



Alexco Keno Hill Mining Corp
Suite 1150-200 Granville Street
Canada V6C 1S4

May 13, 2010

Government of Yukon
Department of Energy, Mines & Resources
P.O. Box 2703 Whitehorse, Yukon Y1A 2C6

Attention
Robert Holmes, Director, Mineral Resources

Subject: Dry Stack Tailings Facility Construction and Operation Plan, QML-0009

As discussed in our meeting with you on April 20, 2010, and pursuant to section 15.11 of QML-0009, we are herewith submitting information for the Dry Stack Tailings Facility (DSTF) Construction and Operation Plan.

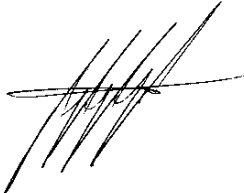
This submission includes the preliminary engineering design and management plan report for the DSTF prepared for Alexco by EBA Engineering Consultants Ltd (Attachment A). In addition, a letter report prepared by EBA (Attachment B) provides a number of additional details regarding water management structures related to the DSTF and mill site pond. This letter report was prepared in response to questions which arose during the adequacy review of our water licence application. Both of these documents are currently on the registry as part of our Type A water licence application.

We believe these submissions address items (a) through (d) of the plan requirements for the Dry Stack Tailings Facility Construction and Operation Plan set forth in your November 18th letter detailing plan requirements. Work in order to fulfill items (e) through (g) is currently being undertaken, and will be completed prior to construction. This supplemental information will be submitted as soon as this work is completed.

Please do not hesitate to call me at (604) 631-4139 if you have any further questions or to discuss any aspect of this submission.

Sincerely,

ALEXCO KENO HILL MINING CORP.



Robert L. McIntyre R.E.T., CCEP
Vice President, Business Development

Cc external: A. Kyle, YG EM&R, D. Buyck, First Nation of Nacho Nyak Dun, J. Janes, Yukon Water Board

Cc internal: C. Nauman, B. Thrall, D. Hillier, P. Johnson, T. Hall, T. Fudge

Attachments: A. EBA Preliminary Engineering Design and Management Plan, Dry-Stacked Tailings Facility, Bellekeno Mine, Yukon

B. EBA Letter Report Re: Water Management Preliminary Designs



ALEXCO KENO HILL MINING CORP.

Dry Stack Tailings Facility Construction and Operation Plan

QML-0009

BELLEKENO PROJECT

KENO HILL SILVER DISTRICT

YUKON

Attachment A

May 2010

Prepared by:



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Alexco Resource Corp.

ISSUED FOR USE

PRELIMINARY ENGINEERING DESIGN AND MANAGEMENT PLAN
DRY-STACKED TAILINGS FACILITY
BELLEKENO MINE MILL SITE, YUKON

W14101178.003

January 2010

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1.0 INTRODUCTION

Alexco Resource Corp. (Alexco) is constructing a silver, lead, zinc concentrating mill in the Keno Hill Silver District, Yukon. Alexco retained EBA Engineering Consultants Ltd (EBA) to provide preliminary engineering level design for tailings management at the Bellekeno Mine Mill Site.

This work was authorized by Purchase Order #3339, and the scope of service is outlined in a letter dated August 17, 2009.

2.0 BACKGROUND

Alexco began preparatory earthworks and foundation work for their concentrating mill at the Bellekeno Mine Mill site in the summer of 2009. The Bellekeno Mine Mill Site is located at an area formerly known as the Flame and Moth site and the location is shown in Figure 1. Alexco plans to store filtered tailings by constructing a dry-stacked tailings facility (DSTF) immediately north of the mill location.

EBA conducted both a preliminary geotechnical investigation, consisting of excavating thirty-one testpits, and a detailed geotechnical investigation, consisting of drilling eleven boreholes with a mini-sonic drill rig.

3.0 BELLEKENO DRY-STACKED TAILINGS FACILITY DESIGN ASSUMPTIONS

EBA used the following assumptions provided by Alexco in the design of the DSTF at the Bellekeno Mill Site:

- Tailings discharge rate of 7.75 dmt/h (dry-metric tonnes per hour) for Years 1 and 2 and 13.95 dmt/h for Years 3 and 4.
- Tailings specific gravity of 3.95.
- 60% of tailings will be stored on surface.
- The remaining 40% of tailings will be stored underground.
- Water collection pond is sized for 2,500 m³.
- An evapo-transpirative cover consisting of 0.5 m of vegetated soil will be used for closure of the DSTF.

EBA made the following assumptions:

- Bleedwater from the tailings pile will be 10% of the porewater in the DSTF.
- The design seismic event was selected to be 1:500 year return period (0.138 g for the selected site), as recommended in “Mined Rock and Overburden Piles Investigation and Design Manual” (Piteau 1991).

4.0 GEOTECHNICAL INVESTIGATIONS

The preliminary geotechnical investigation was summarized in a letter “Geotechnical Evaluation – Proposed Mill (Option 3) and DSTF” dated August 7, 2009. Testpit logs are included for reference in Appendix A.

The detailed geotechnical investigation was conducted between August 28 and September 2, 2009. Mr. Christopher Dixon, P.Eng., and Mr. James Buyck conducted the investigation. Eleven boreholes were drilled using a mini-sonic drill rig provided by Boart Longyear. Approximate UTM (NAD83) coordinates, noted on the testhole logs, were determined using a hand-held GPS unit. Elevations shown on the logs were determined using the approximate coordinates and 1 m contour information generated from air photos and local topographic survey contours provided by Alexco.

4.1 SURFACE CONDITIONS

The site in the vicinity of the DSTF slopes generally west at approximately 15% to 20%. There is disturbance in the area from previous surface earthwork and historic mining. A trail runs roughly north with a ditch that follows it to convey runoff around the former Flame and Moth Mine. Vegetation in the area consists of mosses and small spruce trees. A ridge crosses the site in a north-south direction. The ridge slopes approximately 5% to 10% towards the south.

4.2 SUBSURFACE CONDITIONS

Nine boreholes were drilled near the DSTF. Information gathered in these boreholes indicates two general soil profiles in the area:

- glaciofluvial GRAVEL underlain by bedrock and
- SILT and SAND till underlain by gravel and bedrock.

The testhole locations and general subsurface conditions are shown in Figure 2.

The gravel was encountered along the ridge that crosses the site. The gravel in the area of the DSTF was found in both frozen and unfrozen states. It is typically sandy with trace silt, compact, medium grained, well graded, and brown, and it is underlain by a thin layer of silt and sand till and then bedrock. Bedrock encountered in testholes is a competent quartzite. Subsurface conditions for the gravel area are summarized in Table 1.

TABLE 1: GENERAL SUBSURFACE CONDITIONS FOR GRAVEL AREA

Soil Unit	Min Thickness (m)	Max Thickness (m)	Average Thickness (m)
GRAVEL	1.3	3.7	2.5
SILT and SAND Till	0.2	1.3	1.0
BEDROCK (quartzite)	@2.1 mbgs*	@5.0 mbgs*	@3.4 mbgs*

*metres below ground surface.

All silt and sand till encountered in the area of the DSTF was frozen. The silt and sand till typically contains trace gravel and trace clay, is low to non-plastic, olive grey, is underlain by gravel seams within the till and then by quartzite bedrock. Two boreholes on the west side of the ridge, BH15 and BH17, were drilled through the silt and sand layer. The gravel seams were encountered below 16 m depth in BH15, and bedrock was encountered at 14.2 m depth in BH17. One borehole, BH23, was drilled through the till deposit on the east side of the ridge and gravel seams were encountered at 7.6 m depth.

Two boreholes, BH24 and BH25, were drilled near a proposed water collection pond. The general soil conditions in this area are gravel fill over glaciofluvial gravel over silt and sand till over glaciofluvial gravel. The glaciofluvial gravel and silt and sand till are similar to the soils described above and are all unfrozen.

4.3 GROUNDWATER

No groundwater was encountered within the proposed footprint of the DSTF. However, shallow groundwater was encountered in BH17 at 1.2 m depth, and a standpipe piezometer was installed at that location. A standpipe piezometer was also installed near the proposed water collection pond in BH24. For piezometer installation details, please see the borehole logs in Appendix A.

4.4 PERMAFROST

Permafrost was encountered throughout the proposed DSTF. The permafrost encountered ranged from non-visible, non-excess ice to massive ice lenses. Ice volumes estimated as a percentage of the total soil volume vary between less than 5% and nearly 100%. The type and amount of ice inclusions within the permafrost generally follows the soil stratigraphy.

The permafrost beneath the ridge area can generally be described as containing ice-coated particles, and the amount of ice is estimated at less than 10% of the total soil volume.

The permafrost to the west of the ridge area contains a combination of horizontally stratified ice lenses, massive ice, and non-visible excess ice. The ice lenses are typically about 5 mm thick. The massive ice was encountered in BH15, BH16, BH17, and BH18. It is segmented by layers of ice and silt, and each segment ranges in thickness from 0.6 m to 5 m. The assumed bottom of the massive ice strata was determined in BH15, BH16, and BH17, and the average thickness of massive ice in these three boreholes is 3.8 m.

The permafrost to the east of the ridge area contains a combination of horizontally stratified ice lenses, randomly oriented ice inclusions, and non-visible excess ice. One borehole, BH23, was drilled into the permafrost in this area. The top 3.5 m of the permafrost here is considered to be ice-rich, containing 10% to 35% randomly orientated ice crystals and non-visible excess ice by volume. Below this, the permafrost is considered to be ice-poor (moisture contents in the soil are below the 100% saturation moisture content).

Ground temperature instrumentation was installed in four locations: BH15, BH17, BH18, and BH23. Data collected from these instruments shows that the permafrost to the west and east of the ridge is very warm, approximately between -0.2°C and -0.4°C . The thermal gradient in BH23 is calculated as $+3^{\circ}\text{C}/100\text{ m}$. Based on this data, permafrost is not expected to extend beyond 20 m depth in this area. Ground temperature information is shown on the borehole logs in Appendix B.

4.5 BEDROCK

Bedrock was encountered in five of the nine boreholes drilled near the DSTF. The bedrock was classified as a competent quartzite. The drilling method (sonic drilling) only provides broken chips and small pieces of the bedrock when the bedrock is in a competent state. These pieces are only useful for the classification of the rock type; no other information can be provided on the bedrock at this time.

5.0 LABORATORY TESTING

EBA conducted laboratory tests on recovered samples from the drill program. The following tests were conducted and are explained in more detail below:

- Moisture Content
- Particle Size Distribution
- Atterberg Limits
- Bulk Density
- Porewater Salinity
- Thaw Consolidation
- Direct Shear

5.1 MOISTURE CONTENT

Moisture content determination was conducted on almost all samples returned to EBA's Whitehorse laboratory. Results of the test are reported on the borehole logs. The moisture content reported is defined as mass of water divided by mass of dry solids.

5.2 PARTICLE SIZE DISTRIBUTION

Particle size distribution determination was conducted by both sieve and sieve hydrometer methods on selected samples returned to EBA's Whitehorse laboratory. Results of the testing immediately follow the borehole log from which each sample was collected.

5.3 ATTERBERG LIMIT DETERMINATION

Atterberg limit determination was conducted on selected fine-grained samples returned to EBA's Whitehorse laboratory. Atterberg Limit testing involves determining the liquid limit (LL) and the plastic limit (PL) of a soil and then calculating the plasticity index (PI) which is used to aid in classification of the soil type. Results of the testing are presented on the borehole logs and included here in Table 2.

TABLE 2: RESULTS OF ATTERBERG LIMITS TESTING							
Testhole	Sample	Depth (m)	LL (%)	PL (%)	PI	Moisture Content (%)	Soil Description
BH15	SA08	6.3 – 6.4	18.7	15.7	3.1	70.2	ML
BH16	SA05	2.7 – 3.0	17.6	14.9	2.7	37.6	SM
BH18	SA06	5.1 – 5.4	16.1	15.1	1.0	27.1	ML
BH19	SA02	1.0 – 1.2	18.8	17.7	1.1	47.4	SM
BH22	SA03	1.3 – 1.5	17.8	16.5	1.2	71.5	ML
BH23	SA11	6.4 – 6.5	19.5	14.7	4.8	17.1	ML
BH24	SA03	5.4 – 5.6	20.2	15.6	4.6	10.5	ML
BH25	SA07	8.7 – 8.9	17.4	14.4	3.0	9.7	ML

5.4 FROZEN BULK DENSITY

Frozen bulk density of selected frozen samples of the silt, both ice-rich and ice-poor, was determined in EBA's Whitehorse laboratory. Samples of various moisture contents were selected to establish a relationship between bulk density and moisture content. The relationship between frozen bulk density and moisture content is linear. For moisture contents less than 100%, the relationship is:

$$\gamma_b = 2160.9 - 1060.4\omega \quad [1]$$

Where: γ_b is frozen bulk density (kg/m^3)

ω is moisture content in %/100 (i.e, ω of 27% is used as 0.27)

The results of all the tests are also presented in Table 3.

TABLE 3: FROZEN BULK DENSITY RESULTS

Testhole	Sample	Depth (m)	Bulk Density (kg/m ³)	Moisture Content (%)
BH18	SA06	5.1 – 5.4	1879	27
BH16	SA05	2.7 – 3.0	1754	37
BH16	SA07	4.1 – 4.4	1649	48
BH15	SA08	6.3 – 6.4	1438	71
BH22	SA03	1.3 – 1.5	1389	72
BH16	SA10	6.3 – 6.5	1353	74
BH18	SA09	7.3 – 7.5	1106	279
BH15	SA07	4.7 – 5.3	938	1202
BH17	SA03	4.2 – 4.5	905	3318

5.5 POREWATER SALINITY

Porewater salinity of selected samples was determined in EBA's Whitehorse laboratory. The results are shown in Table 4. Soils with porewater salinity of 3 ppt or less are considered to be non-saline.

TABLE 4: POREWATER SALINITY RESULTS

Testhole	Sample	Depth (m)	Porewater Salinity (ppt)
BH15	SA08	6.3 – 6.4	1.0
BH17	SA07	4.2 – 4.5	2.5
BH19	SA02	1.0 – 1.2	3.0
BH18	SA06	5.1 – 5.4	1.5
BH22	SA03	1.3 – 1.5	1.0
BH23	SA11	6.4 – 6.5	3.0

5.6 THAW CONSOLIDATION

Thaw consolidation tests were conducted on two samples from BH23: SA02 and SA03. These samples are both representative of ice-rich silt. Thaw consolidation tests were conducted by obtaining an undisturbed frozen core sample of the ice-rich silt. The frozen samples were then trimmed to 75 mm diameter and placed in a one-dimensional oedometer and loaded to 150 kPa to simulate the force generated from the mass of the tailings in the DSTF. The samples were allowed to thaw, and the change in sample height was recorded. This data allows the calculation of C_v , which is used in consolidation calculations. The change in sample height (i.e., strain) was also recorded. This can be used to approximate the volume of change due to melting ice and soil consolidation in the foundation soils of the proposed DSTF. The average thaw-strain of the ice-rich silt was 60%. Test results are shown in Appendix B.

5.7 DIRECT SHEAR

Direct shear testing was conducted on both the thawed consolidated silt and sand till and the tailings. The tailings samples were obtained from the Elsa Tailings facility. The particle size distribution of the Elsa Tailings is nearly identical to the particle size distribution determined for the proposed Bellekeno Tailings. Particle size distribution results are shown in Appendix B. The resulting strengths are summarized in Table 5 and included in Appendix B. EBA has applied experience and engineering judgement to the test results and chosen to use a cohesion of 0 kPa and a ϕ of 30° for both materials, even though test results show higher strengths.

TABLE 5: SOIL STRENGTH PROPERTIES

Soil Type	Peak Strength		Residual Strength	
	Cohesion (kPa)	Friction (ϕ)	Cohesion (kPa)	Friction (ϕ)
Thawed Silt and Sand Till	1.0	39.0	0.5	38.5
Tailings	20.2	35.2	7.5	34.7

6.0 DRY-STACKED TAILINGS FACILITY DESIGN

The design of the DSTF at the Bellekeno Mine Mill Site involves the construction of drainage works and the placement and compaction of the filtered tailings.

6.1 TAILINGS PLACEMENT

The tailings will be placed and compacted in the DSTF. Before tailings are placed, all trees will be cut by hand and removed with minimal disturbance to the ground surface, and a minimum 0.5 m gravel drainage blanket will be placed. In the ridge area, some gravel (up to 3 m) will be excavated leaving at least 0.5 m of gravel above the silt and sand till and bedrock. In the area east of the ridge, a minimum 0.5 m thick gravel drainage blanket will be placed over the existing peat. The tailings will be placed directly on this drainage blanket.

The anticipated rate of tailing generation is 187 dmt (dry metric tonnes)/day for the first two years and 408 dmt/day for the next year and nine months. This information was provided to EBA by Alexco. Other tailings assumptions are summarized in Section 3.0. The anticipated in-place tailings volumes are summarized in Table 6. These results are shown graphically in Figures 3 through 6. Three sections through the final geometry of the DSTF are shown in Figure 7.

TABLE 6: ANTICIPATED YEARLY TAILINGS VOLUMES

Months of Operation	Tailings Produced (dmt)	Tailings Produced (m³)	Tailings Stored Underground (m³)	Tailings Stored on Surface (m³)	Cumulative Tailings Stored on Surface (m³)
0–12	67,890	39,940	15,970	23,970	23,970
12–24	67,890	39,940	15,970	23,970	47,940
24–36	122,200	71,890	28,750	43,140	91,080
36–45	91,070	53,570	21,430	32,140	123,220

The tailings are deposited off a conveyor stacker outside the mill building. The tailings will exit the mill at a temperature between 10 and 20°C. Since new warm tailings will continuously pile over the cooling tailings, there is no concern for the tailings freezing in place as long as tailings are constantly being deposited in one location from the mill.

The current plan is to haul tailings from the mill discharge location to the DSTF at least once per day. If tailings cannot be moved from the mill discharge location to the DSTF (e.g., site whiteout conditions), they will be temporarily piled at the discharge location. In such an event, the tailings will be subject to freezing temperatures, and the outer edge of the tailings pile may freeze.

One-dimensional freezing calculations, as described in Andersland and Ladanyi (2004), estimate that in 7 days of -40°C weather, the crust will freeze between 100 mm and 300 mm. Experience from the Minto Mine shows that the tailings placed in a conical pile will develop a frozen edge with a thickness of less than 100 mm in 4 to 6 hours. Experience at the EKATI Diamond Mine shows similar results, but EKATI's coarse processed kimberlite has a coarser gradation and higher moisture content.

