively small quantities of ice rich fine-grained soils can be feasibly and practicably co-disposed with larger quantities of overburden soils in gently sloping areas. If required, toe berms will be constructed to provide containment against flowsliding in an uncontrolled manner.

Frozen soils that do not exhibit flow sliding potential (Types I or III) will be co-disposed with overburden soils set aside for closure. The stability of closure soil stockpiles is addressed separately, but it is assumed that the geotechnical properties of any frozen co-disposed soils will exhibit similar stability to the closure materials sourced from other non-frozen areas. Alternatively, closure materials could be placed in zones that ensure the stability and containment of the frozen soils (upon thawing).

Frozen soils found to be suitable for use as general fill (Type II), that meet criteria for engineered compacted fills, when thawed and drained, will be used accordingly. Their properties will be similar to other cut materials judged suitable for fill or storage in stockpiles where there is an excess above the required fill volume. This material could also ultimately be used for closure.

5.1.3 Soil Stockpiles

5.1.3.1 Soil Stockpile Design

Soil salvage is the removal of soil after vegetation has been cleared and transport of soil by haul trucks to designated long-term storage sites. This includes selected frozen soils (Types I and III) that are not judged to be so wet, ice-rich or fine grained that their presence will cause instability in the stockpiles. Selection of the stockpile locations has taken into account:

- Volume of soil that must be stored,

- Topography (in some instances site preparation to level the area, or to stabilize it in areas of permafrost will need to be completed),
- Avoidance of natural drainages, and
- Travel distances.

Soil stockpiles will be created at several locations at the site. Advantage can be taken of access and haul road embankments to contain weaker materials, and to provide localized sedimentation ponds.

Careful zoning of the stockpiles will facilitate retrieval of selected materials required for closure, and also can result in improved stability by utilizing better drained stronger materials to contain weaker ones.

Also, stripped soils ultimately needed for closure will be stored as close as practical to sites where they will be required, taking advantage of local swales and depressions. All stripped soils, whether frozen or not, and whether ice rich or not, are regarded as very valuable for closure, and will be carefully placed for ease of retrieval.

Soil stockpile storage volumes are based on stockpile heights between 8 to 10 m and slopes of about 2H:1V. The precise slope angle will be determined on the basis of geotechnical evaluation of both specific foundation conditions as encountered, and the actual materials requiring storage.

BMPs and mitigation measures the stockpiling of soils will include the following:

- Soil will be stockpiled in suitable locations where it will not be moved or subject to further disturbance to minimize admixing and physical deterioration;
- Stockpile locations will be a sufficient distance away from operations to protect soils from contamination risk of spills or metal and non-metal deposition;
- Protective ditches will be constructed around stockpiles to prevent any spill reaching stockpiles and prevent any erosion from stockpiles from escaping offsite;
- Erosion will be managed by limiting the height and slope of stockpiles. Where possible, slopes will be approximately 2H:1V and heights will not exceed 10 m;
- Stockpiles will be oriented to reduce wind erosion as much as practical, and stockpiles will not be stored at heights of land to reduce wind exposure;
- Where required, erosion control measures will be implemented;
- Vegetation slash that is not cleared from the site will be incorporated into soil stockpiles;
- Soil stockpile locations and soil types will be identified by signage to prevent removal of material from the site and minimize mixing of soil types; and
- Vegetation will promptly be established on stockpiles, where appropriate, to reduce exposure of bare soil to wind and water erosion forces and control the establishment of invasive plants.

All locally stored Type V frozen material will be added to locally placed stockpiles that will incorporate silt fencing and/or other best practices to prevent the uncontrolled conveyance of sediment laden runoff or melt water from entering watercourses.

5.1.3.2 Foundation Conditions

As noted above, geotechnical evaluation of specific sites, and of materials being stockpiled will require ongoing assessment and field direction. As Type I, II III and V materials thaw and drain, their stability will improve. Similarly, weak wet foundation conditions, if encountered, will require site–specific direction by the geotechnical engineer to ensure that materials are placed in ways that buttress against flow-sliding rather than trigger it.

These stockpiles are not creating permanent structures and the main objectives are to avoid mass sliding during their temporary placement (i.e., during operations), and facilitate ultimate retrieval of valuable soil media. Foundation preparation may be required for adjacent road embankments and this effort should be coordinated with any measures that provide buttressing containment for stockpiled material that requires toe support.

5.1.3.3 Transport and Disposal

All excess cut soils for use at closure will be transported by truck from the excavation sites to the appropriate closest storage/stockpile areas. Detailed layouts of the road access into these areas will be determined by the supervising engineer, making allowance for foundation conditions, and making best use of more competent materials to buttress wetter and weaker ones. As noted above, the disposal layout will seek to ensure mass stability rather than trigger flow sliding.

5.1.3.4 Construction Quality Assurance and Quality Control

Construction of soil stockpiles will be carefully directed, documented and monitored. Corrective action to stabilize localized flow-sliding will be taken by constructing toe berms and/or improving drainage. Upon completion, each stockpile will be characterized geometrically and geotechnically, based on field records, so that closure planning can be optimized.

5.1.4 Monitoring and Surveillance

The role of the supervising engineer in monitoring actual soil conditions and stockpile behavior during construction is important. Ongoing intermittent inspection will be carried out as part of site-wide monitoring of the performance of all civil works. Guided by construction records of actual material conditions and zoning within and beneath the stockpiles, more or less importance will be assigned to the ongoing inspection of stockpiles during the mine life.

As noted earlier, the composition of the soil stockpiles will be documented so that as part of adaptive management the design of the closure capping system can be advanced to best utilize the actual properties and quantities of available material.

5.2 PROBLEMATIC ICE-RICH MATERIALS

5.2.1 Management Approach

This section describes the management strategy for material Type IV, problematic ice-rich soils. Fine-grained silty and clayey soils with relatively thick layers of visible “excess ice” are problematic due to their inherent low stability upon thawing, which in some cases may take a few years. Thus, the management approach for these soils is to segregate at the excavation site and then haul to the IROSA located in the Haggart Creek valley. This section describes the design concept, design criteria and construction issues associated with the storage facility.

5.2.2 Design Concept

5.2.2.1 Siting and Alignment Selection

Site selection for the IROSA was completed in three stages, BGC (April 2013). Twenty-one potential disposal areas were identified around the general project area, and ranked according to storage efficiency. Nine of the highest ranked alternatives were selected for further comparison, and rated according to criteria for resource conflicts, environmental considerations, social considerations, construction and design considerations, and closure and post-closure considerations. A sensitivity analysis identified two superior options in the existing depressions in placer tailings along Haggart Creek, and the area of Suttles Gulch above the diversion channel.

The Haggart Creek site (Figure 5.2-1) was selected as the preferred alternative, with Suttles Gulch (Figure 5.2-2) identified as a contingency, to be developed later for use if the quantities of ice-rich material generated in construction become significantly greater than expected and cannot be accommodated in the IROSA area.

The proposed IROSA is approximately 660 m long by 50 to 150 m wide and has been previously developed for placer mining. It lies along the east valley wall within the Haggart Creek Valley and is comprised of several large mounded tailings piles that separate four large depressions from Haggart Creek, which flows from north to south. The design considered tying five berms into the existing mounded tailings and till side-slopes to create four separate storage cells. The berms will be constructed using readily available coarse tailings material and a filter material on the upstream slope in order to promote draining of excess pore water while containing the fine-grained ice-rich overburden. The combined estimated storage capacity of the storage cells amounts to approximately 255,000 m^3.

5.2.2.2 Site Investigation

Following site selection, a geotechnical investigation was completed by NELPCo (2013) within the perimeter of the proposed IROSA to gather geotechnical information on subsurface conditions to support the design process. The geotechnical investigation consisted of:

- Review of all available historical data for the area of interest;
- A field reconnaissance of the proposed IROSA;
- Drilling of seven boreholes (strategically located in ideal locations for the storage area berms) using hollow stem augers to depths varying from 8 to 18 m to allow for the collection of Standard Penetration Tests and soil samples at 1.5 m intervals;
- Installation of three monitoring wells (one nested) and two standpipe piezometers for monitoring piezometric pressures and completing hydraulic conductivity testing; and
- Index soil testing.

The site area consists of four depressions situated between till cliffs cut into the eastern valley wall and mounded sand and gravel tailings produced by historical placer mining activities. The tailings are sparsely to non-vegetated, with higher densities of brush occurring within low lying areas. An overgrown road that traverses east and uphill from the till cliffs connects with tailings at the southern end of the storage area. A portion of the road includes a ditch that diverts mountainside surface runoff away from the placer tailings area.

Surface water run off drains into the depressions and has formed four small ponds. Runoff entering the ponds has historically originated from upslope road-side ditching along Haggart Creek Road (directed across the road via culverts during September 2013), freshet overflow from a historic diversion built by placer miners (likely early 1990's) from Platinum Gulch and primarily freshet run-off from the eastern slope. Drainage within the depressions is north to south to the southernmost pond, where it exfiltrates to subsurface soils. These ponds are leaky-confined by fine-grained sediments and are perched above the local groundwater table. At the time of the drilling and site work, there was no active outlet from the confined valley.

The soils encountered beneath the tailings included disturbed alluvial and fluvial sands and gravels overlying silt till and weathered bedrock. The in-situ subsurface soil densities varied from very loose to compact sands, compact clay, and very dense to hard till and weathered bedrock. No permafrost was encountered during the geotechnical investigation.

Groundwater was encountered in all but one borehole (MW03 – see Figure 5.2-1). Below the perched ponds, ground water was encountered at roughly the same elevation as Haggart Creek. Recovery tests were completed in a thick gravelly, silty sand aquifer encountered in borehole MW02 (located in the approximate center of the investigation area). The estimated hydraulic conductivity was 9.76×10^{-6} m/s.

Bedrock in the area has been characterized as zones of quartzite and granodiorite. The drill equipment used for this geotechnical investigation was able to drill into weathered bedrock, but unable to penetrate into competent bedrock. A rough comparison using topographic maps and borehole locations indicates that bedrock is highest at MW03 and decreases gradually to the south and dips towards the east.

5.2.2.3 Containment Filter Berm

The design comprises five berms that will form four storage cells within the IROSA (Figure 5.2-1). The crests of the berms will vary from five to eight metres in height with an upstream and downstream slope of 2H:1V. The berms will tie into the contours of the mounded tailings piles at elevations ranging from 750 to 758 m. Table 5.2-1 lists the estimated storage capacities and the required volumes of coarse aggregate and filter material for each berm. The Haggart Creek IROSA will be capable of storing approximately 255,000 m^3 of problematic ice-rich material (i.e., Type IV), assuming an approximate 2% (50H:1V) gradient for the storage surface, with a berm fill quantity of 28,000 m^3. The storage volume could be increased substantially (~25% to 35%) if the ice-rich material can be stacked behind the berms at slightly steeper grades (e.g., 15H:1V), or even more if the tailings mounds along the western side of the IROSA were re-configured and re-shaped into a single berm connecting the four storage cells.

Table 5.2-1: Estimated Storage Capacity and Volume of Berm Material

Storage Area	Overburden (m^3)	
1	37,000	
2	73,000	
3	45,000	
4	100,000	
Total	**255,000**	
Berm	**Coarse Material (m^3)**	**Fine Material (m^3)**
A	4,700	420
B	11,000	1,125
C	5,400	850
D	2,600	375
E	1,400	295
Total	**25,100**	**3,065**

Note: estimated volumes assume 6 m wide crest widths

The filter berms will consist of two parts, a coarse aggregate and a finer filter zone. The bulk of the berms will be constructed with coarse aggregate (25 to 200 mm diameter material with little to no fine-grained gravel) to facilitate proper drainage and avoid the build-up of pore water pressure in the berm.

The containment berm and the storage area's foundation are relatively permeable, and are expected to promote drainage of the thawing stored materials. Silt and clay found at the base of the berms will be relocated to promote increased infiltration of excess pore water into the subsurface and to the ground water table. A 2m wide granular filter, comprised of well graded sand and gravel, will be placed on the storage side of each berm to prevent migration of fines through the berm.

5.2.3 Design Update

The 2013 IROSA design was reviewed and updated to address the following items, mainly with respect to seismic considerations:

- Review and update seismic hazard parameters used in IROSA design;
- Check potential for triggering of seismic liquefaction in susceptible soils;
- Re-run slope stability models, including the post-seismic (liquefied) case for embankments where triggering of liquefaction is expected in the subgrade soils;
- Estimate embankment displacements under seismic and post-seismic (liquefied) conditions; and
- Check material gradations of the embankment and embankment face materials for compatibility with respect to filtering criteria.

Results of the IROSA design update confirm that the recommendations provided in the 2013 design report are valid. It is expected that locally sourced tailings material can be used to build the embankments, and that embankment stability for static and seismic conditions is acceptable in all cases.

However, potentially liquefiable soils have been identified in the vicinity of Embankment A and C, and there could be some associated risk of embankment slope failure and/or large displacements, particularly for embankments in the northern half of the IROSA. This risk has been mitigated as described in Section 5.2.5 Facility Construction.

More detail is provided in Appendix A for each of the individual embankments.

5.2.4 Design Criteria

As described NELPCo (2013) the IROSA will be designed, constructed and operated in accordance with the Design Manual prepared for the British Columbia Mine Waste Rock Pile Research Committee (Piteau, 1991). As noted in section 3.2, approximately 195,000 m^3 (up to 255,000 m^3 assuming 15% swell and 15% for contingency) of ice-rich fine grained soils may require containment at the IROSA. These materials may be generated at rates of about 4,000 m^3 per day under the worst conditions, although it is not practical to predict the rate accurately. It is possible, that approximately 75% to 80% of the total can be expected to be generated in the first year of construction.

5.2.4.1 Materials Properties

The foundation for the berms is composed of a variety of materials ranging from loose to compact sand, and clay tailings all underlain by weathered bedrock. Material properties including $N_{(60)}$ values, angle of internal friction, and bulk unit weight are provided in Table 5.3-1. At this time, the overall ice content of the overburden material to be placed within the storage area cannot be known; therefore, a high ice content has been assumed giving low strength parameters.

Table 5.2-2: Material Properties

		N(60)	Angle of Internal Friction	Bulk Unit Weight (kN/m^3)	Cohesion (kPa)
Foundation and Overburden	Very Loose Sand	<5	25	18.1	0
	Loose Sand	5 to 10	30	18.1	0
	Compact Sand	10 to 20	36	18.1	0
	Clay Tailings	13	30	20	0
	Weathered Bedrock	>50	45	23	0
	Overburden	-	2	15.7	0
Berm Material	Coarse Aggregate	-	36	17.1	0
	Filter Material	-	36	22.5	0

5.2.4.2 Fill Materials

For the purposes of construction and as shown on the appended drawings, the two fill material types to be used in construction of the IROSA embankments are referred to as Type 1 (coarse tailings) and Type 2 (filter material) Fill. Type 1 Fill should consist of coarse tailings with maximum particle size of about 200 mm that has been screened or otherwise processed to remove all particles smaller than about 25 mm in diameter. Type 1 fill should be well graded, with gradation curves having a Coefficient of Uniformity (Cu = D60/D10) greater than 4 and Coefficient of Curvature (Cc = D30 2/(D10*D60)) between 1 and 3.

More detail on the fill material properties is described in Section 4.2 of Appendix A.

5.2.4.3 Stability Assessment

Following the Design Manual, the selected ground motion parameters were based on an exceedence probability of 10% in 50 years, which corresponds with a return period of 475 years, and a Peak Ground Acceleration (PGA) of 0.14g.

The berm designs were analyzed by NELPCo (2013) assuming 1.3 factors of safety for the static condition and 1.0 factor of safety for the pseudostatic condition. These values were chosen based on the Design Manual guidelines, and from presented ranges of values using past experience, the existing site conditions, and material properties determined through site investigation and laboratory testing.

The storage area berms were evaluated assuming that fine-grained tailings were scraped off to expose the berm foundation and enhance the effective draining of excess pore water pressure created by thawing ice-rich overburden. Existing groundwater level readings taken during the geotechnical investigation were used in determining pore water conditions for the stability analyses.

The overburden materials to be placed within the dump are considered to be ice-rich (Type IV). As the overburden thaws this material could experience excess pore water pressure. For design purposes, a phreatic surface was assumed to be at the surface of the overburden material, extending to the inner side of the filter material where it decreases to the existing groundwater table below the base of the berm but into the foundation material. Analyses also considered the potential of higher groundwater table rising to within the foundation material to the base of the berm, although this scenario is considered unlikely.

Three failure modes were considered in the stability analysis: shallow seated, deep seated, and psuedostatic failures. NELPCo found that shallow failures were the most probable failures on the downstream and upstream faces. These failures are not considered to be critical to the stability of the design provided the slumps are repaired promptly. NELPCo considered the deep seated failures to be of greater concern, therefore, a deep seated critical slip surface that would have a larger impact on the stability of the berm was analysed.

Stability was checked for both empty and full capacity cells. Stability analyses were completed for each berm. All berms met or exceeded the minimum factor of safety recommended by the Design Manual.

As part of the Design Update, post-seismic slope stability was checked for each embankment where liquefaction is expected to be triggered, with the zones of liquefied soil identified in the liquefaction triggering assessment incorporated into the slope models and a reduced, post-seismic soil strength assigned to liquefied layers.

No horizontal seismic coefficient was applied in the post-seismic slope stability models (i.e., it is assumed that the reduction in soil strength due to liquefaction occurs after the period of strong shaking during an earthquake). Similar to the seismic slope stability assessment, stability at each embankment was considered for a variety of cases (i.e., empty, full, partially full).

Results of post-seismic (liquefied) stability analyses are described for each embankment in Appendix A. In summary, liquefiable layers were identified in the soil profiles for both Embankment A and C, but not in the other embankments. The results suggest that the embankments would suffer significant stress due to liquefaction following the event of the design earthquake. However, these embankments are low risk structures and the potential of failure is easily mitigated by the construction sequence, which is described below in Section 5.2.5.

5.2.4.4 Water Management

Controlling surface water run-off and groundwater is key in maintaining overall function of the IROSA.. Ensuring that major surface water run-off sources are diverted from entering each storage cell, and that groundwater does not buildup at and along the berm is critical to the overall stability of the storage area. To ensure that melt water adequately drains through the storage berm and into the subsurface, the fine-grained silty tailings will be scraped off the berm foundation, and coarse grained aggregate should be used for berm construction. Surface water run off should be actively managed, if necessary, to minimize the amount of standing water collecting within the storage area.

The historical diversion of Platinum Gulch freshet overflow should be decommissioned to prevent the freshet flows from Platinum Gulch entering the IROSA. Further, the existing interceptor ditch located upslope of the IROSA should be cleared and extended to the north, as much as feasible to divert non-contact runoff from flowing to the south and away from the facility. These efforts will reduce the large majority of water from entering the IROSA. An additional diversion ditch on the east side of the IROSA, will be built, if deemed practical and necessary to intercept runoff from the small interfluvial upslope area, prior to loading of ice-rich material into the IROSA.

Once the ice-rich material has been placed in storage to final grade, surface erosion and sediment control will be required within the containment area. A roadside interceptor ditch draining to a small sediment basin may be required downslope of the storage facility for collection of any water that might seep from the lowermost containment berm. Pond outflow meeting discharge criteria would be directed towards Haggart Creek; if criteria are not met, pond water would be pumped back to within the IROSA where it can later exfiltrate to groundwater. Details of interceptor ditches and sediment control measures are discussed in the Construction & Operations Water Management Plan.

It is expected that some water will enter the containment areas from time to time, in the form of surface runoff and/or groundwater seepage from the forested slopes to the east (particularly during spring freshet), as precipitation, and from thawing of ice-rich overburden soil stored in the IROSA. As such, to minimize accumulation of water in the IROSA containment areas, waste overburden placed in the IROSA should be graded to avoid ponding on top of fine-grained and/or other low permeability soils, and to encourage infiltration of water into the embankments and/or exfiltrate into the ground.

Wherever freeboard for containment of surface runoff does not exist at any point around the perimeter of a filled cell of the IROSA, suitable erosion control measures including (but not limited to) silt fencing will be established such that sediment laden runoff from the cell is intercepted prior to flowing from the cell

The IROSA including containment berm toes have been sited to avoid encroaching into the Haggart Creek floodplain, and are well back from the required 30 m offset of facilities (Figure 5.2-1).

5.2.5 Facility Construction

5.2.5.1 Construction Sequence

Development of the IROSA will consist of the following main tasks:

- Borrow development from placer tailings in the immediate area, including selection and processing of engineering materials for the coarse aggregate berms and the upstream filter zones;
- Foundation preparation, including leveling and relocating of existing organics, fine-grained materials or other unsuitable materials within the footprint of the berm foundation, and excavation of key trenches, as necessary;
- Fill placement and compaction in lifts up to 1.5 m thick, including coincident placement of berm and upstream filter materials;
- Initial survey of completed berm for baseline deformation monitoring.

While each of these activities can be completed throughout most of the year, berm fill placement and compaction will be completed during post-freshet and prior to freeze-up to minimize difficulties with watering and compaction. Details of foundation preparation and embankment construction are described in NELPCo (2013).

The construction of the IROSA will be a staged process, with individual embankments and containment areas built as and when required depending on volumes of ice-rich overburden material generated through the mine life. The intent is to construct the northernmost embankments and containment areas first, to maximize the flow path and filtering of water melting out of stored ice-rich overburden before reaching the sediment basin prior to discharge to Haggart Creek. However, Embankments A and C were identified as being expected to experience liquefaction of foundation soils under the design earthquake event, with likely consequences including damage and/or failure of the embankment and possible release of stored overburden into the adjacent downgradient containment area.

As such, to limit the potential for infiltration of sediment laden water from the IROSA, Embankments A and B are to be constructed at the same time, such that Embankment B would be in place in the event of the design earthquake to ensure that any sediment-rich overburden and/or meltwater is filtered before entering the sediment basin prior to discharge to Haggart Creek. Similarly, Embankments D and E are to be constructed at the same time as Embankment C. Under these conditions a release of stored overburden will not occur.

5.2.5.2 Transport and Disposal

Ice-rich materials will be hauled to and placed in the IROSA by dump truck. Ice-rich materials will not be placed in any of the cells of the IROSA until the confining berm for that cell has been constructed.

Materials will be hauled immediately on excavation to minimize the time for thawing during handling, transport and placement, and should be placed so as to thaw as much as possible to reduce swell and facilitate conditioning for future reclamation. The stored materials may become soft on thawing. This phenomenon will be more pronounced during summer and early fall when air temperatures are highest. Lifts of waste will be graded gently, as feasible and practical depending on trafficability of the materials, toward the working edge to promote drainage away from the stacked waste into temporary in-storage water collection areas within each cell.

5.2.5.3 IROSA Volume Management and Contingency Storage

SGC will conduct frequent (daily when adding material to a facility) monitoring which will include periodic estimates of stockpile volumes. Standard construction management BMPs for maintaining visual inventory (or" counting") of truckloads, which will be complemented by periodic (i.e., monthly when facility is active) surveying of storage facilities to check the volume and rate of filling of each storage facility will also be followed.

Further, the volume build-up in the IROSA will be monitored. Re-assessment of the remaining volume of ice rich soil requiring engineered storage will be identified as being required at the earlier of 12 months from the start of construction, or prior to the ice rich overburden storage area reaching 85% of its design capacity as required by clause 136a of QZ14-041. Additional design capacity would be developed based on predicted additional volume requirements associated with future construction activities. As stated above, the Haggart Creek IROSA was selected because of the potential to continue to build additional capacity, up to 1,000,000 m^3, as needed. It will be highly unlikely, however, that the storage requirements would approach this volume.

Prior to the providing the additional design, a revised amount of the remaining Type IV and other types of ice rich material still to be excavated and deemed to require engineered storage will be estimated. If the revised estimate indicates that there is insufficient storage for expected ice-rich material then additional capacity at at the Haggart Creek IROSA will be installed. This additional storage volume will consider a 15% contingency plus an additional 15% for swell. The current plan calls for additional (or contingency) storage by increasing the capacity at the Haggart Creek IROSA by incrementally increasing berm heights, which would ultimately join some or all of the storage cells until the maximum capacity of the area is reached. Based on preliminary estimates, this area could contain up to 1,000,000 m^3.

5.2.5.4 Construction Quality Assurance and Quality Control

A construction quality assurance plan will be developed to ensure that the parameters used during the design process are achieved. Elements to consider include:

- Monitoring of fill material particle size distribution and placement;
- Preparation of construction record drawings

The site development contractor will prepare a construction quality control plan, and to include, at a minimum, the following components:

- Inspection of foundation subgrades;
- Inspection and testing of selected berm and upstream filter materials;
- Regular accounting of volumes during fill placement and grading;
- Daily inspections and photographic records of construction activities;
- Photographs of the construction process at each stage of construction;
- Oversight of installation of any required deformation monitoring targets;
- Initial baseline survey for deformation monitoring; and

- Preparation of construction record drawings as a record of initial construction signed and sealed by a professional engineer registered in the Yukon.
- A detailed design report submitted to the Board at least 10 days prior to construction of any additional storage capacity to be utilized.

5.2.6 Monitoring and Surveillance

The overall performance of the IROSA will be dependent on the physical stability of the berms. For a Class II dump, the guidelines specify visual monitoring with basic instrumentation. Visual inspections will be completed regularly to check for signs of instability including tension cracking, surficial sloughing, bulging, or seepage zones along the downstream face of the berms.

A monitoring program will be designed, and implemented, and will include the following:

- Regular visual inspection of the berms (crest and toe) looking for any signs of instability (cracking or differential settlement) or erosion;
- Regular visual inspection of the berm toes for any signs of seepage containing fine grained materials;
- Installation of settlement pins for deformation monitoring after construction and initial survey of completed berms for baseline deformation monitoring; and
- Monitoring of settlement pins.

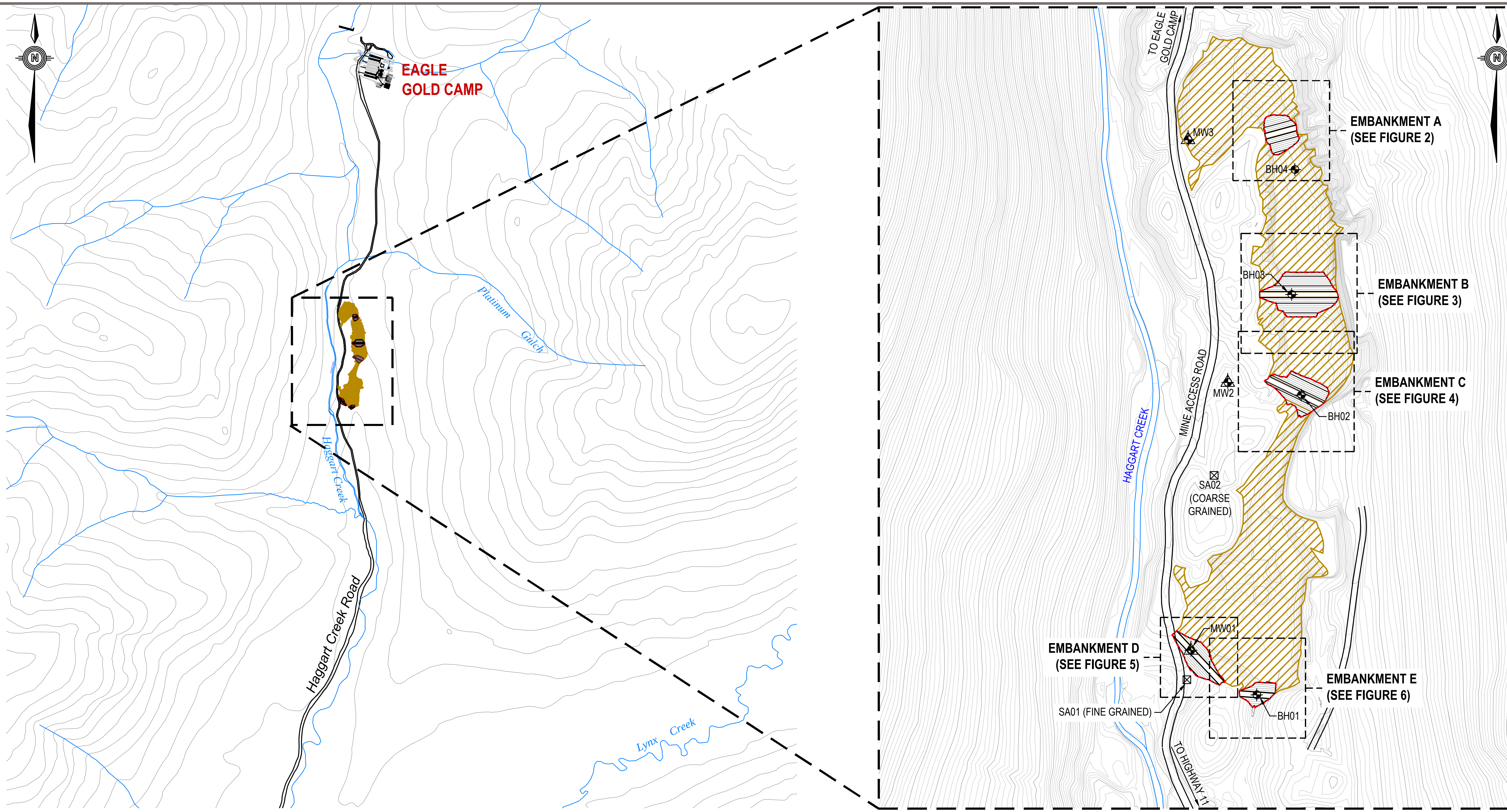
The results of the visual monitoring will provide insight into the physical performance of the filter berms over the course of operations. In the event of instability, or poor performance (e.g. slumping of the crest, bulging of toe areas, erosion), deformation monitoring of specific areas or remedial construction could be undertaken.

Prior to construction, water levels in the existing piezometers/wells will be read a sufficient number of times to establish baseline ground water table conditions.

Visual inspections of the berms will be routinely conducted by technical personnel at the mine. More detailed visual inspections will be conducted on a monthly basis by a competent person who has appropriate experience and is familiar with the technical aspects of the containment berms design, construction, and monitoring.

Data from visual inspections and any more detailed deformation monitoring, if required, will be collected and interpreted in an annual data report, with a detailed assessment and recommendations for monitoring and remediation.

The IROSA will be monitored periodically as warranted by weather and use of the facility. Visual monitoring will include inspection for tension cracking, sloughing, bulging, or seepages flows at the toe of the berm. Groundwater levels will be monitored by piezometers installed prior to construction and use of the IORSA. Survey points will be established on the crests of each berm which will be surveyed on a semi-annual basis to monitor settlement or lateral movement. The frequency of monitoring will increase if significant movement is identified.



LOCATION PLAN

0 1,000m

Scale: 1:25,000 @ 11"x17"

SITE PLAN

0 200m

Scale: 1:4,000 @ 11"x17"

ISSUED FOR USE

LEGEND:

- BORROW SOURCE SAMPLE LOCATION (2013 GEOTECHNICAL EVALUATION - W14103150-02)
- BOREHOLE LOCATION (2013 GEOTECHNICAL EVALUATION - W14103150-02)
- MONITORING WELL LOCATION (2013 GEOTECHNICAL EVALUATION - W14103150-02)
- APPROXIMATE EMBANKMENT FOOTPRINT
- EXISTING DIVERSION DITCH ALIGNMENT

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
SIGNATURE
Date June 8/17
PERMIT NUMBER PP003
Association of Professional Engineers of Yukon

PROFESSIONAL ENGINEER
YUKON TERRITORY
ADAM W. WALLACE
8 June 2017

CLIENT
STRATAGOLD CORPORATION

TETRA TECH

HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

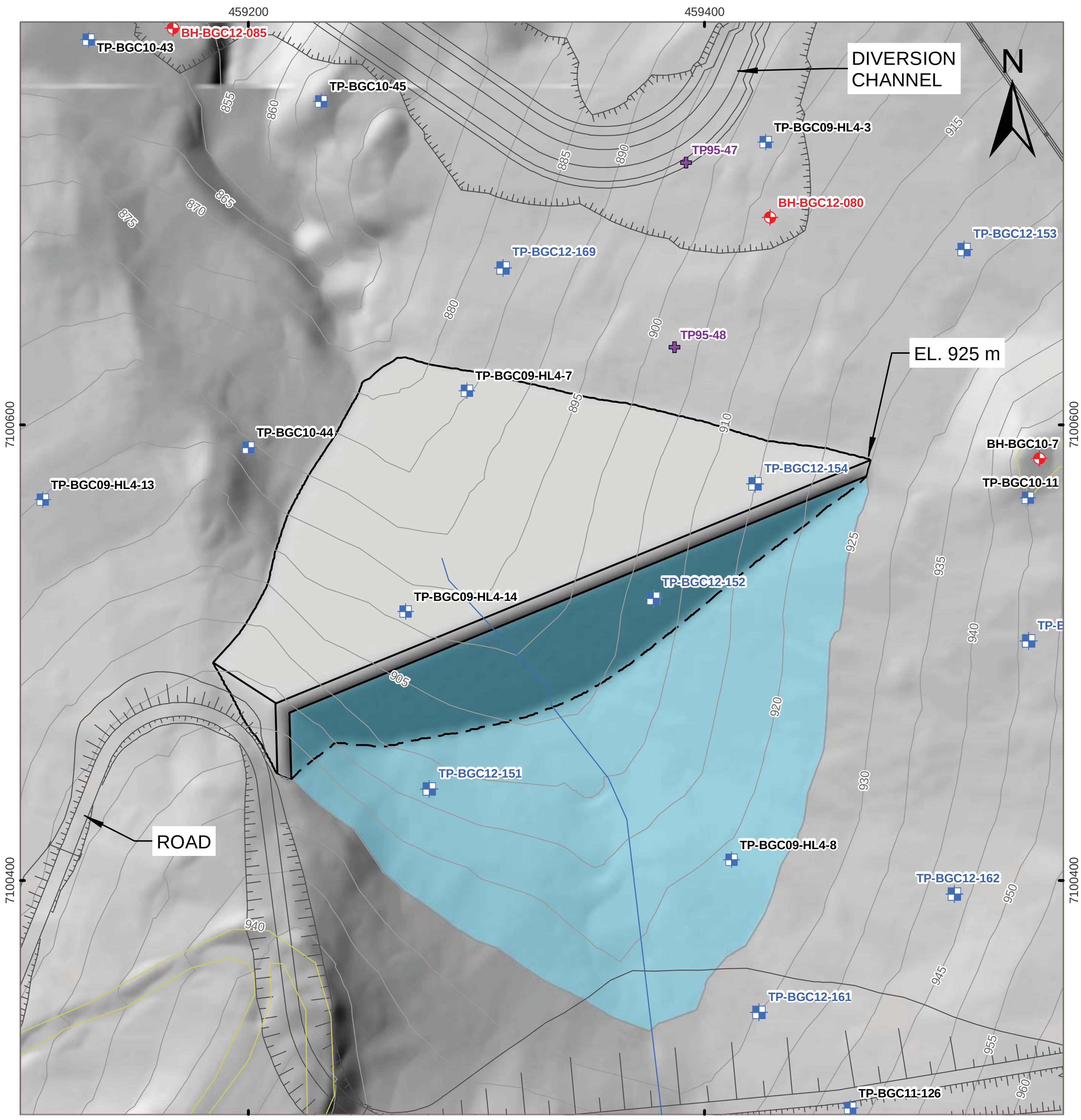
SITE PLAN SHOWING EMBANKMENT LOCATIONS

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0

OFFICE	DATE
EBA-WHSE	May 29, 2017

Figure 1

Q:\Whitehorse\Data\0201drawings\Dublin Gulch\ENG.WARC03235-01 Haggart Creek IROSA Design Update\ENG.WARC03235-01 Fig.1-R0.dwg [FIGURE 1] June 01, 2017 - 1:14:47 pm (BY: BUCHAN, CAMERON)



LEGEND

- PROPOSED INFRASTRUCTURE LAYOUT
- EXISTING ROAD
- STREAM
- BGC BOREHOLE
- BGC TEST PIT
- BOREHOLE BY OTHERS
- TESTPIT BY OTHERS
- CONTAINMENT BERM
- POTENTIAL STORED ICE-RICH MATERIALS
- 5 m CONTOUR

NOTES

1. Proposed infrastructure layout received from Wardrop March 28, 2012.

PRELIMINARY DESIGN.
FOR INFORMATION ONLY.
SUBJECT TO CHANGE.
NOT FOR CONSTRUCTION.