If an emergency or breakdown occurs and the tailings are left out for 7 days without being transported to the DSTF, we can expect a 300 mm thick edge of frozen tailings to have formed around all piles. The tailings beneath the frozen edge will be thawed and still compactable. The thawed tailings should be hauled to the DSTF and placed in accordance with the standard tailings placement method. The frozen edge of tailings should be hauled to a location within the DSTF (at least 30 m from any edge) and placed in a loose state. The frozen tailings should not be covered until they have thawed and are properly compacted. All tailings placed in the DSTF should be properly compacted.

Experience at Minto Mine has shown that dumping tailings from a truck, pushing them into place with a bulldozer, and then compacting them with a vibratory drum packer will result in proper compaction of tailings in cold weather. A procedure similar to this has also been successfully used for placing and compacting granular materials for the construction of frozen core dams in Northern Canada (three at EKATI, one at Polaris, and one at Jericho).

The frozen core dam procedure involves heating the soil with 10% moisture to a temperature of 10°C to 20°C. The warm, saturated soil is then loaded into haul trucks and hauled to site spread into 300 mm lifts by a bulldozer and compacted with a vibratory

compactor in temperatures as low as -50°C. This procedure is very similar to what is being proposed for tailings disposal.

Soils will freeze faster while being spread and compacted than they will if left in a pile. Therefore, once the tailings are hauled to the DSTF, they must be immediately spread and compacted when freezing temperatures are present. Alexco will conduct regular quality control testing to ensure that the tailings are being compacted to at least 95% of maximum dry density as per ASTM D698.

The filtered tailings will have an average moisture content of approximately 17%. EBA determined the maximum dry density and optimum moisture content of the tailings as defined by ASTM D698 to be 1690 kg/m³ at 16.5%. This means that on average the tailings will be placed slightly over the optimum moisture content.

6.2 RUNOFF DIVERSION STRUCTURES

The drainage works for the facility consist of two outer diversion berms, a blanket drain, a toe runoff collection ditch, a conveyance channel, and a water collection pond. The outer diversion berms will be constructed from gravel and are intended to promote runoff flow away from the DSTF and mill pad. The blanket drain will be constructed from gravel or waste rock and be approximately 0.5 m thick. The blanket drain will allow any water that seeps through the tailings or that is generated from thawing permafrost to drain from the facility. A toe runoff collection ditch will collect runoff water from the DSTF and intercept water seeping through the drainage blanket, diverting it to the water collection pond via the conveyance channel. The conveyance channel will be lined and constructed completely from gravel fill (no excavation below ground); it is intended to route water collected in the ditch from the facility to the water collection pond. The water collection pond will be a lined excavation into the native soils. The water collection pond is currently sized for 2,500 m³. This size was provided by Alexco and is the volume expected to be generated for a 10-day freshet with a 1:200 year return period (Clearwater, 2009). The drainage works are shown in Figures 6 and 8.

6.3 TAILINGS SEEPAGE

To fully understand the forces governing seepage from the DSTF, there must be a general understanding of a soil phase diagram, saturation, void ratio, moisture content, and moisture density relationships. Soils are composed of three phases: solids (minerals), liquids (water), and gases (air). Soil voids are defined as the volume occupied by water and air. Saturation is defined as the ratio of volume of water to the volume of voids (i.e., 100% saturation means there is no air in the soil). The void ratio is defined as the ratio of the volume of voids to the volume of solids. Moisture content is defined as the mass of water divided by the mass of solids.

Maximum dry density, as used here, refers to the maximum dry density as determined by ASTM D698. ASTM D698 is a test that uses a constant force to determine the maximum dry density of a soil at that standard force. As the moisture content of a soil increases

towards the optimum moisture content, the dry density that a soil can be compacted to (using the same standard applied force) also increases. The dry density of a soil (using the same standard applied force) will reach a maximum at its optimum moisture content. Increasing a soils moisture content past its optimum moisture content and continuing to apply the same standard force will cause the dry density of the soil to decrease. This is because most of the voids in the soil are filled with water, which is an incompressible fluid. Typically, the optimum moisture content of a fine-grained soil corresponds to a saturation of 80% (Coduto 1999).

When soil is compacted, the total volume of the soil is decreased by decreasing the volume of air in the soil, which decreases the volume of voids. If the volume of voids is decreased but the volume of water is constant, then by definition, the saturation increases. Experience shows that water may seep from soil during compaction when it is over its optimum moisture content (especially when a vibratory compactor is used).

The expected gradation and optimum moisture content of the tailings at Bellekeno Mine Mill Site will be similar to those in the Elsa tailings facility. The optimum moisture content for the Elsa tailings is approximately 16.5%. Since the tailings at Bellekeno Mine Mill Site are expected to be only slightly higher than the optimum moisture content, the seepage from compaction is considered to be negligible. For the purposes of this calculation, however, EBA has conservatively estimated the seepage at 10% of the total porewater, and the total volume of seepage water will depend on the volume of tailings placed. It is not expected that water will seep from the DSTF during the winter months because porewater that might seep out will freeze and be covered by tailings before it has a chance to thaw. In perpetuity, this ice is expected to melt and the tailings in the DSTF are expected to be unfrozen. The tailings are not expected to be over 100% saturation so this water should stay in voids of the tailings over the long term. This ice formation has been accounted for in the short-term stability analysis of the DSTF. The associated minor surface settlement has been accounted for in the long-term stability analysis and closure planning of the DSTF.

The mill is expected to produce 67,890 dmt of tailings a year for Years 1 and 2, 122,202 dmt of tailings in Year 3, and 91,066 dmt of tailings in Year 4 all at a moisture content of 17%. Only 60% of the total tailings will be placed in the DSTF, and the other 40% will be backfilled underground, so the total mass of tailings placed in the DSTF per year is 40,734 dmt for Years 1 and 2, 73,321 dmt for Year 3, and 54,639 dmt for Year 4.

The total volume of water entering the tailings facility per year is 6,925 m³ in Years 1 and 2, 12,464 m³ in Year 3, and 9,289 m³ in Year 4. If 10% of that water seeps from the facility year round, then the total volume of water seeping from the DSTF is 693 m³ per year or 1.9 m³/day in Years 1 and 2, 1,246 m³ per year or 3.4 m³/day in Year 3, and 929 m³ per year or 3.4 m³/day in Year 4. However, this flow will only be shown as active in May, June, July, August, September, and October to better reflect expected operating conditions. Using an average rate of seepage of 1.9 m³/day for Years 1 and 2, and 3.4 m³/day for Years 3 and 4 over 6 months, it is expected that the seepage from the DSTF will be 347 m³ per year in Years 1 and 2 and 623 m³ per year in Years 3 and 4.

7.0 THAW CONSOLIDATION

Construction of the DSTF will involve placing and compacting relatively warm tailings on relatively cold ground. This will change the thermal equilibrium that exists on the site and eventually thaw the existing permafrost in the area.

EBA conducted thaw-consolidation testing on samples of undisturbed ice-rich permafrost recovered from BH23.

Results of the two thaw-consolidation tests are shown in Figures 9 and 10. An average C_v value of $0.0014 \text{ cm}^2/\text{s}$ was determined using standard consolidation theory. The C_v value is low and accounts for volume changes due to melting ice within the soil profile. An assumption in thaw-consolidation theory is that drainage is not impeded from the top of the consolidating layer. EBA has assumed that a 0.5 m thick gravel drainage blanket sufficiently meets this assumption.

To determine excess porewater pressures generated through thawing permafrost, a depth of thaw must first be determined. EBA chose an upper bound to this problem by conducting a one-dimensional thaw calculation presented by Andersland and Ladanyi (2004). Assuming that the ice-rich till has a frozen moisture content of 90% and dry density of 635 kg/m^3 and is at a temperature of -0.4°C , and that the tailings remain at 20°C for four months, the frozen silt will thaw 1.2 m. Using a C_v of $0.0014 \text{ cm}^2/\text{s}$ and a rate of thaw of 1.2 m, in four months, the anticipated excess porewater pressure generated is $R_u=0.35$. This value was used in slope stability calculations, where appropriate.

It was also determined during laboratory testing that the thaw-strain of the ice-rich silt is approximately 60% (Figures 9 and 10). The stratum of ice-rich silt is approximately 3.5 m thick, which will correspond to an anticipated distortion of 2.1 m in perpetuity.

The long-term thaw consolidation of ice-poor silt was determined assuming:

- the strata of ice-poor silt over gravel or bedrock is 7 m thick,
- $C_c = I_p/74 = 0.05$ (Coduto 1999),
- $e_o = 0.5$, typical value for silty sand (Coduto 1999).

Based on information above, the long-term thaw-consolidation of the ice-poor silt would be approximately 0.4 m. Therefore, it is expected that in perpetuity the movement of the crest of the pile will be approximately 2.5 m. There will also be slumping of the south slope of the pile since the ice-poor silt continues in this direction, but there should be minimal settlement in the west slope of the pile since it is founded on gravel over bedrock and any till layer in this area is considered to be thin and ice-poor. This movement has been accounted for in the long-term stability of the pile; however, it may be beneficial to place more cover material in this area during closure. This should be reviewed when a detailed closure plan is developed.

8.0 STABILITY OF THE DSTF

The stability of the DSTF was determined using Geostudio 2007 – Slope/W module, which is a computer program that uses limit equilibrium theory to compute the factor of safety (FS) of slopes. The DSTF slopes were analyzed in several different conditions, including during construction (Years 1 through 4) and after closure activities in both static and pseudo-static scenarios. A minimum FS is suggested for each condition by the BC Mine Waste Rock Pile Research Committee (Piteau 1991).

The suggested FS are given for two cases: Case A and Case B. Case A is typically used when less rigorous analyses are conducted or when where material properties and actual failure mechanisms are not well understood. Case B is typically used when more rigorous analyses are conducted or when material properties and failure mechanisms are well understood. EBA has chosen to compare the calculated FS against Case A except when the long-term strength of ice-rich frozen silt is used in the analysis. The method used to determine the long-term strength of ice-rich silt is overly conservative, and thus these scenarios should be compared against Case B.

The stability of the DSTF was analyzed along three sections in three scenarios:

- Permafrost fully frozen
- Permafrost thawed to 1.2 m depth
- Permafrost fully thawed

The parameters used for and the results of each analysis are summarized in the subsequent sections.

8.1 SOIL STRENGTH PARAMETERS

Seven material types were used in the slope stability model:

- Bedrock
- Frozen ice-rich silt
- Frozen ice-poor silt
- Thawed silt
- Tailings
- Gravel
- Loose Gravel

The material parameters are summarized in Table 7.

TABLE 7: MATERIAL PROPERTIES

Material Type	Unit Weight (kN/m ³)	Frictional Strength		Non-Frictional Strength
		Cohesion (kPa)	Friction (ϕ')	c_u (kPa)
Bedrock	Bedrock is considered impenetrable in this model			
Frozen Ice-Rich Silt (90% ω)	11.8	0	30°	50
Frozen Ice-Poor Silt (20% ω)	19.1	0	30°	N/A
Thawed Silt	19.1	0	30°	N/A
Tailings	19.4	0	30°	N/A
Gravel	24.0	0	35°	N/A
Loose Gravel	21.1	0	30°	N/A

All soils are expected to behave as frictional materials for any short-term loading conditions; these are modelled in the drained state. Short-term loading is considered to be during the construction of the pile or during any pseudo-static analysis. All soils, except for the frozen ice-rich silt, are also expected to behave as frictional materials during long-term loading conditions.

As noted in Johnston (1981), a conservative approach to determining the bearing capacity of frozen soil is to assume that the internal angle of friction (ϕ) of the soil is equal to 0, thus relying solely on the cohesive properties of the frozen soil. Johnston (1981) also describes a formula to determine the lower limit for the 50 year shear strength (in kPa) of frozen soils and it is:

$$C_u = 35 + 28T \quad [2]$$

Where: T is in °C below freezing (with a positive sign).

The properties of each soil type are discussed in more detail below.

8.1.1 Bedrock

The bedrock in the area is a competent quartzite. The strength of the bedrock is assumed to be much higher than that of the soil around it. Any slope failures will therefore happen through the soil and not the bedrock. For modelling purposes, the bedrock was assumed to be impenetrable.

8.1.2 Frozen Ice-Rich Silt

Assuming that the temperature of the frozen ice-rich silt is -0.4°C, the 50 year shear strength would be 46 kPa and the soil would be modelled as undrained. However, EBA believes this value to be extremely low for the soil and based on experience and engineering judgement has decided to use 50 kPa. The bulk density of the ice-rich silt was determined assuming a moisture content of 90%. In short-term loading, it is expected that the ice-rich

silt will behave as a frictional material with properties similar to those determined for the thawed state.

8.1.3 Frozen Ice-Poor Silt

EBA assumed that the frozen ice-poor silt will behave similarly to thawed silt in both short-term and long-term loading conditions. The bulk density of the ice-poor silt was determined using a moisture content of 20%.

8.1.4 Thawed Silt

EBA assumed that the thawed silt would behave as a frictional material in both short-term and long-term loading conditions. The strength was determined using direct shear test results. The bulk density was assumed to be the same as ice-poor silt since there should be little volume change due to the thawing of ice-poor silt.

8.1.5 Tailings

Tailings should behave as a frictional material in both short-term and long-term loading conditions. The strength of the tailings was determined using direct shear test results. The bulk density was determined by first determining the maximum dry density of the tailings (1690 kg/m^3) and then adding the mass of water (assuming moisture content of 17%). This is a conservative estimate since the tailings should be compacted to only 95% of the maximum dry-density.

8.1.6 Gravels

Gravel should behave as a frictional material in both short-term and long-term loading conditions. The friction angle of the gravel was conservatively assumed as 35° based on EBA's experience with gravels in the Keno City area. This was reduced to 30° for gravel placed in a loose state. The bulk density was based on a maximum dry density of $2,385 \text{ kg/m}^3$. It is assumed that the gravel would be placed at 95% density and 8% moisture for the drain area and 87% density and 4% moisture for the cover material.

8.2 PERMAFROST FULLY FROZEN

This scenario is intended to model the condition where the tailings have been placed but the underlying soils have not yet thawed. The factor of safety against long-term slope instability was determined using the long-term strength of ice-rich silt. This is a conservative assumption and should be considered a lower bound for thawing of the ice-rich silt. A summary of the factors of safety for several conditions within this scenario are provided in Table 8. Slope stability plots are found in Appendix C.

TABLE 8: DSTF SLOPE STABILITY FACTOR OF SAFETY – FULLY FROZEN CASE					
Stability Condition	Factor of Safety Suggested Minimum (Piteau 1991)		Calculated for DSTF		
	Case A	Case B	Section A	Section B	Section C
Stability of Surface					
Short-Term (during construction – static)	1.0	<i>1.0</i>	1.7	2.0	2.0
Long-Term (after closure – static)	<i>1.2</i>	1.1	1.5	1.9	2.1
Deep-Seated Stability					
Short-Term (during construction – static)	1.3–1.5	<i>1.1–1.3</i>	2.1	2.2	3.1
Short-Term (during construction – pseudo-static)	1.1–1.3	<i>1.0</i>	1.5	1.5	1.4
Long-Term (after closure – static)	<i>1.5</i>	1.3	1.4	1.6	1.6
Long-Term (after closure – pseudo-static)	1.1–1.3	<i>1.0</i>	1.4	1.3	1.4

Note: **Bold** values are recommended minimum for each condition.

Italic values are provided for information only.

8.3 PERMAFROST THAWED TO 1.2 METRE DEPTH

This scenario is intended to model the condition where the tailings are placed and the underlying soils have thawed 1.2 m in four months. This rate of thaw is relatively quick. It was determined assuming that the tailings would remain at +20°C for four consecutive months. The porewater pressures developed due to this rate of thaw is $R_u=0.35$. This should be considered an upper bound for thawing of the ice-rich silt. Any thaw beyond this initial 1.2 m will likely occur at a much slower rate. The slower rate of thaw will allow porewater to dissipate prior to developing excess porewater pressures. A summary of the factors of safety for several conditions within this scenario are provided in Table 9. Slope stability plots are found in Appendix D.

TABLE 9: DSTF SLOPE STABILITY FACTOR OF SAFETY – 1.2 m THAWED CASE

Stability Condition	Factor of Safety Suggested Minimum (Piteau 1991)		Calculated for DSTF		
	Case A	Case B	Section A	Section B	Section C
Stability of Surface					
Short-Term (during construction – static)	1.0	<i>1.0</i>	1.7	2.0	1.8
Long-Term (after closure – static)	<i>1.2</i>	1.1	1.5	1.9	1.8
Deep-Seated Stability					
Short-Term (during construction – static)	1.3–1.5	<i>1.1–1.3</i>	2.0	2.1	1.8
Short-Term (during construction – pseudo-static)	1.1–1.3	<i>1.0</i>	1.3	1.4	1.2
Long-Term (after closure – static)	<i>1.5</i>	1.3	1.4	1.7	1.9
Long-Term (after closure – pseudo-static)	1.1–1.3	<i>1.0</i>	1.3	1.3	1.2
Note: Bold values are recommended minimum for each condition <i>Italic</i> values are provided for information only.					

8.4 PERMAFROST FULLY THAWED

This scenario is intended to model the anticipated long-term condition where the tailings are placed and the underlying soils have fully thawed and consolidated. Due to the rate of thaw and the lack of excess ice below the ice-rich silt layer, no excess porewater pressure is anticipated. This should be considered a reasonable approximation of the DSTF's long-term state. A summary of the factors of safety for several conditions within this scenario are provided in Table 10. Slope stability plots are found in Appendix E.

TABLE 10: DSTF SLOPE STABILITY FACTOR OF SAFETY – FULLY THAWED CASE

Stability Condition	Factor of Safety Suggested Minimum (Piteau 1991)		Calculated for DSTF		
	Case A	Case B	Section A	Section B	Section C
Stability of Surface					
Short-Term (during construction – static)	1.0	<i>1.0</i>	N/A ¹		
Long-Term (after closure – static)	<i>1.2</i>	1.1	1.5	1.9	2.0
Deep-Seated Stability					
Short-Term (during construction – static)	1.3–1.5	<i>1.1–1.3</i>	N/A ¹		
Short-Term (during construction – pseudo-static)	1.1–1.3	<i>1.0</i>	N/A ¹		
Long-Term (after closure – static)	<i>1.5</i>	1.3	2.2	2.3	2.3
Long-Term (after closure – pseudo-static)	1.1–1.3	<i>1.0</i>	1.5	1.5	1.5
Note: Bold values are recommended minimum for each condition <i>Italic</i> values are provided for information only. ¹ Foundation will not be fully thawed during construction of the pile.					

9.0 DSTF RISKS AND MITIGATIONS

The risks associated with the DSTF and suggested mitigations are summarized in Table 11.

TABLE 11: DRY-STACKED TAILINGS FACILITY RISK AND MITIGATION SUMMARY TABLE			
Risk	Design Constraint	Mitigation	Discussion
Deep-seated slope failure	Minimum FS = 1.3 (static); 1.3 (pseudo-static 1:500 year event)	Facility is designed to the applicable guidelines.	Probability of exceedance of the design seismic event is 10% in 50 years.
Long-term surface slope failure	Minimum FS = 1.4 (static)	Facility is designed to the applicable guidelines	Surface failures can be repaired without major effort.
Short-term surface slope failure	Minimum FS = 1.7 (static)	Facility is designed to the applicable guidelines	Surface failures can be repaired with available on-site equipment.
Pile erosion	Minimize surface runoff	Diversion berm included upgradient pile is sloped to allow runoff to flow off the pile.	Diversion berm is intended to direct runoff around the pile. Closure plan includes capping with a coarser material to prevent erosion.
Insufficient drainage	Melting ice in permafrost needs to drain.	Drainage blanket provided beneath entire footprint of DSTF.	Drainage blanket will also aid in draining any water percolating through the pile.
Liquefaction	Compact tailings	Tailings are specified to be compacted with a steel drum vibratory compactor.	Foundation soils should be coarse enough not to liquefy.
Snow and ice buried during pile construction	Operational issue	Operational procedures will be developed to minimize this.	Buried snow and ice could affect the stability and capacity of the facility.
Frost heave	Limit excess porewater in frost-susceptible materials	Free draining foundation soils limits excess porewater available to generate frost heave.	Frost heaving deforms the structure and affects the stability of the facility.
Leaking from capping material upon closure	Monitor pile upon closure	Monitoring stations located downgradient from the facility will detect leaks and then repairs can be made. Water will be collected and treated if necessary.	Capping material can be repaired by mechanical means if a leak is detected

10.0 DSTF CLOSURE PLAN

Since the DSTF will be constructed as a sidehill fill, progressive reclamation is feasible and will be conducted. Once tailings placement for a portion of the DSTF is complete, an evapo-transpirative cover (0.5 m of loosely placed gravel soil) will be placed over the surface of the compacted tailings to temporarily store runoff and allow it evaporate or to be used by plants. The water collection pond and diversion berms and ditches will be left in place. The water collection pond will be able to act as bio-reactors if necessary, and the berms will continue to divert runoff water away from the DSTF area. The entire affected footprint will be re-vegetated with plants that promote soil evapo-transpiration, similar to those used at Brewery Creek Mine. This procedure has been successfully used at the Brewery Creek Mine, which was reclaimed by Alexco, and is also feasible here since the annual pan evaporation exceeds the annual precipitation (Tremblay et al. 2001).

The DSTF will require an annual geotechnical inspection for at least five years after closure. This requirement should be reviewed after five years. EBA also recommends that piezometers, ground temperature instrumentation, and slope indicator instrumentation be installed for long-term monitoring of the DSTF. These instruments can be installed as progressive closure activities during construction of the DSTF. The recommended approximate locations of these instruments are shown in Figures 11 and 12.

11.0 LIMITATIONS

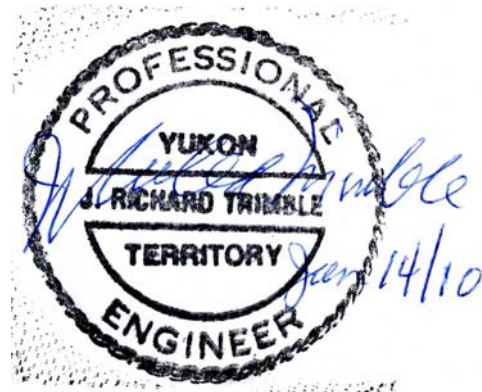
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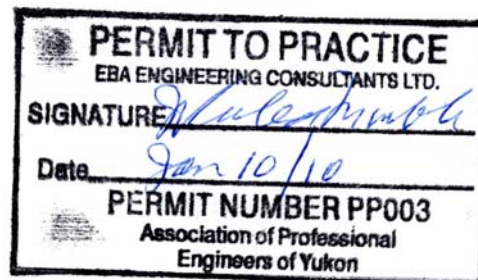
Sincerely,
EBA Engineering Consultants Ltd.



Christopher J. Dixon, P.Eng.
Geotechnical Engineer, Yukon Region
Direct Line: 867.668.2071 x241
cdixon@eba.ca
/jnc



Reviewed by:
J. Richard Trimble, M.Sc. (Eng.), P.Eng.
Principal Consultant, Office Manager
Direct Line: 867.668.2071 x222
rtrimble@eba.ca



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FIGURES



CHRISTAL
LAKE

MACKENO SITE

CITY
DUMP

BELLEKENO
MINE MILL
SITE

KENO
CITY

DUNCAN CREEK ROAD

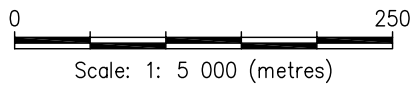
LIGHTNING CREEK

BELLEKENO MINE SITE

ISSUED FOR USE

NOTES:

BASE PLAN PROVIDED BY ALEXCO RESOURCE
CANADA CORP.



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DRY-STACK TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

GENERAL LOCATION PLAN

PROJECT NO.
W14101178.003

OFFICE
EBA-WHSE

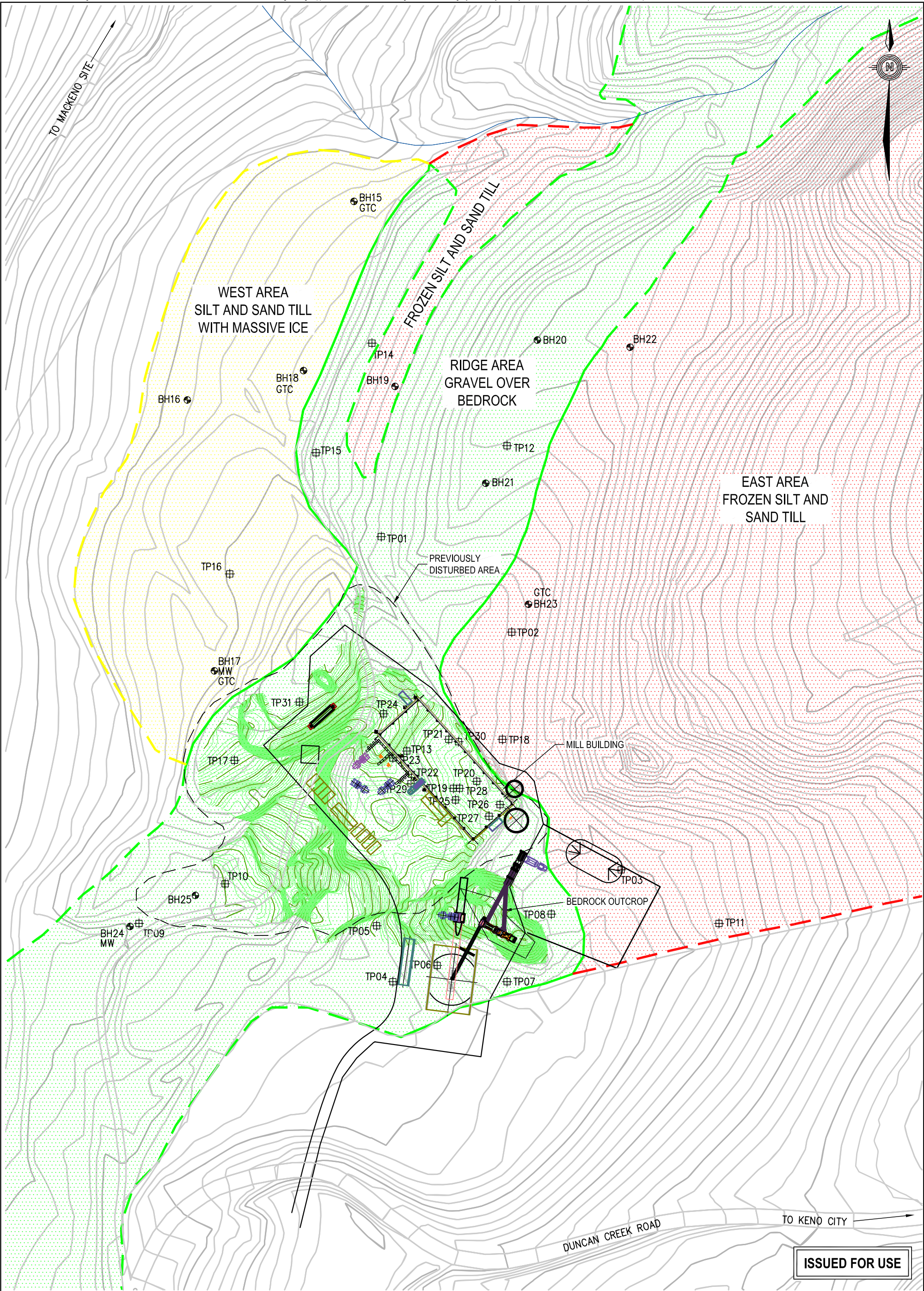
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DATE
January 13, 2010

CKD
CJD

REV
1

Figure 1



LEGEND

- TESTPIT LOCATIONS
- BOREHOLE LOCATIONS
- GTC GROUND TEMPERATURE CABLE
- MW MONITORING WELL

NOTES

- NTS MAP ZONE 8 M/14 NAD 83
- CONTOUR INTERVALS - 1.0 m
- BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

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DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

BOREHOLE LOCATION PLAN AND
SUBSURFACE CONDITION SUMMARY

PROJECT NO.
W14101178.003

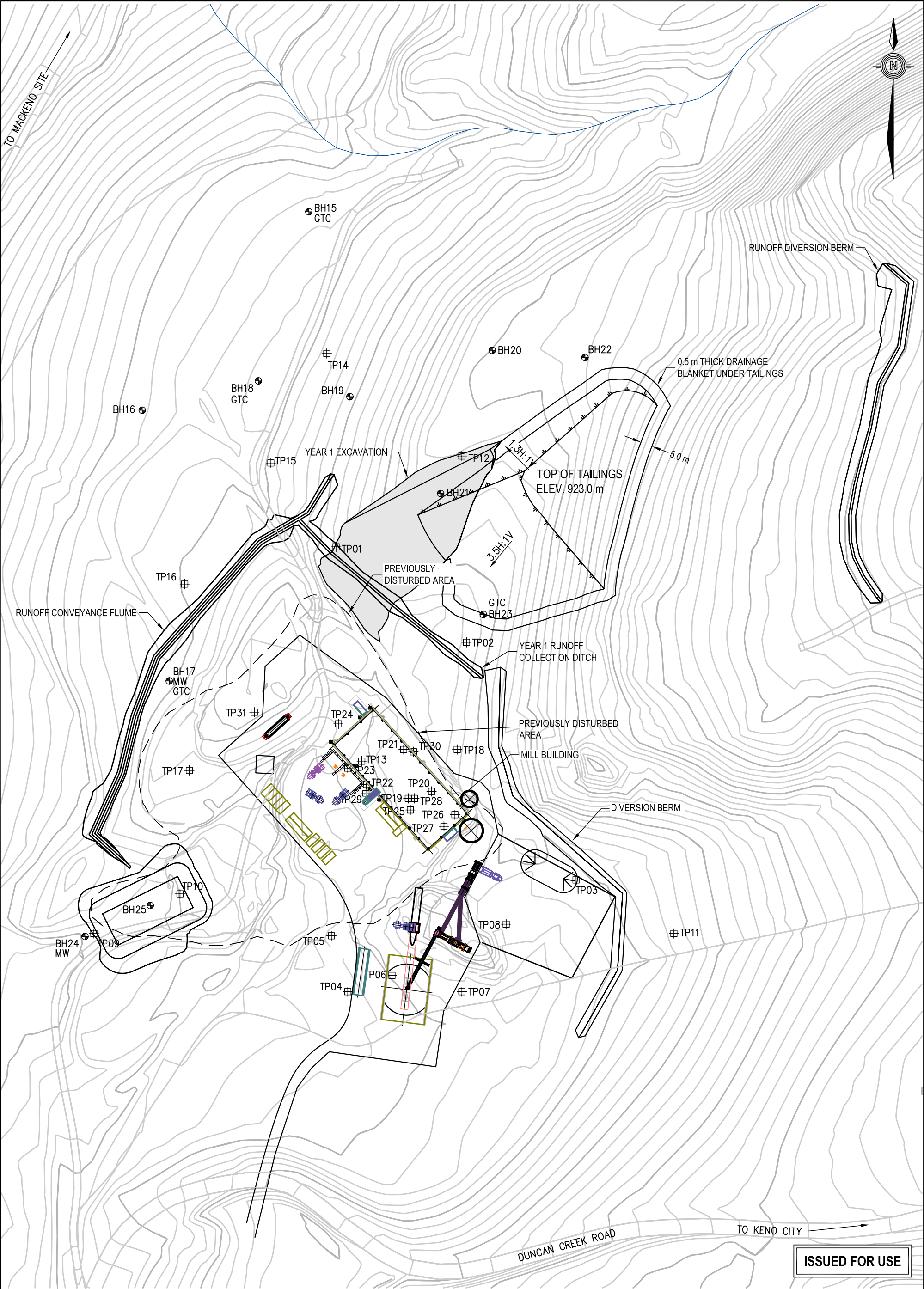
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DATE
January 13, 2010

Figure 2



LEGEND

- TESTPIT LOCATIONS
- BOREHOLE LOCATIONS

NOTES

- NTS MAP ZONE 8 M/14 NAD 83
- CONTOUR INTERVALS - 1.0 m
- BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

0 50
Scale: 1: 1 500 (metres)

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DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

GENERAL SITE LAYOUT
YEAR 1 TAILINGS PLACEMENT

PROJECT NO.
W14101178.003

DWN
KJT

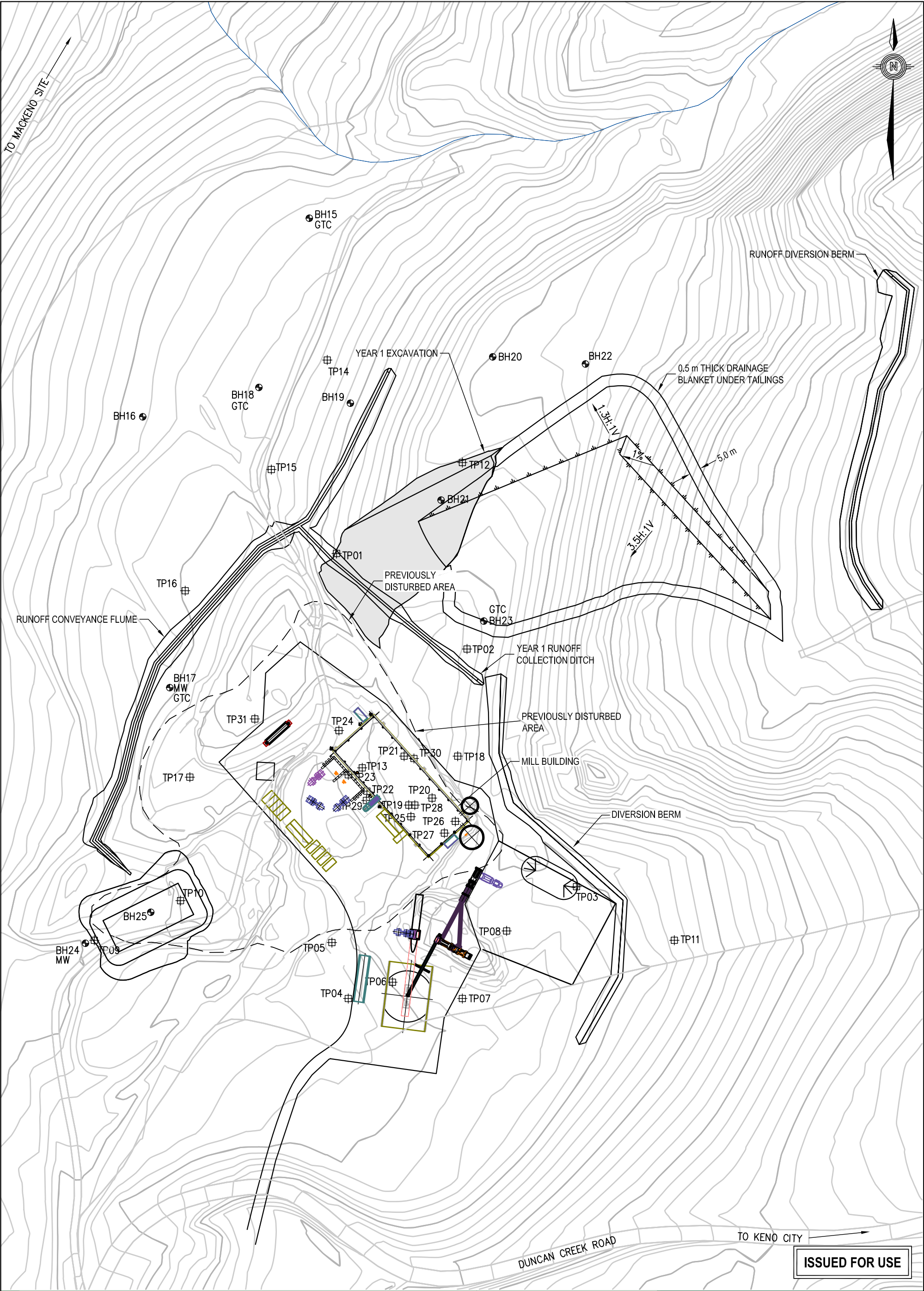
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OFFICE
EBA-WHSE

DATE
January 13, 2010

Figure 3



LEGEND

- TESTPIT LOCATIONS
- BOREHOLE LOCATIONS

NOTES

- NTS MAP ZONE 8 M/14 NAD 83
- CONTOUR INTERVALS - 1.0 m
- BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

0 50
Scale: 1: 1 500 (metres)

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DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