EAGLE GOLD PROJECT
YUKON TERRITORY

Suttles Gulch Ice-Rich Overburden Storage Area

PROJECTION	DATUM	CLIENT
UTM Zone 8	NAD83	StrataGold Corporation

Scale: 1:2,500
40 20 0 40
Metres

FILE NO.
0792008-03-10

BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY
Vancouver, BC Phone: (604) 684 5900

PROFESSIONAL SEAL

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	LL	DW	PQ	0

STATUS	OFFICE	DATE
FINAL		April 2013

Figure 5.2-2

BGC: X:\Projects\0792 Victoria Gold\008\Workspace\20130108_REPORT_Ice_Rich_Materials_Management_Plan\fig_5_1-2_Suttles_Gulch_Option_Location_FINAL.mxd

Drawing to be read in conjunction with Management Plan for Ice-rich Materials dated April 2013

6 REPORTING

An annual report will be prepared that will summarize management activities and field results from the excavation, construction, transport, stockpiling, disposal and monitoring of frozen materials. Records of monitoring shall include summaries of data generated as a result of the monitoring activities described herein, including analysis and interpretation by a qualified individual or firm and a discussion of any variances from baseline conditions, from the previous years' data, or from expected performance, or variances from expected conditions such as the volume of ice rich material.

7 REFERENCES

BGC Engineering Inc 2013. *Draft* Ice-rich Materials Management Plan, version 2013-01, April 2013.

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Knight Piésold 1996b. Report on Feasibility Design of the Mine Waste Rock Storage Area, First Dynasty Mines, Dublin Gulch Property.

Piteau 1991. Investigation and Design Manual – Interim Guidelines; Investigation and Design of Mine Dumps, prepared for the BC Mine Waste Rock Pile Research Committee, by Piteau Associates Engineering, Ltd, May 1991.

Sitka Corp. 1996. Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining.

APPENDIX A

Geotechnical Design Update and IFC Drawings

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TETRA TECH

June 8, 2017

ISSUED FOR USE
FILE: ENG.WARC03235-01
Via Email: kevinm@jdsmining.ca

JDS Energy and Mining Inc.
206 – 3200 Richter Street
Kelowna, BC V1W 5K9

Attention: Kevin Mather, President

Subject: Geotechnical Design Update and IFC Drawings
Haggart Creek Ice-Rich Overburden Storage Area
Eagle Gold Project – Dublin Gulch, YT

1.0 INTRODUCTION

NND-EBA Land Protection Corporation, operating as NELPCo Limited Partnership (NELPCo) was retained by JDS Energy and Mining Inc. (JDS), on behalf of StrataGold Corporation (StrataGold), to review the existing design and prepare drawings for construction of a proposed Ice-Rich Overburden Storage Area (IROSA) at StrataGold's Eagle Gold Project, located at Dublin Gulch, YT.

NELPCo is an aboriginal company that is majority owned by the Na-Cho Nyak Dun Development Corporation, in partnership with Tetra Tech Canada Inc. (Tetra Tech), NELPCo's exclusive engineering service provider, which has completed the scope of work described herein.

IROSA facilities at the Eagle Gold Project are intended to be used for storage and disposal of waste overburden material, including ice-rich permafrost, which is expected to be produced during construction of the Eagle Gold Mine.

The Haggart Creek IROSA is located in an area of tailings produced during historical placer mining activity, on the east side of Haggart Creek and the existing mine access road and about 2 km south of the mine camp.

A preliminary geotechnical design for the Haggart Creek IROSA was developed in 2013 by Tetra Tech (operating as EBA, a Tetra Tech Company), and a geotechnical design report (*Geotechnical Design – Ice-Rich Overburden Storage Area Berms – Eagle Gold Property, Yukon Territories,* File No. W14103150-02) was prepared and submitted to StrataGold, via NELPCo, in December 2013.

The purpose of Tetra Tech's current scope of work is to review and update the existing IROSA design, and prepare Issued for Construction (IFC) drawings for construction of the IROSA facility berms. This report serves as a covering letter for transmittal of the IFC drawing package, and summarizes the work completed to update and revise the 2013 design.

IFC drawings are attached to this report in Appendix C.

2.0 2013 IROSA DESIGN

The 2013 IROSA design report provided recommendations for construction of five embankments, defining four containment areas located within a series of existing depressions in an area of old placer mine tailings, for storage of ice-rich waste overburden. The embankments were located to separate the various containment areas from one another and from exterior areas outside of the IROSA, and designed in accordance with the guidelines set forth in the 1991 *Mined Rock and Overburden Piles Investigation and Design Manual*, published by the BC Mine Waste Rock Pile Research Committee.

Tetra Tech completed a geotechnical drilling program at the site, to assess the subsurface conditions and collect geotechnical information that was used to check the stability of the proposed embankments under post-construction (empty), operating (full) and seismic (pseudostatic) conditions. Triggering of liquefaction in layers of sandy soil encountered in the drilling investigation was noted as a possible area of concern, but was not checked in detail at that time.

The IROSA embankments were to be constructed using locally sourced tailings material, consisting of highly permeable, coarse material (particle gradation between 25 and 200 mm diameter) for the bulk of the embankment, with a layer of finer tailings material (75 mm minus gravel) on the embankment face to act as a filter between the coarse embankment fill and the fine-grained overburden. The embankment face would be sloped at 2H:1V.

As described in the 2013 design report, the Haggart Creek IROSA was considered to satisfy the applicable design guidelines, and would provide a storage area for about 255,000 m^3 of waste overburden material.

The 2013 report is attached for reference in Appendix B. In general, the recommendations contained therein are considered to remain valid for the design and construction of the IROSA, with the exception of items described below in Sections 3 and 4; where there is conflict between the two documents, recommendations in this report will supercede those provided in the 2013 design.

3.0 SUMMARY OF DESIGN UPDATE

As described in NELPCo's proposal, the 2013 IROSA design was reviewed and updated to address the following items, mainly with respect to seismic considerations:

- Review and update seismic hazard parameters used in IROSA design;
- Check potential for triggering of seismic liquefaction in susceptible soils;
- Re-run slope stability models, including the post-seismic (liquefied) case for embankments where triggering of liquefaction is expected in the subgrade soils;
- Estimate embankment displacements under seismic and post-seismic (liquefied) conditions; and
- Check material gradations of the embankment and embankment face materials for compatibility with respect to filtering criteria.

3.1 Seismic Hazard Parameters

The 1991 Design Guidelines specify that waste dumps/piles should be designed to withstand a seismic event with an annual probability of exceedance of 10% in 50 years (i.e., 1:475 year earthquake). The 1:475 year event was commonly used in several design codes, such as the National Building Code of Canada (NBCC), at the time these guidelines were published; however, in recent times (e.g., NBCC since 2005) design standards have required consideration of more severe earthquake events, typically with annual probability of exceedance of 2% in 50 years (i.e., 1:2,475 year earthquake).

For certain structures (e.g., large dams), design guidelines stipulate that more severe seismic events must be considered, such as the 1:10,000 year earthquake, or the Maximum Credible Earthquake (MCE), which is a deterministic (rather than probabilistic) representation of the most severe seismic event likely to occur at a given site, based on knowledge of the surrounding tectonic setting.

For the IROSA embankments, which are considered to not have a major consequence of failure, the 475 year earthquake is considered to be appropriate for design, as recommended in the 1991 Guidelines. As such, the IROSA design considered the site seismic hazard from the 2015 edition of the NBCC, as generated by Natural Resources Canada's (NRC) seismic hazard calculator, available online at: http://www.earthquakescanada.nrcan.gc.ca/index-en.php.

While the 475 year earthquake is considered to be the "design" event for this project, the online calculator output also includes seismic hazard for the 2,475 year earthquake (current NBCC design earthquake), and an estimate of hazard (PGA and moment magnitude) due to the MCE event is available in a Technical Memorandum (Tetra Tech 2012) prepared for StrataGold's parent company, Victoria Gold Corporation. As such, both of these hazard levels were also checked in the liquefaction triggering and embankment stability analyses, to estimate the potential damage that may be associated with more severe earthquake events.

All seismic analyses described below considered an amplified Peak Ground Acceleration (PGA) reflecting Site Class D conditions, per NBCC 2015. Generation of an amplified acceleration spectrum for the MCE event was estimated by linear scaling of the NBCC uniform hazard spectrum for the 2,475 year event to match the PGA provided for the MCE, and amplification factors were then applied per the routine NBCC procedure. Scaling in this way is considered to provide only a crude approximation of the acceleration spectrum, however it may still be reasonable for use in estimating impacts of the MCE to the IROSA embankments.

Earthquake magnitudes used in the liquefaction triggering assessment were the mean magnitude from a de-aggregation of the NBCC seismic hazard, provided by NRC, and the magnitude recommended in Tetra Tech's 2012 memo for the MCE event.

3.2 Liquefaction Triggering

Seismic liquefaction can occur when loose, saturated, sandy soil is subjected to cyclic shear stresses during an earthquake, and is characterized by a rapid rise in the soil porewater pressure and a corresponding rapid loss in soil strength and stiffness. Seismic liquefaction is commonly accompanied by vertical and horizontal displacements on level ground, and slope failures in areas with topographic relief.

Sand and silt layers encountered on the site, including both native soils and tailings material, are potentially susceptible to seismic liquefaction. As such, liquefaction triggering was checked according to the simplified procedures described by Idriss and Boulanger (2008), for the 475 year, 2,475 year, and MCE events, using the SPT N-values and groundwater conditions encountered during the 2013 drilling program.

Because only one borehole was drilled in the vicinity of each embankment, the liquefaction triggering analysis in each case is based on the soil profile and SPT N-values encountered in that single borehole; for the purposes of checking post-seismic embankment stability and estimating post-seismic displacement, liquefiable layers encountered in each borehole are assumed to be continuous within the vicinity of the corresponding embankment.

Results of the liquefaction triggering analysis for each embankment are provided in Section 4.

3.3 Embankment Slope Stability

Slope stability models were re-checked using Slope/W software, to account for the updated seismic design criteria and to check stability of embankments in the event of liquefaction.

For embankments A, B and C, which are bounded on both sides by containment areas, various scenarios were checked with respect to the influence that the sequence of overburden placement on either side of the embankment might have on embankment stability.

Minimum Factors of Safety (FS) of 1.5 and 1.0 were targeted for static and seismic (pseudostatic and post-seismic) conditions, respectively.

Results of the slope stability assessment for each embankment are discussed in Section 4.

3.3.1 Static Conditions

Slope stability under static conditions was checked for each of the embankments. A variety of operating conditions were assessed, including with empty containment areas (i.e., free standing embankment with no surrounding overburden), full containment areas (i.e., containment area full on the north, south, or both sides of the embankment) and partially full containment areas (i.e., various combinations with partially full containment areas on one or both sides of the embankments).

3.3.2 Seismic (Pseudostatic) Conditions

Seismic slope stability for each embankment was checked for the 475 year, 2,475 year and MCE events using the pseudostatic approach, where the seismic inertial force affecting the embankment is represented as a static horizontal force, defined as a horizontal seismic coefficient (as a proportion of gravitational force). In all cases, a horizontal seismic coefficient equal to 50% of PGA, scaled for Site Class D, was used.

For each embankment, the same range of operating conditions from the static load case (i.e., empty, full, partially full) was checked.

3.3.3 Post-Seismic (Liquefied) Conditions

Post-seismic slope stability was checked for each embankment where liquefaction is expected to be triggered, with the zones of liquefied soil identified in the liquefaction triggering assessment incorporated into the slope models and a reduced, post-seismic soil strength assigned to liquefied layers.

No horizontal seismic coefficient was applied in the post-seismic slope stability models (i.e., it is assumed that the reduction in soil strength due to liquefaction occurs after the period of strong shaking during an earthquake).

Similar to the seismic slope stability assessment, stability at each embankment was considered for a variety of cases (i.e., empty, full, partially full).

3.4 Estimated Seismic and Post-Seismic Displacement

Seismic displacements, caused directly by shaking during an earthquake, were estimated for each embankment and each seismic event following the method described by Bray and Travasarou (2007). Seismic yield accelerations were determined for each embankment using Slope/W software, and spectral acceleration at a period (T) of zero seconds (adjusted for Site Class D conditions) was used in the displacement calculation; due to the characteristic shape of NBCC hazard spectra, using spectral acceleration at T = 0 s will be equivalent or conservative compared to using the spectral acceleration at 1.5x the natural period of the embankment, as recommended by Bray and Travasarou.

Post-seismic displacement at ground surface, caused by lateral shear and vertical reconsolidation strain in liquefied layers, was estimated using the simplified procedures described by Idriss and Boulanger (2008). Lateral displacements estimated using this method are generated through cumulative summation of shear strains estimated in liquefiable layers, and are generally considered to be conservative, since the influence of fine-grained soil content is neglected and the summation of shear strains represents a "worst-case" scenario. However, this method is also intended for use to estimate "free-field" displacement (i.e., level ground conditions); because the IROSA embankments and surrounding tailings ridges form topographic features, this method can also be considered to be unconservative, and therefore should be considered alongside the results of slope stability analyses.

Estimated seismic and post-seismic displacement is provided for each of the embankments in Section 4.

3.5 Embankment Fill Gradation

In order for the embankments to satisfy their intended function, the fill materials used for construction must be highly permeable and allow free passage of water melting out from the stored ice-rich overburden, while also acting as a filter to remove suspended sediment from the water before it enters Haggart Creek or other natural drainages.

As described above and in the 2013 design report, the general design concept consists of a coarsely graded embankment with finer material placed on the embankment face to act as filter against the stored overburden material. It is understood that all materials required for embankment construction can be produced using locally available placer tailings. The coarse embankment fill would be produced by screening tailings to obtain a gravel and cobble material with a well-graded particle size distribution between about 25 mm and 200 mm. The finer-graded filtering material used on embankment faces would consist of well-graded, 75 mm-minus sand and gravel, ideally with minimal fines content (i.e., particles passing a 0.075 mm sieve); based on a sample of tailings collected during the 2013 drilling program, it is expected that this material can be sourced directly from the tailings with little to no processing required.

The recommended fill gradations provided in the 2013 report were checked for compatibility with respect to conventional filtering criteria, to assess the possibility for migration of the filter material into the coarser embankment fill. Both of the recommended fill material gradations were also checked for internal stability, to assess the possibility for internal erosion of fine particles from within each of the recommended fill materials.

4.0 RESULTS OF DESIGN UPDATE

4.1 General

In general, results of the IROSA design update confirm that the recommendations provided in the 2013 design report are valid. It is expected that locally sourced tailings material can be used to build the embankments, and that embankment stability for static and seismic conditions is acceptable in all cases.

However, potentially liquefiable soils have been identified in the vicinity of several embankments, and there will be some associated risk of embankment slope failure and/or large displacements, particularly for embankments in the northern half of the IROSA.

More detail is provided below for each of the individual embankments.

4.2 Fill Materials

For the purposes of construction and as shown on the appended drawings, the two fill material types to be used in construction of the IROSA embankments are referred to as Type 1 (coarse tailings) and Type 2 (filter material) Fill.

Type 1 Fill should consist of coarse tailings with maximum particle size of about 200 mm that has been screened or otherwise processed to remove all particles smaller than about 25 mm in diameter. Type 1 fill should be well graded, with gradation curves having a Coefficient of Uniformity ($C_u = D_{60}/D_{10}$) greater than 4 and Coefficient of Curvature ($C_c = D_{30}^2/(D_{10}*D_{60})$) between 1 and 3.

The recommended gradation for Type 2 Fill is provided on Table 4.2-1 below:

Table 4.2-1: Recommended Gradation for Type 2 Fill

Particle Size (mm)	Percent Finer (% by weight)
75	100
25	65 – 100
12.5	45 – 85
4.75	25 – 70
0.825	5 – 30
0.425	0 – 20
0.163	0 – 15
0.075	0 – 10

The recommended gradation of Type 2 Fill has been modified slightly from that provided in the 2013 report. The gradation curve for the sample of proposed filter material that was recovered and tested during the 2013 drilling program still conforms to the gradation specified above, however it falls at approximately the fine limit of the specified gradation band; i.e., unprocessed tailings available on-site may be generally suitable for use as Type 2 Fill, however coarser material compared to the sample recovered in 2013 is desirable for increased permeability and drainage of meltwater through the embankment face.

Both of the material types described above are considered to be internally stable. However, the difference in gradation between Type 1 and Type 2 Fill is too great for the materials to effectively filter one another; i.e., there is a risk that the fine portion of the Type 2 Fill would be washed into the larger voids in the adjacent Type 1 Fill as water seeps through the embankment. As such, a layer of geotextile filter fabric should be installed between Type 1 and Type 2 fill. The geotextile will also help to remove suspended fine soil particles compared to the granular filtering action alone.

Alternatively, a multi-layer granular filter could be used, however this would require more material processing to produce fill for multiple filtering layers, and would also be more complex with respect to fill placement for embankment construction.

4.3 Embankment A

As noted in Section 4.1, embankment stability meets applicable target FS for static operating conditions (target FS = 1.5), as well as seismic (pseudostatic, target FS = 1.0) conditions for the design 475 year earthquake, as well as the larger 2,475 year and MCE events.

Median seismic displacement estimated using the Bray and Travasarou method is 1.6 cm for the 475 year earthquake, and 6.0 and 11.2 cm for the 2,475 year and MCE events, respectively. It is expected that seismic displacement caused by each of these earthquake events can be sustained with minimal distress to the embankment.

However, liquefiable layers were identified in the soil profile encountered in BH04, as shown on Table 4.3-1 below. Note that depths shown on the table are measured from ground surface at the applicable borehole location, and not from the embankment crest.

Table 4.3-1: Liquefaction at Embankment A (2013 BH04)

Parameter	475 year EQ	2,475 Year EQ	MCE
Depth Range of Liquefiable Soil (m bgs)	2.5 – 5.5	1.5 – 7.7	1.5 – 7.7
Estimated Free-Field Lateral Displacement (m)	1.1	2.2	2.2
Estimated Vertical Settlement (mm)	70	205	205

Based on the slope stability modeling of Embankment A, with a reduced soil strength applied to liquefied layers, post-seismic stability may be greater than the target FS of 1.0 when the containment areas on both sides are filled to within about 3 m of the crest, due to the buttressing effect of the overburden material. However, under most operating conditions the FS for embankment slope stability falls below 1.0 for each of the considered earthquake events, including the design (475 year) event.

Combined with the relatively large estimated displacements shown on Table 4.3-1, the post-seismic FS of less than 1.0 implies that the embankment would suffer significant distress due to liquefaction following an earthquake, including several hundred millimetres of vertical settlement and lateral displacement on the order of several metres; it is likely that Embankment A would require major repair and/or complete reconstruction in the event of the design earthquake.

4.4 Embankment B

As noted in Section 4.1, embankment stability meets applicable target FS for static operating conditions (target FS = 1.5), as well as seismic (pseudostatic, target FS = 1.0) conditions for the design 475 year earthquake, as well as the larger 2,475 year and MCE events.

Median seismic displacement estimated using the Bray and Travasarou method is 1.6 cm for the 475 year earthquake, and 6.0 and 11.2 cm for the 2,475 year and MCE events, respectively. It is expected that seismic displacement caused by each of these earthquake events can be sustained with minimal distress to the embankment.

Furthermore, based on the soil profile encountered in BH03, no liquefaction is expected under the design earthquake event. However, liquefiable soils were identified for more severe earthquake events, as shown on Table 4.4-1 below. Note that depths shown on the table are measured from ground surface at the applicable borehole location, and not from the embankment crest.

Table 4.4-1: Liquefaction at Embankment B (2013 BH03)

Parameter	475 year EQ	2,475 Year EQ	MCE
Depth Range of Liquefiable Soil (m bgs)	None	4.5 – 6.1	4.5 – 6.1
Estimated Free-Field Lateral Displacement (m)	Minor	0.4	0.4
Estimated Vertical Settlement (mm)	Minor	50	50

Because no liquefiable layers were identified at Embankment B for the 475 year earthquake, post-seismic embankment stability is not expected to be of concern for design purposes.

However, in the event of a larger earthquake, large displacements similar those shown on Table 4.4-1 and described above for Embankment A can be expected, and significant repair and/or reconstruction of the embankment would likely be required.

4.5 Embankment C

As noted in Section 4.1, embankment stability meets applicable target FS for static operating conditions (target FS = 1.5), as well as seismic (pseudostatic, target FS = 1.0) conditions for the design 475 year earthquake, as well as the larger 2,475 year and MCE events.

Median seismic displacement estimated using the Bray and Travasarou method is 2.0 cm for the 475 year earthquake, and 7.5 and 13.7 cm for the 2,475 year and MCE events, respectively. It is expected that seismic displacement caused by each of these earthquake events can be sustained with minimal distress to the embankment.

However, liquefiable layers were identified in the soil profile encountered in BH02, as shown on Table 4.5-1 below. Note that depths shown on the table are measured from ground surface at the applicable borehole location, and not from the embankment crest.

Table 4.5-1: Liquefaction at Embankment C (2013 BH02)

Parameter	475 year EQ	2,475 Year EQ	MCE
Depth Range of Liquefiable Soil (m bgs)	13.7 – 15.0	7.0 – 16.2	7.0 – 16.2
Estimated Free-Field Lateral Displacement (m)	0.7	4.0	4.0
Estimated Vertical Settlement (mm)	75	350	350

Based on the slope stability modeling of Embankment C, with a reduced soil strength applied to liquefied layers, the FS for post-seismic stability under the 475 year event will be greater than the target FS of 1.0, since the depth to the liquefiable layer is great enough that stability of the embankment is not overly affected. However, some degree of vertical settlement and lateral displacement will likely occur, which may cause damage requiring some repair to the embankment.

For the 2,475 year and MCE events, liquefaction is expected to occur in a thicker, shallower layer of soil, which would be accompanied by large displacements and significant damage to the embankment that would require repair and/or reconstruction, similar to that described for Embankment A.

4.6 Embankment D

As noted in Section 4.1, embankment stability meets applicable target FS for static operating conditions (target FS = 1.5), as well as seismic (pseudostatic, target FS = 1.0) conditions for the design 475 year earthquake, as well as the larger 2,475 year and MCE events.

Median seismic displacement estimated using the Bray and Travasarou method is 1.7 cm for the 475 year earthquake, and 6.4 and 11.8 cm for the 2,475 year and MCE events, respectively. It is expected that seismic displacement caused by each of these earthquake events can be sustained with minimal distress to the embankment.

Furthermore, based on the soil profile encountered in MW01, no liquefaction is expected to occur beneath Embankment D for the 475 year earthquake, nor for the 2,475 year or MCE events.

Because no liquefiable layers were identified at Embankment B, post-seismic embankment stability is not expected to be of concern, and any associated post-seismic displacement will be minimal.

4.7 Embankment E

As noted in Section 4.1, embankment stability meets applicable target FS for static operating conditions (target FS = 1.5), as well as seismic (pseudostatic, target FS = 1.0) conditions for the design 475 year earthquake, as well as the larger 2,475 year and MCE events.

Median seismic displacement estimated using the Bray and Travasarou method is 1.0 cm for the 475 year earthquake, and 4.2 and 8.1 cm for the 2,475 year and MCE events, respectively. It is expected that seismic displacement caused by each of these earthquake events can be sustained with minimal distress to the embankment.

Furthermore, based on the soil profile encountered in BH01, no liquefaction is expected under the design earthquake event. However, liquefiable soils were identified for more severe earthquake events, as shown on Table 4.7-1 below. Note that depths shown on the table are measured from ground surface at the applicable borehole location, and not from the embankment crest.

Table 4.7-1: Liquefaction at Embankment E (2013 BH01)

Parameter	475 year EQ	2,475 Year EQ	MCE
Depth Range of Liquefiable Soil (m bgs)	None	4.9 – 7.6	4.9 – 7.6
Estimated Free-Field Lateral Displacement (m)	Minor	1.1	1.1
Estimated Vertical Settlement (mm)	Minor	95	95

Because no liquefiable layers were identified at Embankment E for the 475 year earthquake, post-seismic embankment stability is not expected to be of concern for design purposes.

Furthermore, in the event of a larger earthquake which would be expected to cause liquefaction, the FS with respect to post-seismic stability will be greater than the target FS of 1.0, and no major slope failure or large displacements would be expected. However, some degree of vertical settlement and lateral displacement will likely occur, which may require some repair to the embankment.

5.0 GEOTECHNICAL RECOMMENDATIONS FOR IROSA OPERATION

5.1 Water Management

The IROSA embankments and containment areas are not intended to be used as water retaining structures, and have not been designed as such.

Surface water management will be an important consideration during operation of the IROSA. During a visit to the site completed by Tetra Tech, JDS and StrataGold in May 2017, a stream descending from Platinum Gulch was observed spilling into the northeast corner of the Haggart Creek IROSA; based on discussion during the site visit, we understand that this stream will be diverted away from the IROSA and towards a proposed collection pond as part of the site’s overall water management plan.

At the time of the site visit, no other significant streams were observed entering the IROSA area, however any other streams or concentrated flows noted in the future should be diverted away from the IROSA containment areas, similar to the stream emanating from Platinum Gulch.

It is also expected that water will enter the containment areas from time to time, in the form of surface runoff and/or groundwater seepage from the forested slopes to the east (particularly during spring freshet), as precipitation, and from thawing of ice-rich overburden soil stored in the IROSA.

As such, to minimize accumulation of water in the IROSA containment areas, waste overburden placed in the IROSA should be graded to avoid ponding on top of fine-grained and/or other low permeability soils, and to encourage infiltration of water into the embankments and/or other areas of similarly permeable tailings.

5.2 Sequence of IROSA Embankment Construction

Tetra Tech understands that construction of the IROSA facility will be a staged process, with individual embankments and containment areas built as and when required depending on volumes of ice-rich overburden material generated through the mine life.

It is also understood that the intent is to construct the northernmost embankments and containment areas first, to maximize the flow path and filtering of water melting out of stored ice-rich overburden before reaching Haggart Creek. However, Embankments A and C were identified as being expected to experience liquefaction of foundation soils under the design earthquake event, with likely consequences including damage and/or failure of the embankment and possible release of stored overburden into the adjacent downstream containment area.

As such, to satisfy applicable water license requirements limiting infiltration of sediment laden water into Haggart Creek from the IROSA, it is recommended that Embankments A and B are constructed at the same time, such that Embankment B would be in place to ensure that any sediment-rich overburden or meltwater does not reach Haggart Creek in the event of the design earthquake. Similarly, it is recommended that Embankments D and E are constructed at the same time as Embankment C.

5.3 Survey and Monitoring Requirements

Monitoring requirements during IROSA operation were discussed in the 2013 report. These include:

- Regular visual inspection of the embankment condition, to check for distress in the embankments including cracking, sloughing, slumping, toe bulging, etc.

- Regular visual inspection of surface water conditions in the IROSA containment areas.
- Regular visual inspection of surface water and seepage entering the IROSA from surrounding areas, particularly the natural slopes to the east.
- Survey monuments should be established along the crest of each embankment and regularly monitored to track lateral and vertical settlement. Monuments should be surveyed nominally twice a year (spring freshet and fall freeze-up) during routine operations, and more frequently in the event that ongoing movement is noted or “extreme” operating conditions are present (e.g., earthquake, high volumes of ponded water entering IROSA).
- If desired, monitoring wells can be installed in the embankments to allow for water quality sampling.

6.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of StrataGold Corporation and their agents, including JDS Energy and Mining Inc. Tetra Tech Canada Inc. (operating as Tetra Tech) 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 StrataGold Corporation, 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 Tetra Tech Canada Inc.’s Services Agreement. Tetra Tech’s General Conditions are provided in Appendix A of this report.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,

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APPENDIX A

TETRA TECH'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

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

1.1 USE OF REPORT AND OWNERSHIP

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

This report and the recommendations contained in it are intended for the sole use of TETRA TECH's Client. TETRA TECH 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 TETRA TECH's Client unless otherwise authorized in writing by TETRA TECH. 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 TETRA TECH. Additional copies of the report, if required, may be obtained upon request.

1.2 ALTERNATE REPORT FORMAT

Where TETRA TECH submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed TETRA TECH'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 TETRA TECH shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of TETRA TECH's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except TETRA TECH. TETRA TECH's instruments of professional service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH 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.

1.4 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. TETRA TECH 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.

1.5 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.

1.6 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. TETRA TECH 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 SAMPLES

TETRA TECH 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.

1.14 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

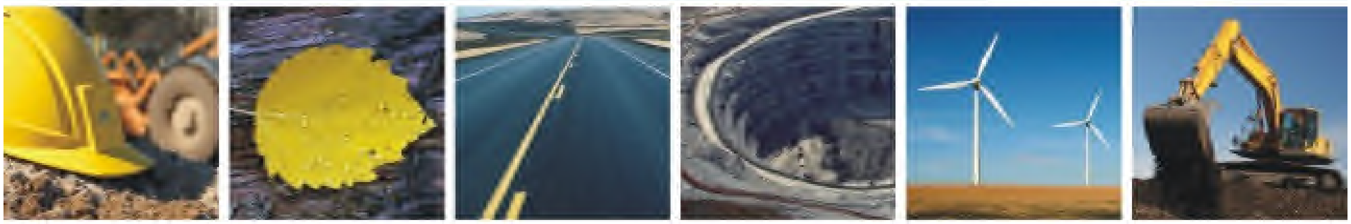
During the performance of the work and the preparation of the report, TETRA TECH may rely on information provided by persons other than the Client. While TETRA TECH endeavours to verify the accuracy of such information when instructed to do so by the Client, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

GEOTECHNICAL DESIGN – ICE-RICH OVERBURDEN STORAGE AREA BERMS – EAGLE GOLD PROPERTY, YUKON TERRITORIES – 2013 REPORT

VICTORIA GOLD CORPORATION

GEOTECHNICAL DESIGN
ICE-RICH OVERBURDEN STORAGE AREA BERMS
EAGLE GOLD PROPERTY, YUKON TERRITORIES



REPORT

DECEMBER 2013
ISSUED FOR USE
FILE: W14103150-02

NND EBA Land Protection Company
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EXECUTIVE SUMMARY

NND EBA Land Protection Corp. (NELPCo) was requested by Strata Gold Corporation (SGC), a wholly owned subsidiary of Victoria Gold Corporation to complete the design of the proposed Ice-Rich Overburden Storage Area (IROSA) at their Eagle Gold Property located 85 km north of Mayo, Yukon. The proposed IROSA is located approximately 2.0 km south of Eagle Gold Camp along Haggart Creek Road.

The proposed area has been previously developed for placer mining and was chosen based on the siting and alignment selection criteria described in a 2013 report completed by BGC Engineering for SGC. The existing area lies along the east valley wall within the Haggart Creek Valley, and is comprised of several large mounded tailings piles that separate four large depressions from Haggart Creek. The design considered tying five berms into the existing mounded tailings and till side-slopes to create four separate storage areas. The berms will be constructed using coarse tailings material and a filter material on the upstream slope in order to promote draining of excess pore water while containing the fine-grained ice-rich overburden. The combined estimated storage capacity of the storage areas amounts to about 255,000 m^3.

A geotechnical investigation was completed within the perimeter of the proposed IROSA to gather geotechnical information on subsurface conditions to support the design process. Boreholes were strategically located in ideal locations for storage area berms.

The following report presents the findings of the geotechnical investigation and the subsequent design of the storage area berms. The design was undertaken with reference to Mined Rock and Overburden Piles Investigation and Design Manual (1991) published by the British Columbia Mine Waste Rock Pile Research Committee. The stability analysis yielded factors of safety that met or exceeded the minimum factors of safety as per the Design Manual recommendations.

The upstream slope and downstream slope are designed at 2H:1V slopes. The berm is to be constructed using coarse aggregate with trace fine-grained materials and a two mete thick filter material on the upstream facing slope to limit infiltration of fine-grained particles into the berms. The foundation soils for the berms should be scarified to promote good bonding of natural and fill material.

The management of surface water will impact the effectiveness of the storage area and the trafficability of the overburden. The removal of fine-grained tailings from the upstream toe of the berms will promote drainage into the underlying granular soils.

A quality assurance program should be established prior to beginning construction to ensure that recommendations in this report are met.

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1.0 INTRODUCTION

NND EBA Land Protection Corp. (NELPCo) was requested by StrataGold Corporation (SGC), a wholly owned subsidiary of Victoria Gold Corporation to complete storage area berm designs for the proposed ice-rich overburden storage area (IROSA) at Eagle Gold property, Yukon.

The Eagle Gold property is located 85 km north northeast from the village of Mayo, Yukon. The proposed gold mine received a Quartz Mining License for the Eagle Gold Project on September 20, 2013 authorizing SGC to begin surface construction. SGC is now completing the necessary design work for waste and water management as part of their application for a Water Use Licence. As part of their application for a water use licence, SGC is required to provide a management plan for mine rock and overburden piles.

The following report details the berm designs for the proposed IROSA that will be used to store ice-rich overburden that may be excavated during the construction of various mine-site facilities. Ice-rich overburden or material is used to describe soils with "excess ice" that occupies a larger pore space in the soil than water in an unfrozen state. When this ice thaws, the resulting water exceeds the water holding capacity of the soil and excess water will be present. Frozen ground with excess ice, hereafter called "ice-rich", may become unstable upon thawing, and will therefore generally need to have specific material management strategies, which includes for some of the more problematic ice-rich soils, excavation and haulage to the IROSA.

1.1 IROSA Background

The area proposed for the IROSA is located 2 km south of the existing Eagle Gold Camp along Haggart Creek Road. The site has been previously developed for placer mining and has no surface outlet, as evident in Photograph 1.

Photograph 1
Aerial View of IROSA looking west (September, 2009)

The design concept includes a multi-unit storage area design for the IROSA making use of the shape of existing mounds and depressions and available placer tailing materials. The multi-unit storage area design also allows for phased construction of the IROSA. Each storage area berm is to be designed to allow excess water originating from melting ice-rich overburden to flow through the berm structures and exfiltrate into the subsurface soils to the ground water table.

1.2 Scope of Services

NELPCo's scope of services included the following:

- 2013 IROSA Geotechnical Investigation:
  - Review of all available historical data for the area of interest;
  - Drilling of seven boreholes using hollow stem augers to depths varying from 8 to 18 m to allow for the collection of Standard Penetration Tests and soil samples at 1.5 m intervals;
  - Installation of three monitoring wells (one nested) and two standpipe piezometers for monitoring piezometric pressures and complete hydraulic conductivity testing; and
  - Index soil testing.
- Geotechnical Design of IROSA Berms:
  - Earthworks and stability models to maximize the proposed areas for the ice-rich overburden storage taking into consideration the existing topography and surficial geology, construction methods, available storage capacity, height, and stability of storage berms;
  - Detailed design report including issued for construction (IFC) drawings and construction specifications stamped and signed by an engineer licensed to practice in the Yukon.

NELPCo services completed during the geotechnical investigation and detailed design, are done in accordance to the General Conditions attached in Appendix A.

2.0 DESIGN BASIS

2.1 Siting and Alignment Selection

The proposed location for the IROSA (Figure 1) was originally identified by SGC on the basis that there would be minimal concerns for permafrost and thaw unstable foundation soils as the overburden materials throughout the area consist of old placer workings that are disturbed down to the bedrock surface or underlying dense silt/sand/gravel till.

Site selection was completed in three stages earlier this year (BGC 2013)[1] prior to the geotechnical investigation. During the first stage of site selection, a total of 21 potential disposal areas were identified around the general project area. Conceptual containment berms were sited, and associated storage

[1] BGC Engineering Inc., "Eagle Gold Project Ice-Rich Materials Management Plan", Draft Version 2013-01, April 2013

volumes calculated. These 21 alternatives were then ranked according to storage ratio, calculated as the ratio of storage quantity to berm fill quantity. This ratio is a simple first estimate of cost effectiveness. Nine of the highest ranked alternatives were selected for further comparison.