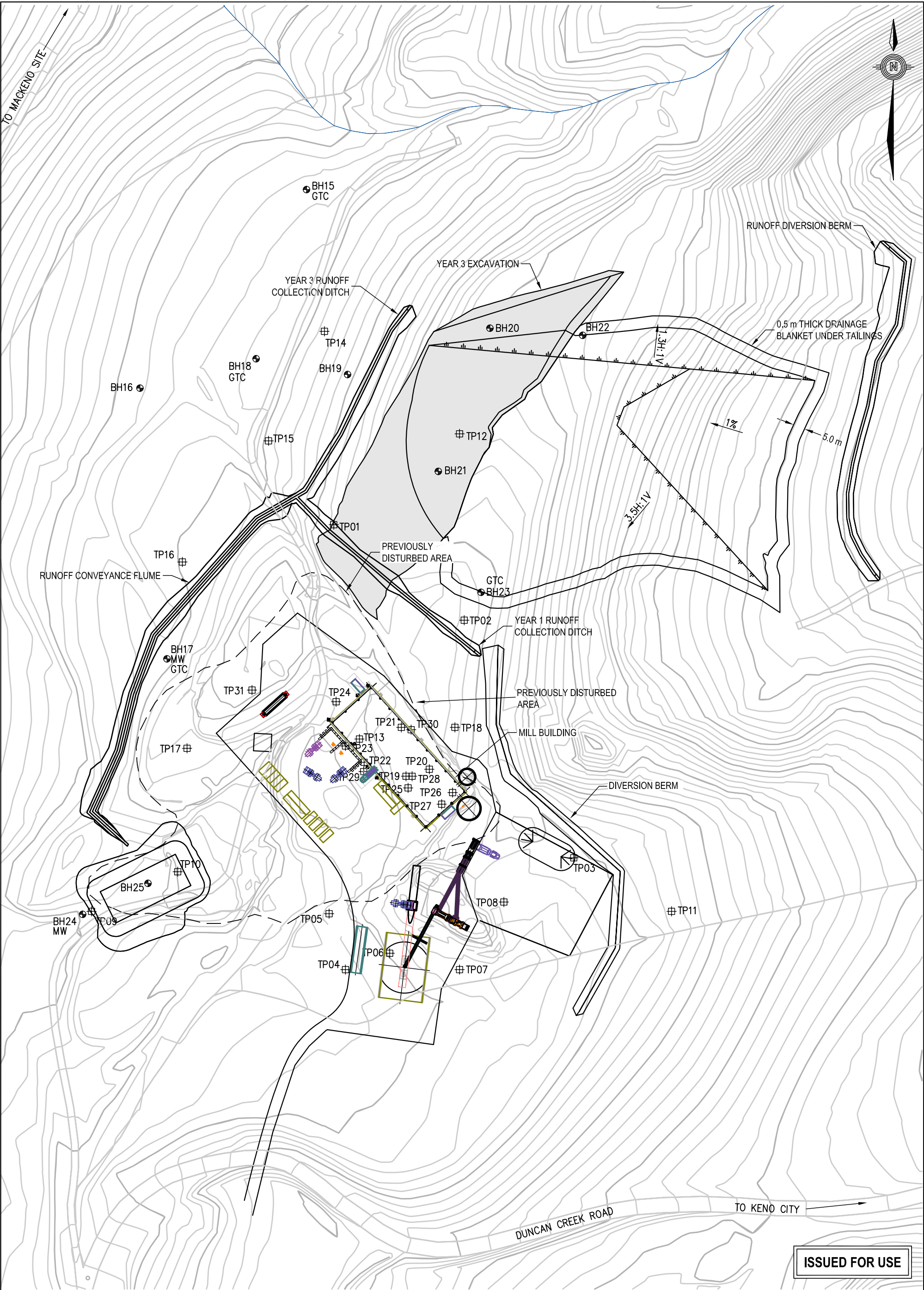
GENERAL SITE LAYOUT
YEAR 2 TAILINGS PLACEMENT

PROJECT NO.
W14101178.003
OFFICE
EBA-WHSE

DWN
KJT
DATE
January 13, 2010

CKD
CJD
REV
1

Figure 4



LEGEND

- TESTPIT LOCATIONS
- BOREHOLE LOCATIONS

NOTES

- NTS MAP ZONE 8 M/14 NAD 83
- CONTOUR INTERVALS - 1.0 m
- BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

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Scale: 1: 1 500 (metres)

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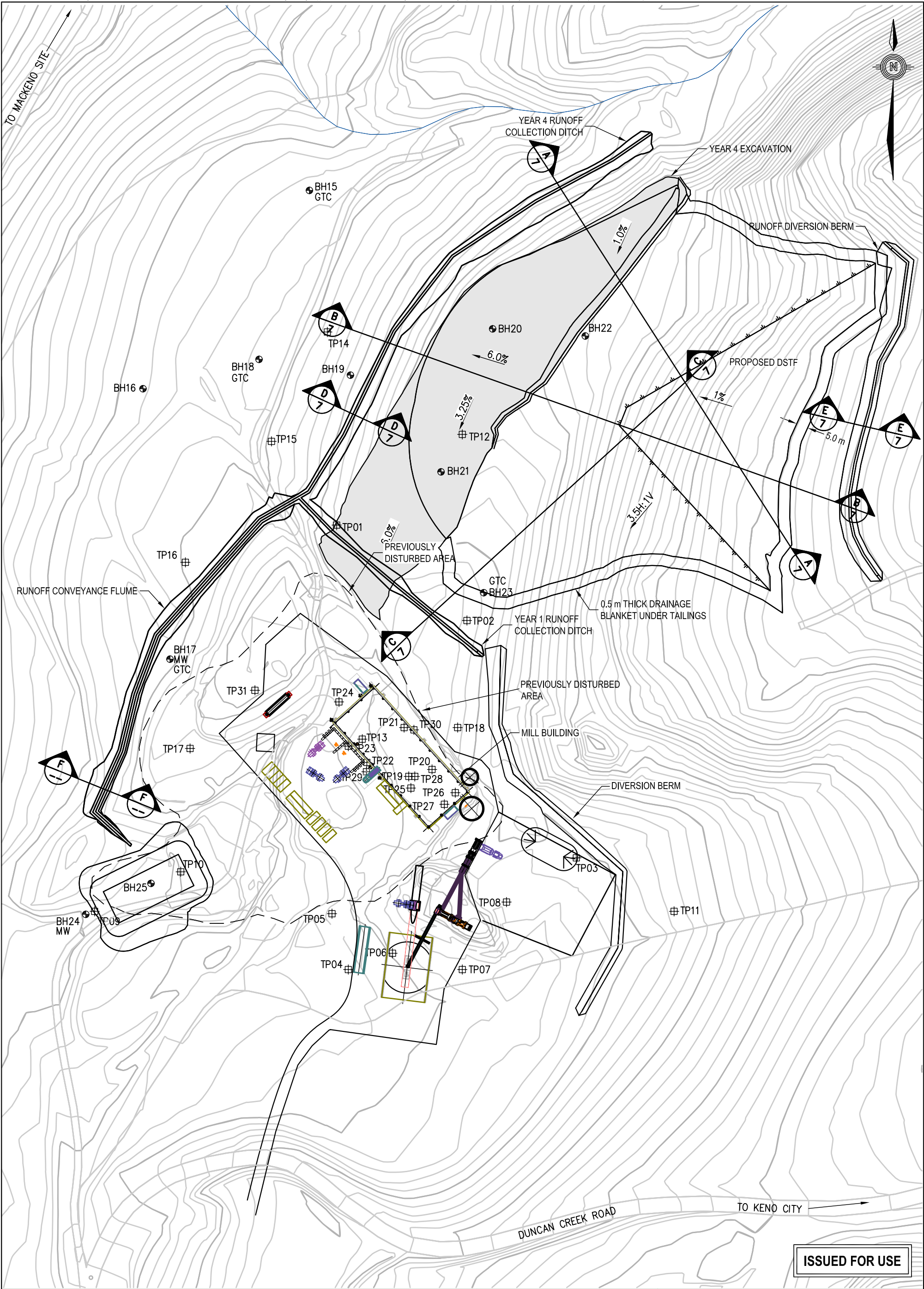


DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

GENERAL SITE LAYOUT
YEAR 3 TAILINGS PLACEMENT

PROJECT NO. W14101178.003	DWN KJT	CKD CJD	REV 1
OFFICE EBA-WHSE	DATE January 13, 2010		

Figure 5



ISSUED FOR USE

LEGEND

- TESTPIT LOCATIONS
- BOREHOLE LOCATIONS

NOTES

- NTS MAP ZONE 8 M/14 NAD 83
- CONTOUR INTERVALS - 1.0 m
- BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

0 50
Scale: 1: 1 500 (metres)

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DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

GENERAL SITE LAYOUT
YEAR 4 TAILINGS PLACEMENT

PROJECT NO.
W14101178.003

DWN
KJT

CKD
CJD

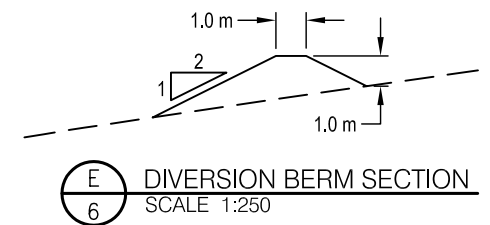
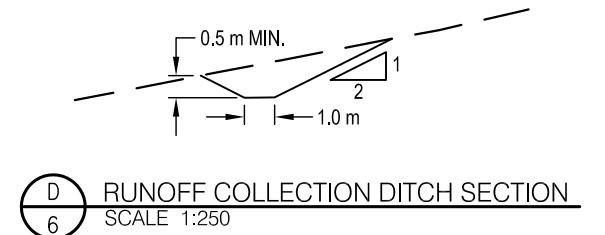
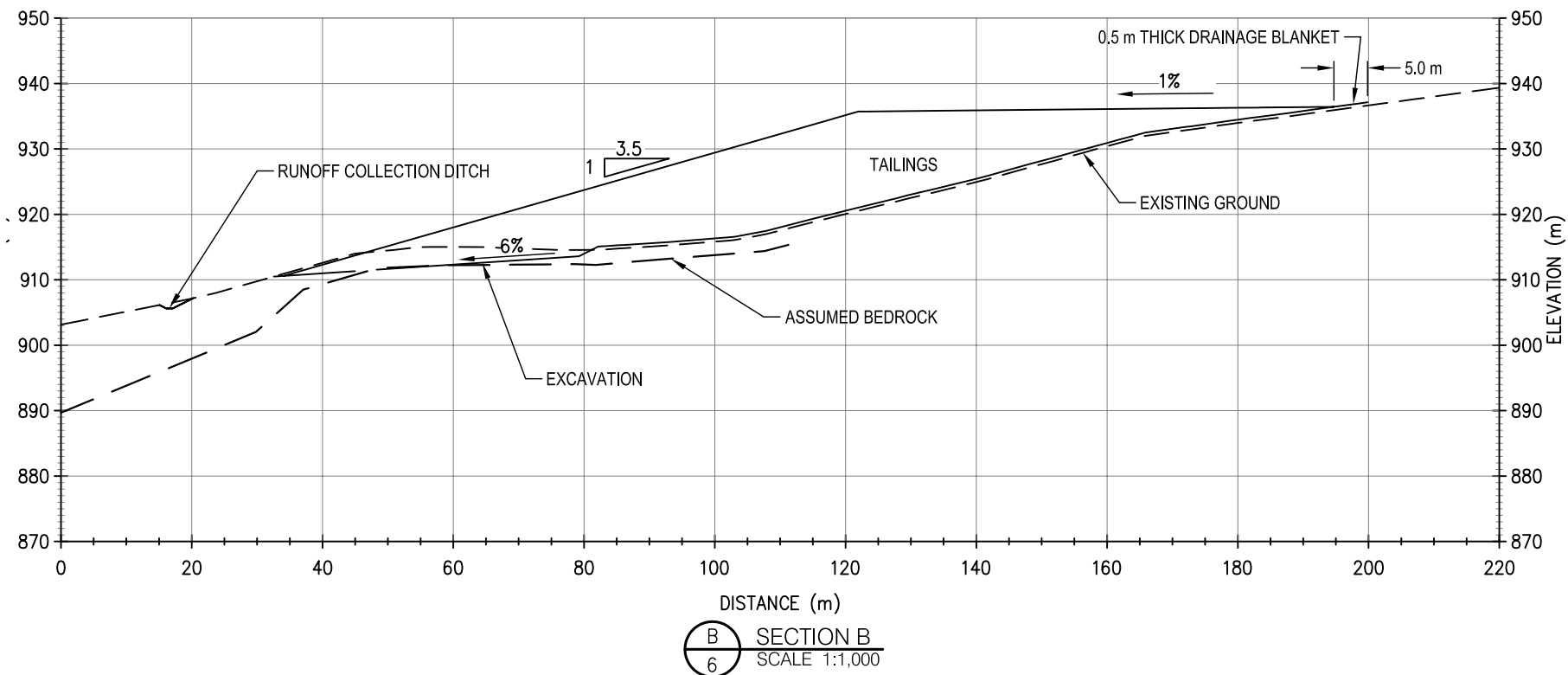
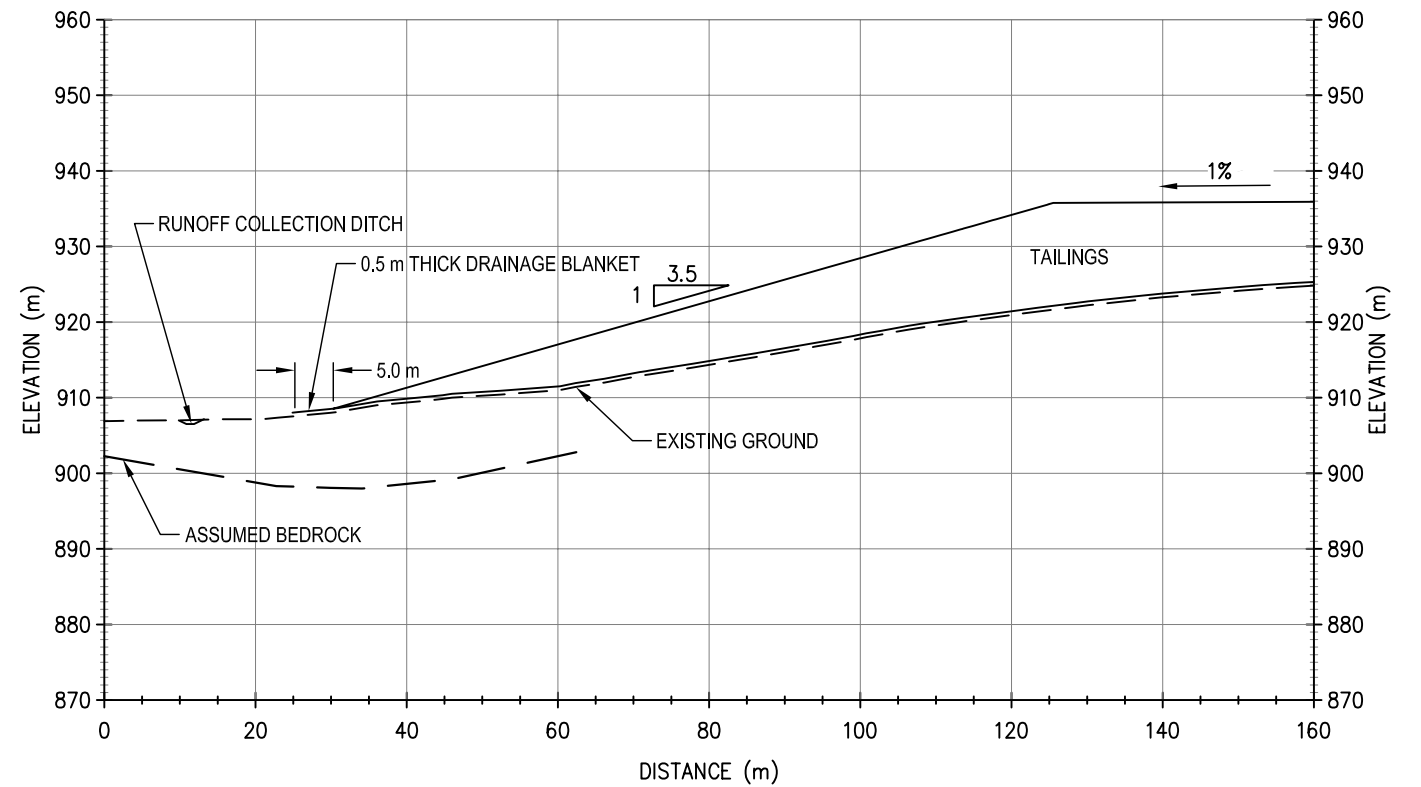
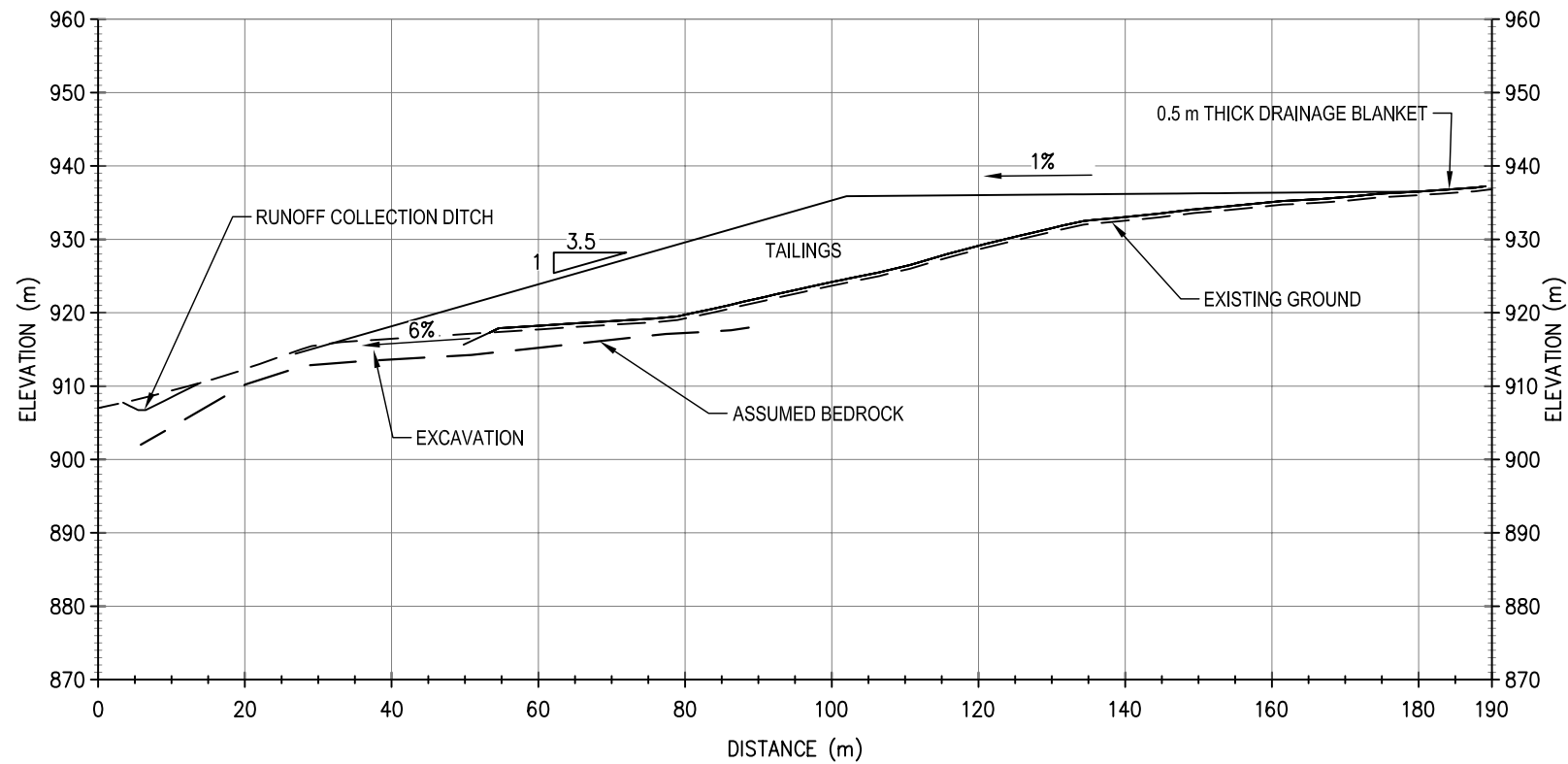
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OFFICE
EBA-WHSE

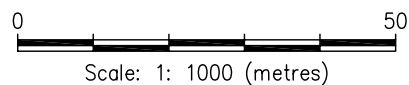
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Figure 6

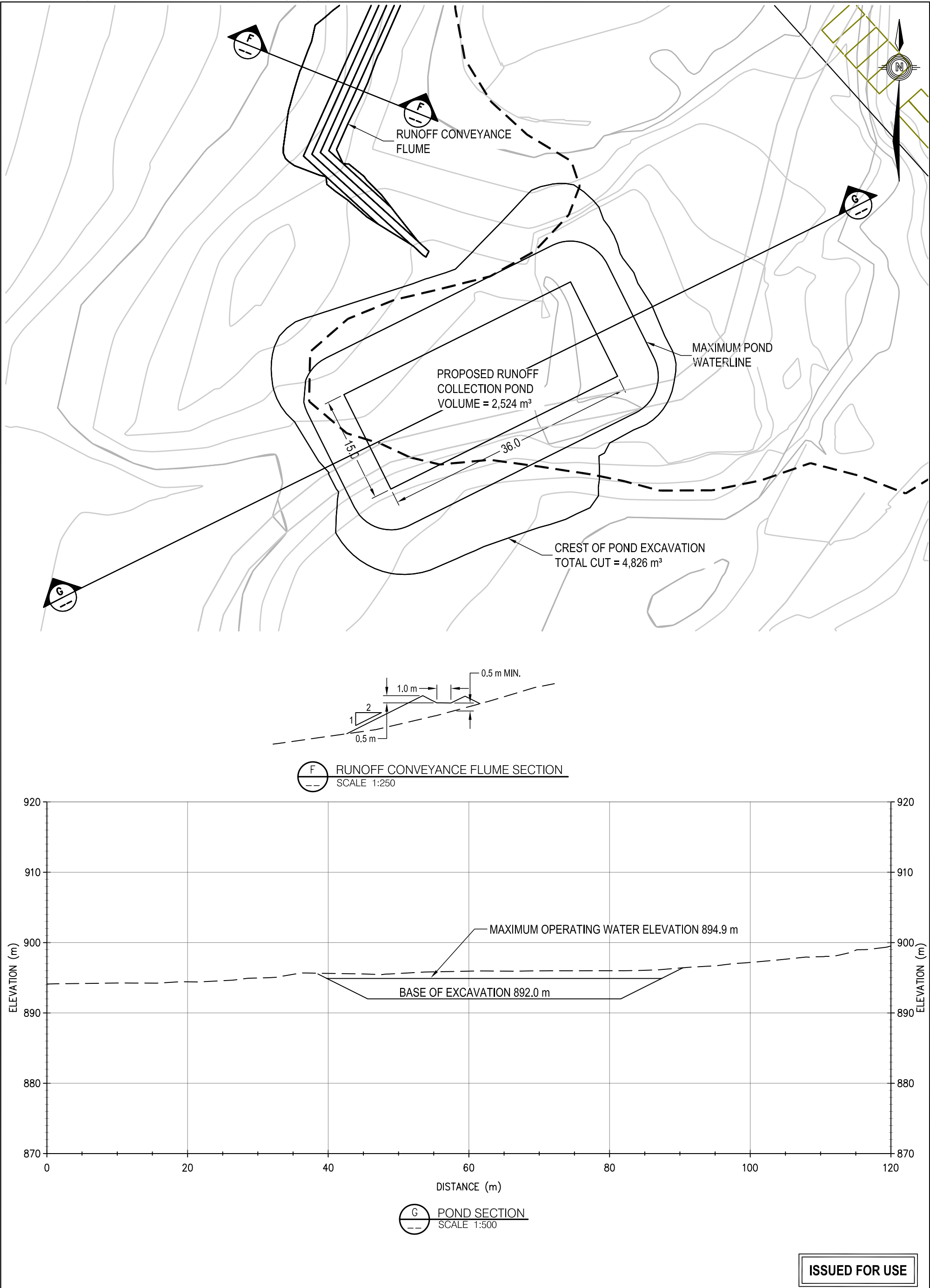
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ISSUED FOR USE



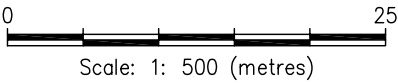
CLIENT		ALEXCO		DRY-STACK TAILINGS FACILITY DESIGN BELLEKENO MINE MILL SITE, YUKON	
EBA Engineering Consultants Ltd.		eba		SECTIONS AT YEAR 4 PLACEMENT	
PROJECT NO. W14101178.003	DWN KJT	CKD CJD	REV 1	Figure 7	
OFFICE WHSE	DATE January 13, 2010				



ISSUED FOR USE

NOTES

1. NTS MAP ZONE 8 M/14 NAD 83
2. CONTOUR INTERVALS - 1.0 m
3. BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES



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DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

WATER COLLECTION POND
PLAN AND PROFILE

PROJECT NO. W14101178.003	DWN KJT	CKD CJD	REV 1
OFFICE EBA-WHSE	DATE January 13, 2010		

Figure 8

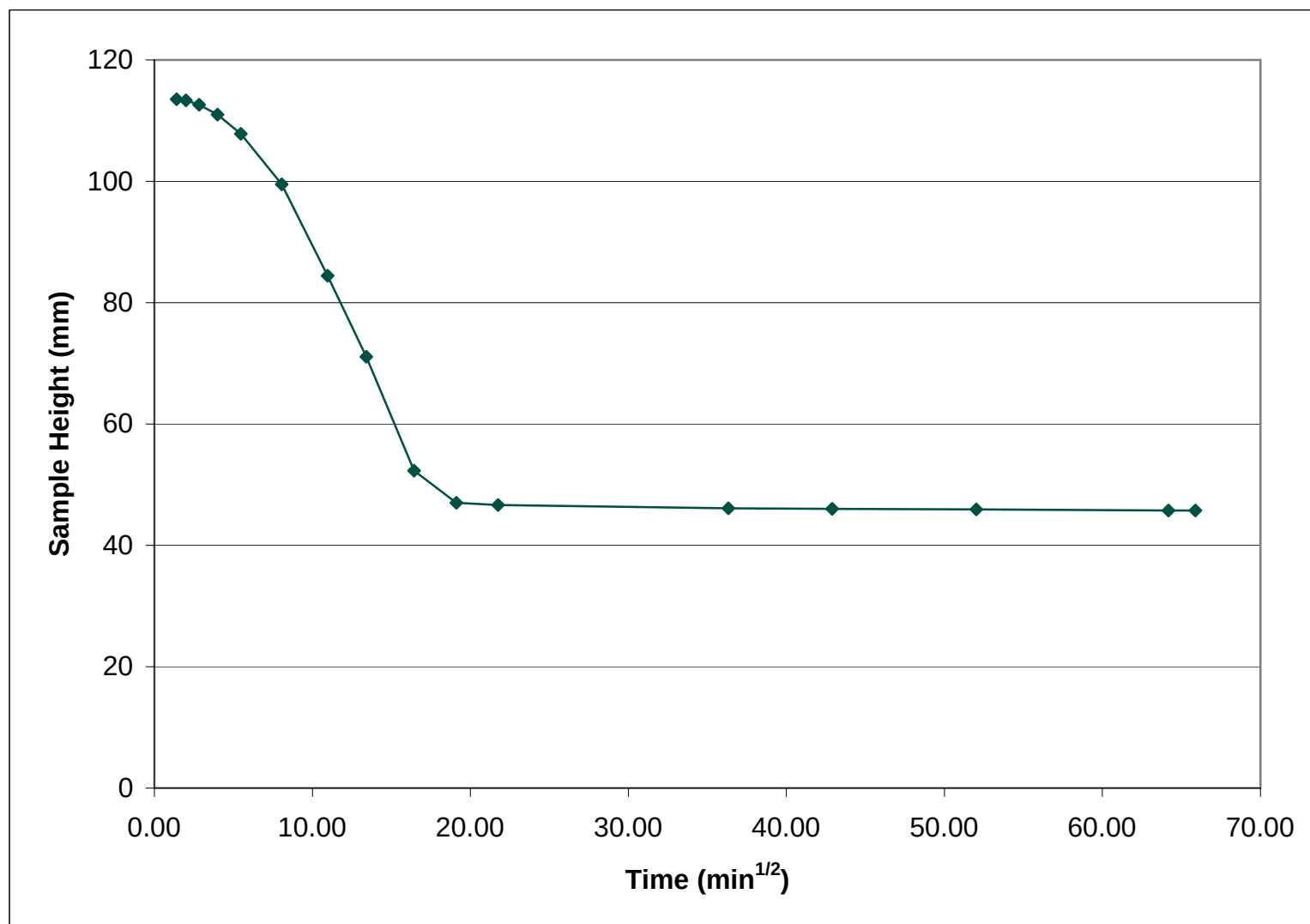


FIGURE 9
Borehole 23 - SA02 Thaw Consolidation Results

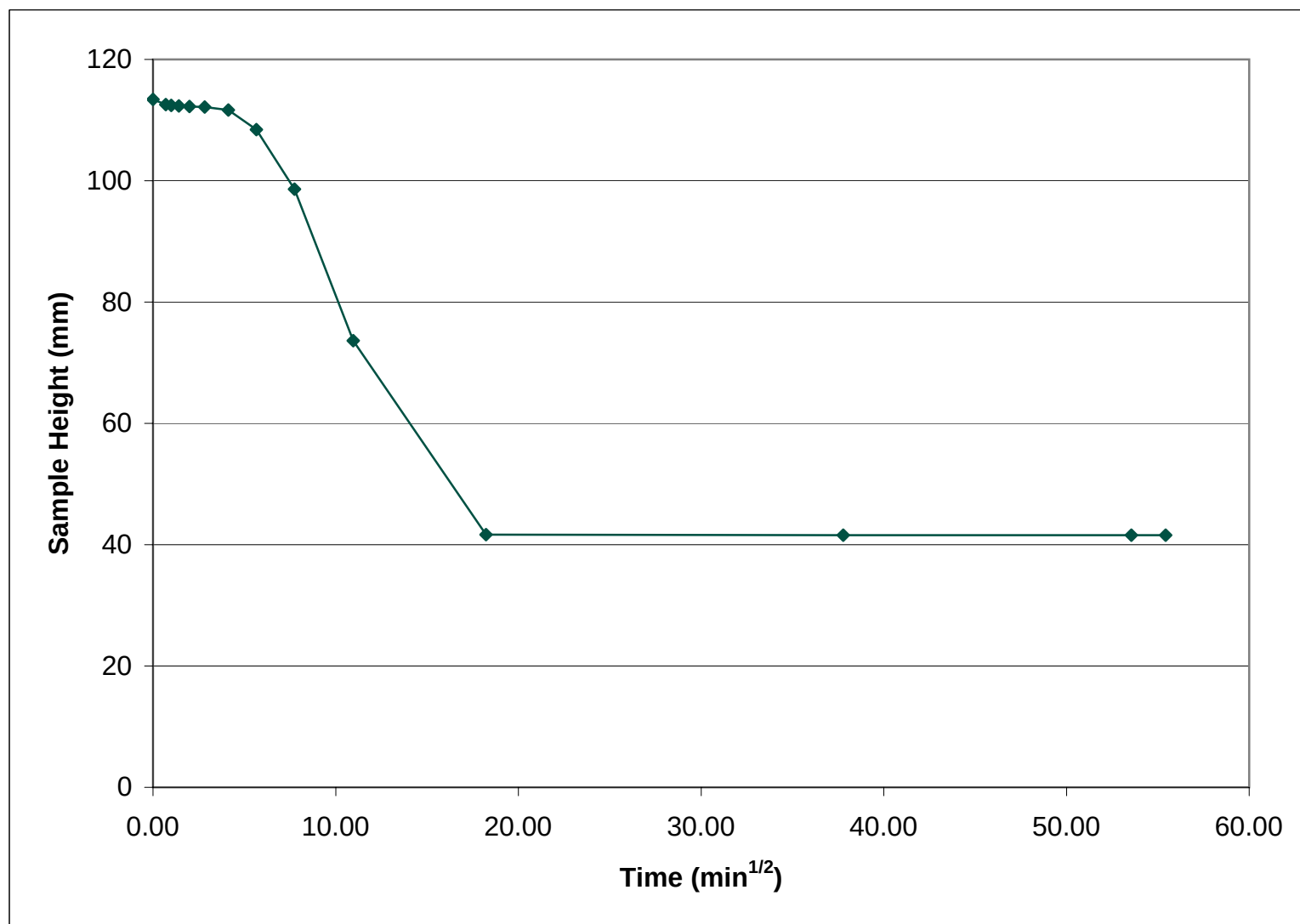
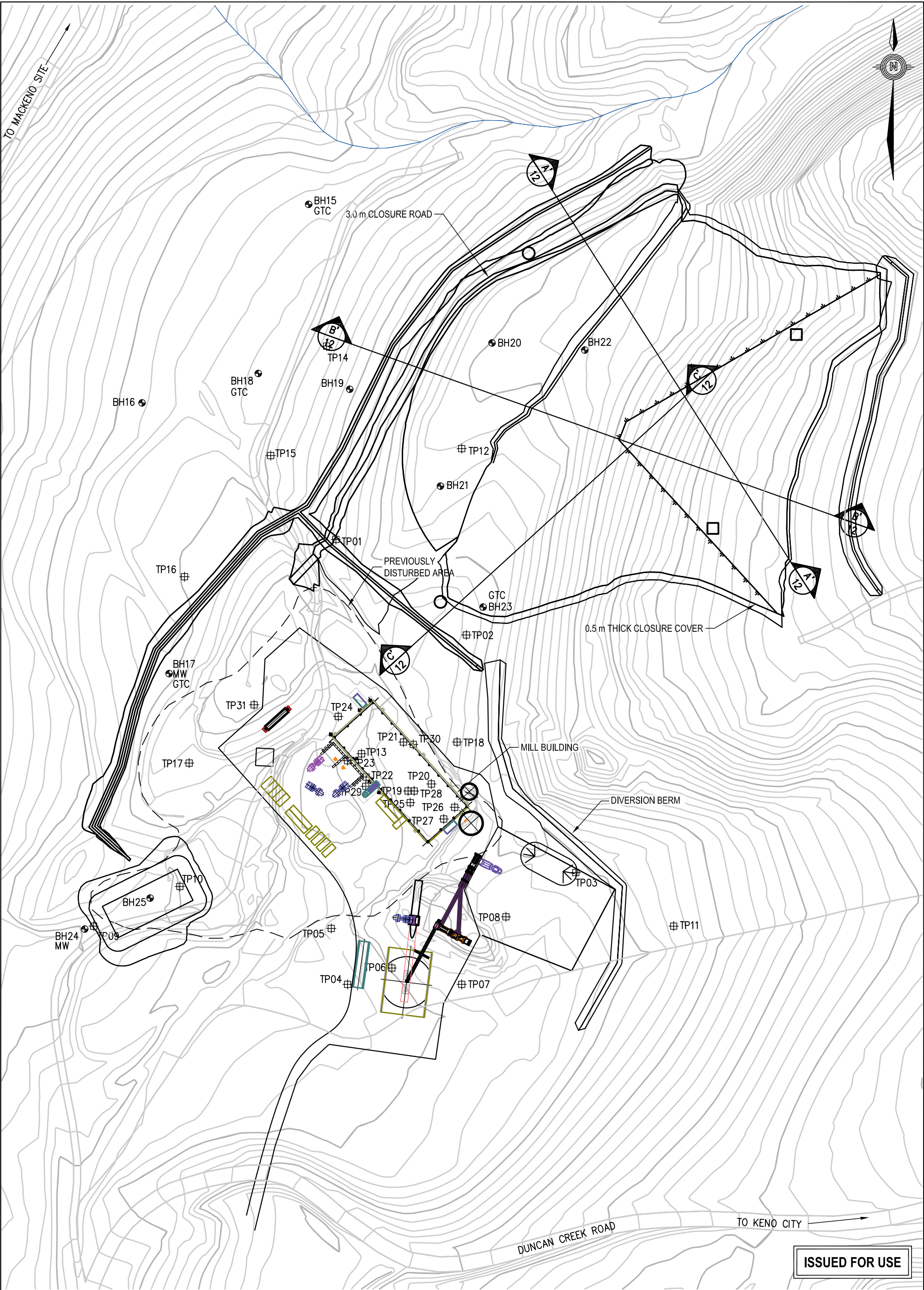


FIGURE 10
Borehole 23 - SA03 Thaw Consolidation Results



ISSUED FOR USE

LEGEND

- TESTPIT LOCATIONS
- BOREHOLE LOCATIONS
- PROPOSED SLOPE INDICATOR INSTALLATION
- PROPOSED GROUND TEMPERATURE CABLE AND SLOPE INDICATOR INSTALLATION

NOTES

- NTS MAP ZONE 8 M/14 NAD 83
- CONTOUR INTERVALS - 1.0 m
- BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

0 50
Scale: 1: 1 500 (metres)

CLIENT



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Consultants Ltd.