The nine shortlisted alternatives were each rated according to 12 specific criteria in five broad categories: resource conflicts, environmental considerations, social considerations, construction and design considerations, and closure and post-closure considerations. The 12 criteria were assigned weights according to assumed importance and scores assigned by consensus between BGC and SGC. The location at Haggart Creek was selected as the primary location as a result of the site selection analysis.

BGC also developed a preliminary design for this location with the objective of ascertaining a possible maximum storage capacity for the site. Since then, SGC and Merit Consultants International (MCI) have completed additional detailed evaluation on:

- Test pit and borehole data;
- Material take-offs from facility design work from areas previously identified as having ice-rich material; and
- Subsequent development of materials excavation and handling plans.

The above evaluation has identified approximately 195,000 m3 (up to 254,000 assuming 15% swell and 15% contingency) of ice-rich material requiring storage.

At the start of the field drilling program, representatives from both NELPCo and SGC completed a site reconnaissance to identify proposed locations for storage area berms that would accommodate the use of the surrounding placer tailings and meet the containment volume requirements.

2.2 Storage Area Berm Concept

The storage area berms are designed to be flow through structures that will allow for excess pore water resulting in the thaw of ice-rich material to drain laterally and vertically into the surrounding subsurface soils. The material used to construct the berms will be sourced from existing placer tailings available in the vicinity of the proposed storage area.

The core of the berm will be constructed using course grained aggregate with the placement of a 75 mm minus filter material on the upstream slope to prevent fine grain material from infiltrating into the berm, but which will allow the drainage of water. Figure 2 presents a typical berm construction.

2.3 Consequence Classification of Storage Area Berm

Based on the following and according to the British Columbia Mined Rock and Overburden Piles Investigation and Design Manual Interim Guidelines, 1991 (Design Manual), NELPCo has determined that the consequence classification of the storage area berms would be Dump Stability Class II. A summary of the rationale used for this classification is as follows:

- The purpose of the berms is to contain ice-rich overburden;

- A failure of a storage area berm would result in organic and inorganic material slumping downgradient with minimal to no impacts on natural watercourses;
- A failure is not anticipated to result in loss of human life or cause significant or permanent environmental damage; and
- During the geotechnical investigation low blow counts in the underlying saturated sands and silts were encountered during the completion of Standard Penetration Tests (SPTs). These materials are considered potentially liquefiable and; therefore, robust stability analyses were completed (Section 4.2).

2.4 Design and Construction Considerations

The storage areas will be constructed upon receipt of a Water Use License and approval of the design under the Quartz Mining Act and the seasonal weather allows access to the construction materials. This is anticipated to be as early as spring 2014.

The storage area berms will be constructed with materials available from surrounding placer tailings. Additional sorting of the two recommended material types may be required as the actual volumes of available materials has not been determined, although based on visual observations of the area, the required fill material is likely readily available in the immediate area. It is expected that all construction materials will be sourced from the placer tailings.

3.0 GEOTECHNICAL INVESTIGATION

3.1 General

A geotechnical investigation was completed to provide support for NELPCo's detailed design for five proposed storage berms. NELPCo's representatives Kisa Elmer, EIT, and Chad Cowan, P.Eng, and Midnight Sun Drilling Company Ltd. (MSDL) representative, Ryan Babala mobilized to site on September 18, 2013. Stephen Wilbur, and Mike Gunn, from SGC were onsite to provide a site orientation and review the objectives for the geotechnical investigation.

Seven boreholes were advanced within the proposed IROSA using MSDL's M4 auger drill. The locations of boreholes completed during the geotechnical investigation are included on Figure 1 and the borehole logs and index test results are included in Appendix B. UTM locations were taken using a hand held GPS and elevations have been inferred from topographic survey data provided by SGC. Table 1 (attached) summarizes the boreholes completed and instrumentation installed. Two inch slotted PVC wells have been installed at MW01, MW02, and MW03 with a nested one inch slotted PVC standpipe was installed within MW02. One inch slotted PVC stand pipe piezometers were installed into BH01 to BH04.

3.2 Methodology

Samples were collected for visual classification and in situ density testing using standard penetration testing (SPT) with a 50 mm split spoon. NELPCo used the Modified Unified Soils Classification System (MUSCS) for characterizing soils. A copy of this system is included in Appendix B. Soil index testing was completed on select soil samples to confirm field classifications. All testing completed adheres to the American Society for Testing and Materials Standards.

3.3 Surficial Conditions

The site for the proposed IROSA mainly consists of four depressions situated between mounded sand and gravel tailings produced by historical placer mining activities and eastern till cliffs. The tailings are sparsely to non-vegetated, with higher densities of brush occurring within low lying areas. An overgrown road that traverses east and uphill from the till cliffs connects with tailings at the southern end of the storage area at a location near BH02. A portion of the road includes a ditch that diverts mountainside surface runoff away from the placer tailings area.

Four ponds have formed at the base of the depressions and east of the mounded tailings deposits. These ponds are leaky-confined by fine grained sediments and are perched above the local groundwater table.

Surface water runoff drains into the depressions from three main sources: upslope road-side ditching along Haggart Creek Road and two sources of surface water runoff from the eastern slope. Surface water runoff overflows from each depression within the valley and drains from north to south to the southernmost pond, where it exfiltrates to subsurface soils. At the time of the drilling and site work, there was no active outlet from the confined valley.

3.4 Subsurface Conditions

3.4.1 Soil Stratigraphy

The soils encountered beneath the tailings included disturbed alluvial and fluvial sands and gravels overlying silt till and weathered bedrock. The soil stratum encountered in each borehole is described in the borehole logs attached in Appendix B.

The in situ subsurface soil densities varied from very loose to compact sands, compact clay, and very dense to hard till and weathered bedrock. SPTs could not be completed in strata or tailings that contained high percentage of cobbles and boulders.

3.4.2 Groundwater

Groundwater was encountered in all but one MW03. Below the perched tailings ponds, ground water was encountered at roughly the same elevation as Haggart Creek. Initial water level readings were taken during the geotechnical investigation and are included in Table 1 (attached). At the time of the investigation, measured ground water elevations varied from 736.2 m in BH04 to 744.0 m in BH02.

Hydraulic conductivity testing (slug test) was completed within the two inch slotted PVC monitoring well MW02 that has a 1.5 m well screen from 7.6 to 9.1 m in depth within an unconfined sand aquifer approximately 7.3 m in thickness.

NELPCo analyzed slug test results from MW02 using the Hvorslev (1951) and Bouwer & Rice (1976) analysis methods implemented in the AquiferTest™ (ver. 2011.1) software. The geometric mean of the Hvorslev and Bouwer & Rice analysis results was used to estimate the hydraulic conductivity of the aquifer encountered by MW02. The estimated hydraulic conductivity of the gravelly, silty sand aquifer encountered by MW02 was 9.76×10^{-6} m/s. The hydraulic conductivity testing results and plots are attached in Appendix C.

3.4.3 Permafrost

The site is located in a zone of discontinuous permafrost; however, no permafrost was encountered during the geotechnical investigation and based on subsurface investigations completed in placer tailings material throughout the area (BGC 2013), permafrost is not expected to occur anywhere in the historic placer tailings.

3.4.4 Bedrock

Bedrock in the area has been characterized as zones of metasediments (interbedded quartzites and phyllites) and granodiorite. The drill equipment used for this geotechnical investigation was able to drill into weathered bedrock, but unable to penetrate into competent bedrock. A rough comparison using topographic maps provided by SGC and borehole locations indicates that bedrock is highest at MW03 and decreases gradually to the south dipping towards the east.

4.0 BERM DESIGN

4.1 Layout and Geometry

NELPCo has completed the design of five berms that will form four storage areas within the IROSA. The crests of the berms will vary from five to eight metres in height with an upstream and downstream slope of 2H:1V. The berms will tie into the contours of the mounded tailings piles at elevations ranging from 750 to 758 m. The crest width may range between four and six meters as required for accessibility. Table 2 lists the volumes for estimated storage capacity and required coarse aggregate and filter material assuming a six meter crest for each berm.

Table 2: Estimated Storage Capacity and Volume of Berm Material

Storage Area	Overburden (m^3)	
1	37,000	
2	73,000	
3	45,000	
4	100,000	
Total	**255,000**	
Berm	**Coarse Material (m^3)**	**Fine Material (m^3)**
A	4,700	450
B	11,000	1,150
C	5,400	850
D	2,600	400
E	1,400	300
Total	**25,100**	**3,150**

Granular pads had been constructed to provide access for drill equipment at BH01, BH02, and BH03. The design has been completed assuming that these pads will be either incorporated or removed depending on the soil suitability.

4.2 Stability Evaluation

4.2.1 Methodology

Limit equilibrium analyses were conducted to determine the factors of safety against slope failure both during construction and mine operation. All analysis was completed using the commercially available, two-dimensional software SLOPE/W (Geo-Slope International Ltd., Version 7.19). The process follows the following methodology:

- A slip mechanism is assumed;
- The shear resistance required to equilibrate the assumed slip mechanism is calculated using statics;
- The calculated shear resistance required for equilibrium is compared with the available shear strength in terms of a factor of safety; and
- The slip mechanism with the lowest factor of safety is determined through iteration.

Earthquake loading is modeled using a pseudostatic peak horizontal ground acceleration taken from the 2010 National Building Code Seismic Hazard calculation. The stability analysis was competed using cross sections through the deepest section of the berms.

4.2.2 Design Criteria

The Design Manual (1991) referenced above in Section 2.3, presents interim guidelines regarding minimum factors of safety which should be adhered to in mine waste pile design. NELPCo has conducted the design of these berms according to the factors of safety that are presented in Table 3. These guidelines have been chosen from presented ranges of values using past experience and the existing site conditions and material properties determined through site investigation and laboratory testing.

Table 3: Minimum Factor of Safety

Condition	Minimum Factor of Safety
Static	1.3
Psuedostatic	1.0

The Design Manual recommends that seismic stability be evaluated using horizontal pseudostatic peak ground accelerations (PGA) that correspond to a 10% probability of exceedance in 50 years. Therefore, the seismic stability evaluation should use a PGA that corresponds to a 1 in 500-year seismic event. The PGA used in this analysis is 0.139 g based on regional seismic data obtained from National Building Code of Canada 2010.

4.2.3 Material Properties

The foundation for the berms in question is composed of a variety of materials ranging from loose to compact sand and clay tailings all underlain by weathered bedrock. The $N_{(60)}$ values are calculated using blow counts collected during SPT testing and provide an indication of material densities. Angles of internal friction indicate the materials ability to withstand shear stresses. Angles were inferred using empirical relationships between $N_{(60)}$ and the internal angle of friction. Material properties including $N_{(60)}$ values, angle of internal friction, and bulk unit weight are provided in Table 4.

Table 4: Material Properties

		N(60)	Angle of Internal Friction	Bulk Unit Weight (kN/m^3)	Cohesion (kPa)
Foundation and Overburden	Very Loose Sand	<5	25	18.1	0
	Loose Sand	5 to 10	30	18.1	0
	Compact Sand	10 to 20	36	18.1	0
	Clay Tailings	13	30	20	0
	Weathered Bedrock	>50	45	23	0
	Overburden	-	2	15.7	0
Berm Material	Coarse Aggregate	-	36	17.1	0
	Filter Material	-	36	22.5	0

At this time, the overall ice content of the overburden material to be placed within the storage area cannot be known; therefore, high ice content has been assumed giving low strength parameters. Specifications for filter material and coarse aggregate are provided in Section 5.1.

4.2.4 Pore Water Conditions

4.2.4.1 Foundation

NELPCo has evaluated the storage area berms assuming that SGC will scrape the surface of the natural material and relocate as much of fine grained silt lining within the foot print of the berms as possible to enhance the effective draining of excess pore water created by thawing ice-rich overburden. Existing groundwater level readings taken during the geotechnical investigation were used in assigning piezometric and pore water conditions for the stability analyses.

4.2.4.2 Overburden Material

The overburden materials to be placed within the dump are considered to be ice-rich. As the overburden thaws the material may experience excess pore water pressure in certain regions of the pile. For design purposes, it is conservatively assumed that phreatic surface will develop near the surface of the overburden material, extending to the inner side of the filter material where it drops off to the existing groundwater table in the foundation material. Analysis has also considered the potential of the existing groundwater table within the foundation material rising to the base of the berm, although this scenario is considered unlikely.

4.3 Stability Analysis

Three failure modes were considered in the stability analysis: shallow seated, deep seated, and psuedostatic failures. NELPCo found that a shallow failure is the most probable type of failure on the downstream and upstream faces. These failures would only occur on the berm face extending marginally from the berm base and are not considered to be critical to the stability of the design provided the slumps are repaired promptly. Stability was checked for both empty and full capacity storage areas.

NELPCo considers the deep seated failures to be of greater concern; therefore, a deep seated critical slip surface would involve a larger portion of the berm core and have a larger impact on the berm stability, possibly resulting in some flowage of the thawing ice-rich material to the next downgradient storage area, and in the case of the last berm, towards Haggart Creek. While a deep seated failure is not likely, this condition was considered in the stability analysis. Figure 2 presents a typical cross section of the storage area berms, including typical shallow and deep seated slip surfaces.

Stability analysis was completed for each berm and the resulting factors of safety are summarized in Table 5. In general, all berms met or exceeded the minimum factor of safety recommended by the Design Manual.

Table 5: Summary of Factor of Safety

Berm	Scenario	Failure Type and Corresponding FOS		
		Shallow	Deep Seated	Pseudostatic
A	Downstream	1.4	1.5	1.1
	Upstream	1.5	1.5	1.2
	Overburden Placed	1.4	1.5	1.1
B	Downstream	1.5	1.7	1.1
	Upstream	1.6	1.6	1.2
	Overburden Placed	1.5	1.7	1.1
C	Downstream	1.5	1.7	1.1
	Upstream	1.5	1.6	1.1
	Overburden Placed	1.5	1.6	1.1
D	Downstream	1.6	1.6	1.1
	Upstream	1.5	1.6	1.1
	Overburden Placed	1.5	1.8	1.1
E	Downstream	1.6	1.9	1.2
	Upstream	1.3	1.9	1.2
	Overburden Placed	1.6	1.9	1.2

4.3.1 Static Case – Empty Storage Area

This scenario presumes the possibility of a storage area berm built and the storage area left empty for an undetermined duration of time. Each analysis resulted in factors of safety exceeding the minimum factor of safety of 1.3. Shallow failures occurred on the upstream and downstream facing slopes with a factor of safety ranging from 1.3 to 1.6.

4.3.2 Static Case – Full Capacity

A static analysis was completed for the storage area at full capacity. The overburden was assumed to be thawed and fully saturated. This condition is considered unlikely to develop provided the excess pore water is able to drain through the flow through berm.

Shallow failures on the downstream face of the berms had factors of safety ranging from 1.4 to 1.6, with the analyzed cases exceeding the minimum of 1.3. As in Section 4.3.1, these shallow failures are not expected to impact the stability of the berm if they are repaired promptly. A critical slip surface was analyzed that would impact the ability of the berm to retain overburden material. Deep seated failures exceeded the minimum recommended factor of safety, ranging from 1.5 to 1.9.

Saturation of the overburden material would be considered unlikely if the fine grained material lining the existing berm area was removed prior to storing ice-rich material and surface water runoff is managed appropriately. If those conditions are met, the factor of safety of the berms will to increase.

4.3.3 Pseudostatic Analysis

A pseusdostatic analysis was conducted for the full capacity case as well as for the empty storage area case. A PGA of 0.139 g, estimated using the National Building Code of Canada, 2010 was inputted into the stability model. The deep seated failures yielded factors of safety ranging from 1.1 to 1.2. The psuedostatic analysis has been characterized as conservative in its approach by the Design Manual. Therefore, the minimum FOS of 1.0 is acceptable for the purpose of this analysis.

The analysis assumed the phreatic surface has developed within the ice-rich overburden that extends into the storage berm. This assumption resulted in a conservative factor of safety.

A seismic movement analysis was completed on berm C (the tallest berm proposed) using two methods recommended in Appendix E of the British Columbian Guidelines for Legislated Landslide Assessments. The results of the movement analysis indicate that the berms will not experience a slope displacement greater than 150 mm. This movement is considered acceptable since the berms are earth structures and are able to accommodate such deformations and still perform their intended design function.

4.3.4 Discussion

The build-up of pore water pressures within the berm will negatively impact stability. Ensuring that the foundation area for each berm is adequately scarified to encourage exfiltration of melt water from thawing ice-rich material is critical to the overall stability of the storage area. To ensure that water adequately drains through the storage berm, it is also crucial to ensure that coarse grained aggregate is used for its construction.

Surface water runoff may be intercepted and diverted to reduce runoff into the storage areas and avoid standing water and the creation of trafficability concerns. Methods of managing surface water and run-off from upgradient areas are further discussed in Section 5.3.

5.0 CONSTRUCTION PLAN

5.1 Materials

Samples were taken from coarse and fine sections of the tailings material borrow source for grain size distribution testing. Coarse aggregate was sourced from Location 1, and filter material was sourced from Location 2 shown on Figure 1. The resulting distribution curves are included in Appendix D.

5.1.1 Coarse Aggregate Berm

NELPCo has assumed that the bulk of the berms will be constructed with 25 to 200 mm diameter material with little to no fine grained gravel. To facilitate proper drainage and avoid the build-up of pore water pressure in the berm, the material should contain less than 5% of 25 mm minus material. One method of ensuring a low percentage of fine grained material is to screen the borrow source prior to placement.

Coarse aggregate may be placed in lifts up to 1.5 m thick depending on the maximum size of the rock used. Track packing with heavy construction equipment evenly over each lift will provide sufficient compaction of the material. It should be noted that the material placement should be done in a manner that does not segregate or nest coarse material.

5.1.2 Filter Material

The filter material used on the upstream facing slope should meet the following grain-size specifications:

Table 6: Gradation of 75 mm Filter Material

Sieve Size (mm)	% Passing by Mass
75	100
25	80-100
12.5	65-100
5	45-80
0.825	15-45
0.425	10-35
0.16	5-23
0.08	0-15

A grain size distribution analysis was completed on 75 mm minus tailings. The grain size distribution test result confirms that the filter material meets specifications. The filter material should be placed in lifts no thicker than 300 mm and should be nominally compacted, or track packed, to favour permeability over compaction.

5.2 Foundation Preparation

NELPCo recommends relocating as much the silt and clay tailings as reasonably possible along the upstream toe of each storage area berm to allow for increased infiltration of excess pore water into the subsurface ground water. The material is assumed to stay within the perimeter of the IROSA. Excavation areas and volumes are detailed on Figure 2. The existing soil within the footprint of the storage area berm should be scarified to enhance bonding between the natural soils and fill. The berm should be keyed into the side slopes, where feasible, by at least a meter to create interlocking of the fill and side slopes.

Sections of the underlying soils have been characterized as loose granular sands. It is estimated that some consolidation of the underlying soils will occur during the construction phase.

5.3 Surface Water Management

Management of eastern slope runoff above the storage area is important in minimizing the potential for the collection of an excessive volume of surface water in each storage area, which could affect berm stability and/or trafficability of the storage area. A drainage ditch was observed on the upslope side of the abandoned access road that traversed above the eastern till cliffs and is shown on Figure 1. The existing portion of the ditch should be cleared and re-graded to allow for positive drainage along the abandoned access road. If required to reduce surface runoff from draining into the storage areas, the ditch could be extended northward from the abandoned access road to increase its catchment where practical. The Haggart Creek Road ditch was re-routed in fall 2013 after the site investigation work, and now directs drainage away from the most northern storage area.

Surface water runoff within the storage area is also important to the performance of the IROSA. Perched ground water lenses may develop in the overburden if surface water becomes trapped in depressions and could result in soft surfaces and reduced trafficability. Where practical, SGC should grade the overburden material to promote positive drainage towards the berms and side slopes of each storage area.

5.4 Quality Assurance

A construction quality assurance plan should be developed to ensure that the parameters used during the design process are achieved. Elements to consider include:

- Monitoring of fill material particle size distribution and placement;
- Photographs of the construction process at each stage of construction; and
- Preparation of construction record drawings signed and sealed by a professional engineer registered in the Yukon.

Detailed specifications and quality control measures will be part of the preparation of Issued for Construction Design drawings.

6.0 MONITORING REQUIREMENTS

For a Class II dump, the guidelines specify visual monitoring with basic instrumentation. Visual inspections should be completed periodically (e.g., based on specific weather conditions and IROSA activity) to check for signs of instability including tension cracking, surficial sloughing, bulging, or seepage zones along the downstream face of the berm.

Prior to construction, water levels in the existing piezometers/wells should be read a sufficient number of times to establish baseline ground water table conditions. Once construction begins, instrumentation should be monitored regularly to inform the construction process until the berm construction is completed.

A benchmark should be established and survey pins should be installed along the crests of each berm. These pins should be surveyed twice a year, once in spring and once in fall, to monitor settlements and lateral movements of the berms. The frequency of surveying should increase if evidence of movement or instability is observed, or be discontinued once the downgradient storage area is filled to the berm location.

7.0 CONCEPTUAL ABANDONMENT AND RESTORATION

SGC may desire to use some of the overburden material for mine reclamation. This will be described in the preliminary decommissioning and reclamation plan to be completed by SGC as required by the Quartz Mining and Yukon Waters Acts. The overburden not used for reclamation of mine site facilities that remain within the storage areas after mine closure should be graded to promote positive drainage, and re-seeded to promote regrowth. A detailed reclamation plan is not included in NELPCo's scope of work but can be developed at SGC's request.

8.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of SGC and their agents NND EBA Land Protection Corp., 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 SGC, 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 NELPCo's Services Agreement. NELPCo's General Conditions are provided in Appendix A of this report.

9.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
NND EBA Land Protection Corp.

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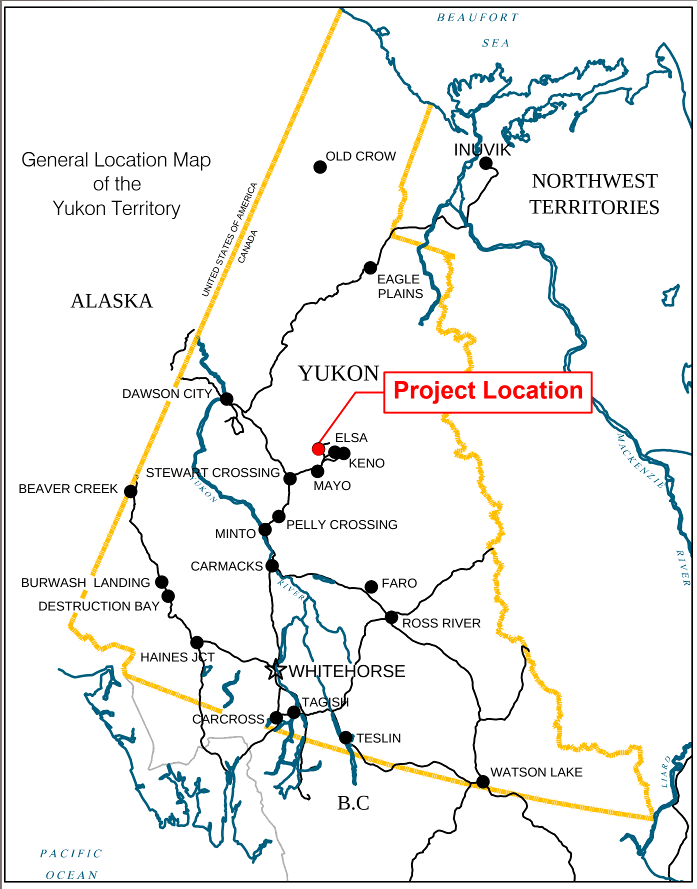
TABLES

Table 1: Eagle Gold Property IROSA 2013 Geotechnical Investigation Summary

Borehole ID	Date Completed	Location (UTM)			Completion Depth (m)	ft	Depth to Bedrock (m)	Inferred Bedrock Elevation	Brief Soil Lithology	Instrumentation Installed	PVC stick up (m)	Monument stick up (m)	Top of Screen (m bgs)	Bottom of Well (m bgs)	Water Level Reading		
		Nothing	Easting	Elevation											Date	GW (m bgs)	Water Elevation
MW01	19-Sep-13	7098661	458296	746	10.7	35	10.6	735.3	Tailings (0-4.9 m), Clay [Tailings pond](4.9 m - 7.6 m), Sand (7.6 m - 9.3 m), Silt [Till](9.3 m - 10.6 m), Bedrock (10.6 m)	Monitoring Well	0.7	0.88	7.71	9.21	22-Sep-13	6.14	739.86
BH01	19-Sep-13	7098615	458364	746	9.6	31	7.6	736.4	Tailings (0-3 m), Sand [Till](3 m - 7.6 m), Weathered Bedrock (7.6 m)	Standpipe	0.9	1	7.85	9.35	22-Sep-13	7.30	738.70
MW02	20-Sep-13	7098938	458334	752	11.6	38	-	-	Tailings (0 - 9.1 m), Sand (9.1 m - 11.6 m)	Monitoring Well	0.77	0.96	7.83	9.33	22-Sep-13	8.10	743.90
										Standpipe	0.77	0.96	10.17	11.67	22-Sep-13	8.10	743.90
BH02	20-Sep-13	7098925	458410	751	16.2	53	-	-	Tailings (0 - 13.7 m), Sand (13.7 m - 16.2 m), Till (16.2 m)	Standpipe	0.84	0.97	13.83	15.33	22-Sep-13	7.00	744.00
BH03	21-Sep-13	7099029	458299	749	11.6	38	9	740	Tailings (0-6.1 m), Silt [Till](6.1 m - 9.4 m), Weathered Bedrock (9.4 m -11.6 m)	Standpipe	0.78	0.95	10.00	11.5	22-Sep-13	5.35	743.65
BH04	21-Sep-13	7099158	458400	740	7.9	26	7.7	732	Tailings (0 m - 1.5 m), Silt and Sand (1.5 m - 7.7 m), Weathered Bedrock (7.7 m - 7.9 m)	Standpipe	0.86	0.95	4.44	5.94	22-Sep-13	3.84	736.16
MW03	22-Sep-13	7099189	458293	756	6.5	21	6.1	750	Tailings [Boulders and cobbles] (0 - 6.1 m), Weathered Till or Bedrock (6.1 - 6.5 m)	Monitoring Well	0.76	0.9	4.75	6.2	22-Sep-13	-	-
				Total	74.1												
				Feet	243												

FIGURES

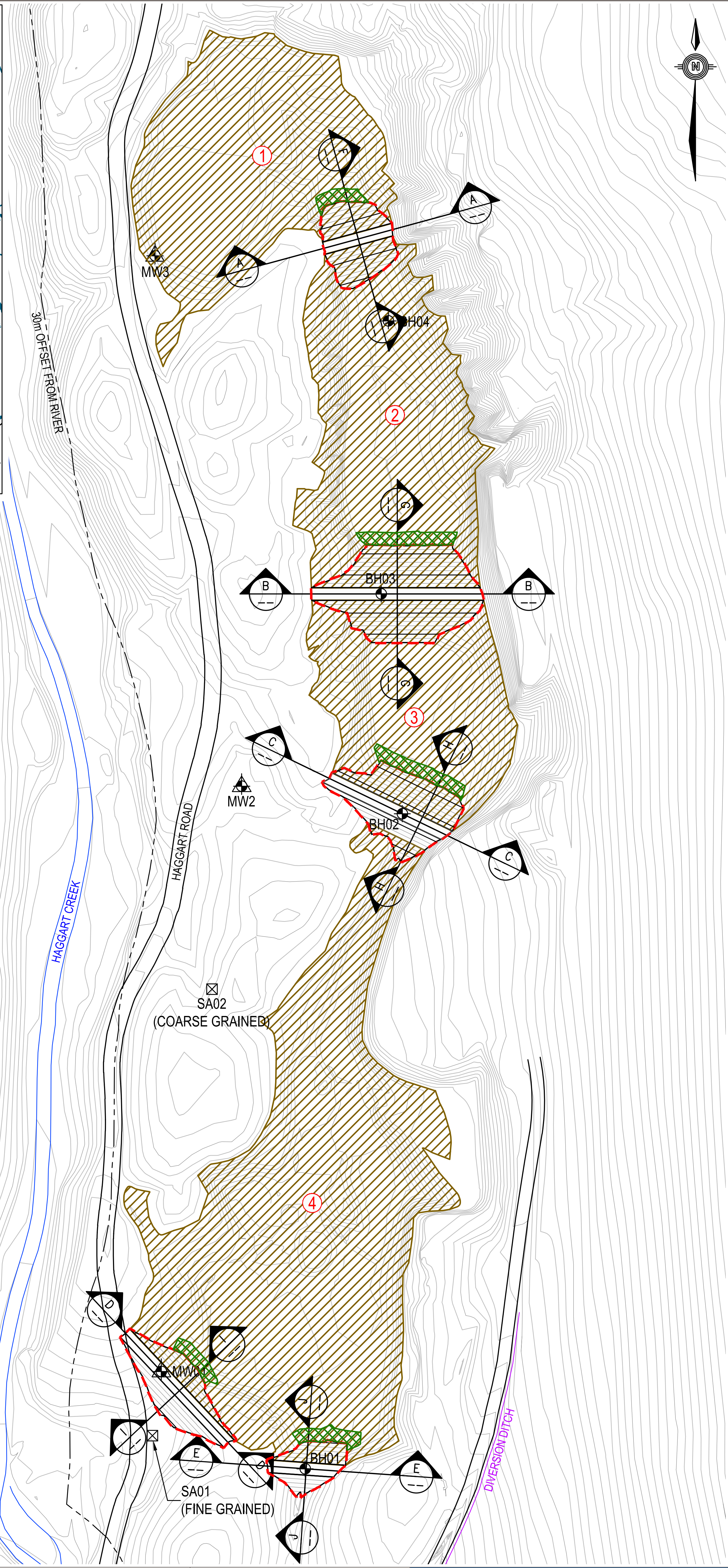
Q:\Whitehorse\Data\0201drawings\Whitehorse\W141\W14103150-02 Victoria Gold IROD Geotechnical Investigation\W14103150-02 Fig.1_R0 Overburden Storage V2.dwg [FIGURE 1] December 02, 2013 - 9:28:40 am (BY: BUCHAN, CAMERON)



STORAGE AREA VOLUMES	
STORAGE AREA	**OVERBURDEN (m^3)**
1	37000
2	73000
3	45000
4	100000
TOTAL	**255000**

BERM MATERIAL VOLUMES		
BERM	**COARSE MATERIAL (m^3)**	**FINE MATERIAL (m^3)**
A	4700	450
B	11000	1150
C	5400	850
D	2600	400
E	1400	300
TOTAL	**25100**	**3150**

FINE GRAINED MATERIAL VOLUME ESTIMATES	
BERM	**MATERIAL (m^3)**
A	150
B	280
C	280
D	160
E	200
TOTAL	**1070**



LEGEND:

- BORROW SOURCE SAMPLE LOCATION
- BOREHOLE LOCATION
- MONITORING WELL LOCATION
- PROPOSED CONTAINMENT BERM FOOTPRINT
- CONTAINMENT AREA
- ESTIMATED MATERIAL TAKE OFF LOCATION
- EXISTING DIVERSION DITCH ALIGNMENT

0 100

Scale: 1: 2 000 (metres)

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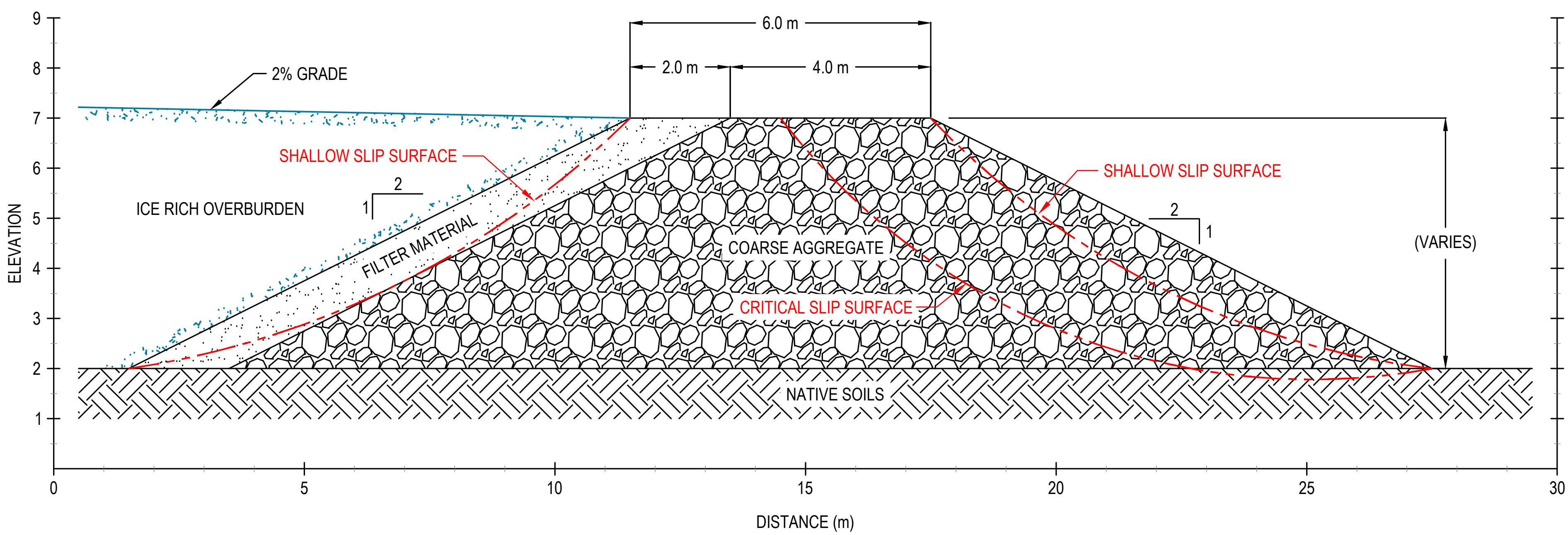
2013 GEOTECHNICAL INVESTIGATION
VICTORIA GOLD ICE RICH OVERBURDEN STORAGE AREA

SITE PLAN SHOWING
PROPOSED CONTAINMENT BERM LOCATIONS

PROJECT NO.	DWN	CKD	REV	
W14103150-02	CB	KAE	0	**Figure 1**
OFFICE	DATE			
EBA-WHSE	November 28, 2013			



LEGEND :

- NATIVE SOILS
- COARSE AGGREGATE
- FILTER MATERIAL
- ICE RICH OVERBURDEN

Scale: 1: 125 (metres)

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2013 GEOTECHNICAL INVESTIGATION
VICTORIA GOLD ICE RICH OVERBURDEN STORAGE AREA