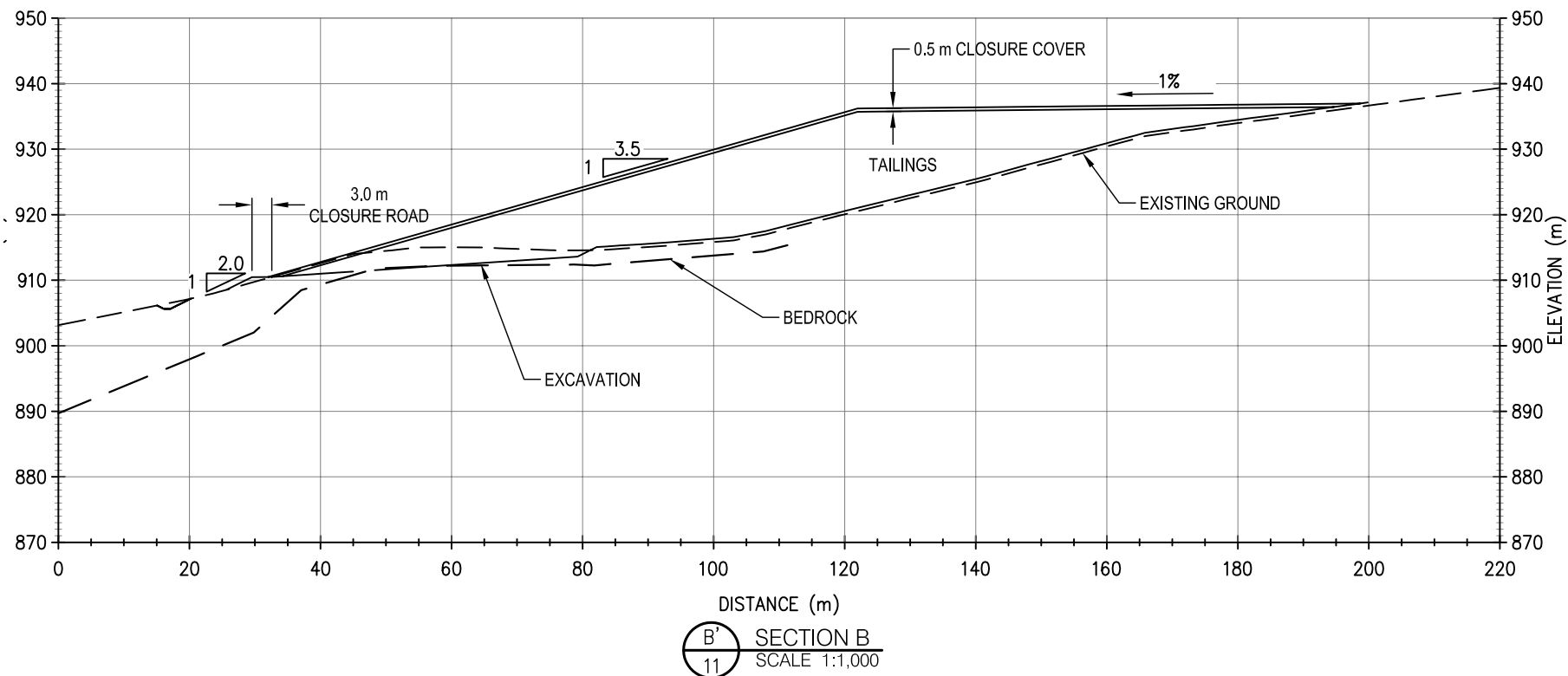
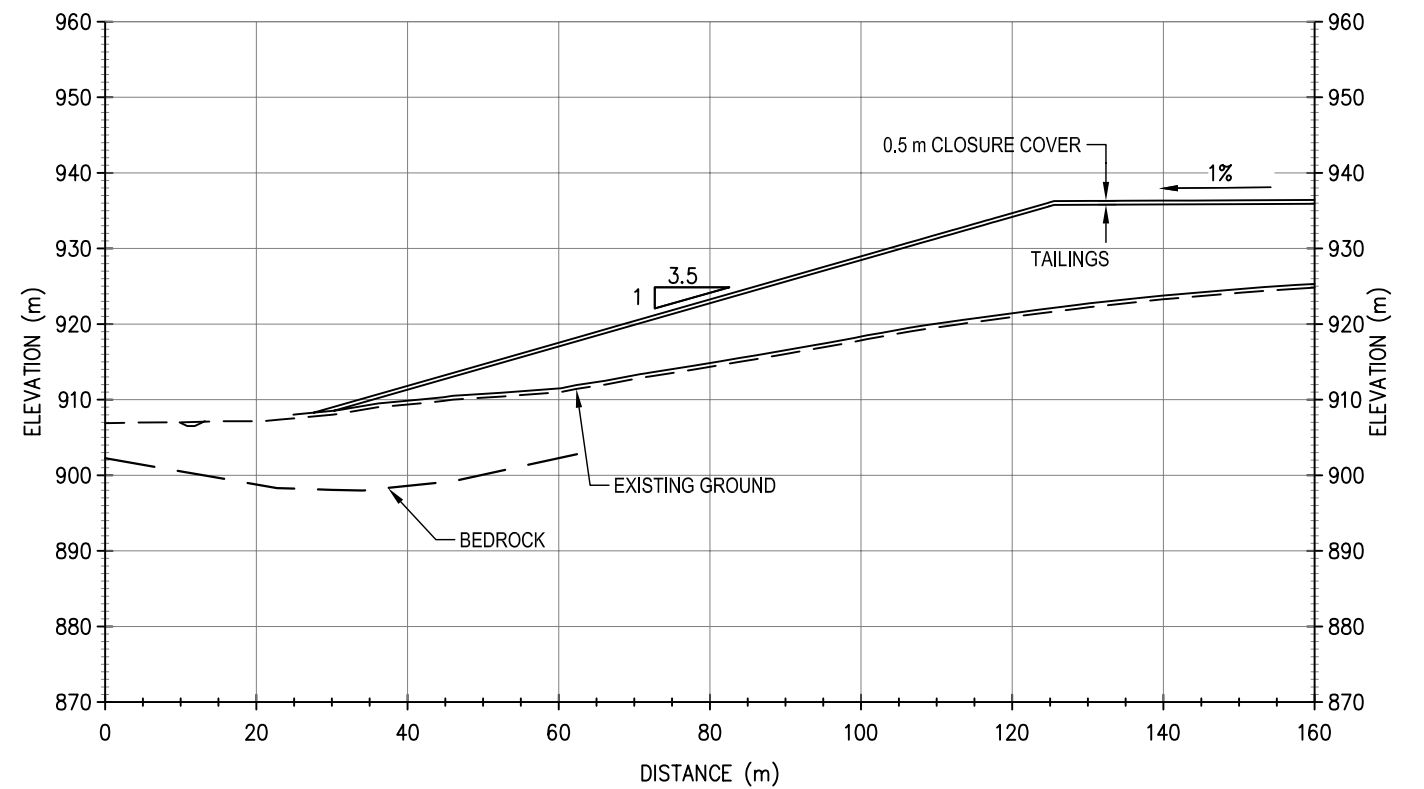
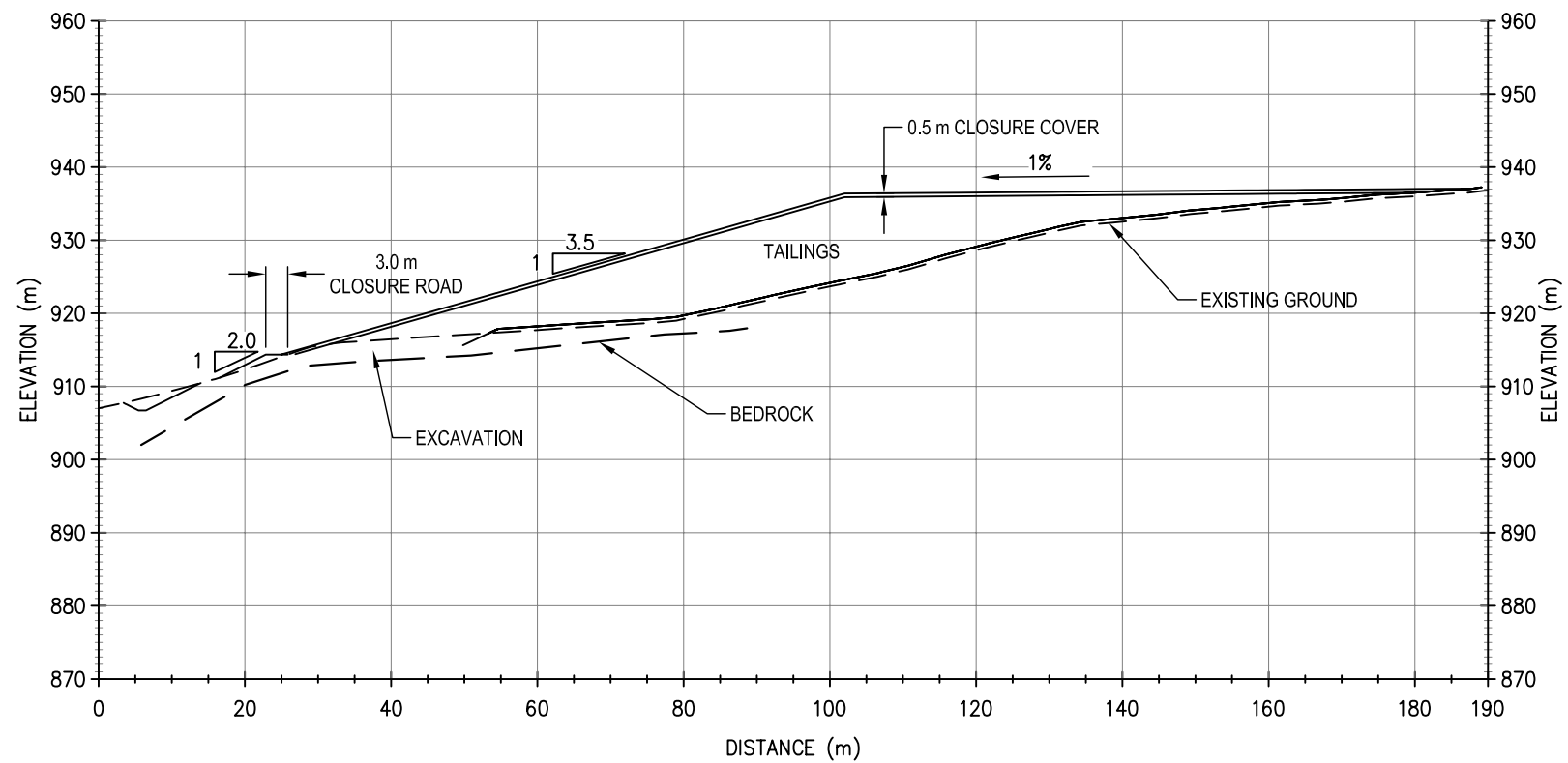
DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

CLOSURE PLAN

PROJECT NO. W14101178.003	DWN KJT	CKD CJD	REV 1
OFFICE EBA-WHSE	DATE January 13, 2010		

Figure 11

Q:\Whitehorse\Drawings\Keno\W14101178.dwg [FIGURE 12] January 14, 2010 - 11:33:32 am (BY: JAMES BUYCK)



ISSUED FOR USE

0 50
Scale: 1: 1000 (metres)

CLIENT



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DRY-STACK TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

CLOSURE SECTIONS

PROJECT NO.
W14101178.003

DWN
KJT

CKD
CJD

REV
1

OFFICE
WHSE

DATE
January 13, 2010

Figure 12

APPENDIX A

APPENDIX A TESTHOLE LOGS

MODIFIED UNIFIED SOIL CLASSIFICATION							
MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA		
COARSE - GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve GW, GP, SW, SP More than 12% pass No. 200 sieve GM, GC, SM, SC Borderline classification 5% to 12% pass No. 200 sieve 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 below 'A' line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above 'A' line and plasticity index greater than 7	

FINE - GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid Limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH	Inorganic clay of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity

PLASTICITY CHART

For classification of fine-grained soils and fine fraction of coarse-grained soils

Equation of 'A' line: $PI = 0.73(LL-20)$

PLASTICITY INDEX

LIQUID LIMIT

HIGHLY ORGANIC SOILS	PT	Peat, muck and other highly organic soils	* Based on the material passing the 3 in. (75 mm) sieve † ASTM Designation D 2487, for identification procedure see D 2488
----------------------	----	---	---

GROUND ICE DESCRIPTION

ICE NOT VISIBLE

VISIBLE ICE LESS THAN 50% BY VOLUME

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

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

Ice

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

VISIBLE ICE GREATER THAN 50% BY VOLUME

ICE	ICE + Soil Type	Ice with soil inclusions	
	ICE	Ice without soil inclusions (greater than 25 mm (1 in.) thick)	

MODIFIED UNIFIED SOIL CLASSIFICATION †

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA						
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines GW, GP, SW, SP GM, GC, SM, SC Bordering Classification requiring use of dual symbols Less than 5% Pass No. 200 sieve More than 12% Pass No. 200 sieve 5% to 12% Pass No. 200 sieve	$C_u = D_{60}/D_{10}$ Greater than 4 $C_u = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 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		Atterburg limits plot below "A" line or plasticity index less than 4		Atterburg limits plotting in hatched area are borderline classifications requiring use of dual symbols			
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterburg limits plot above "A" line or 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 $C_u = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 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		Atterburg limits plot below "A" line or plasticity index less than 4		Atterburg limits plotting in hatched area are borderline classifications requiring use of dual symbols			
			SC	Clayey sands, sand-clay mixtures		Atterburg limits plot above "A" line or plasticity index greater than 7					
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	PLASTICITY CHART							
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays								
		OL	Organic silts and organic silty clays of low plasticity								
	SILTS AND CLAYS Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts								
		CH	Inorganic clays of high plasticity, fat clays								
		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 3 in. (75 mm) sieve †ASTM Designation D 2487, for identification procedure see D2488		
	SOIL COMPONENTS						OVERSIZE MATERIAL				
	FRACTION	SIEVE SIZE					DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS		Rounded or subrounded		
	PASSING	RETAINED	PERCENTAGE	DESCRIPTOR	COBBLES 75 mm to 200 mm BOULDERS > 200 mm						
GRAVEL					Not rounded						
coarse	75 mm	19 mm	>35 %	"and"	ROCK FRAGMENTS >75 mm						
fine	19 mm	4.75 mm	21 to 35 %	"y-adjective"	ROCKS > 0.76 cubic metre in volume						
SAND											
coarse	4.75 mm	2.00 mm	10 to 20 %	"some"							
medium	2.00 mm	425 m	>0 to 10 %	"trace"							
fine	425 m	75 m									
SILT (non plastic) or CLAY (plastic)	75 m		as above but by behavior								



Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.					
Lower Diversion Structure		DRILL: Mini-Sonic		W14101178.003-BH15					
Keno City, YT				ELEVATION: 896.9m					
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	TEMP (°C)	SPT (N)	GROUND ICE DESCRIPTION		Thermistor	Elevation (m)
0	PEAT - amorphous, granular, dark brown, damp					UNFROZEN			
1	GRAVEL AND SAND - trace silt, compact (est.), medium grained, well graded, damp, light brown		SA01	-0.5					896.0
2			SA02	0					895.0
3	GRAVEL AND SILT (TILL) - sandy, non-plastic, gap graded, massive, olive grey, contains cobbles		SA03	0	94	FROZEN - no visible ice in cuttings			894.0
4	ICE AND SILT - some sand, some gravel, trace clay, low plastic		SA04			Vs(65%)			893.0
5	ICE - massive ice		SA05	-0.1		MASSIVE ICE - cloudy, white, stratified			892.0
6	SILT (TILL) - gravelly, sandy, trace clay, low plastic		SA06			oriented			891.0
7	ICE - massive ice		SA07	-0.2		Vr, Vx (15%) Nbe (25%)			890.0
8	SILT (TILL) - sandy, gravelly, trace clay, low plastic, olive grey		SA08			becomes Vx (10%) Nbe (50%)			889.0
9			SA09			Vs (10%)			888.0
10			SA10						887.0
			SA11						
			SA12						
			SA13						
			SA14						



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REVIEWED BY:

DRAWING NO:

COMPLETION DEPTH: 21.3m

COMPLETE: 8/30/2009

Page 1 of 3

Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.					
Lower Diversion Structure		DRILL: Mini-Sonic		W14101178.003-BH15					
Keno City, YT				ELEVATION: 896.9m					
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	TEMP (°C)	SPT (N)	GROUND ICE DESCRIPTION		Thermistor	Elevation (m)
						 PLASTIC M.C. LIQUID 			
10			SA15						
11			SA16						886.0
			SA17						
12			SA18						885.0
	ICE - massive ice		SA19	-0.2			MASSIVE ICE - cloudy, stratified crystals		884.0
13									
	SILT AND GRAVEL - sandy, trace clay, low plastic, gap graded, massive, olive grey						(Vs, Vx 10%), ice stratification is vertical		883.0
14			SA20	-0.2					882.0
15			SA21	-0.2					881.0
			SA22	-0.2					880.0
16	BOULDERS AND COBBLES - gravelly, some sand, gap graded, lens of fine gravel - slough at borehole at completion			-0.1			- no visible ice but may be thawed by drilling, sample wet		879.0
	SAND - some silt, trace gravel, fine grained, well sorted, wet, grey/yellow								878.0
17	SILT (TILL) - gravelly, sandy, trace clay, soft, non-plastic, massive, wet, brownish-grey								877.0
18	SAND - some gravel, coarse grained, well graded, moist, grey - becomes fine grained, well sorted		SA23	-0.2					
	SILT AND GRAVEL (TILL) - sandy, non-plastic, massive, firm, moist, olive grey		SA24						
19	GRAVEL - cobbly, sandy, trace silt, dense, well graded, damp, light grey								
20	SILT AND GRAVEL - sandy, non-plastic, firm, massive,								



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DRAWING NO:

COMPLETION DEPTH: 21.3m

COMPLETE: 8/30/2009

Page 2 of 3

Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.				
Lower Diversion Structure		DRILL: Mini-Sonic		W14101178.003-BH15				
Keno City, YT				ELEVATION: 896.9m				
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	TEMP (°C)	SPT (N)	GROUND ICE DESCRIPTION	Thermistor	Elevation (m)
20	damp, olive grey		SA25		●			876.0
21	GRAVEL - sandy, cobbles, trace silt, dense, well graded, dry to damp, light brown, subrounded to subangular END OF BOREHOLE 21.3 m		SA26		●			875.0
22								874.0
23								873.0
24								872.0
25								871.0
26								870.0
27								869.0
28								868.0
29								867.0
30								


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LOGGED BY: CJD
 REVIEWED BY:
 DRAWING NO:

COMPLETION DEPTH: 21.3m
 COMPLETE: 8/30/2009
 Page 3 of 3

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

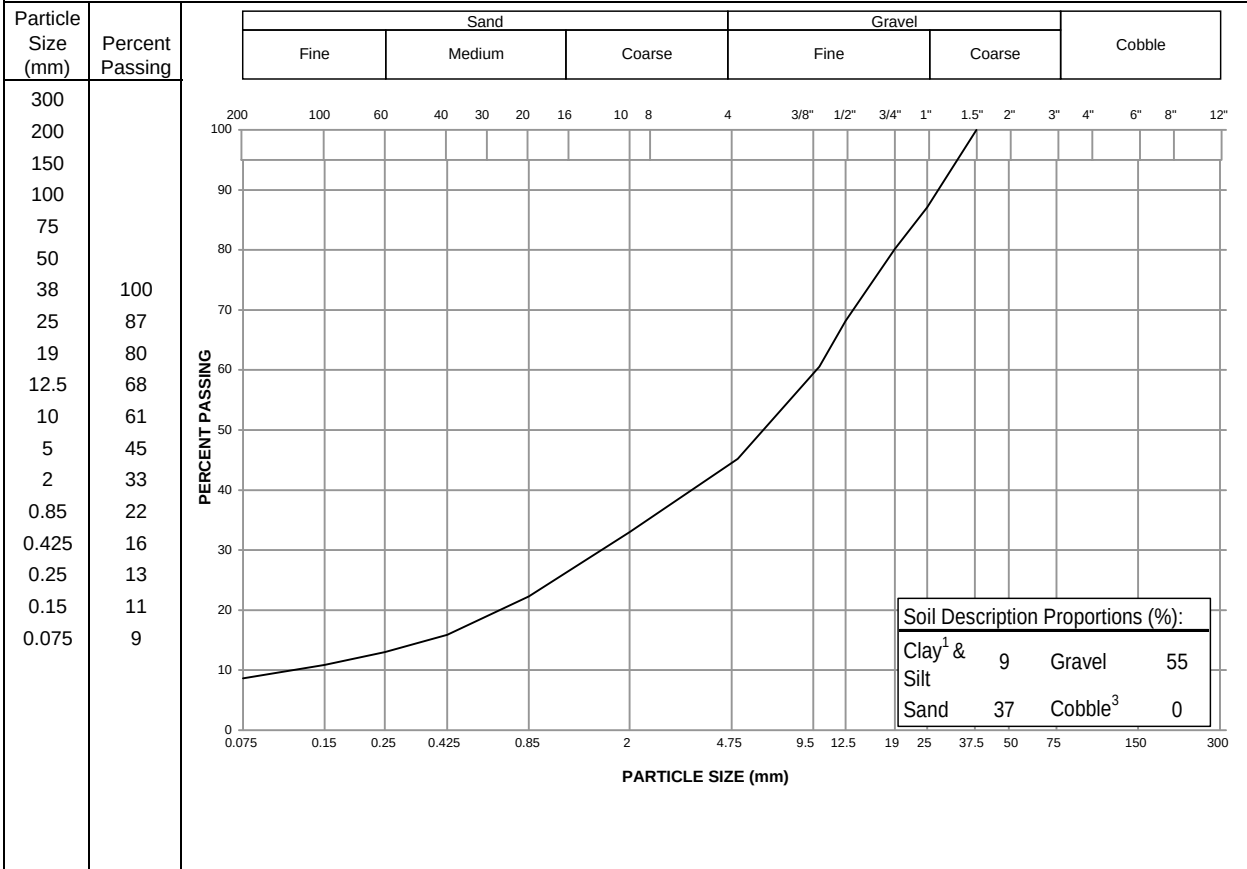
Project: Flame & Moth DSTF Drilling
Project No.: W14101178.003
Site: Keno City, YT

Client: Alexco Resource Corp
Client Rep.:

Material Type:
Sample No.: SA01
Sample Loc.: BH15
Sample Depth: 1.0 - 1.2 m
Sampling Method:
Date sampled: Sep-09

Date Tested: 20-Oct-2009 By: SMS
Soil Description²: GRAVEL AND SAND - trace silt

USC Classification: Cu: 81.0
Cc: 2.4
Moisture Content: 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

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

Specification: _____

Remarks:

Reviewed By:

C. J. Dignan

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Consultants Ltd.



PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

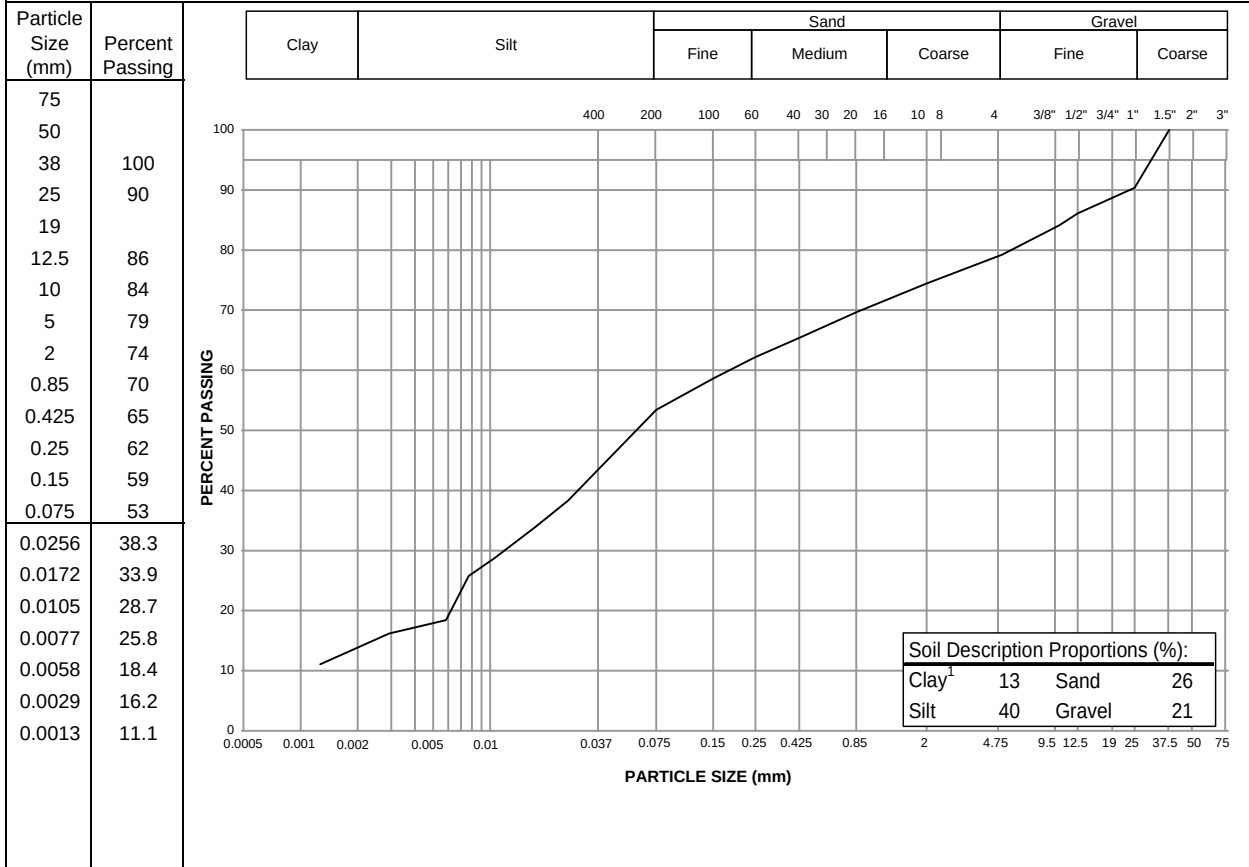
Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA08
 Sample Loc.: BH15
 Sample Depth: 6.3 - 6.4 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: SILT - sandy, gravelly, trace clay

USC Classification: Cu:
 Moisture Content: 70.2 Cc:

By: Client



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:

C. J. Dignan

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PARTICLE SIZE ANALYSIS TEST REPORT

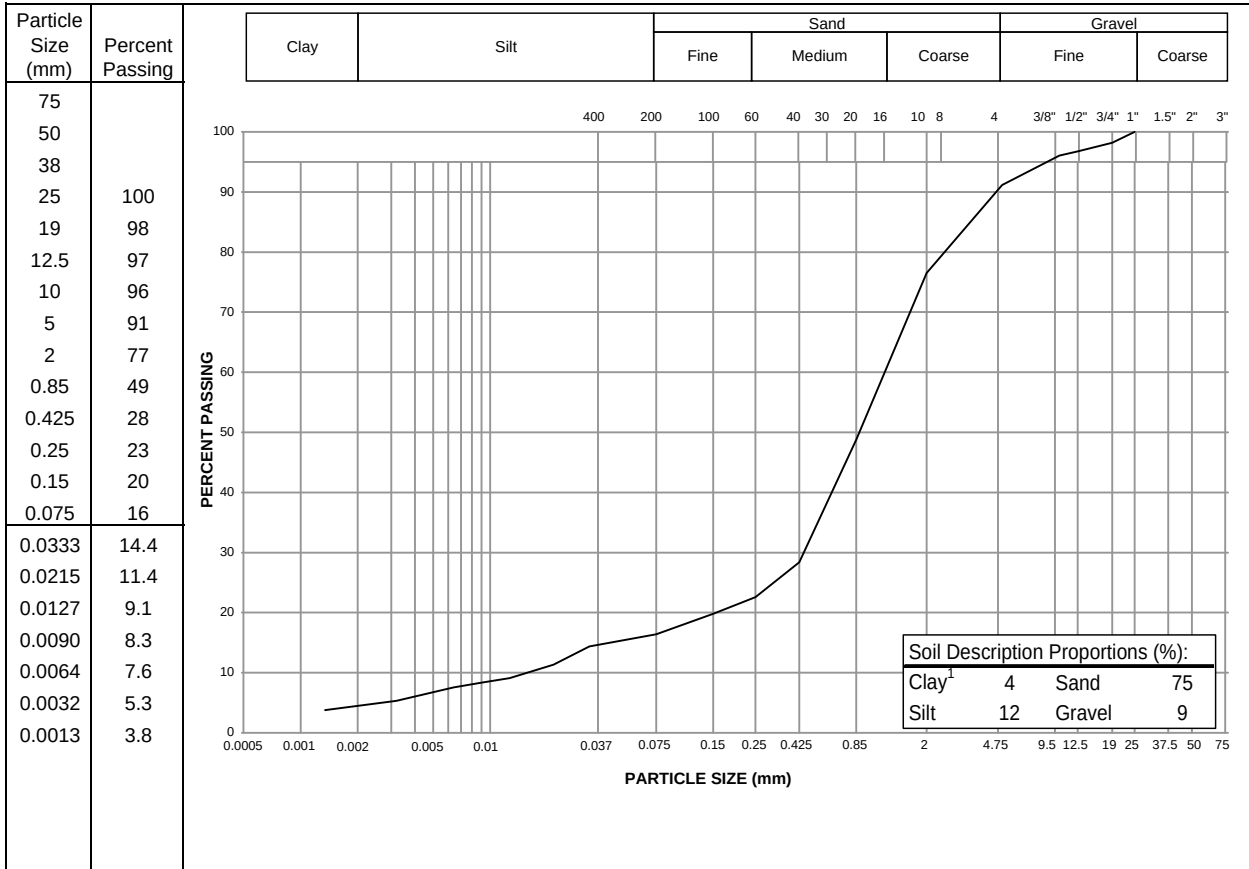
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA23
 Sample Loc.: BH15
 Sample Depth: 18.2 - 18.3 M
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: SAND - some silt, trace gravel, trace clay
 USC Classification: Cu: 81.2
 Cc: 9.9
 Moisture Content: 1.3



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:

C. J. Dixon

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 Consultants Ltd.



Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Lower Diversion Structure		DRILL: Mini-Sonic		W14101178.003-BH16		
Keno City, YT				ELEVATION: 895.8m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	MOSS COVER - peat, black				UNFROZEN	
	GRAVEL AND SAND - some silt, well graded, subrounded gravel, medium to coarse sand, compact, moist, brown		SA01			895.0
1	- colour changes to mottled grey around 1.0 m		SA02		FROZEN - visible ice inclusions <5%, poorly bonded, partial thaw during drilling	
			SA03			894.0
2	SAND (TILL) - some gravel, some silt, trace clay, medium to coarse sand, well graded, subrounded gravel, grey		SA04			
			SA05	H	Vs, Vr (30%)	893.0
3			SA06			892.0
4			SA07			891.0
5			SA08			890.0
6			SA09			
			SA10			889.0
7	ICE - massive ice				MASSIVE ICE	
8						888.0
9						887.0
10						886.0
EBA Engineering Consultants Ltd.		LOGGED BY: JSB		COMPLETION DEPTH: 15.2m		
		REVIEWED BY:		COMPLETE: 9/7/2009		
		DRAWING NO:		Page 1 of 2		

Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Lower Diversion Stucture		DRILL: Mini-Sonic		W14101178.003-BH16		
Keno City, YT				ELEVATION: 895.8m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
10	SAND (TILL) - some gravel, some silt, trace clay, medium to coarse sand, well graded, sub rounded gravel, grey				- visible ice inclusions <5%, well bonded	885.0
11						884.0
12						883.0
13						882.0
14			SA11			881.0
15			SA12		UNFROZEN	880.0
16	END OF BOREHOLE 15.2 m		SA13			879.0
17						878.0
18						877.0
19						876.0
20						



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LOGGED BY: JSB

REVIEWED BY:

DRAWING NO:

COMPLETION DEPTH: 15.2m

COMPLETE: 9/7/2009

Page 2 of 2

PARTICLE SIZE ANALYSIS TEST REPORT

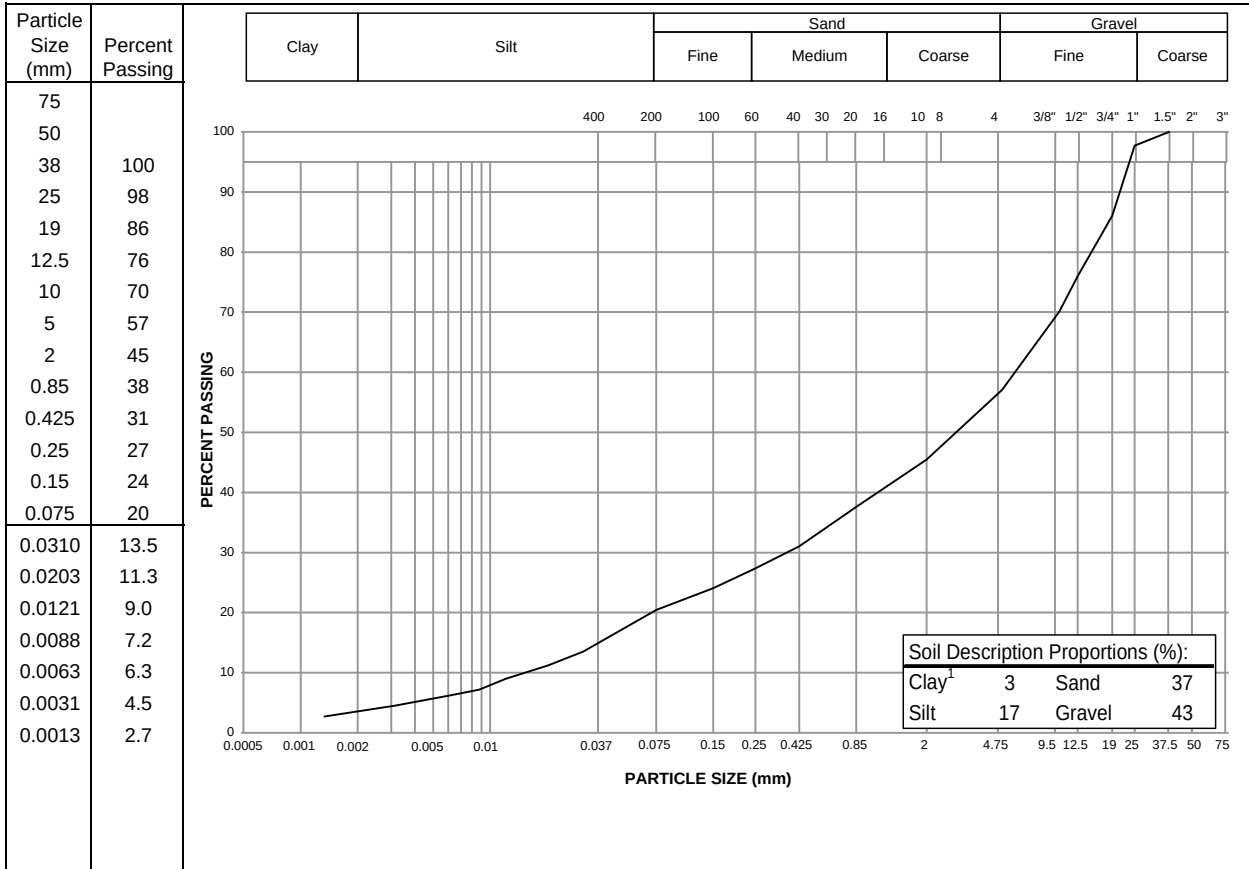
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA02
 Sample Loc.: BH16
 Sample Depth: 0.2 - 0.4 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: GRAVEL AND SAND - some silt,
 trace clay
 USC Classification: Cu: 389.9
 Cc: 1.5
 Moisture Content: 10.0



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

Specification: _____

Remarks: _____

Reviewed By:

C. J. Dixon

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PARTICLE SIZE ANALYSIS TEST REPORT

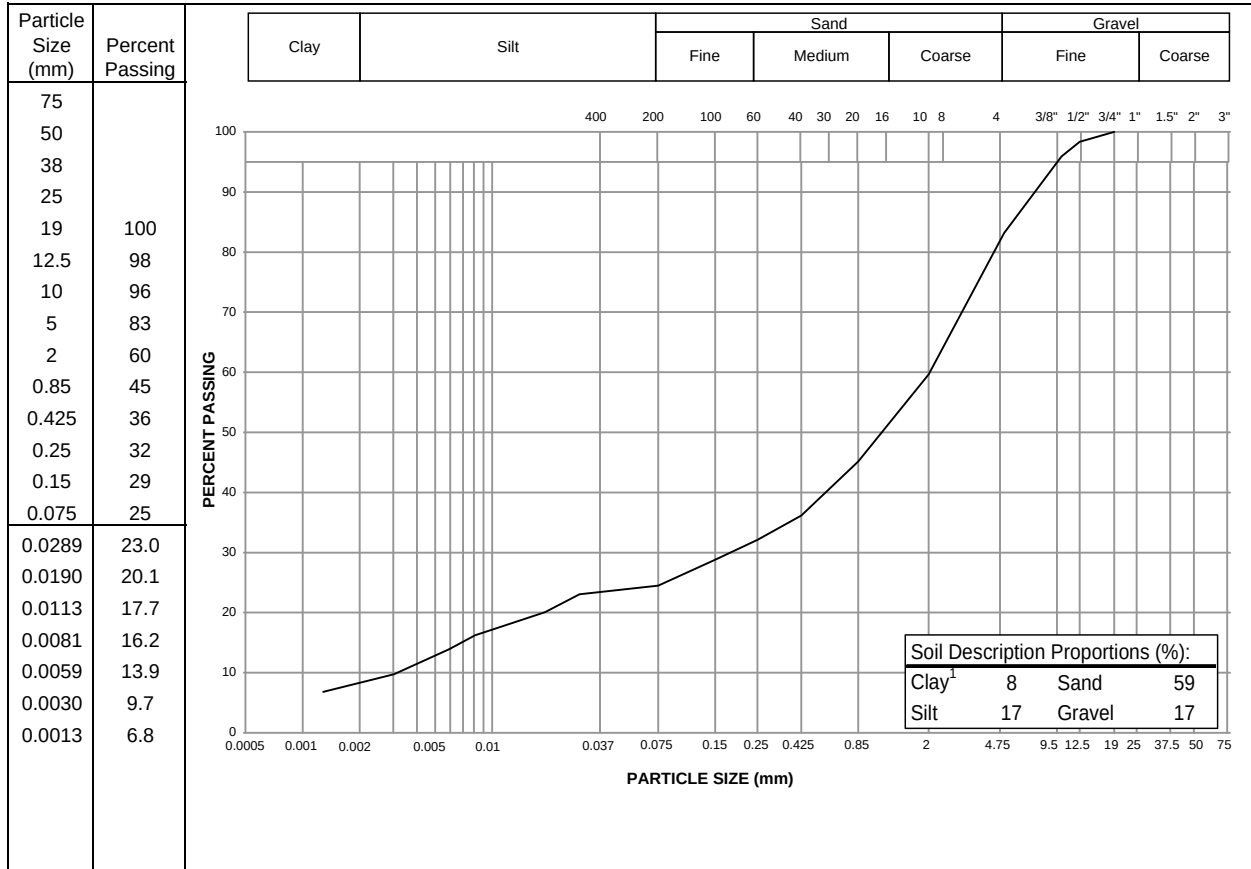
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
Project No.: W14101178.003
Site: Keno City, YT