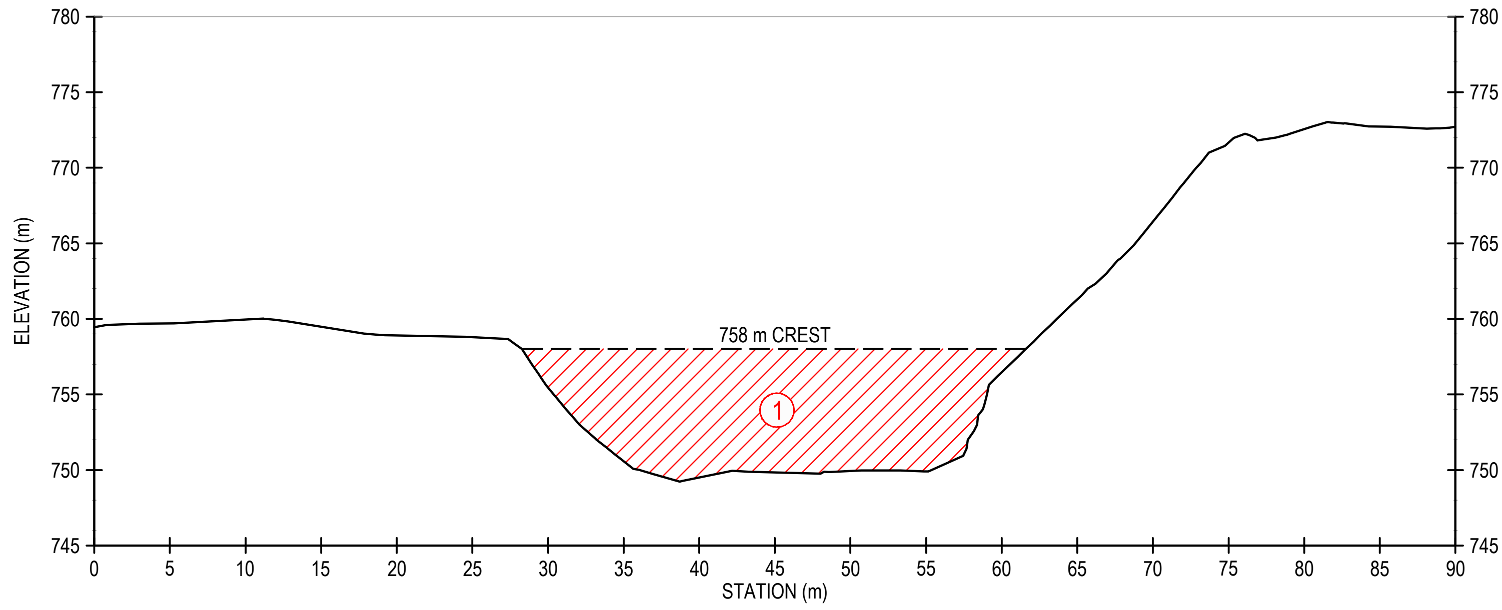
TYPICAL BERM CROSS-SECTION

PROJECT NO.	DWN	CKD	REV
W14103150-02	KF	CPC	0

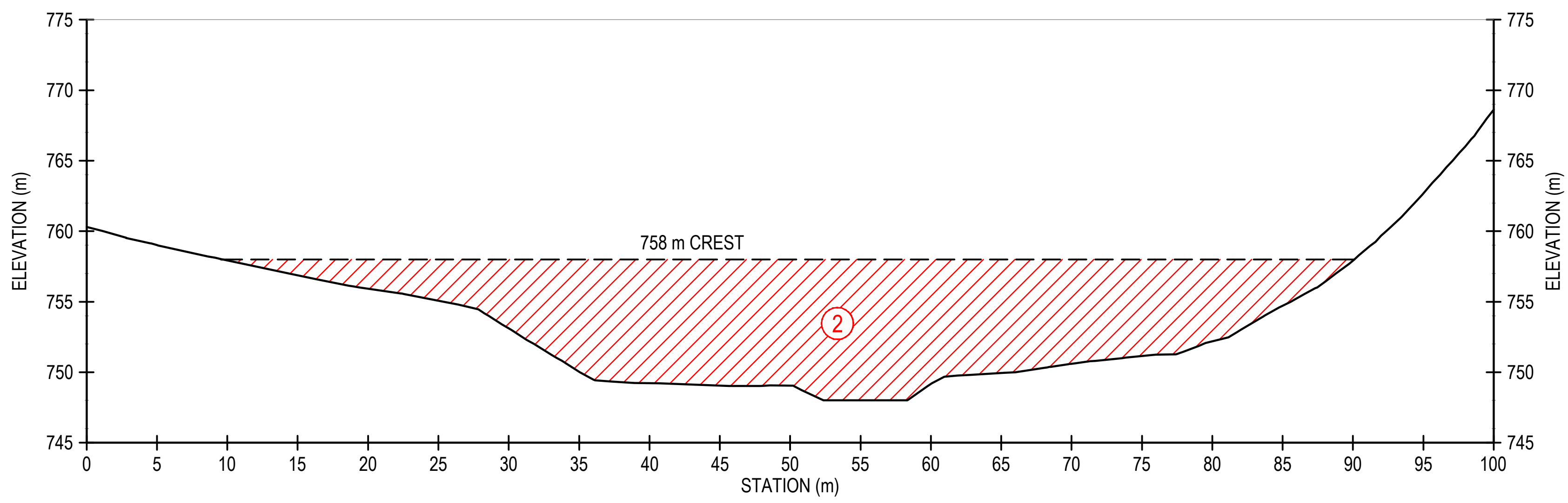
OFFICE	DATE
EBA-WHSE	November 20, 2013

Figure 2

Q:\Whitehorse\Data\0201drawings\Whitehorse\W141\W14103150-02 Victoria Gold IROD Geotechnical Investigation\W14103150-02 Fig.1_R0 Overburden Storage.dwg [FIGURE 3] November 20, 2013 - 2:05:30 pm (BY: BUCHAN, CAMERON)



SECTION A - A'



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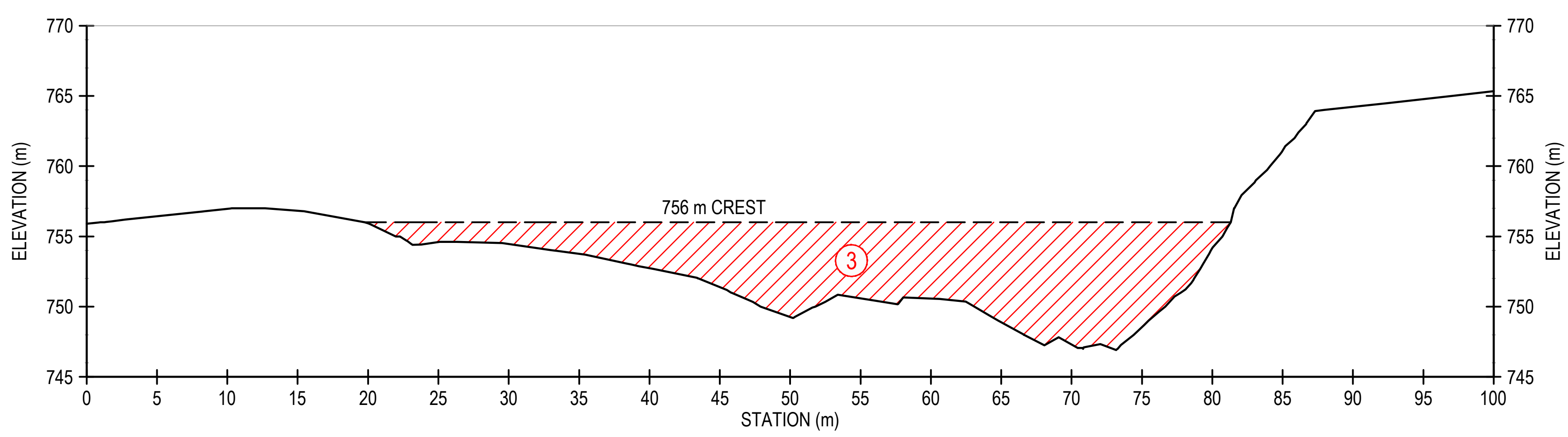

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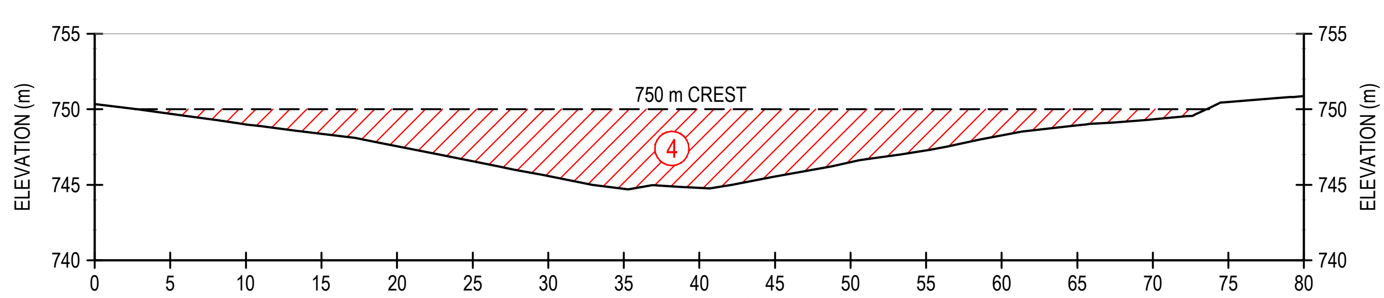

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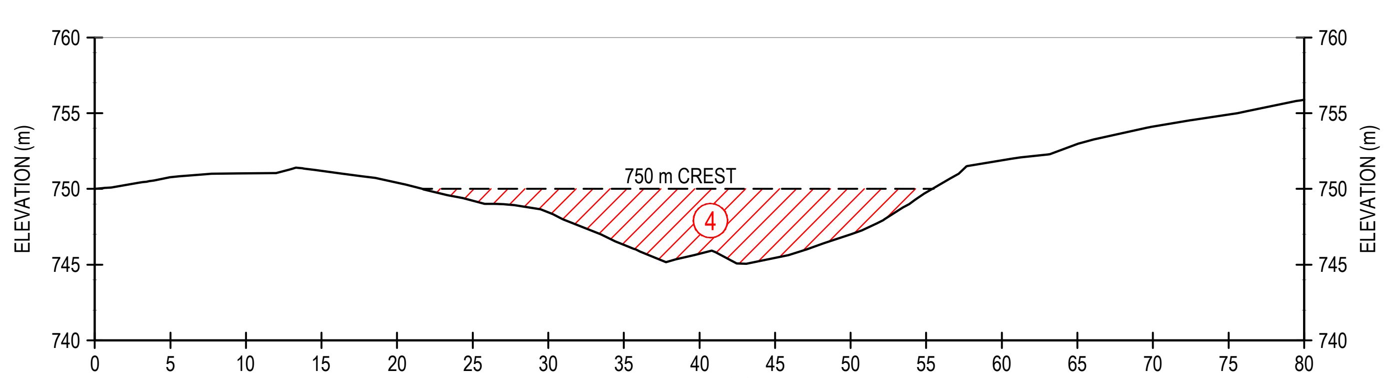

SECTION E - E'

0 25

Scale: 1: 500 (metres)

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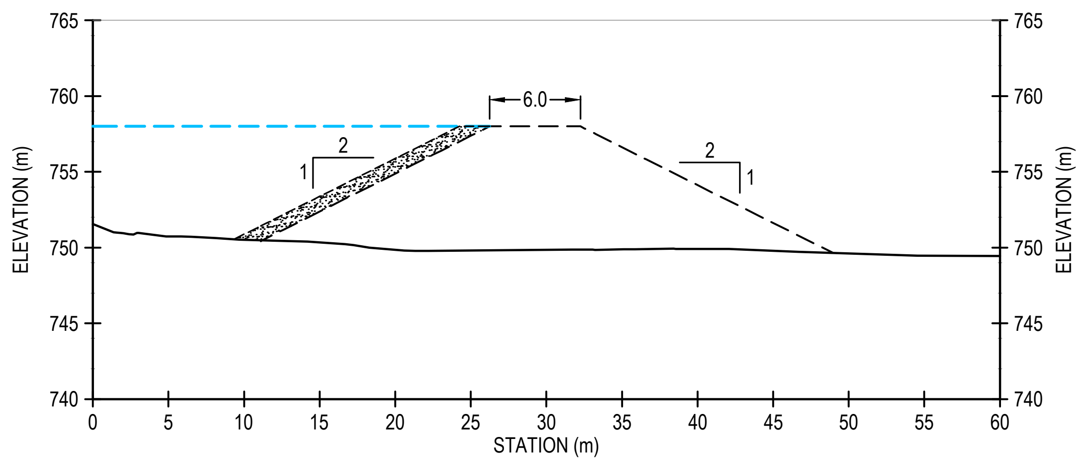
2013 GEOTECHNICAL INVESTIGATION
VICTORIA GOLD ICE RICH OVERBURDEN STORAGE AREA

CROSS-SECTIONS A - E

PROJECT NO.	DWN	CKD	REV	
W14103150-02	CB	CPC	0	**Figure 3**
OFFICE	DATE			
EBA-WHSE	November 20, 2013			



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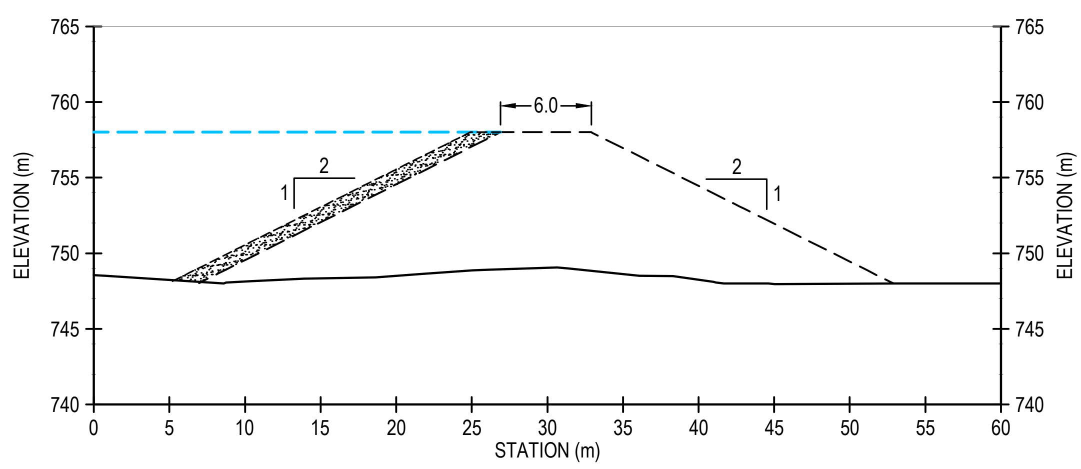
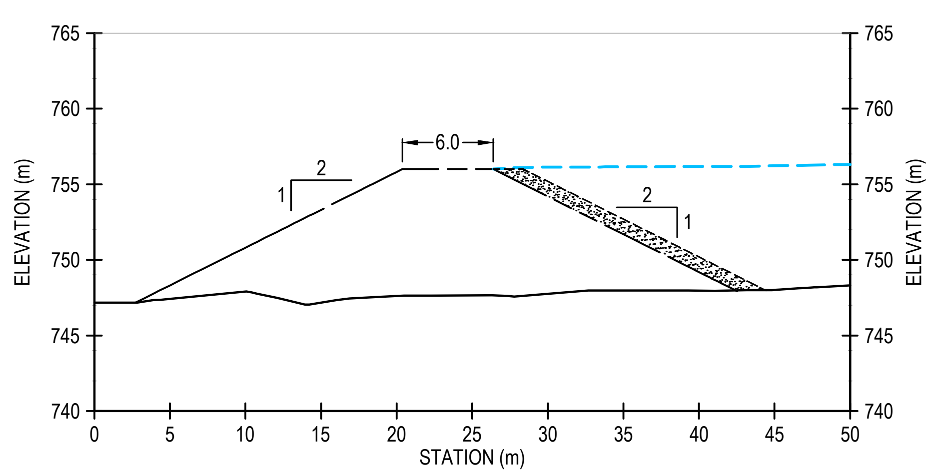


SECTION G - G'



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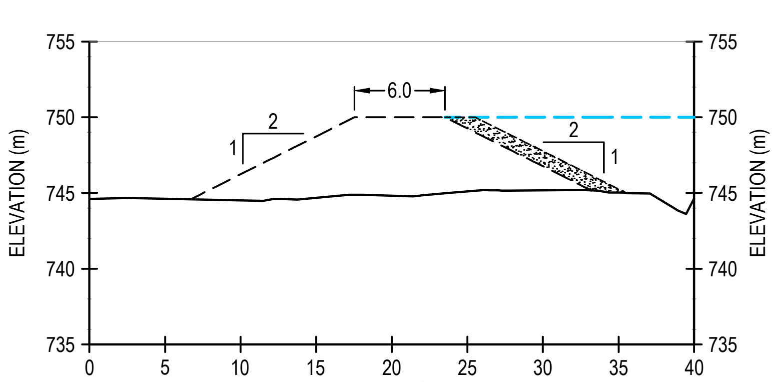

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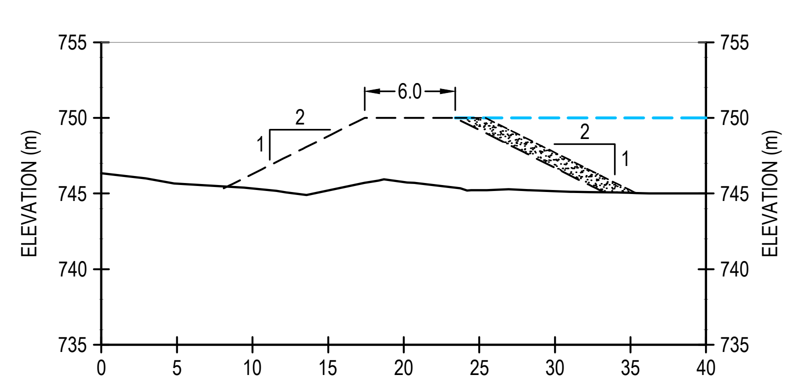

SECTION J - J'

LEGEND:

- OVERBURDEN MATERIAL PLACEMENT
- FILTER MATERIAL PLACEMENT

0 25

Scale: 1: 500 (metres)

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2013 GEOTECHNICAL INVESTIGATION
VICTORIA GOLD ICE RICH OVERBURDEN STORAGE AREA

CROSS-SECTIONS F - J

PROJECT NO.	DWN	CKD	REV
W14103150-02	CB	CPC	0

OFFICE	DATE
EBA-WHSE	November 20, 2013

Figure 4

APPENDIX A

NELPCO'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

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 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.

8.0 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.

9.0 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.

10.0 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.

11.0 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.

12.0 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.

13.0 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.

14.0 INFORMATION PROVIDED TO EBA BY OTHERS

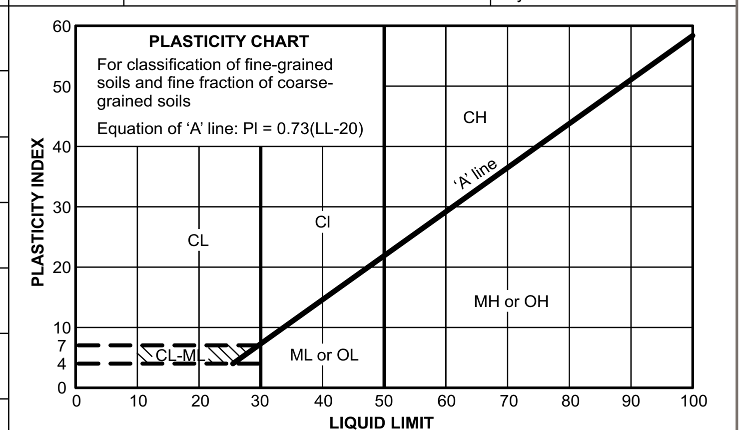
During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

BOREHOLE LOGS AND TEST RESULTS

MODIFIED UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE - GRAINED SOILS More than 50% retained on No. 75 µm sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines: Less than 5% pass 75 µm sieve: GW, GP, SW, SP; More than 12% pass 75 µm sieve: GM, GC, SM, SC; 5% to 12% pass 75 µm sieve: Borderline classification requiring use of dual symbols	$C_U = D_{60} / D_{10}$ Greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly-graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below 'A' line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above 'A' line and plasticity index greater than 7	
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines		$C_U = D_{60} / D_{10}$ Greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly-graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures		Atterberg limits plot above 'A' line and plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above 'A' line and plasticity index greater than 7	
FINE-GRAINED SOILS (by behavior) 50% or more passes 75 µm sieve*	SILTS	Liquid limit <50	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity			
		Liquid limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
	CLAYS Above "A" line on plasticity chart negligible organic content	Liquid limit <30	CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays			
		Liquid limit 30-50	CI	Inorganic clay of medium plasticity, silty clays			
		Liquid limit >50	CH	Inorganic clay of high plasticity, fat clays			
	ORGANIC SILTS AND CLAYS	Liquid limit <50	OL	Organic silts and organic silty clays of low plasticity			
		Liquid limit >50	OH	Organic clays of medium to high plasticity			
HIGHLY ORGANIC SOILS			PT	Peat, muck and other highly organic soils			



* Based on the material passing the 75 mm sieve

† ASTM Designation D 2487, for identification procedure see D 2488 USC as modified by PFRA

GROUND ICE DESCRIPTION

ICE NOT VISIBLE

GROUP SYMBOL	SYMBOL	SUBGROUP DESCRIPTION	
N	Nf	Poorly-bonded or friable	[symbol]
	Nbn	No excess ice, well-bonded	[symbol]
	Nbe	Excess ice, well-bonded	[symbol]

VISIBLE ICE LESS THAN 50% BY VOLUME

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

VISIBLE ICE GREATER THAN 50% BY VOLUME

ICE	ICE + Soil Type	Ice with soil inclusions	[symbol]
	ICE	Ice without soil inclusions (greater than 25 mm thick	[symbol]

NOTES:

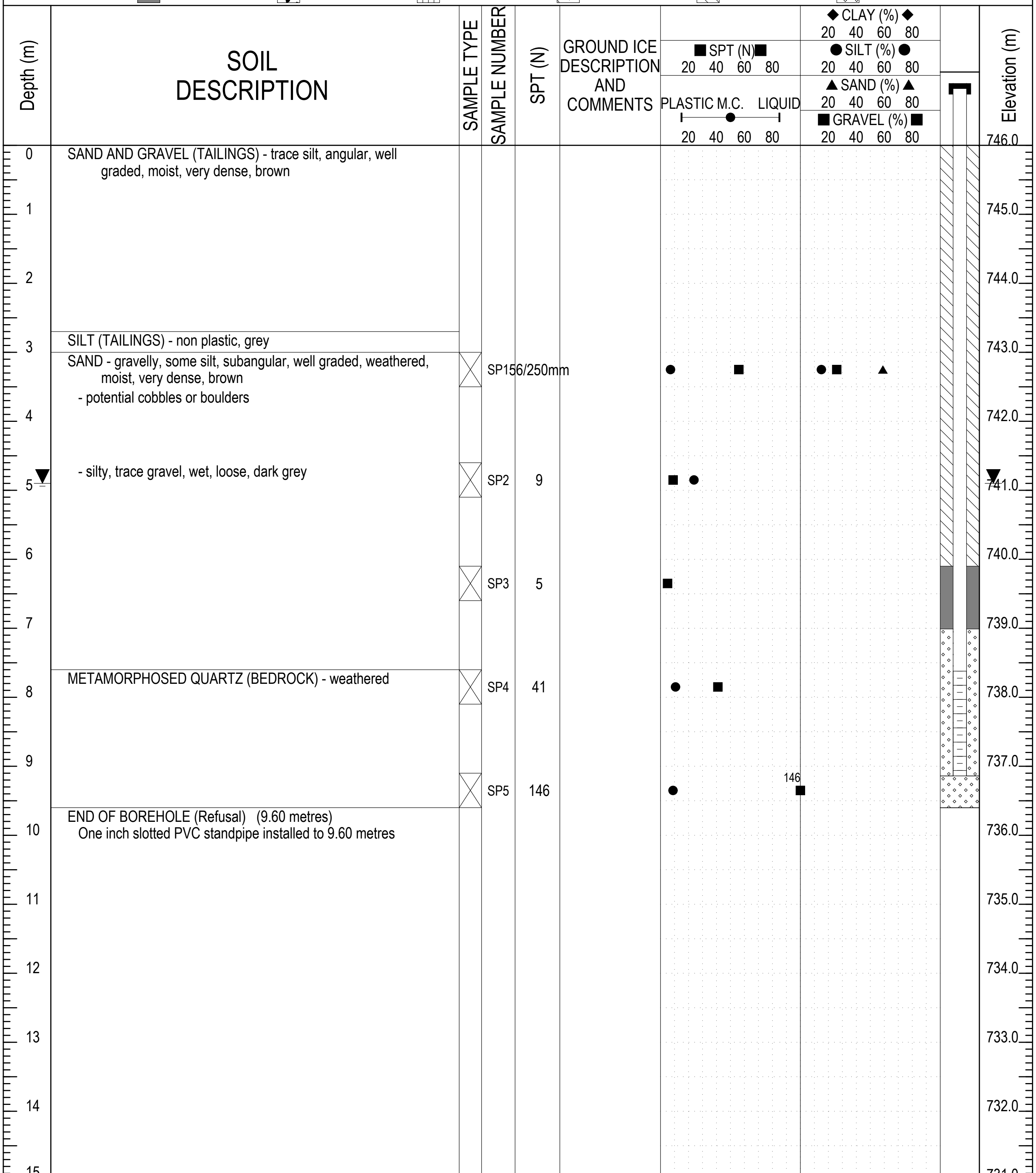
1. Dual symbols are used to indicate borderline or mixed ice classifications.
2. Visual estimates of ice contents indicated on borehole logs ± 5%
3. This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes.

LEGEND: Soil [white box] Ice [black box]

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-BH01
WHITEHORSE, YUKON TERRITORY	7098615N; 458364E; Zone 8	ELEVATION: 746 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



Depth (m)	Soil Description
0	SAND AND GRAVEL (TAILINGS) - trace silt, angular, well graded, moist, very dense, brown
~2.7	SILT (TAILINGS) - non plastic, grey
~3.0	SAND - gravelly, some silt, subangular, well graded, weathered, moist, very dense, brown - potential cobbles or boulders - silty, trace gravel, wet, loose, dark grey
~7.6	METAMORPHOSED QUARTZ (BEDROCK) - weathered
9.6	END OF BOREHOLE (Refusal) (9.60 metres) One inch slotted PVC standpipe installed to 9.60 metres

Sample Type	Sample Number	SPT (N)
SPT	SP1	56/250mm
SPT	SP2	9
SPT	SP3	5
SPT	SP4	41
SPT	SP5	146

LOGGED BY: KAE	COMPLETION DEPTH: 9.6m
REVIEWED BY: CC	COMPLETE: 9/19/2013
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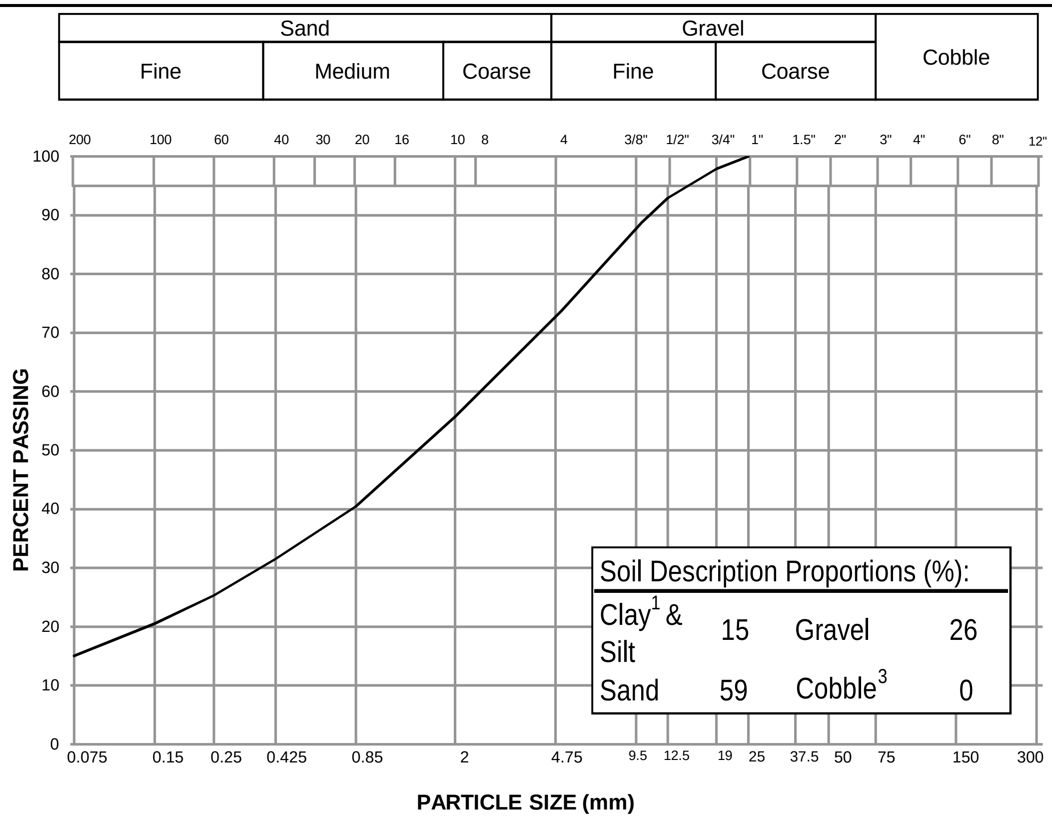
WHITEHORSE W14103150-02.GPJ EBA.GDT 13/11/19

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP01
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH01
Client:	NND EBA Land Protection Corp	Sample Depth:	3.0 - 3.5 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 19, 2013
Soil Description[2]:	SAND - gravelly, some silt	Sampled By:	KAE
		USC Classification:	Cu: n/a
Moisture Content:	7.1%		Cc: n/a

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	
25	100
19	98
12.5	93
10	89
5	74
2	56
0.85	40
0.425	32
0.25	25
0.15	21
0.075	15



Soil Description Proportions (%):			
Clay[1] & Silt	15	Gravel	26
Sand	59	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By: ____________

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-BH02
WHITEHORSE, YUKON TERRITORY	7098925N; 458410E; Zone 8	ELEVATION: 751 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	GROUND ICE DESCRIPTION AND COMMENTS	■ SPT (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ CLAY (%) ◆ 20 40 60 80 / ● SILT (%) ● 20 40 60 80 / ▲ SAND (%) ▲ 20 40 60 80 / ■ GRAVEL (%) ■ 20 40 60 80	Elevation (m)
0	SAND AND GRAVEL (TAILINGS) - trace silt, trace cobbles, angular, well graded, damp, compact, brown							751.0
1								750.0
2	SAND - some gravel, trace silt, well graded, damp, compact, brown	SPT	SP1	10				749.0
3		SPT	SP2	10				748.0
4								747.0
5	- 300 mm thick silt lens - moist, loose	SPT	SP3	9				746.0
6								745.0
7	- saturated							744.0
8		SPT	SP4	8				743.0
9		SPT	SP5	7				742.0
10								741.0
11								740.0
12								739.0
13	SILT - sandy, trace clay, trace gravel, saturated, stiff, dark olive brown - 300 mm thick clay layer	SPT	SP6	10				738.0
14	SAND - some gravel, trace silt, angular, well graded, saturated, loose, brown	SPT	SP7	3				737.0
15								736.0

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	REVIEWED BY: CC	COMPLETE: 9/20/2013
	DRAWING NO:	Page 1 of 2

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-BH02
WHITEHORSE, YUKON TERRITORY	7098925N; 458410E; Zone 8	ELEVATION: 751 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	GROUND ICE DESCRIPTION AND COMMENTS	■ SPT (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ CLAY (%) ◆ / ● SILT (%) ● / ▲ SAND (%) ▲ / ■ GRAVEL (%) ■ 20 40 60 80	Standpipe	Elevation (m)
15									736.0
		SPT	SP8	8		■			
16									735.0
		DISTURBED	G1						
	END OF BOREHOLE (Refusal) (16.20 metres) One inch slotted PVC standpipe installed to 15.24 metres Note: Stopped due to auger refusal on till.								
17									734.0
18									733.0
19									732.0
20									731.0
21									730.0
22									729.0
23									728.0
24									727.0
25									726.0
26									725.0
27									724.0
28									723.0
29									722.0
30									721.0

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LOGGED BY: KAE	COMPLETION DEPTH: 16.2m
REVIEWED BY: CC	COMPLETE: 9/20/2013
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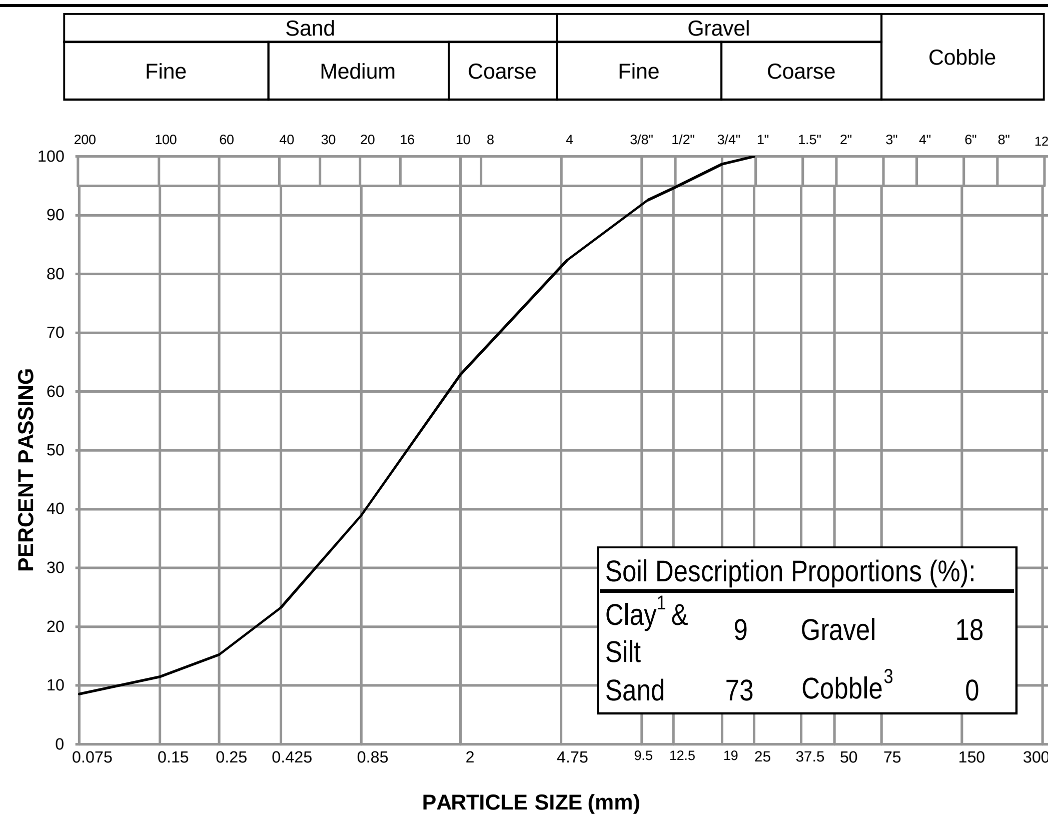
PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP02
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH02
Client:	NND EBA Land Protection Corp	Sample Depth:	3.0 - 3.5 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 20, 2013
Soil Description[2]:	SAND - some gravel, trace silt	Sampled By:	KAE
		USC Classification:	Cu: 16.6
Moisture Content:	3.0%		Cc: 1.8

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	
25	100
19	99
12.5	95
10	93
5	82
2	63
0.85	39
0.425	23
0.25	15
0.15	12
0.075	9



Soil Description Proportions (%):			
Clay[1] & Silt	9	Gravel	18
Sand	73	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols
[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: __________

Remarks:

Reviewed By: __________

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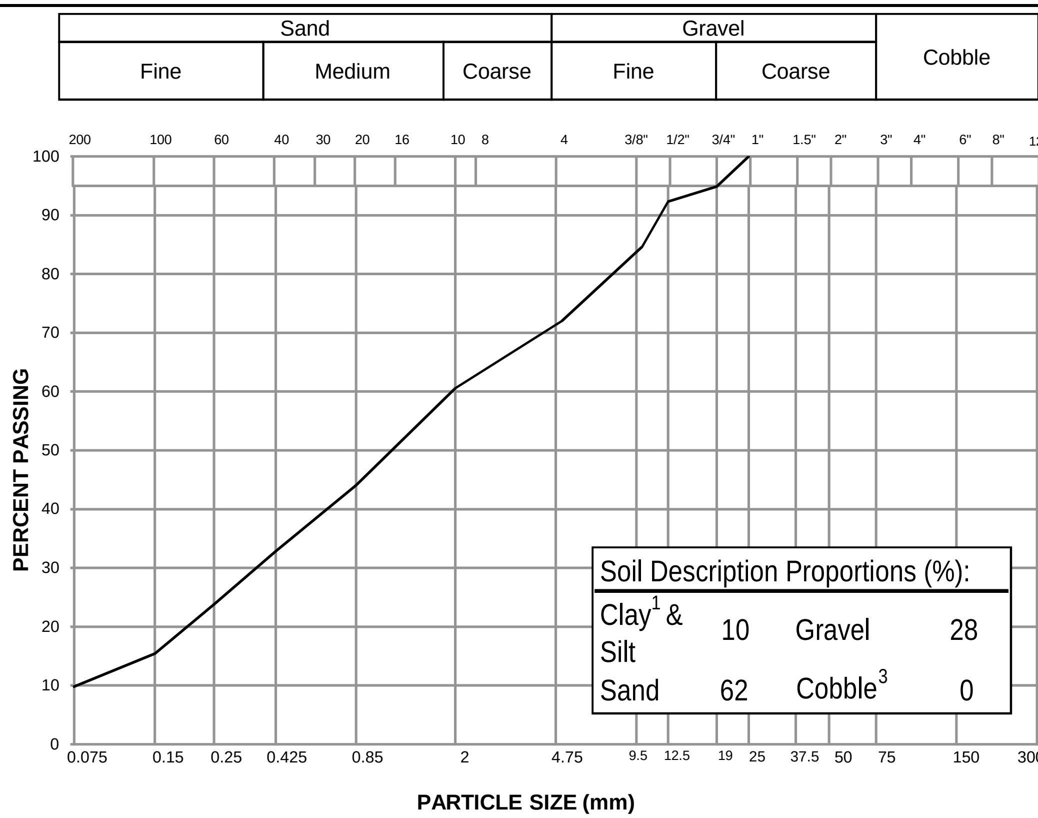
PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP07
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH02
Client:	NND EBA Land Protection Corp	Sample Depth:	13.7 - 14.2 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 20, 2013
Soil Description[2]:	SAND - gravelly, trace silt	Sampled By:	KAE
		USC Classification:	Cu: 25.3
Moisture Content:	16.6%		Cc: 0.9

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	
25	100
19	95
12.5	92
10	85
5	72
2	61
0.85	44
0.425	33
0.25	24
0.15	15
0.075	10



Soil Description Proportions (%):			
Clay[1] & Silt	10	Gravel	28
Sand	62	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols
[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: __________

Remarks: __________

Reviewed By: __________

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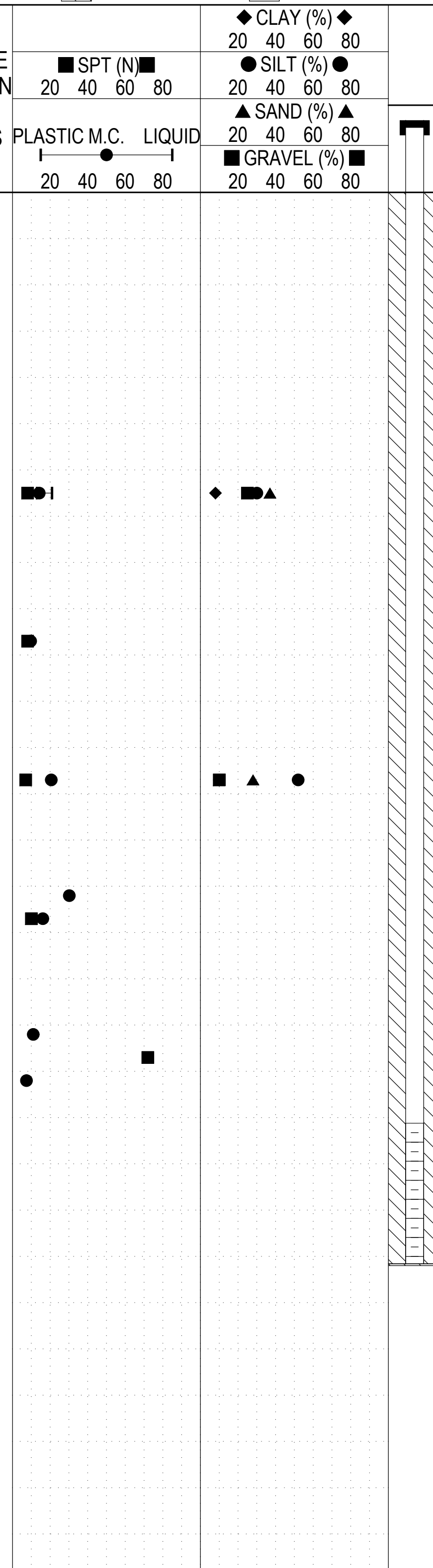
IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-BH03
WHITEHORSE, YUKON TERRITORY	7099029N; 458299E; Zone 8	ELEVATION: 749 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	USC	SOIL SYMBOL	GROUND ICE DESCRIPTION AND COMMENTS	Elevation (m)
0	SAND (TAILINGS) - gravelly, some cobbles and boulders, damp, dense (est.), brown - cobbles							749.0
1								748.0
2	- silty, trace clay, well graded, saturated, loose							747.0
3		SPT	SP1	8	CL-ML			746.0
4								745.0
5		SPT	SP2	8				744.0
6	SILT (TILL) - sandy, trace gravel, trace clay, saturated, firm, non to low plastic, dark brown	SPT	SP3	7				743.0
7								742.0
8	- trace sand, moist, compact, non plastic	SPT	SP4	10				741.0
9	BEDROCK - weathered	SPT	SP5	72/275mm				740.0
10								739.0
11								738.0
12	END OF BOREHOLE (Refusal) (11.60 metres) One inch slotted PVC standpipe installed to 11.58 metres							737.0
13								736.0
14								735.0
15								734.0



LOGGED BY: KAE	COMPLETION DEPTH: 11.6m
REVIEWED BY: CC	COMPLETE: 9/21/2013
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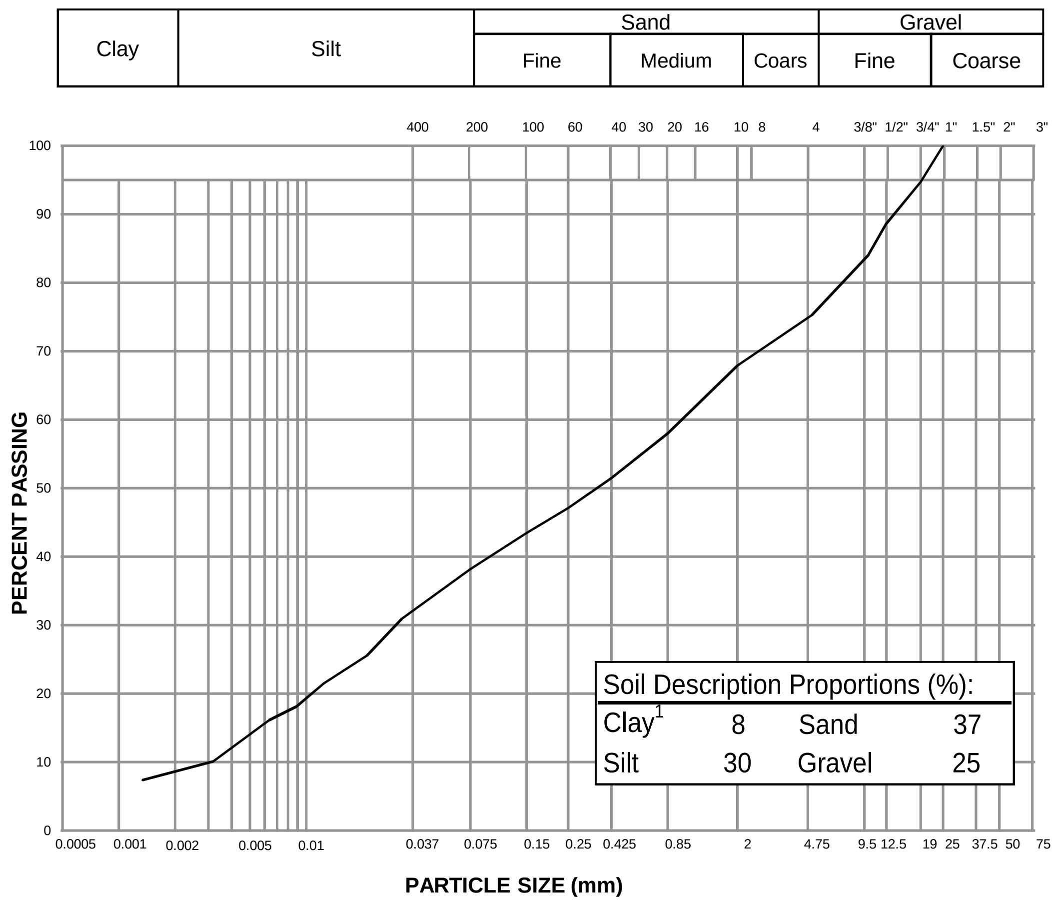
PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP01
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH03
Client:	NND EBA Land Protection Corp	Sample Depth:	3.0 - 3.3 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 4, 2013 By: SMS	Date sampled:	September 21, 2013
Soil Description[2]:	SAND - silty, gravelly, trace clay	Sampled By:	KAE
		USC Classification:	Cu: 345.9
Moisture Content:	12.5%		Cc: 0.3

Particle Size (mm)	Percent Passing
75	
50	
38	
25	100
19	95
12.5	89
10	84
5	75
2	68
0.85	58
0.425	51
0.25	47
0.15	43
0.075	38
0.0324	30.9
0.0211	25.5
0.0124	21.5
0.0089	18.2
0.0063	16.1
0.0032	10.1
0.0013	7.4



Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

Reviewed By:

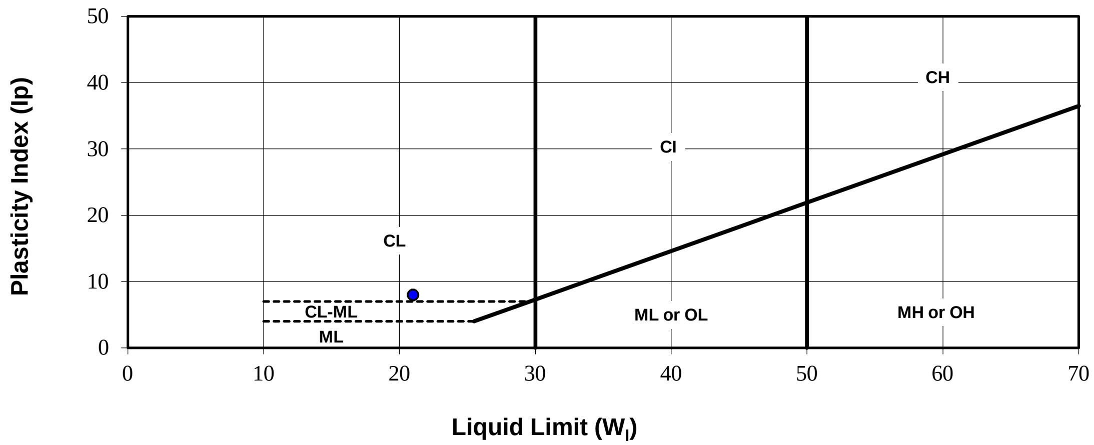
eba A TETRA TECH COMPANY

ATTERBERG LIMITS TEST REPORT

ASTM D4318

Project:	Victoria Gold IROD Geotechnical Investiga	Sample Number:	SP01
	Dublin Gulch Property, YT	Borehole Number:	BH03
Project No:	W14103150-02	Depth:	3.0 - 3.3 m
Client:	NND EBA Land Protection Corp	Sampled By:	KAE Tested By: SMS
Attention:	Pat Titus	Date Sampled:	September 21, 2013
Email:		Date Tested:	October 8, 2013

Sample Description: SAND - silty, gravelly, trace clay



Liquid Limit ($W_{1)}$:	21	Natural Moisture (%)	12.5
Plastic Limit :	13	Soil Plasticity:	Low
Plasticity Index (Ip) :	**8**	Mod.USCS Symbol:	CL-ML

Remarks:

Reviewed By:

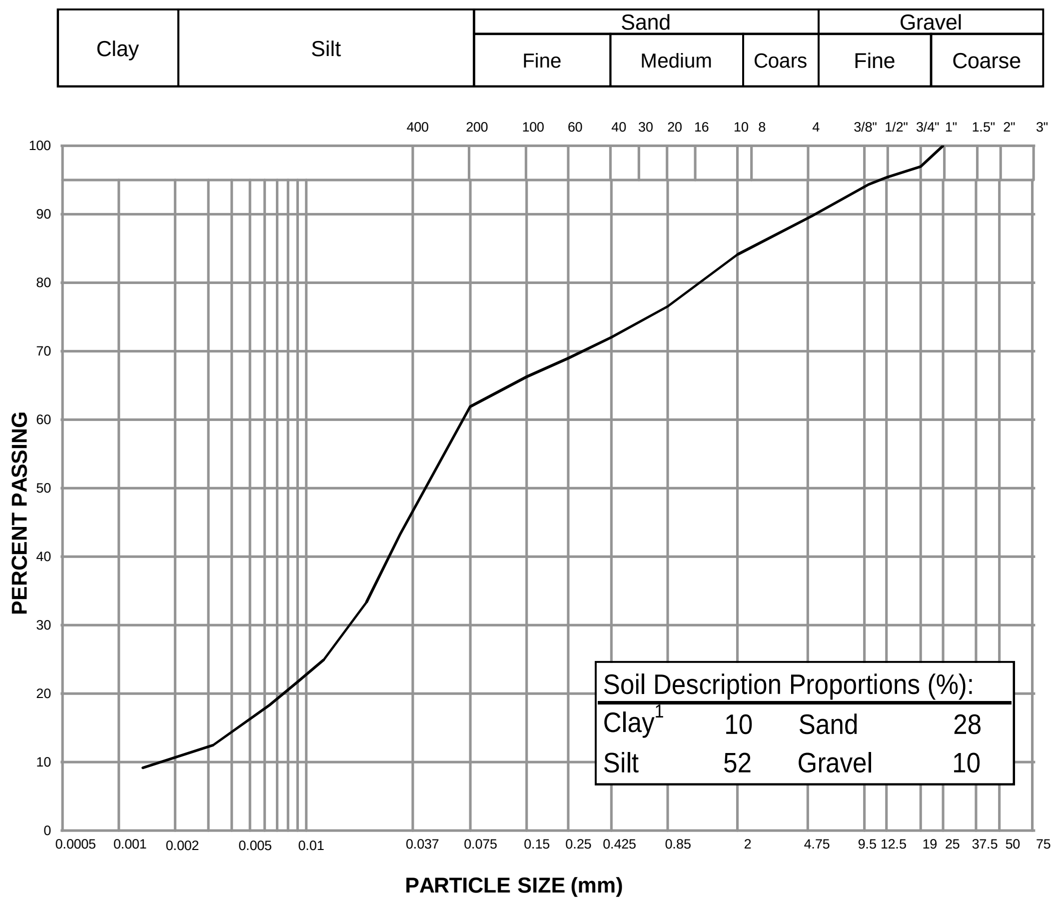
eba A TETRA TECH COMPANY

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP03
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH03
Client:	NND EBA Land Protection Corp	Sample Depth:	6.1 - 6.6 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 4, 2013 By: SMS	Date sampled:	September 21, 2013
Soil Description[2]:	SILT - sandy, trace gravel, trace clay	Sampled By:	KAE
		USC Classification:	Cu: 39.1
Moisture Content:	20.6%		Cc: 2.4

Particle Size (mm)	Percent Passing
75	
50	
38	
25	100
19	97
12.5	95
10	94
5	90
2	84
0.85	77
0.425	72
0.25	69
0.15	66
0.075	62
0.0318	43.3
0.0209	33.3
0.0124	25.0
0.0089	21.6
0.0064	18.3
0.0032	12.5
0.0013	9.2



Soil Description Proportions (%):			
Clay[1]	10	Sand	28
Silt	52	Gravel	10

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

Reviewed By:

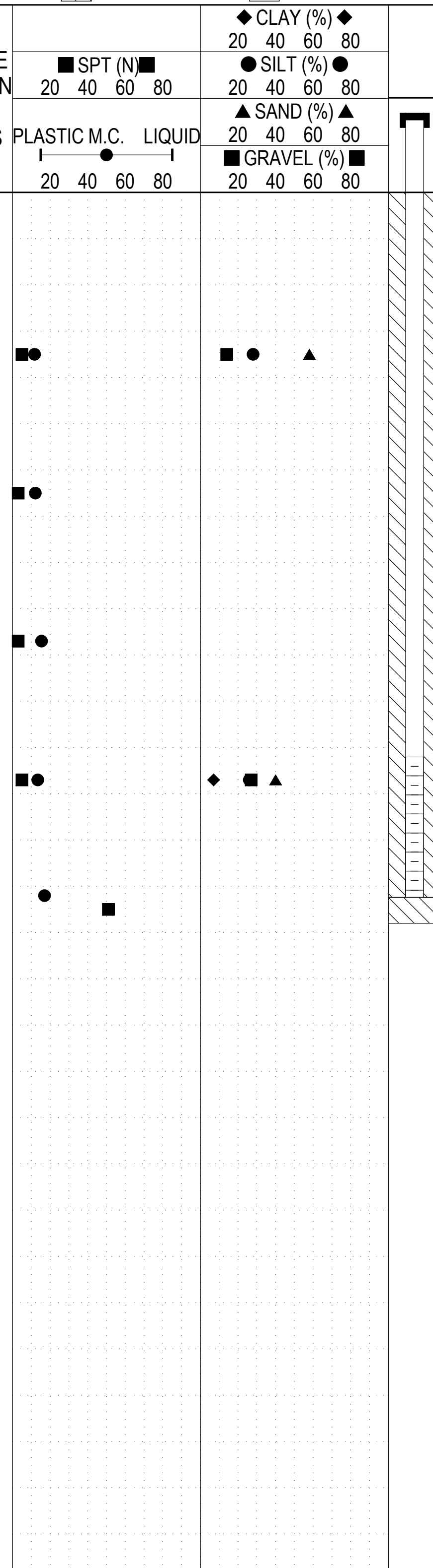
eba A TETRA TECH COMPANY

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-BH04
WHITEHORSE, YUKON TERRITORY	7099158N; 458400E; Zone 8	ELEVATION: 750 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	GROUND ICE DESCRIPTION AND COMMENTS	Elevation (m)
0	GRAVEL (TAILINGS) - sandy, some silt, trace cobbles, well graded, saturated, loose, brown					750.0
1.5	SAND - silty, some gravel, trace clay, well graded sand, saturated, loose, non plastic silt, brown	SPT	SP1	5		
3	- very loose	SPT	SP2	3		
5		SPT	SP3	3		
6	- gravelly, loose	SPT	SP4	5		
7.7	BEDROCK - weathered	SPT	SP5	51/200mm		
7.9	END OF BOREHOLE (Refusal) (7.90 metres) One inch slotted PVC standpipe installed to 7.62 metres					



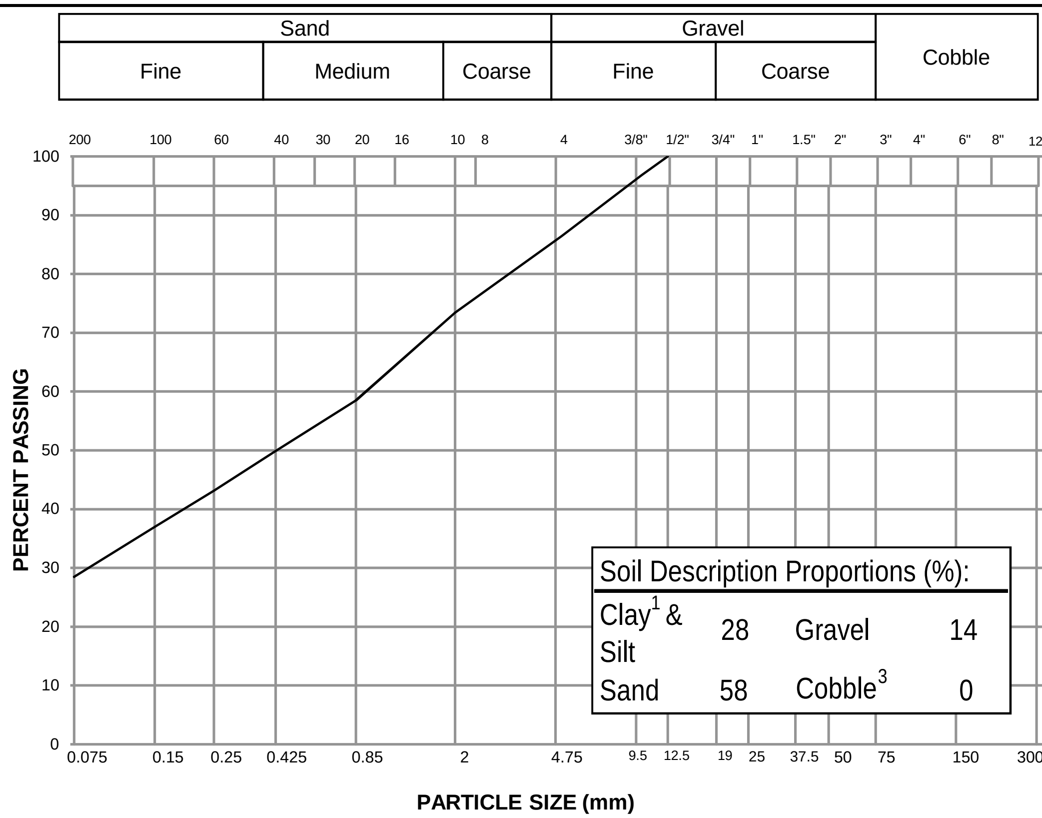
LOGGED BY: KAE	COMPLETION DEPTH: 7.9m
REVIEWED BY: CC	COMPLETE: 9/21/2013
DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP01
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH04
Client:	NND EBA Land Protection Corp	Sample Depth:	1.5 - 2.0 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 21, 2013
Soil Description[2]:	SAND - silty, some gravel	Sampled By:	KAE
		USC Classification:	Cu: n/a
Moisture Content:	11.7%		Cc: n/a

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	
25	
19	
12.5	100
10	97
5	86
2	73
0.85	59
0.425	50
0.25	43
0.15	37
0.075	28



Soil Description Proportions (%):			
Clay[1] & Silt	28	Gravel	14
Sand	58	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By: ____________________

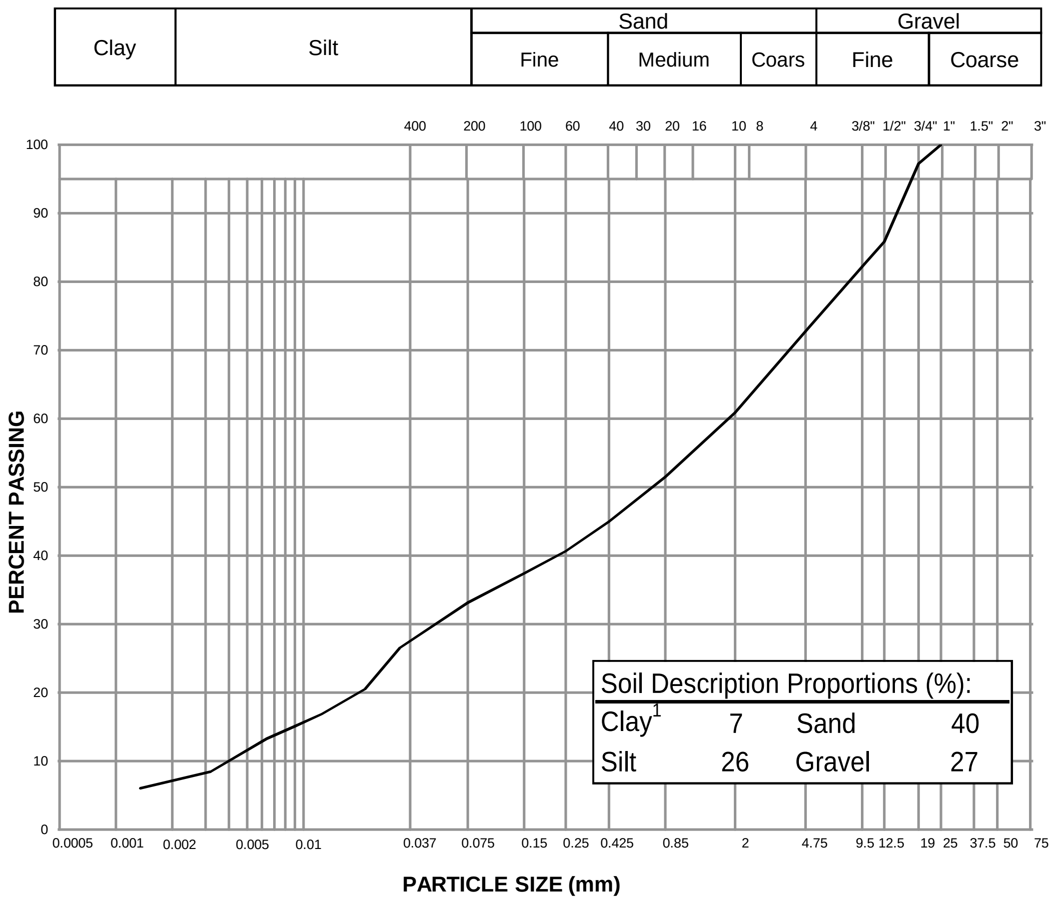
eba A TETRA TECH COMPANY

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP04
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	BH04
Client:	NND EBA Land Protection Corp	Sample Depth:	6.1 - 6.6 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 4, 2013 By: SMS	Date sampled:	September 21, 2013
Soil Description[2]:	SAND - silty, gravelly, trace clay	Sampled By:	KAE
		USC Classification:	Cu: 447.3
Moisture Content:	13.3%		Cc: 0.4

Particle Size (mm)	Percent Passing
75	
50	
38	
25	100
19	97
12.5	86
10	83
5	73
2	61
0.85	52
0.425	45
0.25	41
0.15	37
0.075	33
0.0327	26.5
0.0213	20.5
0.0125	16.9
0.0089	15.1
0.0064	13.3
0.0032	8.4
0.0013	6.0



Soil Description Proportions (%):			
Clay[1]	7	Sand	40
Silt	26	Gravel	27

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification: __________

Remarks: __________

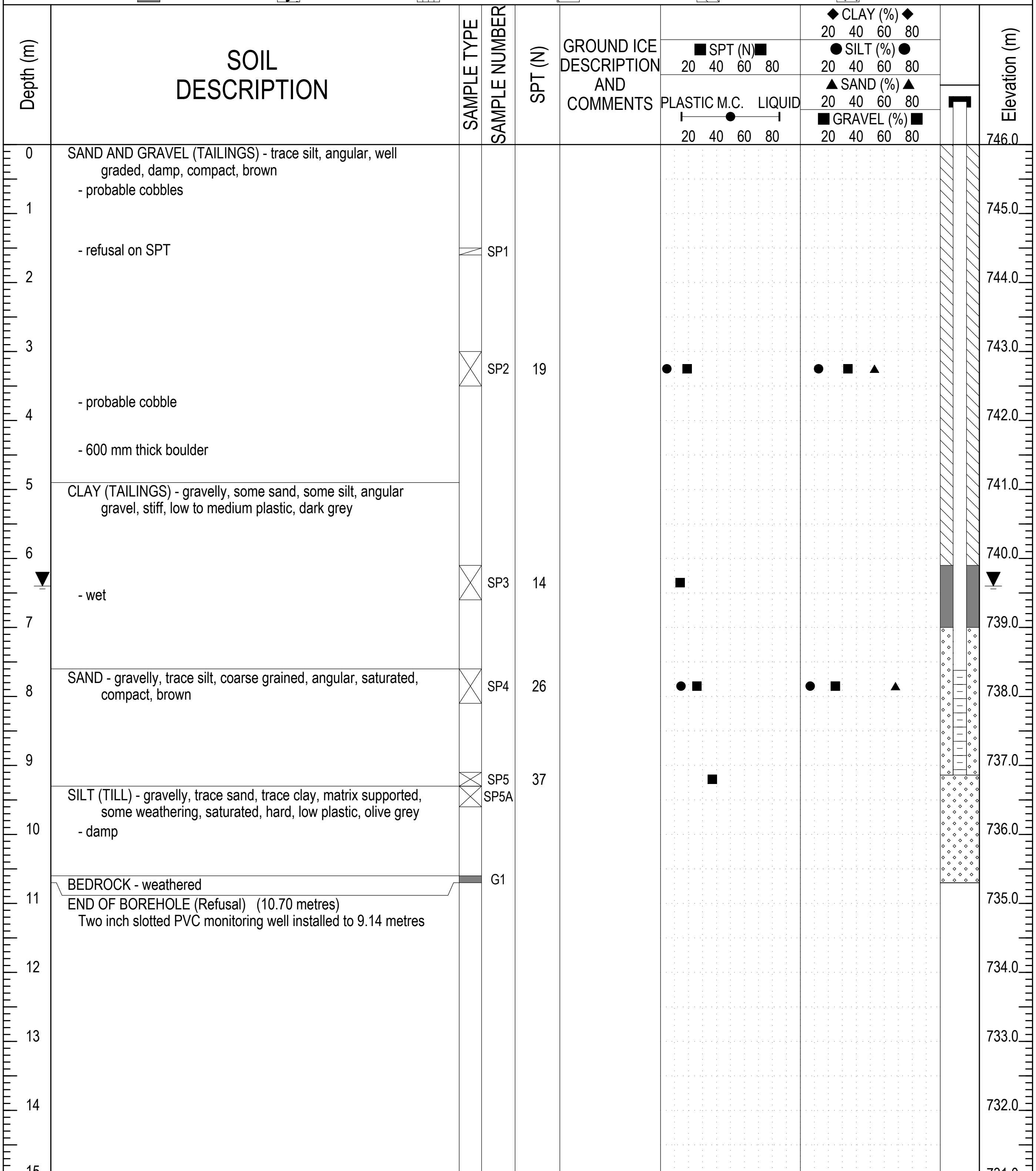
Reviewed By: __________

eba A TETRA TECH COMPANY

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-MW01
WHITEHORSE, YUKON TERRITORY	7098661N; 458296E; Zone 8	ELEVATION: 746 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



LOGGED BY: KAE	COMPLETION DEPTH: 10.7m
REVIEWED BY: CC	COMPLETE: 9/19/2013
DRAWING NO:	Page 1 of 1

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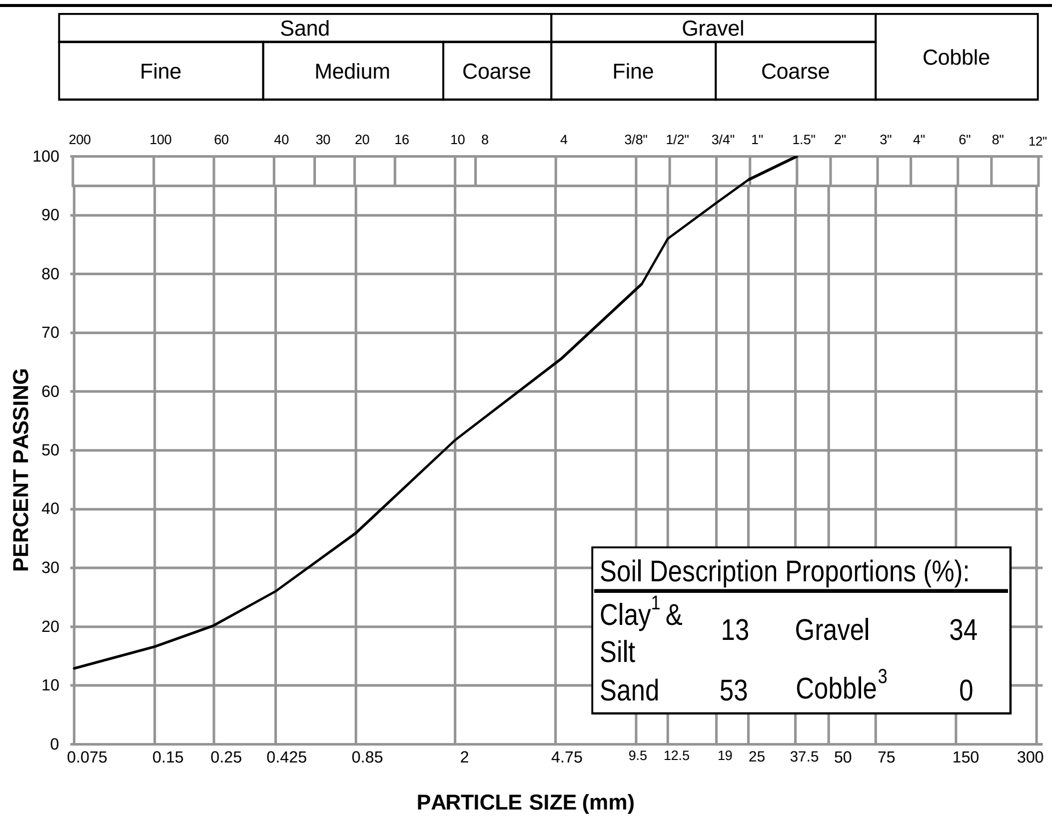
PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP02
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	MW01
Client:	NND EBA Land Protection Corp	Sample Depth:	3.0 - 3.5 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 19, 2013
Soil Description[2]:	SAND - gravelly, some silt	Sampled By:	KAE
		USC Classification:	Cu: n/a
Moisture Content:	4.5%		Cc: n/a

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	100
25	96
19	92
12.5	86
10	78
5	66
2	52
0.85	36
0.425	26
0.25	20
0.15	17
0.075	13



Soil Description Proportions (%):			
Clay[1] & Silt	13	Gravel	34
Sand	53	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols
[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

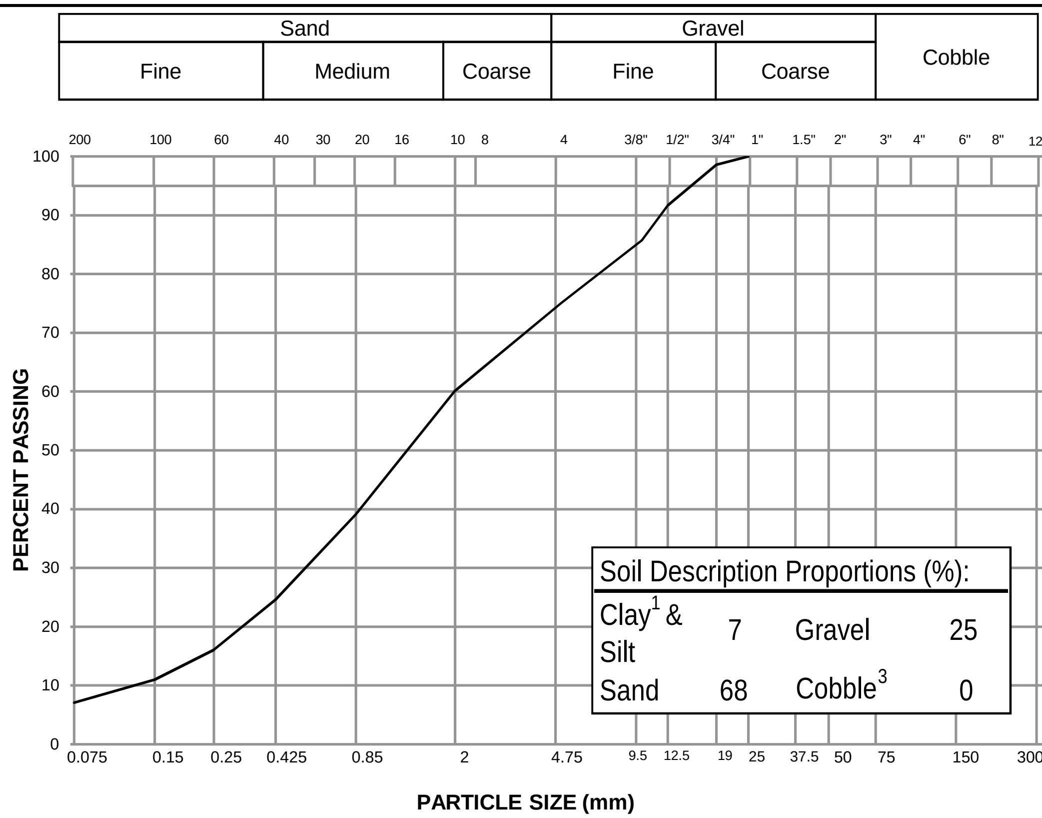
Reviewed By: ____________

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP04
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	MW01
Client:	NND EBA Land Protection Corp	Sample Depth:	7.6 - 8.1 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 19, 2013
Soil Description[2]:	SAND - gravelly, trace silt	Sampled By:	KAE
		USC Classification:	Cu: 15.3
Moisture Content:	14.6%		Cc: 1.3

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	
25	100
19	99
12.5	92
10	86
5	75
2	60
0.85	39
0.425	25
0.25	16
0.15	11
0.075	7



Soil Description Proportions (%):			
Clay[1] & Silt	7	Gravel	25
Sand	68	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By: ____________

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-MW02
WHITEHORSE, YUKON TERRITORY	7098938N; 458334E; Zone 8	ELEVATION: 752 m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	USC	SOIL SYMBOL	GROUND ICE DESCRIPTION AND COMMENTS	■ SPT (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ CLAY (%) ◆ / ● SILT (%) ● / ▲ SAND (%) ▲ / ■ GRAVEL (%) ■ 20 40 60 80	Elevation (m)
0	GRAVEL AND SAND (TAILINGS) - trace cobbles and silt, angular, well graded, wet, hard, brown									752.0
1	- damp									751.0
		SPT	SP1	50/100mm						
2										750.0
	- dark grey									
3	- probable cobbles and boulders									749.0
	SAND - gravelly, silty, well graded, subangular, moist, compact, non plastic silt, brown, root inclusions									
4										748.0
5		SPT	SP2	11						747.0
	- cobble or boulder									
6										746.0
		SPT	SP3	9						
	- CLAY - trace silt, moist, stiff, medium plastic, grey 200 mm thick	SPT	SP3A		CI					
7										745.0
	▼									▼
8	- saturated, olive brown	SPT	SP4	11						744.0
9										743.0
	- trace silt	SPT	SP5	12						
10										742.0
11	- medium and coarse grained, some oxidation	SPT	SP6	50/75mm						741.0
	- hard									
12		DISTURBED	G1							740.0
	END OF BOREHOLE (Refusal) (11.90 metres) Two inch slotted PVC monitoring well 2A installed to 11.89 metres One inch slotted PVC monitoring well 2B installed to 9.14 metres									
13										739.0
14										738.0
15										737.0

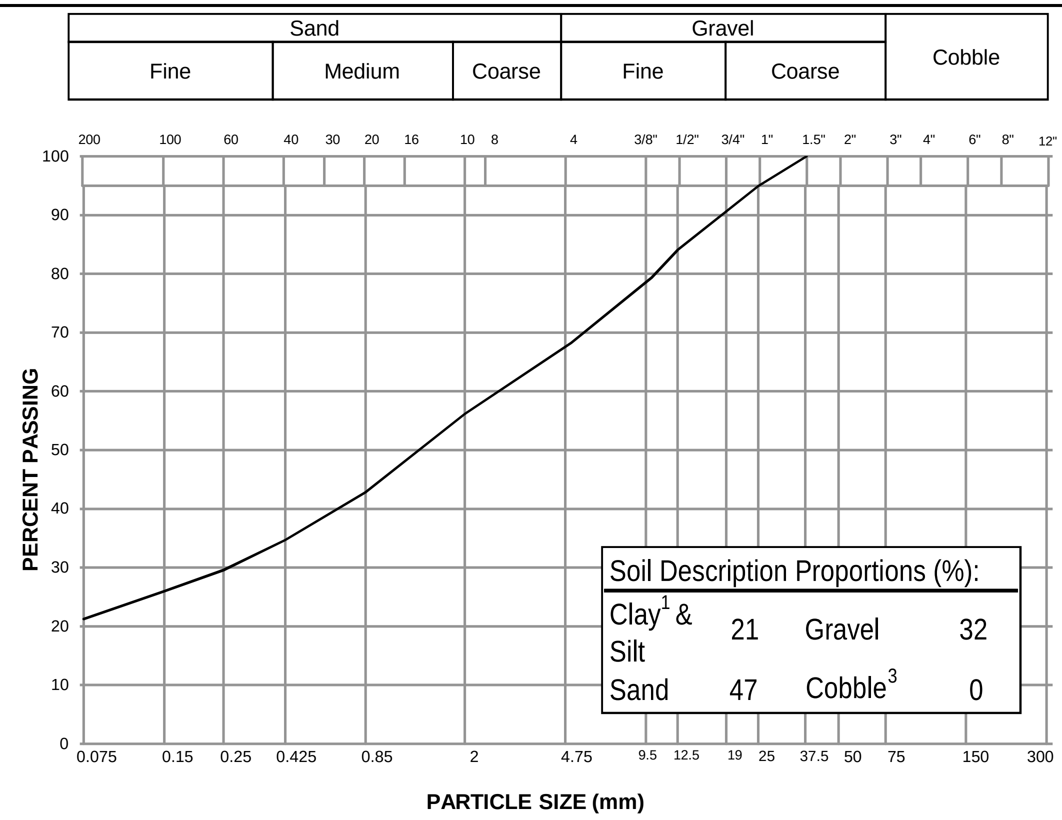
eba A TETRA TECH COMPANY	LOGGED BY: KAE	COMPLETION DEPTH: 11.9m
	REVIEWED BY: CC	COMPLETE: 9/20/2013
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP02
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	MW02
Client:	NND EBA Land Protection Corp	Sample Depth:	4.6 - 5.1 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 20, 2013
Soil Description[2]:	SAND - gravelly, silty	Sampled By:	KAE
		USC Classification:	Cu: n/a
Moisture Content:	7.4%		Cc: n/a

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	100
25	95
19	95
12.5	84
10	79
5	68
2	56
0.85	43
0.425	35
0.25	30
0.15	26
0.075	21



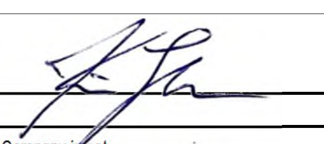
Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______________________

Remarks: ______________________

Reviewed By: 

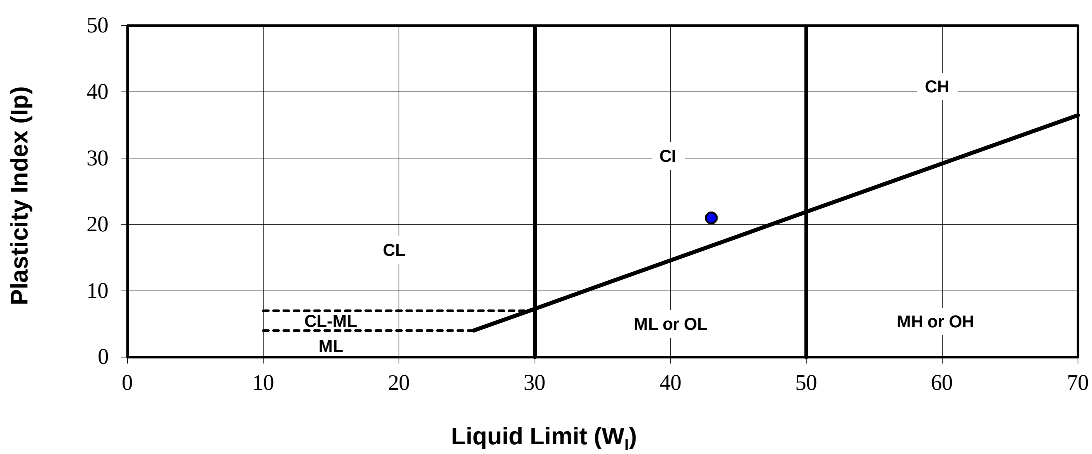
eba A TETRA TECH COMPANY

ATTERBERG LIMITS TEST REPORT

ASTM D4318

Project:	Victoria Gold IROD Geotechnical Investiga	Sample Number:	SP03a
	Dublin Gulch Property, YT	Borehole Number:	MW02
Project No:	W14103150-02	Depth:	6.4 - 6.6 m
Client:	NND EBA Land Protection Corp	Sampled By:	KAE Tested By: SMS
Attention:	Pat Titus	Date Sampled:	September 20, 2013
Email:		Date Tested:	October 8, 2013

Sample Description:



Liquid Limit (W_1) :	43	Natural Moisture (%)	40.6
Plastic Limit :	22	Soil Plasticity:	Medium
Plasticity Index (Ip) :	**21**	Mod.USCS Symbol:	CI

Remarks:

Reviewed By:

eba A TETRA TECH COMPANY

IROD GEOTECHNICAL INVESTIGATION	VICTORIA GOLD CORPORATION	PROJECT NO. - BOREHOLE NO.
EAGLE GOLD PROPERTY	DRILL: HOLLOW STEM AUGER	W14103150-02-MW03
WHITEHORSE, YUKON TERRITORY	7099189N; 458293E; Zone 8	ELEVATION: 756 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	GROUND ICE DESCRIPTION AND COMMENTS	■ SPT (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ CLAY (%) ◆ / ● SILT (%) ● / ▲ SAND (%) ▲ / ■ GRAVEL (%) ■ 20 40 60 80	Elevation (m)
0	SAND AND GRAVEL (TAILINGS) - trace to some silt, cobbles and boulders, damp, very dense, brown							756.0
1								755.0
2								754.0
3								753.0
4	- boulders							752.0
5								751.0
6								750.0
	BEDROCK - weathered	SPT	SP1	87		■		
	END OF BOREHOLE (Refusal) (6.50 metres) Two inch slotted PVC monitoring well installed to 6.10 metres							
7								749.0
8								748.0
9								747.0
10								746.0
11								745.0
12								744.0
13								743.0
14								742.0
15								741.0

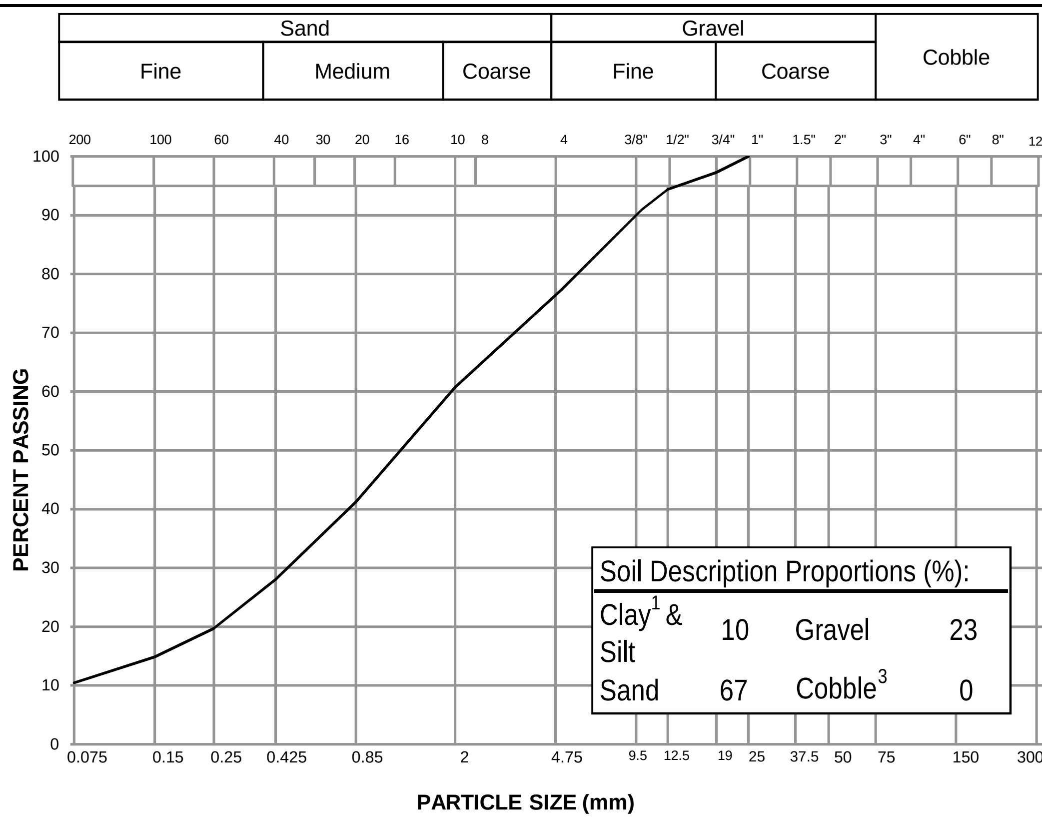
eba A TETRA TECH COMPANY	LOGGED BY: KAE	COMPLETION DEPTH: 6.5m
	REVIEWED BY: CC	COMPLETE: 9/22/2013
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	SP05
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	MW02
Client:	NND EBA Land Protection Corp	Sample Depth:	9.1 - 9.6 m
Client Rep.:	Pat Titus	Sampling Method:	Split Spoon
Date Tested:	October 9, 2013 By: SMS	Date sampled:	September 20, 2013
Soil Description[2]:	SAND - gravelly, trace silt	Sampled By:	KAE
		USC Classification:	Cu: n/a
Moisture Content:	11.3%		Cc: n/a

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	
25	100
19	97
12.5	94
10	91
5	77
2	61
0.85	41
0.425	28
0.25	20
0.15	15
0.075	10



Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

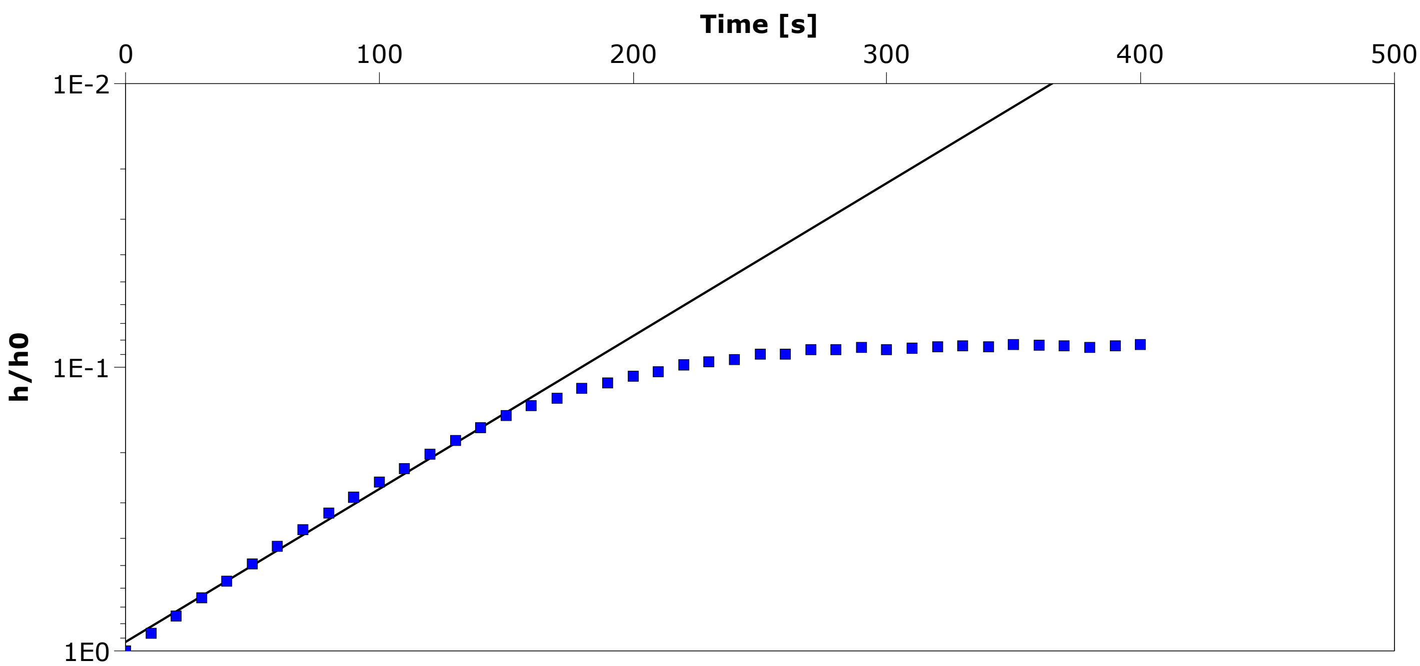
Reviewed By: ____________________

eba A TETRA TECH COMPANY

APPENDIX C

HYDRAULIC CONDUCTIVITY TESTING

EBA, A Tetra Tech Company **61 Wasson Place** **Whitehorse, YT Y1A 0H7**		**Slug Test Analysis Report**
		Project: Eagle Gold Project
		Number: W14103150-02
		Client: Strata Gold Corporation
Location: Dublin Gulch Property	Slug Test: Rising Head Test	Test Well: MW02
Test Conducted by: Kisa Elmer		Test Date: 10/10/2013
Analysis Performed by: KRR	Hvorslev	Analysis Date: 10/10/2013
Aquifer Thickness: 8.10 m		

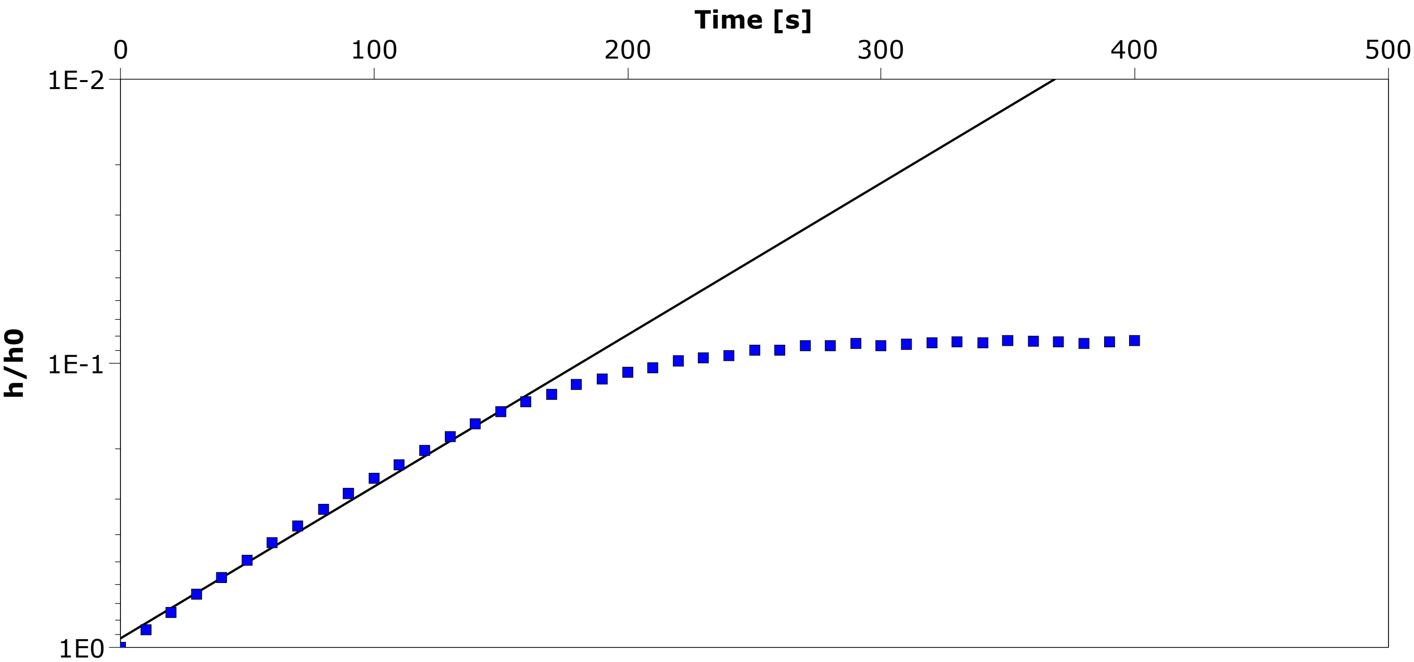


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW02	1.12×10^{-5}	

EBA, A Tetra Tech Company 61 Wasson Place Whitehorse, YT Y1A 0H7	**Slug Test Analysis Report**	
	Project: Eagle Gold Project	
	Number: W14103150-02	
	Client: Strata Gold Corporation	

Location: Dublin Gulch Property	Slug Test: Rising Head Test	Test Well: MW02
Test Conducted by: Kisa Elmer		Test Date: 10/10/2013
Analysis Performed by: KRR	Bouwer & Rice	Analysis Date: 10/10/2013
Aquifer Thickness: 8.10 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW02	8.50×10^{-6}	

APPENDIX D

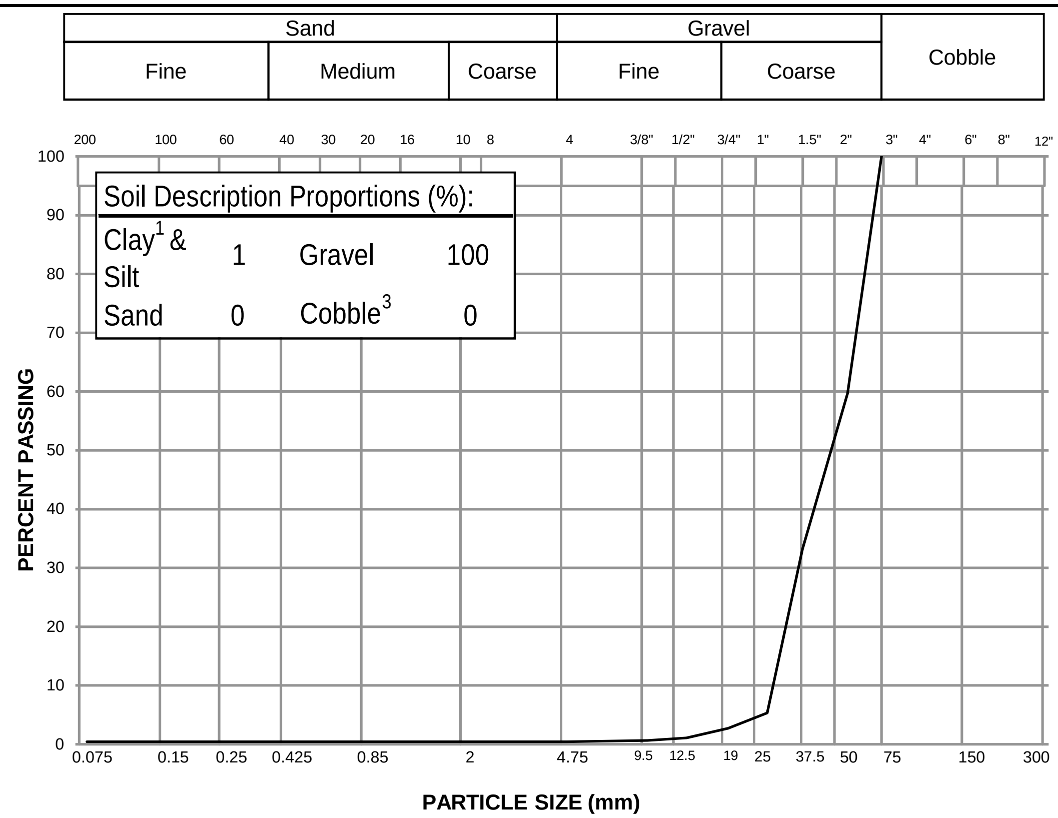
MATERIAL TESTING FOR BERM DESIGN

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigatio	Sample No.:	Coarse
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	n/a
Client:	NND EBA Land Protection Corp	Sample Depth:	n/a
Client Rep.:	Pat Titus	Sampling Method:	Grab
Date Tested:	November 1, 2013 By: SP	Date sampled:	n/a
Soil Description[2]:	GRAVEL - trace silt	Sampled By:	Client
		USC Classification:	Cu: 1.9
Moisture Content:	1.2%		Cc: 0.8

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
56	60
38	33
28	5
20	3
14	1
10	1
5	0
2.5	0
1.25	0
0.63	0
0.315	0
0.16	0
0.08	0



Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______________________

Remarks: ______________________

Reviewed By: ______________________

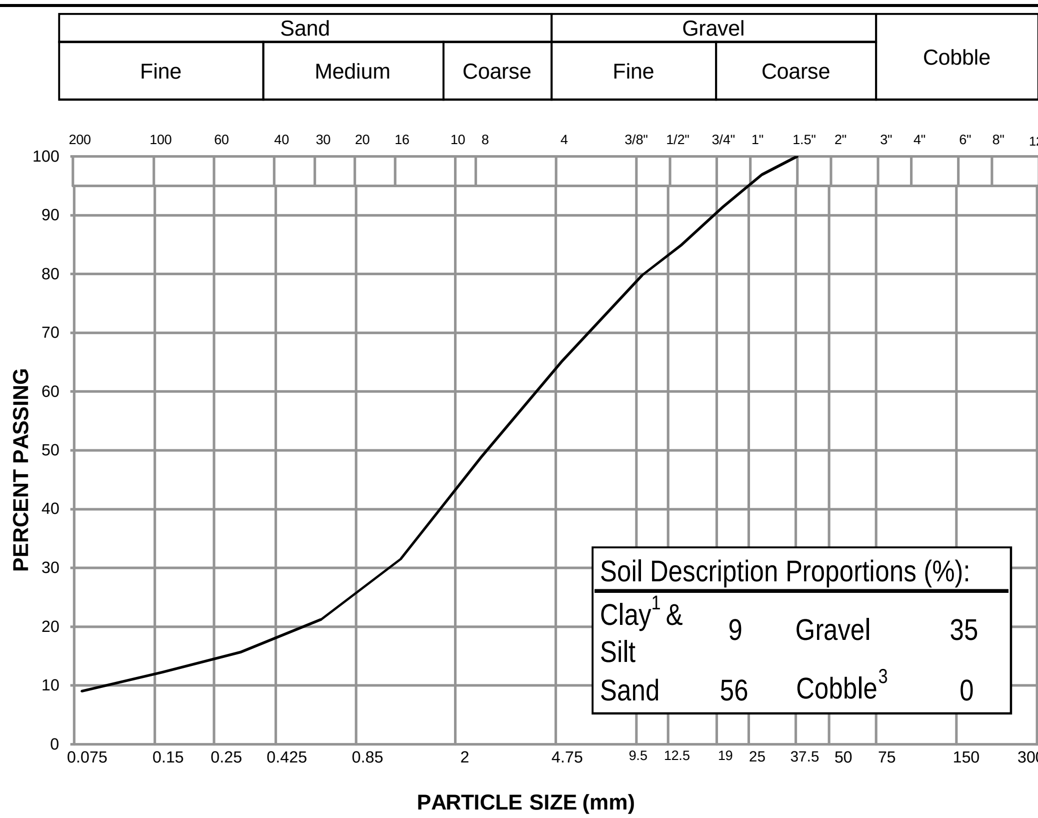
eba A TETRA TECH COMPANY

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422, C136 & C117

Project:	Victoria Gold IROD Geotechnical Investigatio	Sample No.:	Fine
Project No.:	W141013150-02	Material Type:	
Site:	Dublin Gulch Property, YT	Sample Loc.:	n/a
Client:	NND EBA Land Protection Corp	Sample Depth:	n/a
Client Rep.:	Pat Titus	Sampling Method:	Grab
Date Tested:	November 1, 2013 By: SP	Date sampled:	n/a
Soil Description[2]:	SAND - gravelly, trace silt	Sampled By:	Client
		USC Classification:	Cu: 40.7
Moisture Content:	2.3%		Cc: 3.1

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
56	
38	100
28	97
20	91
14	85
10	80
5	65
2.5	49
1.25	32
0.63	21
0.315	16
0.16	12
0.08	9



Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By: ____________________

A TETRA TECH COMPANY

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

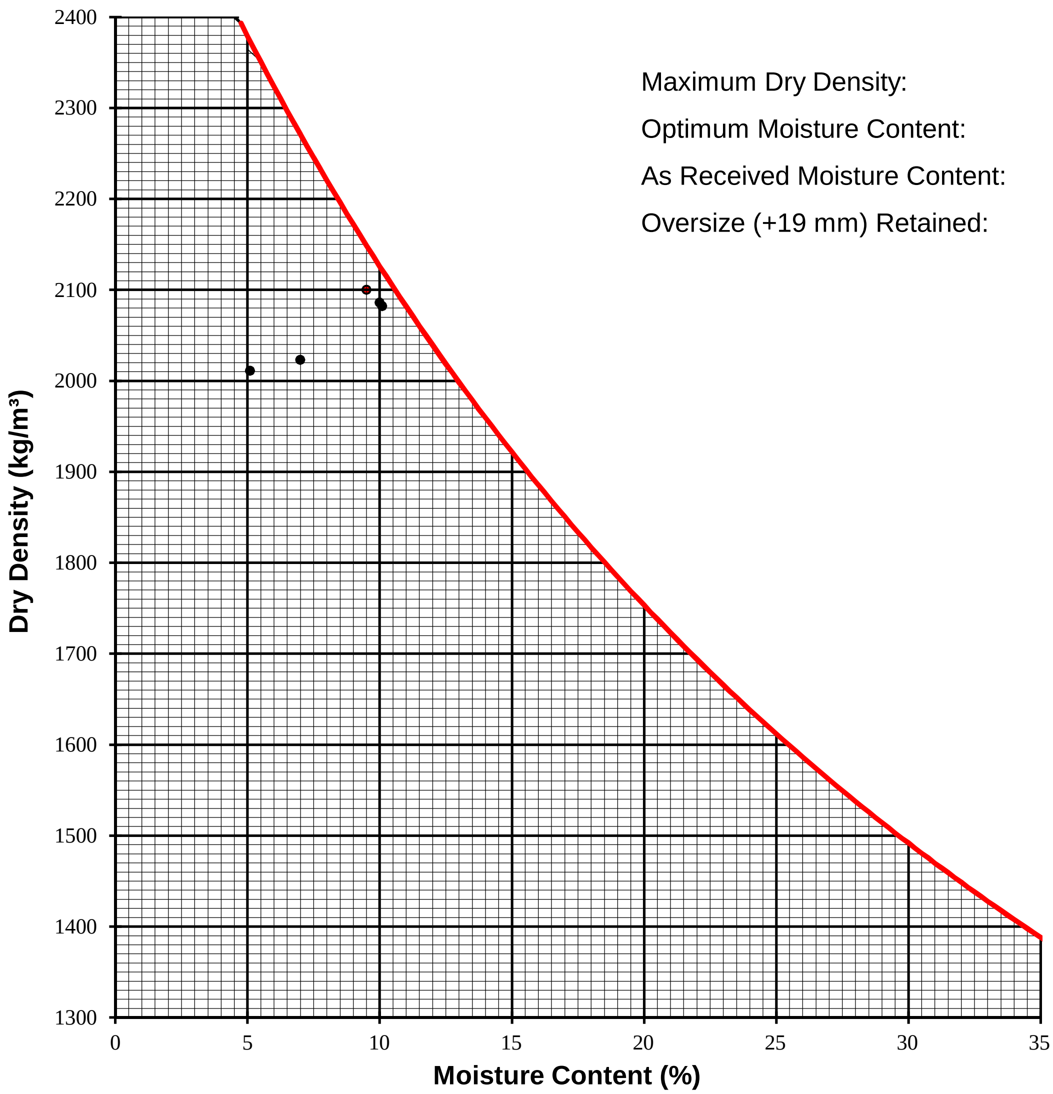
ASTM D698 (Standard Proctor)

Project:	Victoria Gold IROD Geotechnical Investigation	Sample No.:	Fines
Project No.:	W14103150-02	Sampled By:	Client
Client:	NND EBA Land Protection Corp	Date Received:	28-Oct-13
Attention:	Pat Titus	Test Date:	1-Nov-13
E-mail:		Test Method:	Method A
Source:		Compaction:	Manual

Sample Location:

Sample Description: SAND - gravelly, trace silt

Maximum Dry Density:	**2100**	kg/m³
Optimum Moisture Content:	**9.5**	%
As Received Moisture Content:	2.3	%
Oversize (+19 mm) Retained:		%



Remarks:

Reviewed By:____________________

eba
A TETRA TECH COMPANY

APPENDIX C

ISSUED FOR CONSTRUCTION DRAWINGS

MAY 2017

HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

ISSUED FOR USE

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Date June 8/17
PERMIT NUMBER PP003
Association of Professional
Engineers of Yukon

PROFESSIONAL
YUKON
ADAM W. WALLACE
TERRITORY
8 June 2017
ENGINEER

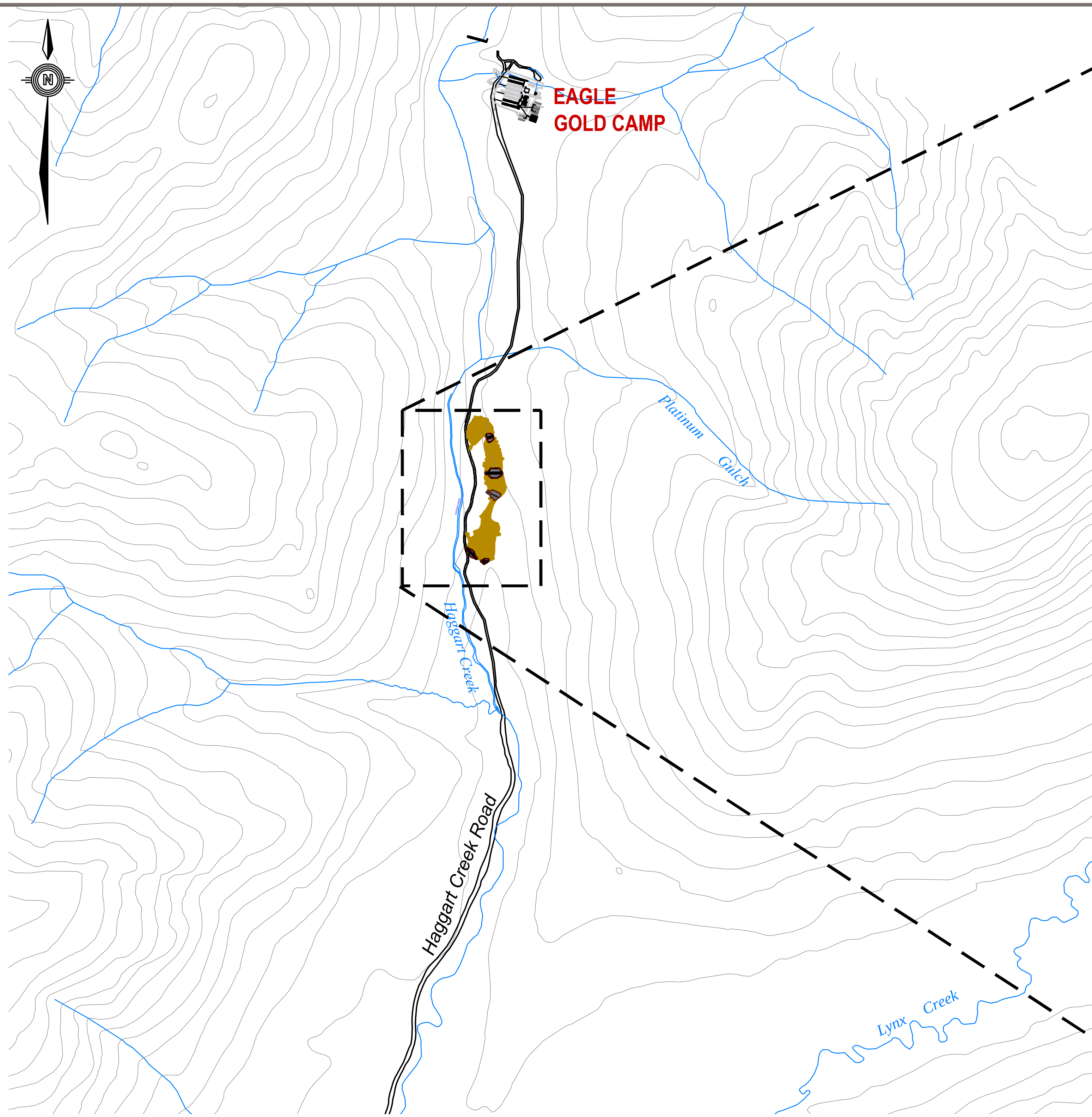
PREPARED FOR:

STRATAGOLD CORPORATION

PREPARED BY:

TETRA TECH

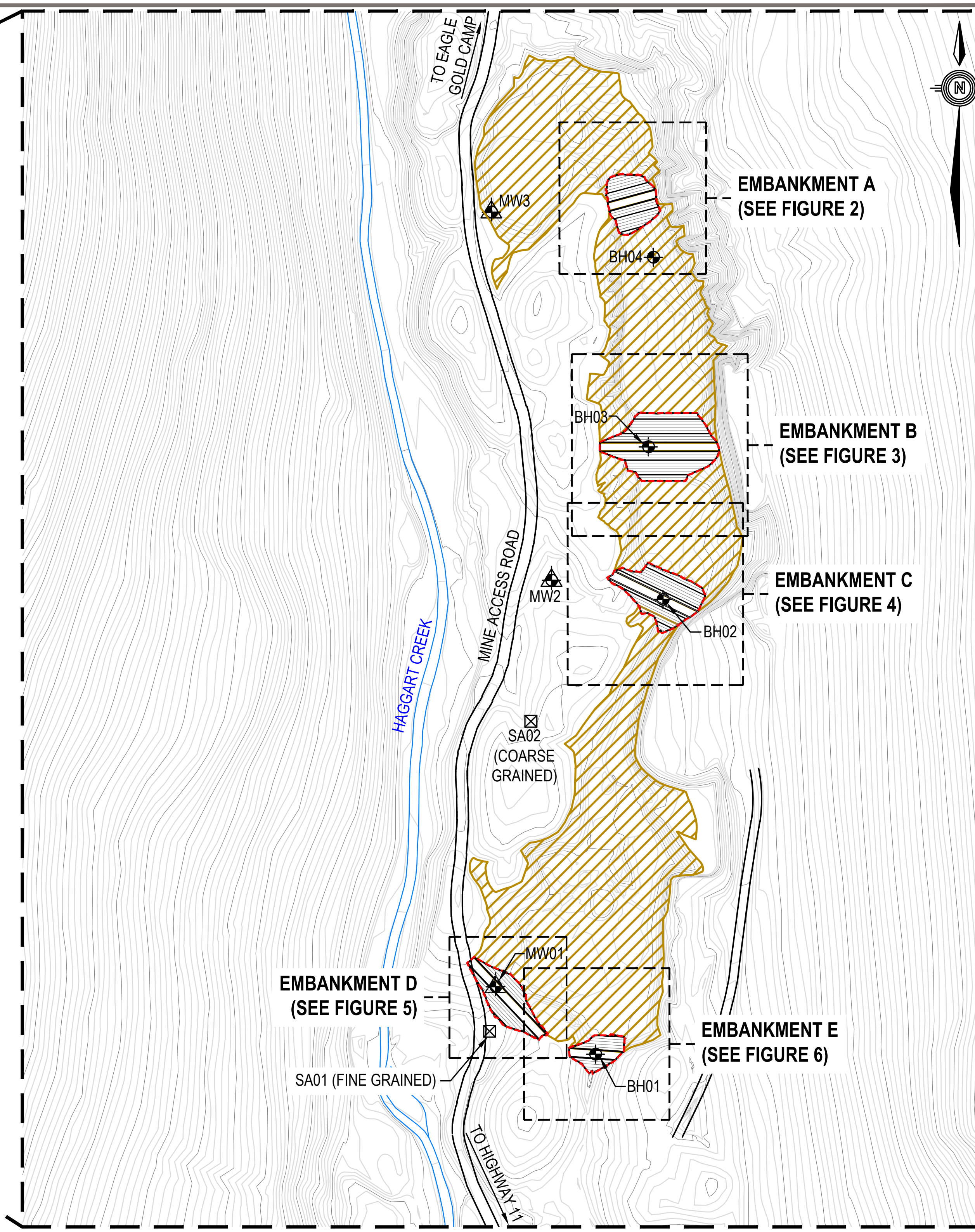
FILE PATH: Q:\Whitehorse\Data\0201drawings\Dublin Gulch\ENG.WARC03235-01 Haggart Creek IROSA Design Update



LOCATION PLAN

0 1,000m

Scale: 1:25,000 @ 11"x17"



SITE PLAN

0 200m

Scale: 1:4,000 @ 11"x17"

ISSUED FOR USE

LEGEND:

- ⊠ - BORROW SOURCE SAMPLE LOCATION (2013 GEOTECHNICAL EVALUATION - W14103150-02)
- - BOREHOLE LOCATION (2013 GEOTECHNICAL EVALUATION - W14103150-02)
- - MONITORING WELL LOCATION (2013 GEOTECHNICAL EVALUATION - W14103150-02)
- - APPROXIMATE EMBANKMENT FOOTPRINT
- - EXISTING DIVERSION DITCH ALIGNMENT

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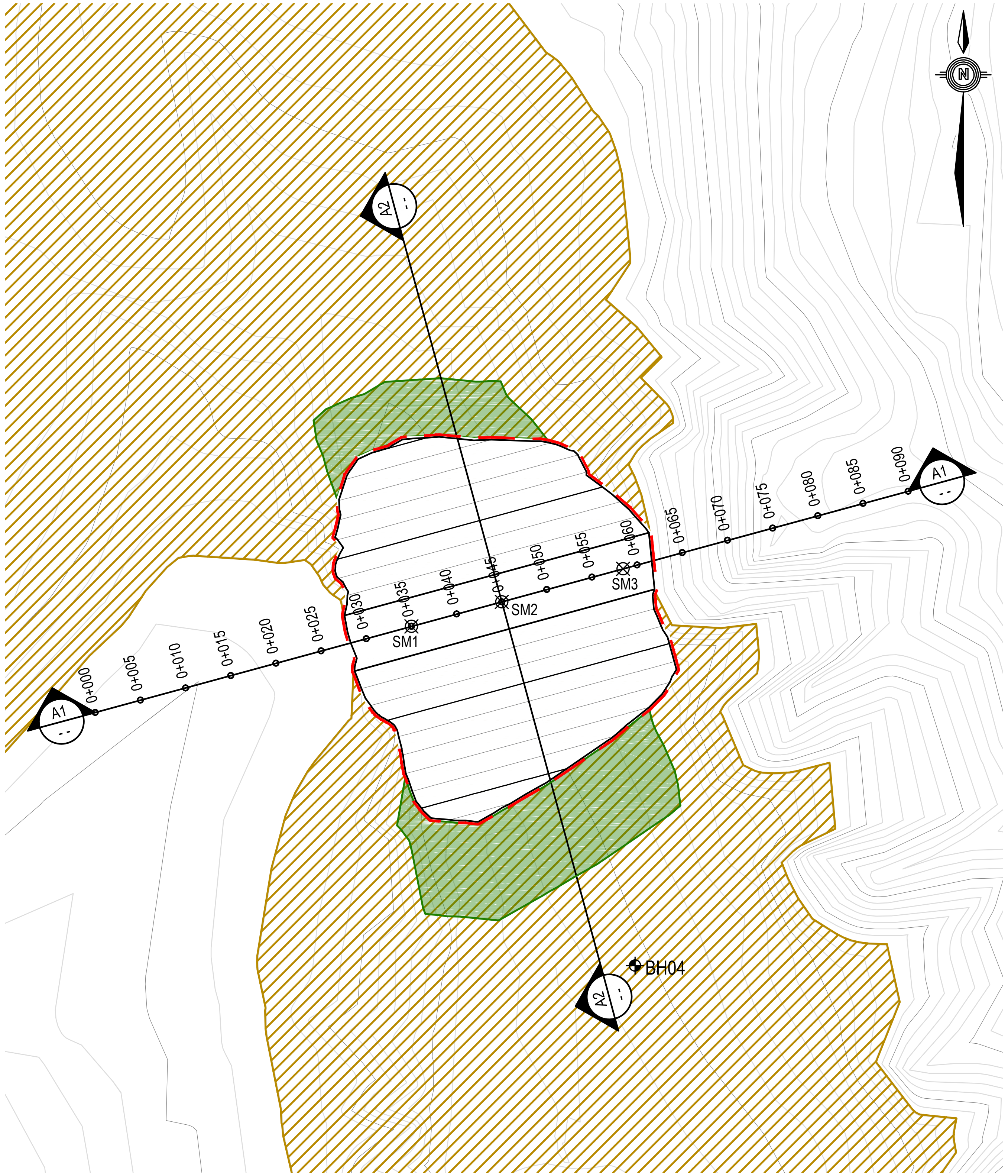
CLIENT	HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON
STRATAGOLD CORPORATION	SITE PLAN SHOWING EMBANKMENT LOCATIONS

TETRA TECH

PROJECT NO.	DWN	CKD	REV	
ENG.WARC03235-01	CB	AW	0	Figure 1
OFFICE	DATE			
EBA-WHSE	May 29, 2017			

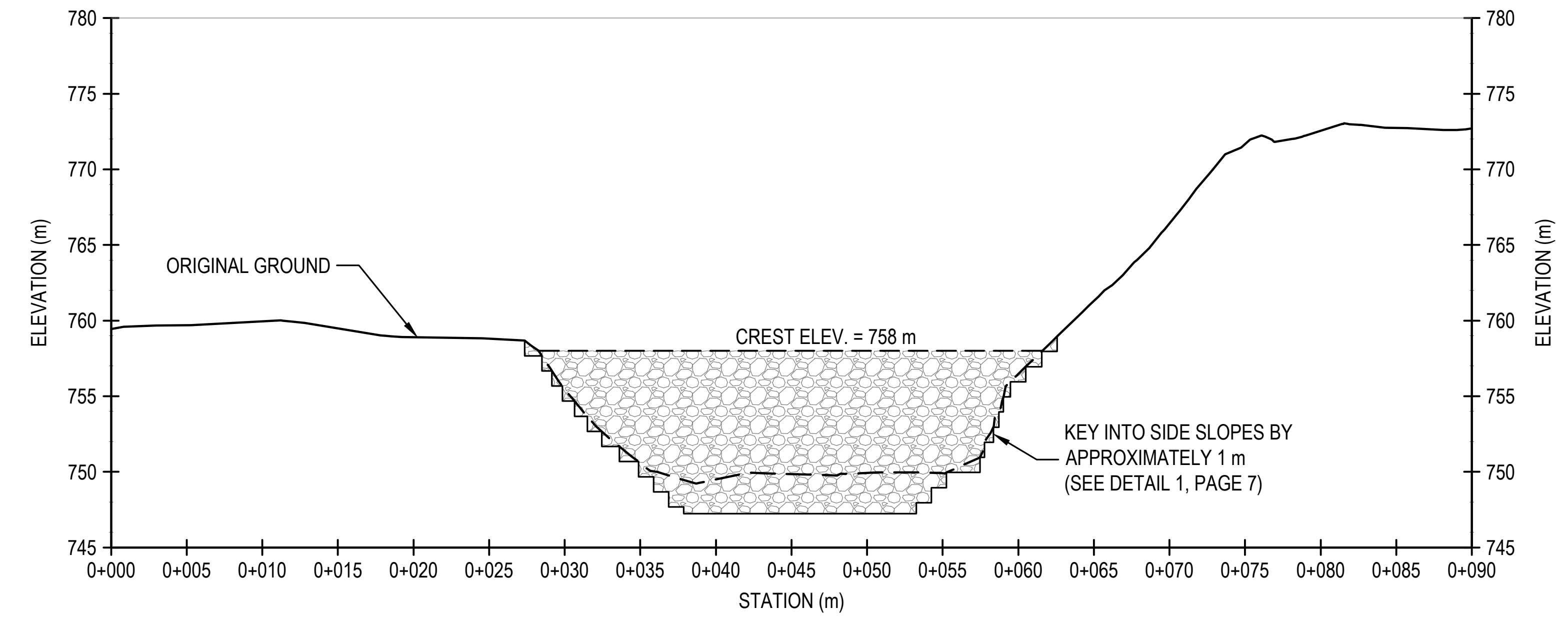
Q:\Whitehorse\Data\0201drawings\Dublin Gulch\ENG.WARC03235-01 Haggart Creek IROSA Design Update\ENG.WARC03235-01 Fig.1-R0.dwg [FIGURE 1] June 01, 2017 - 1:14:47 pm (BY: BUCHAN, CAMERON)



SITE PLAN

0 250m

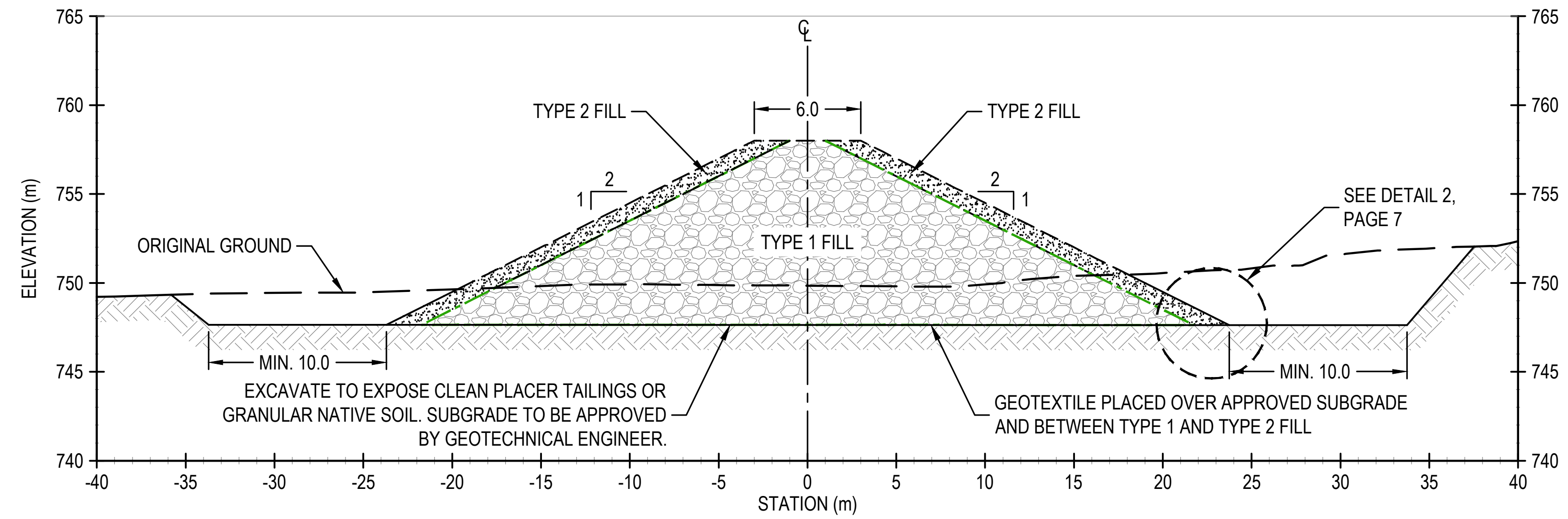
Scale: 1:600 @ 11"x17"



SECTION A1

0 25m

Scale: 1:500 @ 11"x17"



SECTION A2

0 20m

Scale: 1:400 @ 11"x17"

ISSUED FOR USE

LEGEND

- BOREHOLE LOCATION
- APPROXIMATE EMBANKMENT FOOTPRINT
- EXPOSED PLACER TAILINGS
- FOUNDATION SOILS (PLACER TAILINGS OR GRANULAR NATIVE SOIL)
- TYPE 1 FILL
- TYPE 2 FILL
- GEOTEXTILE FILTER FABRIC
- SM1 ⊠ - PROPOSED SURVEY MONITORING POINT

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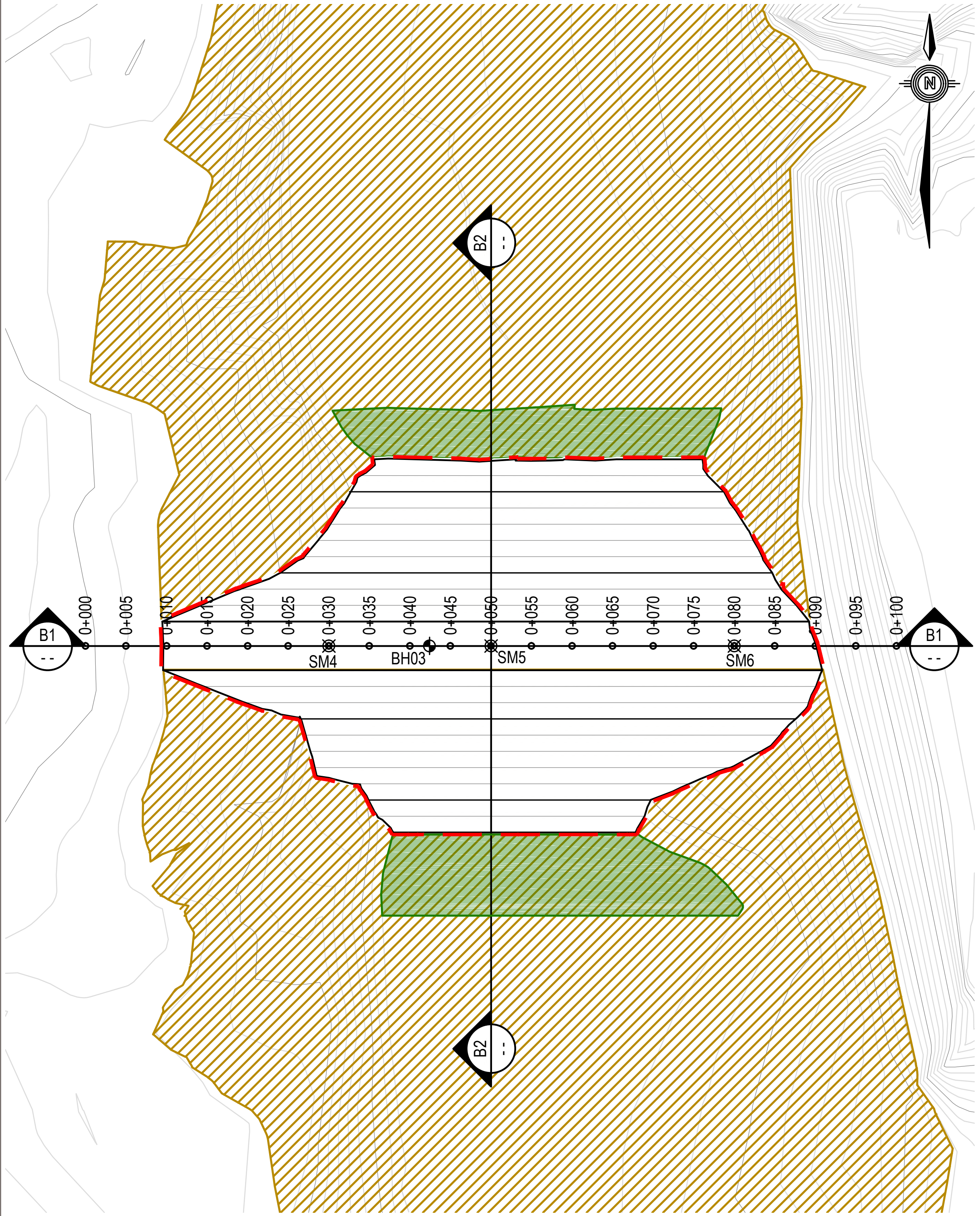
HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

EMBANKMENT A
PLAN AND SECTIONS

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0
OFFICE	DATE		
EBA-WHSE	May 26, 2017		

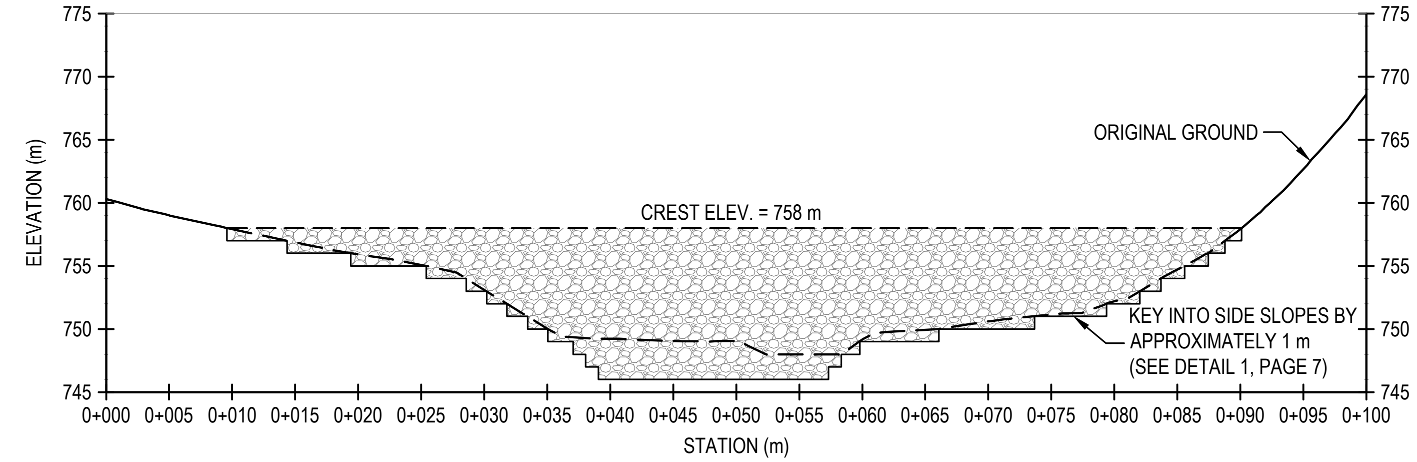
Figure 2



SITE PLAN

0 25m

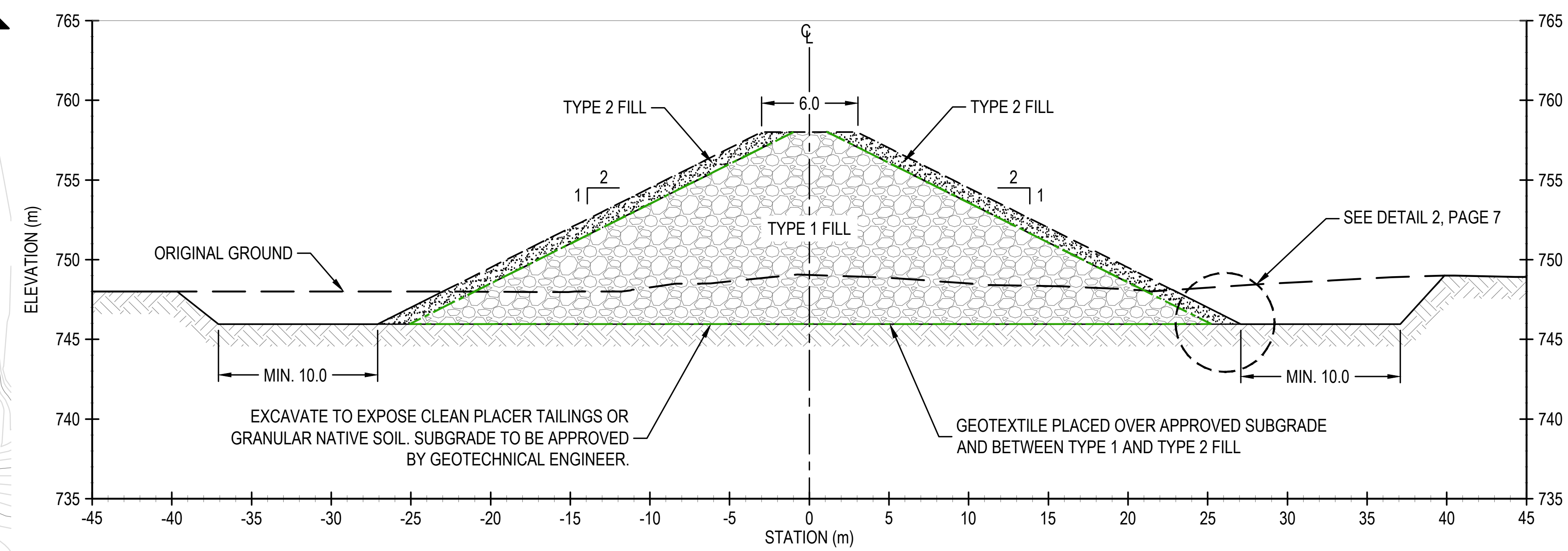
Scale: 1:750 @ 11"x17"



SECTION B1

0 25m

Scale: 1:600 @ 11"x17"



SECTION B2

0 20m

Scale: 1:400 @ 11"x17"

ISSUED FOR USE

LEGEND

- BOREHOLE LOCATION
- APPROXIMATE EMBANKMENT FOOTPRINT
- EXPOSED PLACER TAILINGS
- FOUNDATION SOILS (PLACER TAILINGS OR GRANULAR NATIVE SOIL)
- TYPE 1 FILL
- TYPE 2 FILL
- GEOTEXTILE FILTER FABRIC
- SM1 ⊠ - PROPOSED SURVEY MONITORING POINT

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HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

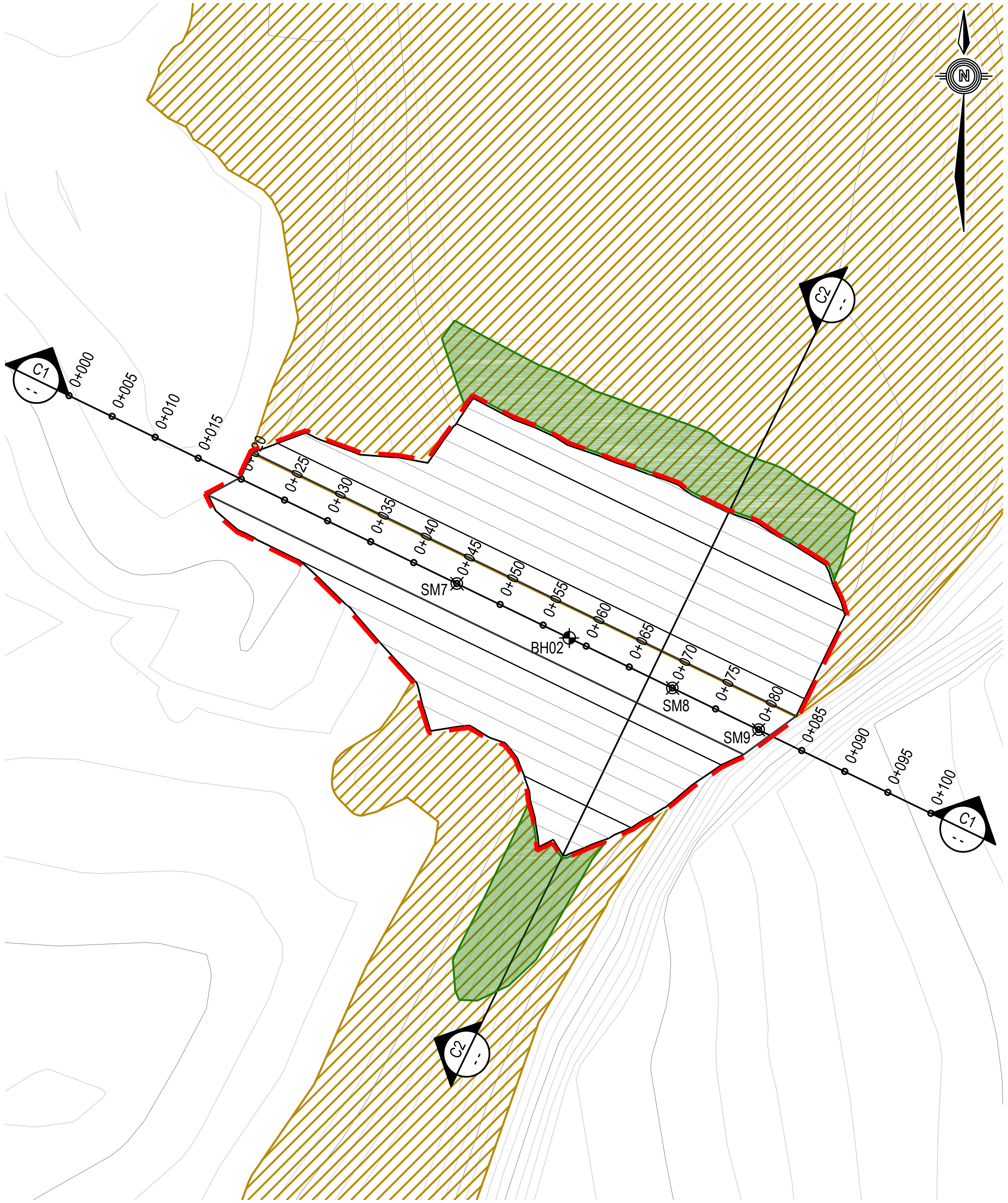
EMBANKMENT B
PLAN AND SECTIONS

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0

OFFICE	DATE
EBA-WHSE	May 26, 2017

Figure 3

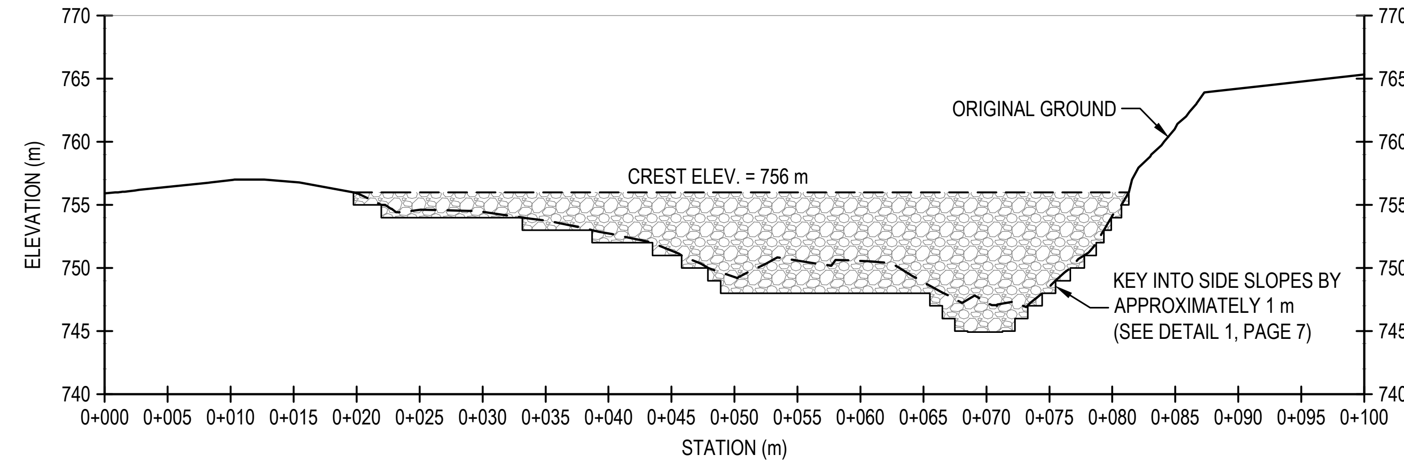
Q:\Whitehorse\Data\0201drawings\Dublin Gulch\ENG.WARC03235-01 Haggart Creek IROSA Design Update\ENG.WARC03235-01 Figs-2-6-R0.dwg [FIGURE 4] June 01, 2017 - 1:18:16 pm (BY: BUCHAN, CAMERON)



SITE PLAN

0 25m

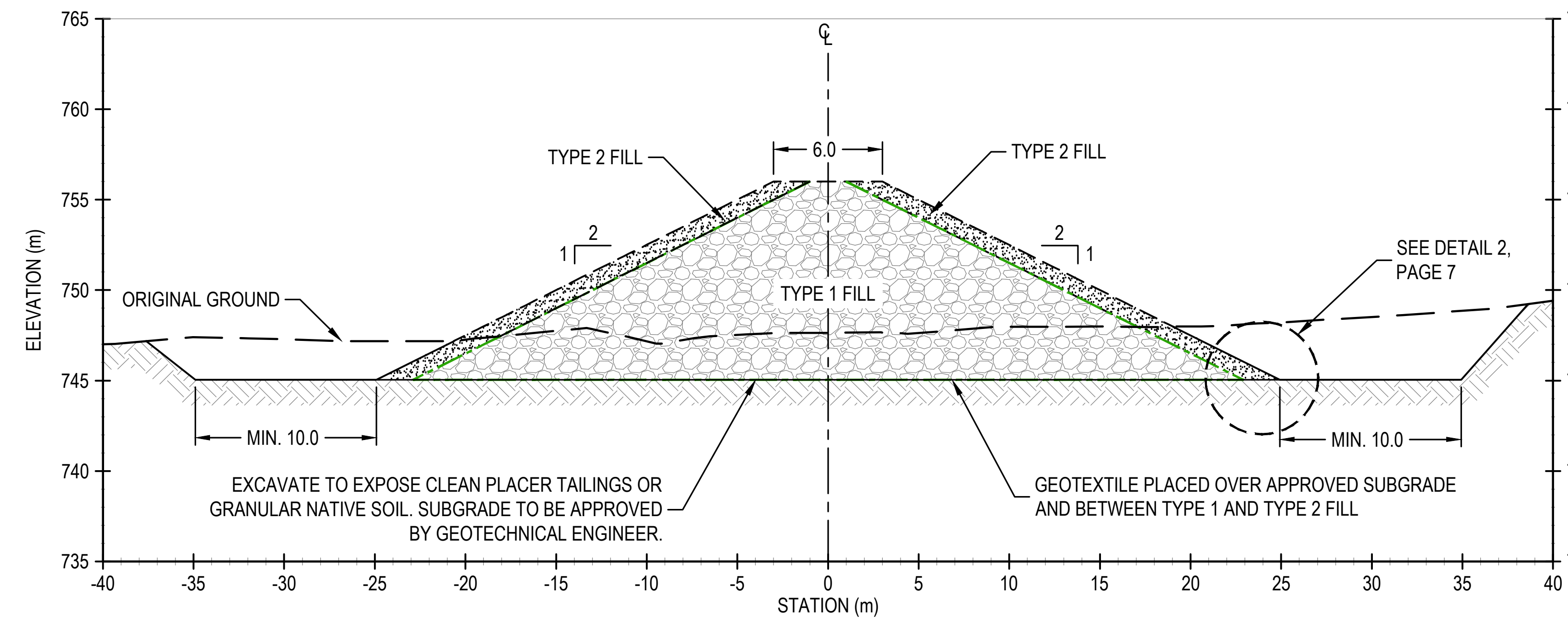
Scale: 1:600 @ 11"x17"



SECTION C1

0 25m

Scale: 1:600 @ 11"x17"



SECTION C2

0 20m

Scale: 1:400 @ 11"x17"

ISSUED FOR USE

LEGEND

- BOREHOLE LOCATION
- APPROXIMATE EMBANKMENT FOOTPRINT
- EXPOSED PLACER TAILINGS
- FOUNDATION SOILS (PLACER TAILINGS OR GRANULAR NATIVE SOIL)
- TYPE 1 FILL
- TYPE 2 FILL
- GEOTEXTILE FILTER FABRIC
- SM1 - PROPOSED SURVEY MONITORING POINT

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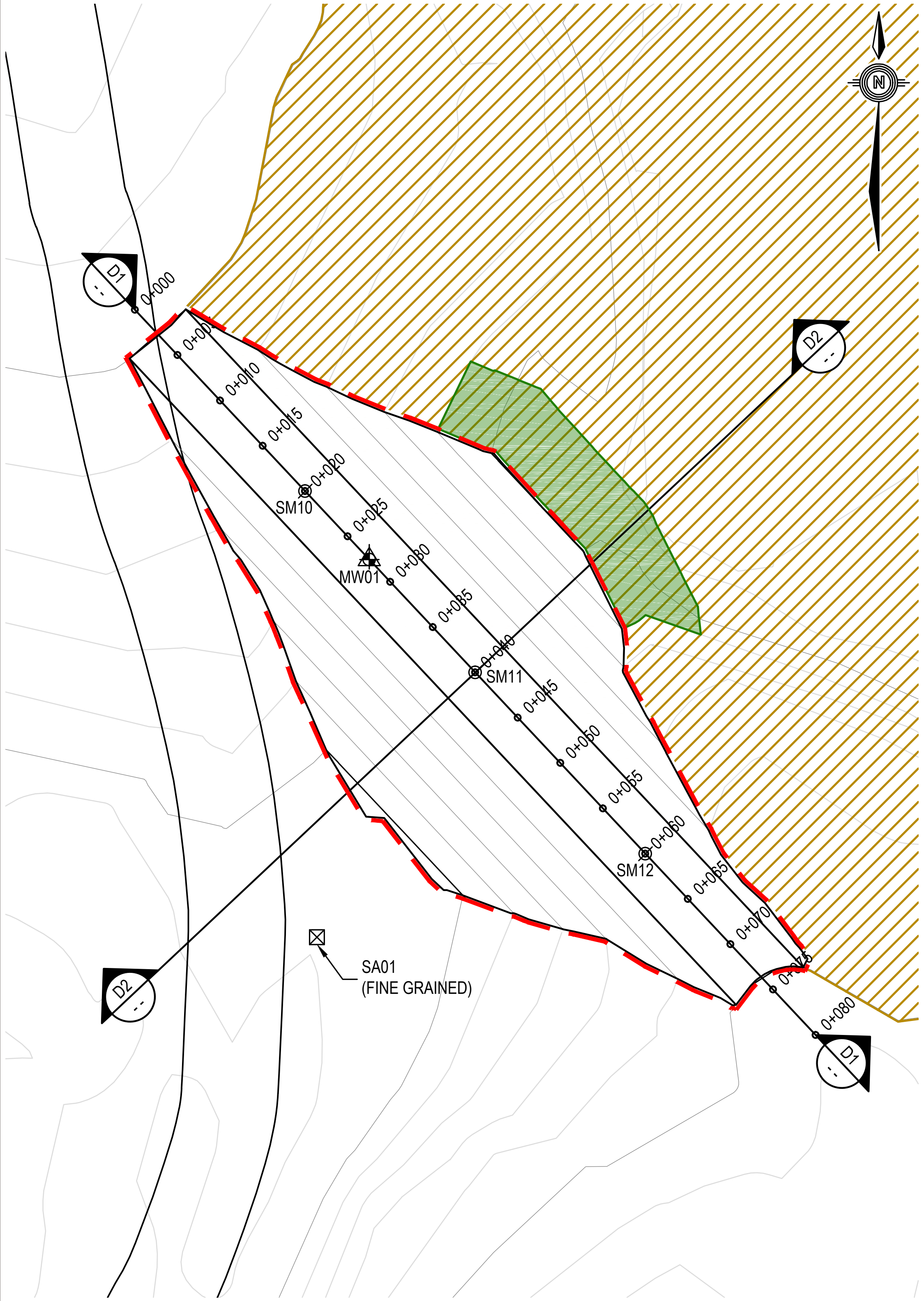
HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

EMBANKMENT C
PLAN AND SECTIONS

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0

OFFICE	DATE
EBA-WHSE	May 26, 2017

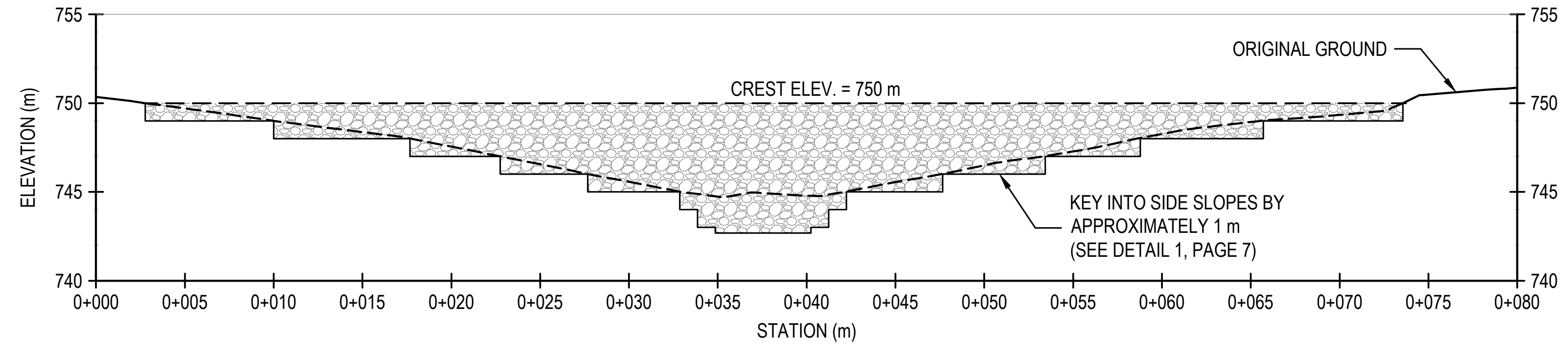
Figure 4



SITE PLAN

0 25m

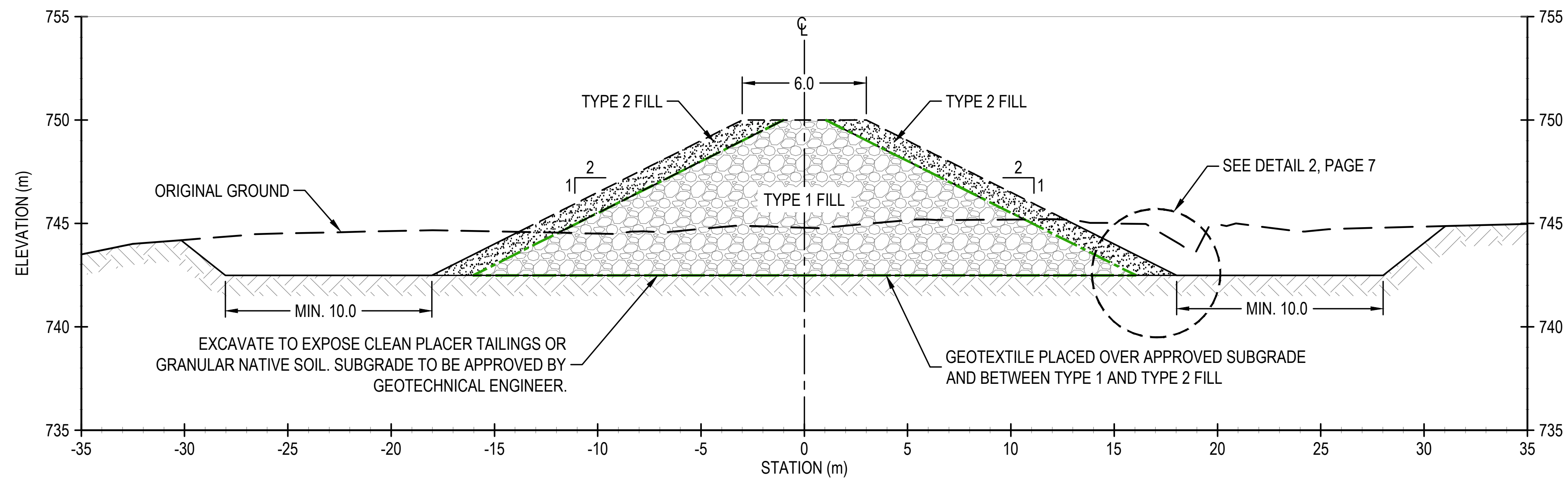
Scale: 1:500 @ 11"x17"



SECTION D1

0 20m

Scale: 1:400 @ 11"x17"



SECTION D2

0 15m

Scale: 1:300 @ 11"x17"

ISSUED FOR USE

LEGEND

- BOREHOLE LOCATION
- APPROXIMATE EMBANKMENT FOOTPRINT
- EXPOSED PLACER TAILINGS
- FOUNDATION SOILS (PLACER TAILINGS OR GRANULAR NATIVE SOIL)
- TYPE 1 FILL
- TYPE 2 FILL
- TYPE 2 FILL
- GEOTEXTILE FILTER FABRIC
- SM1 PROPOSED SURVEY MONITORING POINT

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8 June 2017

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HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

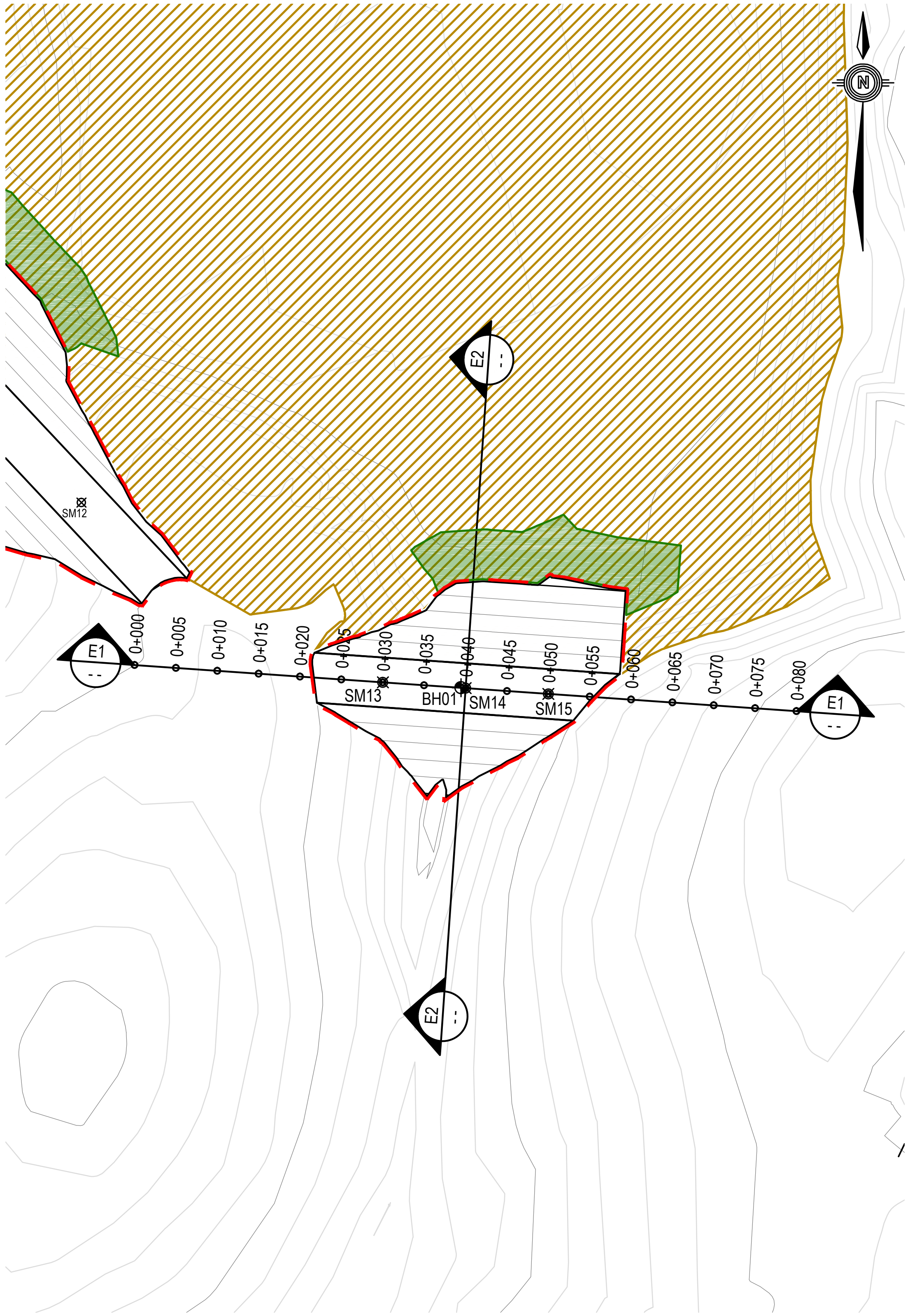
EMBANKMENT D
PLAN AND SECTIONS

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0

OFFICE	DATE
EBA-WHSE	May 26, 2017

Figure 5

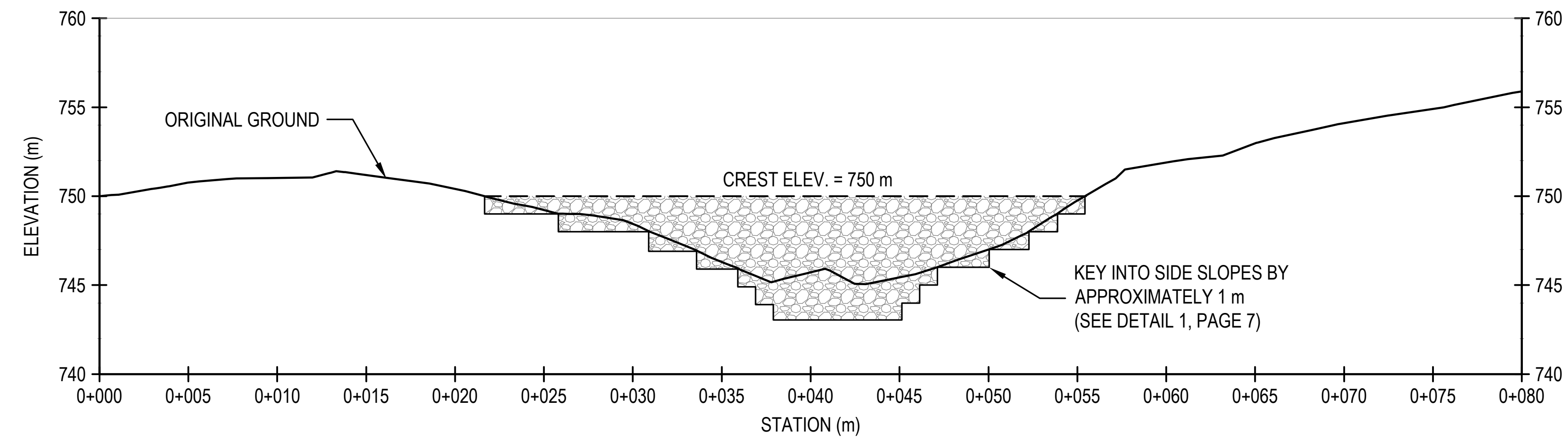
Q:\Whitehorse\Data\0201drawings\Dublin Gulch\ENG.WARC03235-01 Haggart Creek IROSA Design Update\ENG.WARC03235-01 Figs.2-6-R0.dwg [FIGURE 5] June 01, 2017 - 1:18:43 pm (BY: BUCHAN, CAMERON)



SITE PLAN

0 — 25m

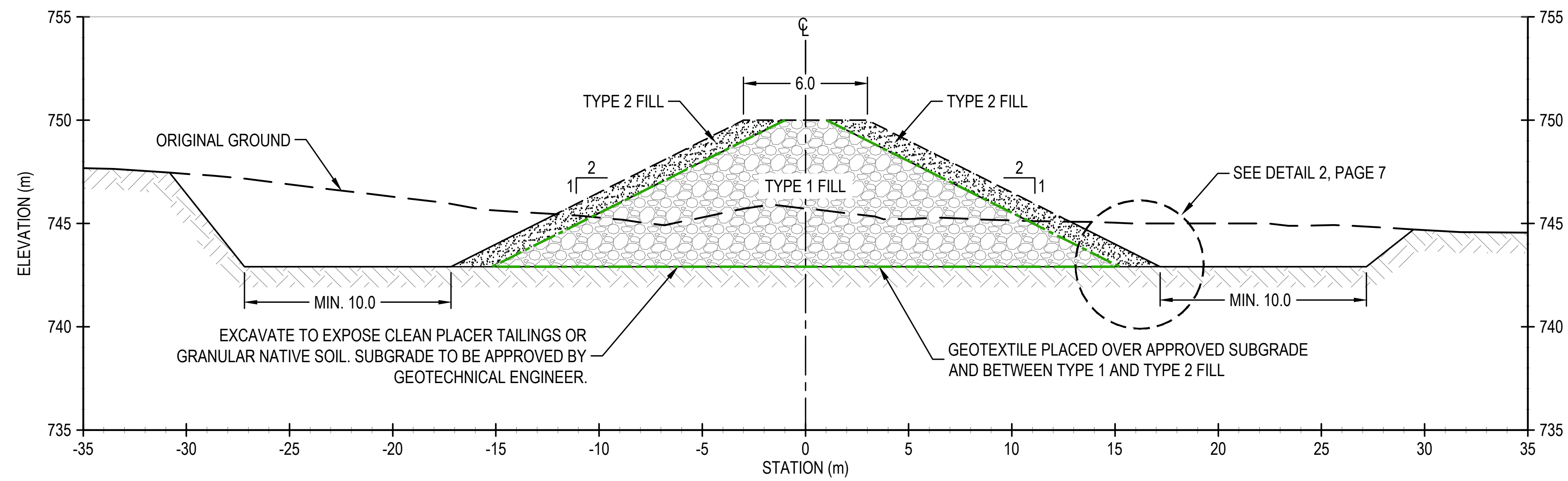
Scale: 1:750 @ 11"x17"



SECTION E1

0 — 20m

Scale: 1:400 @ 11"x17"



SECTION E2

0 — 15m

Scale: 1:300 @ 11"x17"

ISSUED FOR USE

LEGEND

- BOREHOLE LOCATION
- APPROXIMATE EMBANKMENT FOOTPRINT
- EXPOSED PLACER TAILINGS
- FOUNDATION SOILS (PLACER TAILINGS OR GRANULAR NATIVE SOIL)
- TYPE 1 FILL
- TYPE 2 FILL
- GEOTEXTILE FILTER FABRIC
- SM1 ⊠ - PROPOSED SURVEY MONITORING POINT

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8 June 2017

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STRATAGOLD CORPORATION

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HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

EMBANKMENT E
PLAN AND SECTIONS

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0
OFFICE	DATE		
EBA-WHSE	May 26, 2017		

Figure 6

EMBANKMENT A STATIONING

STATION	NORTHING	EASTING
0+000	7099185.3	458345.7
0+005	7099186.6	458350.6
0+010	7099187.9	458355.4
0+015	7099189.2	458360.2
0+020	7099190.5	458365.0
0+025	7099191.8	458369.9
E.O.E.	7099192.7	458373.0
0+030	7099193.1	458374.7
0+035 (SM1)	7099194.5	458379.5
0+040	7099195.8	458384.3
0+045 (SM2)	7099197.1	458389.2
0+050	7099198.4	458394.0
0+055	7099199.7	458398.8
SM3	7099200.6	458402.1
0+060	7099201.0	458403.6
E.O.E.	7099201.4	458405.2
0+065	7099202.3	458408.5
0+070	7099203.6	458413.3
0+075	7099205.0	458418.1
0+080	7099206.3	458422.9
0+085	7099207.6	458427.8
0+090	7099208.9	458432.6

EMBANKMENT B STATIONING

STATION	NORTHING	EASTING
0+000	7099029.0	458357.6
0+005	7099029.0	458362.6
E.O.E.	7099029.0	458367.2
0+010	7099029.0	458367.6
0+015	7099029.0	458372.6
0+020	7099029.0	458377.6
0+025	7099029.0	458382.6
0+030 (SM4)	7099029.0	458387.6
0+035	7099029.0	458392.6
0+040	7099029.0	458397.6
0+045	7099029.0	458402.6
0+050 (SM5)	7099029.0	458407.6
0+055	7099029.0	458412.6
0+060	7099029.0	458417.6
0+065	7099029.0	458422.6
0+070	7099029.0	458427.6
0+075	7099029.0	458432.6
0+080 (SM6)	7099029.0	458437.6
0+085	7099029.0	458442.6
0+090	7099029.0	458447.6
E.O.E.	7099029.0	458447.7
0+095	7099029.0	458452.6
0+100	7099029.0	458457.6

EMBANKMENT C STATIONING

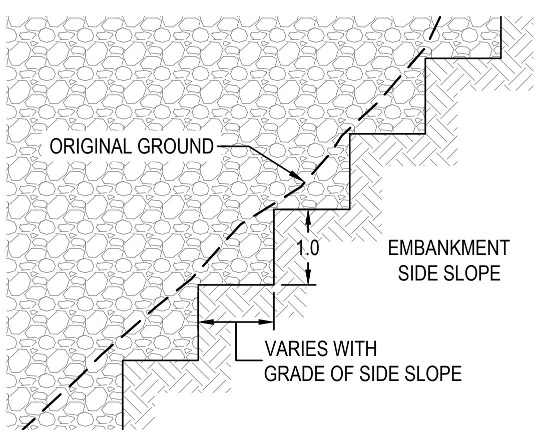
STATION	NORTHING	EASTING
0+000	7098950.3	458357.8
0+005	7098948.1	458362.3
0+010	7098945.9	458366.8
0+015	7098943.7	458371.3
E.O.E.	7098941.7	458375.6
0+020	7098941.6	458375.8
0+025	7098939.4	458380.3
0+030	7098937.2	458384.8
0+035	7098935.0	458389.3
0+040	7098932.9	458393.8
0+045 (SM7)	7098930.7	458398.3
0+050	7098928.5	458402.8
0+055	7098926.3	458407.3
0+060	7098924.1	458411.8
0+065	7098922.0	458416.3
0+070 (SM8)	7098919.8	458420.8
0+075	7098917.6	458425.3
0+080 (SM9)	7098915.4	458429.8
E.O.E.	7098914.9	458431.0
0+085	7098913.2	458434.3
0+090	7098911.0	458438.8
0+095	7098908.9	458443.3
0+100	7098906.7	458447.8

EMBANKMENT D STATIONING

STATION	NORTHING	EASTING
0+000	7098681.0	458277.2
E.O.E.	7098679.1	458279.1
0+005	7098677.4	458280.6
0+010	7098673.8	458284.0
0+015	7098670.1	458287.4
0+020 (SM10)	7098666.5	458290.8
0+025	7098662.9	458294.3
0+030	7098659.2	458297.7
0+035	7098655.6	458301.1
0+040 (SM11)	7098651.9	458304.5
0+045	7098648.3	458308.0
0+050	7098644.6	458311.4
0+055	7098641.0	458314.8
0+060 (SM12)	7098637.3	458318.2
0+065	7098633.7	458321.6
0+070	7098630.1	458325.1
E.O.E.	7098627.5	458327.5
0+075	7098626.4	458328.5
0+080	7098622.8	458331.9

EMBANKMENT E STATIONING

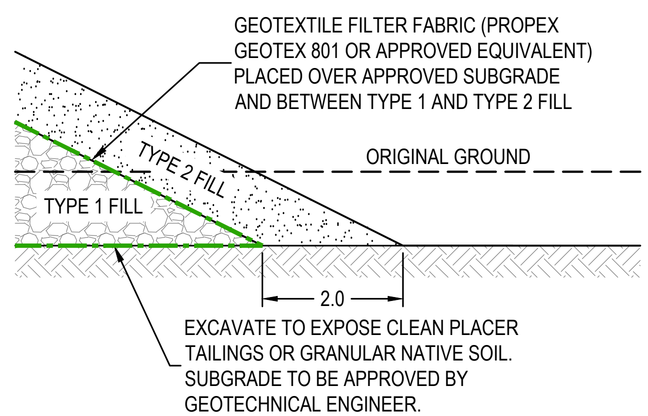
STATION	NORTHING	EASTING
0+000	7098617.8	458324.6
0+005	7098617.4	458329.6
0+010	7098617.1	458334.6
0+015	7098616.7	458339.6
0+020	7098616.4	458344.6
E.O.E.	7098616.2	458346.2
0+025	7098616.0	458349.6
0+030 (SM13)	7098615.7	458354.6
0+035	7098615.3	458359.6
0+040 (SM14)	7098615.0	458364.5
0+045	7098614.6	458369.5
0+050 (SM15)	7098614.3	458374.5
0+055	7098613.9	458379.5
E.O.E.	7098613.9	458379.9
0+060	7098613.6	458384.5
0+065	7098613.2	458389.5
0+070	7098612.9	458394.5
0+075	7098612.5	458399.5
0+080	7098612.2	458404.4



DETAIL 1 - KEY INTO EMBANKMENT SLOPE

0 5m

Scale: 1:100 @ 11"x17"



DETAIL 2 - EMBANKMENT FILL CONFIGURATION

0 5m

Scale: 1:100 @ 11"x17"

STORAGE AREA VOLUMES

STORAGE AREA	OVERBURDEN (m^3)
1	37000
2	73000
3	45000
4	100000
TOTAL	**255000**

BERM MATERIAL VOLUMES

BERM	TYPE 1 (m^3)	TYPE 2 (m^3)	GEOTEXTILE (m^2)
A	4700	450	1211
B	11000	1150	2936
C	5400	850	1794
D	2600	400	1323
E	1400	300	687
TOTAL	**25100**	**3150**	**7951**

ISSUED FOR USE

LEGEND

- FOUNDATION SOILS (PLACER TAILINGS OR GRANULAR NATIVE SOIL)
- TYPE 1 FILL
- TYPE 2 FILL
- GEOTEXTILE FILTER FABRIC

E.O.E. - EDGE OF EMBANKMENT

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PROFESSIONAL ENGINEER
YUKON TERRITORY
ADAM W. WALLACE
8 June 2017

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STRATAGOLD CORPORATION

TETRA TECH

HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

DETAILS AND SPECIFICATIONS
PAGE 1

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0

OFFICE	DATE
EBA-WHSE	May 26, 2017

Figure 7

HAGGART CREEK IROSA CONSTRUCTION PROCEDURES AND SPECIFICATIONS

1.0 REFERENCES

1.1 GEOTECHNICAL DESIGN, ICE-RICH OVERBURDEN STORAGE AREA BERMS, EAGLE GOLD PROPERTY, YUKON TERRITORIES, GEOTECHNICAL DESIGN REPORT PREPARED BY TETRA TECH CANADA INC. (OPERATING AS EBA, A TETRA TECH COMPANY), DECEMBER 2013.

1.2 GEOTECHNICAL DESIGN UPDATE AND IFC DRAWINGS, HAGGART CREEK ICE-RICH OVERBURDEN STORAGE AREA, EAGLE GOLD PROJECT - DUBLIN GULCH, YT, GEOTECHNICAL DESIGN REPORT PREPARED BY TETRA TECH CANADA INC., JUNE 2017.

1.3 ASTM C117, STANDARD TEST METHOD FOR MATERIALS FINER THAN 75 µm (No. 200) SIEVE IN MINERAL AGGREGATES BY WASHING

1.4 ASTM C136, STANDARD TEST METHOD FOR SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES.

1.5 ASTM D422, STANDARD TEST METHOD FOR PARTICLE-SIZE ANALYSIS OF SOILS.

1.6 ASTM D698, STANDARD TEST METHODS FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING STANDARD EFFORT (12,400 ft*lbf / ft^3 (600 kN*m / m^3)).

2.0 MATERIALS

2.1 TYPES

2.1.1 TYPE 1 FILL: WELL GRADED, SCREENED TAILINGS (GRAVEL AND COBBLES) FOR BULK EMBANKMENT FILL. RECOMMENDED PROPERTIES AS FOLLOWS, PER ASTM C117, C136, AND / OR D422:

- MAXIMUM PARTICLE SIZE: 200 mm
- MINIMUM PARTICLE SIZE: 25 mm
- COEFFICIENT OF UNIFORMITY (Cu = D60 / D10): 4 OR GREATER
- COEFFICIENT OF CURVATURE (Cc = D302 / (D10*D60)): BETWEEN 1 AND 3

2.1.2 TYPE 2 FILL: WELL GRADED, 75 mm MINUS TAILINGS (SAND AND GRAVEL) FOR EMBANKMENT FACING. RECOMMENDED GRADATION AS FOLLOWS, PER ASTM C117, C136, AND / OR D422:

PARTICLE SIZE (mm)	PERCENT FINER (% BY WEIGHT)
75	100
25	65 - 100
12.5	45 - 85
4.75	25 - 70
0.825	5 - 30
0.425	0 - 20
0.163	0 - 15
0.075	0 - 10

2.1.3 GEOTEXTILE FILTER FABRIC: CLASS 1 NON-WOVEN GEOTEXTILE, PROPEX GEOTEX 801 OR APPROVED EQUIVALENT.

2.2 TRANSPORT AND STORAGE

2.2.1 TYPE 1 FILL SHOULD BE TRANSPORTED AND STOCKPILED TO PREVENT INGRESS OF MOISTURE, FREEZING, CONTAMINATION AND/OR SEGREGATION OF FINE AND COARSE PARTICLES.

2.2.2 TYPE 2 FILL SHOULD TRANSPORTED AND STOCKPILED TO PREVENT INGRESS OF MOISTURE, FREEZING, CONTAMINATION, AND/OR SEGREGATION OF FINE AND COARSE PARTICLES.

2.2.3 GEOTEXTILE FILTER FABRIC SHOULD BE TRANSPORTED AND STORED AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

2.3 SAMPLING AND LABORATORY TESTING

2.3.1 SAMPLES OF TYPE 1 FILL SHOULD BE SUBMITTED TO A CERTIFIED GEOTECHNICAL LABORATORY FOR CONFIRMATION TESTING OF MATERIAL GRADATION ASTM C117, C136, AND / OR D422). MINIMUM ONE 70 kg SAMPLE SHOULD BE SUBMITTED PER EMBANKMENT. IF MULTIPLE MATERIAL SOURCES OR PRODUCTION METHODS ARE TO BE USED, MINIMUM ONE 70 kg SAMPLE SHOULD BE SUBMITTED PER SOURCE.

2.3.2 SAMPLES OF TYPE 2 FILL SHOULD BE SUBMITTED TO A CERTIFIED GEOTECHNICAL LABORATORY FOR CONFIRMATION TESTING OF MATERIAL GRADATION (ASTM C117, C136, and/or D422) AND COMPACTION CHARACTERISTICS (ASTM D698). MINIMUM ONE 70 kg SAMPLE SHOULD BE SUBMITTED PER EMBANKMENT. IF MULTIPLE MATERIAL SOURCES OR PRODUCTION METHODS ARE TO BE USED, MINIMUM ONE 70 kg SAMPLE SHOULD BE SUBMITTED PER SOURCE.

2.3.3 THE PROPOSED GEOTEXTILE FILTER FABRIC SHOULD BE IDENTIFIED AND MANUFACTURER'S SPECIFICATIONS FORWARDED TO THE GEOTECHNICAL ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SAMPLING AND TESTING OF GEOTEXTILE FILTER FABRIC MAY NOT BE REQUIRED.

2.4 PLACEMENT

2.4.1 TYPE 1 FILL SHOULD BE PLACED IN MAXIMUM 1000 mm THICK LIFTS AND NOMINALLY COMPACTED TO ENSURE ADEQUATE ROCK-ON-ROCK CONTACT WITHIN THE FILL. SUITABLE COMPACTION EQUIPMENT MAY INCLUDE STATIC OR VIBRATORY ROLLER COMPACTORS, OR TRACK PACKING USING HEAVY EQUIPMENT.

2.4.2 TYPE 2 FILL SHOULD BE PLACED IN MAXIMUM 300 mm THICK LIFTS AND COMPACTED TO 95% SPMDD (ASTM D698). VIBRATORY COMPACTION EQUIPMENT (ROLLER OR PLATE COMPACTORS) SHOULD BE USED TO COMPACT TYPE 2 FILL.

2.4.3 GEOTEXTILE FILTER FABRIC SHOULD BE PLACED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO MINIMIZE INSTALLATION DAMAGE. MINIMUM 0.5 m OVERLAP SHOULD BE PROVIDED BETWEEN ADJACENT ROLLS OF GEOTEXTILE.

3.0 IROSA EMBANKMENT CONSTRUCTION

3.1 EMBANKMENT LAYOUT / SURVEY

3.1.1 LAYOUT / SURVEY SHOULD BE COMPLETED PRIOR TO CONSTRUCTION TO CONFIRM THE SITE TOPOGRAPHY AND EXTENT OF THE EMBANKMENT FOOTPRINT. AT EACH EMBANKMENT, AS A MINIMUM, THE LOCATIONS OF THE CENTERLINE OF THE EMBANKMENT CREST AND TOE OF THE EMBANKMENT SLOPES SHOULD BE ESTABLISHED.

3.2 FOUNDATION PREPARATION

3.2.1 REMOVE ALL SNOW, ICE, WATER, TOPSOIL, FINE-GRAINED SOIL, DISTURBED OR OTHERWISE DELETERIOUS MATERIALS TO EXPOSE CLEAN, FREE-DRAINING SAND AND GRAVEL (PLACER TAILINGS) AS INDICATED.

3.2.2 IF PLACER TAILINGS ARE NOT PRESENT, EXCAVATE TO EXPOSE NATIVE GRANULAR SOIL (SAND AND/OR GRAVEL), TO A MAXIMUM DEPTH OF 2 m BELOW EXISTING GRADE, OR AS OTHERWISE DIRECTED BY THE GEOTECHNICAL ENGINEER.

3.2.3 SIDE SLOPES SHOULD BE BENCHED TO PROVIDE POSITIVE INTERLOCK BETWEEN IN SITU MATERIALS AND EMBANKMENT FILL. BENCHES SHOULD BE NOMINALLY 1 M IN HEIGHT; BENCH WIDTH WILL VARY DEPENDING ON STEEPNESS OF THE SIDE SLOPES.

3.2.4 THE EXPOSED EMBANKMENT SUBGRADE AND SIDE SLOPES SHOULD BE INSPECTED BY A QUALIFIED GEOTECHNICAL ENGINEER, LICENSED TO PRACTICE IN THE YUKON TERRITORY.

3.2.5 THE EXPOSED SUBGRADE SHOULD BE NOMINALLY RE-COMPACTED BY STATIC ROLLING, UNLESS OTHERWISE DIRECTED BY THE GEOTECHNICAL ENGINEER.

3.2.6 THE EXPOSED SUBGRADE AND SIDE SLOPES SHOULD BE COVERED WITH GEOTEXTILE FILTER FABRIC, UNLESS OTHERWISE DIRECTED BY THE GEOTECHNICAL ENGINEER.

3.2.7 THE PREPARED SUBGRADE AND SIDE SLOPES SHOULD BE PROTECTED AT ALL TIMES FROM DISTURBANCE, INFLOW OF WATER, AND/OR FREEZING. EMBANKMENT FILL SHOULD NOT BE PLACED OVER DISTURBED, SATURATED, OR FROZEN SUBGRADE.

3.2.8 WASTE OVERBURDEN MATERIALS EXCAVATED DURING FOUNDATION PREPARATION SHOULD BE DISPOSED OF EITHER OFF-SITE OR WITHIN THE IROSA CONTAINMENT AREA(S), AS DIRECTED BY THE OWNER.

3.3 EMBANKMENT CONSTRUCTION

3.3.1 EMBANKMENT FILL AND GEOTEXTILE MATERIALS SHOULD BE PLACED AS INDICATED. MATERIAL TYPES, TRANSPORT, STORAGE, PLACEMENT AND COMPACTION SHOULD BE COMPLETED AS SPECIFIED IN SECTION 2.0.

3.4 INSTALL INSTRUMENTATION

3.4.1 ESTABLISH SURVEY MONUMENTS FOR MONITORING OF LONG-TERM EMBANKMENT PERFORMANCE IN LOCATIONS AS INDICATED.

3.4.2 SURVEY MONUMENTS SHOULD BE PROTECTED FROM DAMAGE OR DESTRUCTION BY EQUIPMENT OR VEHICLE TRAFFIC, AS REQUIRED.

3.5 CONSTRUCTION INSPECTION AND QUALITY CONTROL TESTING

3.5.1 REGULAR INSPECTIONS SHOULD BE CONDUCTED DURING CONSTRUCTION BY A QUALIFIED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE YUKON TERRITORY. FREQUENCY OF INSPECTIONS AND REQUIRED REPORTING AND DELIVERABLES TO BE DETERMINED BY THE OWNER.

3.5.2 CONFIRMATORY TESTING OF CONSTRUCTION MATERIALS TO BE COMPLETED AS SPECIFIED IN SECTION 2.3.

3.5.3 ON-SITE QUALITY CONTROL TESTING IS REQUIRED TO CONFIRM COMPACTION OF TYPE 2 FILL. MINIMUM ONE TEST PER LIFT USING NUCLEAR DENSOMETER OR SAND CONE METHOD.

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
SIGNATURE
Date June 8/17
PERMIT NUMBER PP003
Association of Professional Engineers of Yukon

PROFESSIONAL ENGINEER
YUKON TERRITORY
ADAM W. WALLACE
8 June 2017

ISSUED FOR

STRATAGOLD CORPORATION

TETRA TECH

HAGGART CREEK ICE RICH OVERBURDEN STORAGE AREA
EAGLE GOLD PROJECT - DUBLIN GULCH, YUKON

DETAILS AND SPECIFICATIONS
PAGE 2

PROJECT NO.	DWN	CKD	REV
ENG.WARC03235-01	CB	AW	0
OFFICE	DATE		
EBA-WHSE	May 26, 2017		

Figure 8