Client: Alexco Resource Corp
Client Rep.:

Material Type:
Sample No.: SA05
Sample Loc.: BH16
Sample Depth: 2.7 - 3.0 m
Sampling Method:
Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
Soil Description²: SAND - some gravel, some silt, trace clay
USC Classification: Cu: 638.2
Cc: 5.3
Moisture Content: 37.6



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: _____

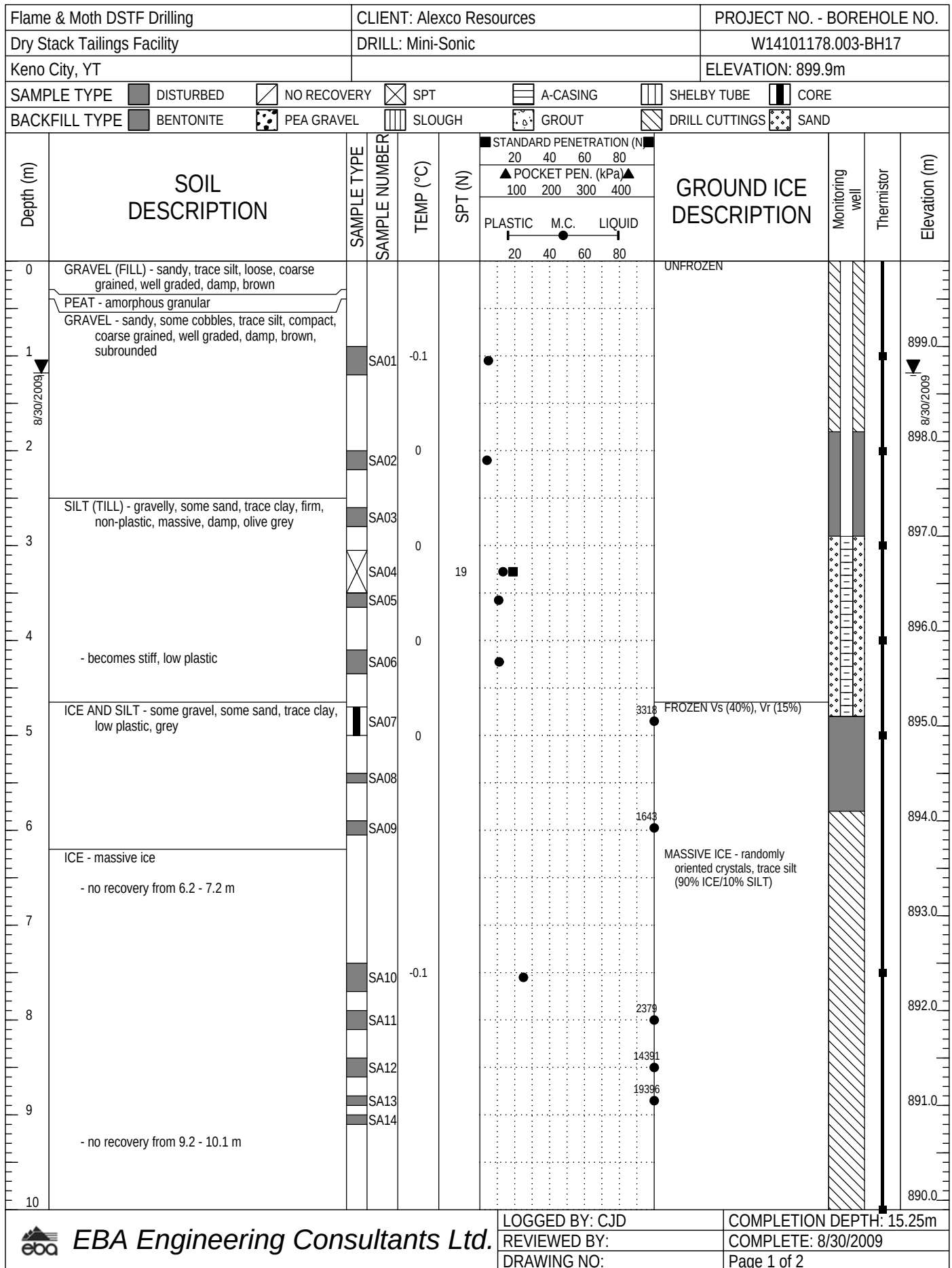
Reviewed By:

C. J. Dignan

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Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.							
Dry Stack Tailings Facility		DRILL: Mini-Sonic		W14101178.003-BH17							
Keno City, YT				ELEVATION: 899.9m							
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	TEMP (°C)	SPT (N)	STANDARD PENETRATION (N) POCKET PEN. (kPa)▲ 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80		GROUND ICE DESCRIPTION	Monitoring well	Thermistor	Elevation (m)
10	ICE AND SILT - sandy, some gravel, trace clay, low plastic, massive, grey			-0.1				Vs (25%), Vr (15%)			
	SILT (TILL) - sandy, gravelly, trace clay, non-plastic, massive, grey							Vr (5%)			
11			SA15	-0.1		●					889.0
			SA16			●					888.0
12			SA17	-0.1		●					887.0
			SA18			●					886.0
13				0							885.0
14	BEDROCK (quartzite)		SA19	0.1		●					884.0
15				0.1							883.0
16	END OF BOREHOLE - target depth 15.25 m										882.0
17											881.0
18											880.0
19											
20											



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LOGGED BY: CJD

REVIEWED BY:

DRAWING NO:

COMPLETION DEPTH: 15.25m

COMPLETE: 8/30/2009

Page 2 of 2

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

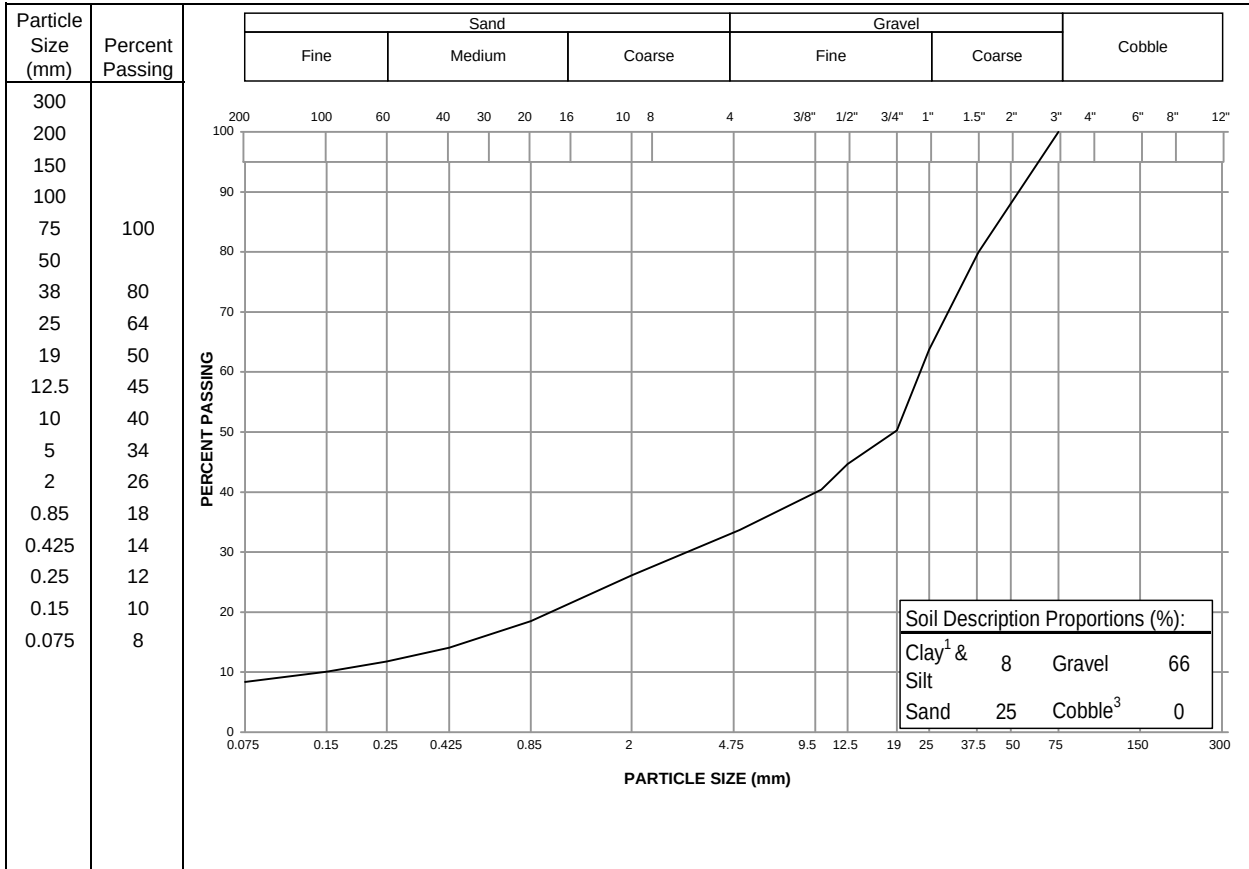
Project: Flame & Moth DSTF Drilling
Project No.: W14101178.003
Site: Keno City, YT

Client: Alexco Resource Corp
Client Rep.:

Material Type:
Sample No.: SA01
Sample Loc.: BH17
Sample Depth: 0.9 - 1.2 m
Sampling Method:
Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
Soil Description²: GRAVEL - sandy, trace silt

USC Classification: Cu: 158.7
Cc: 3.6
Moisture Content: 4.6



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:

C. J. Dignan

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PARTICLE SIZE ANALYSIS TEST REPORT

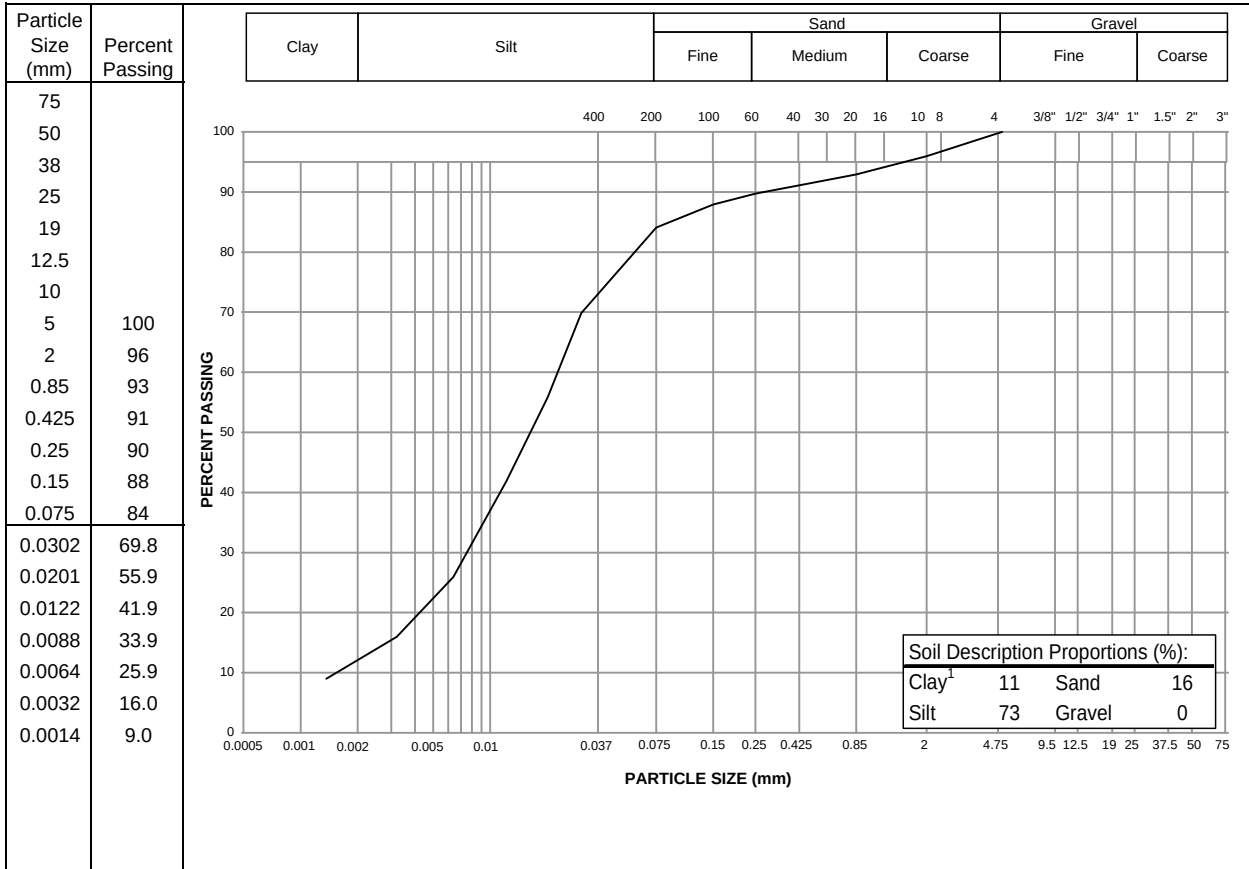
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA08
 Sample Loc.: BH17
 Sample Depth: 5.4 - 5.5
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 2-Nov-2009 By: SMS
 Soil Description²: SILT - some sand, some clay
 USC Classification: Cu: 14.1
 Cc: 1.5
 Moisture Content:



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: _____

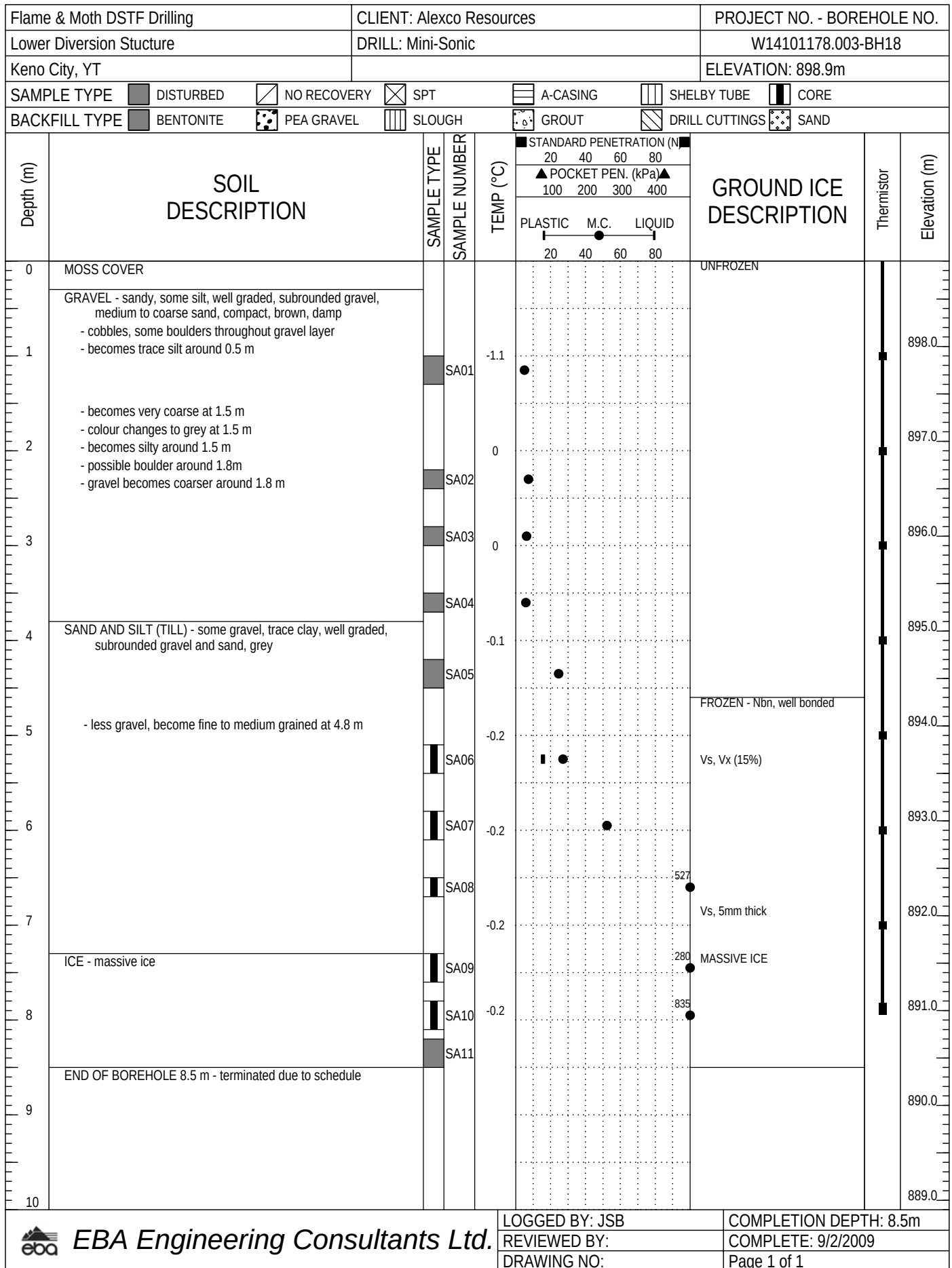
Reviewed By:

C. J. Digby

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PARTICLE SIZE ANALYSIS TEST REPORT

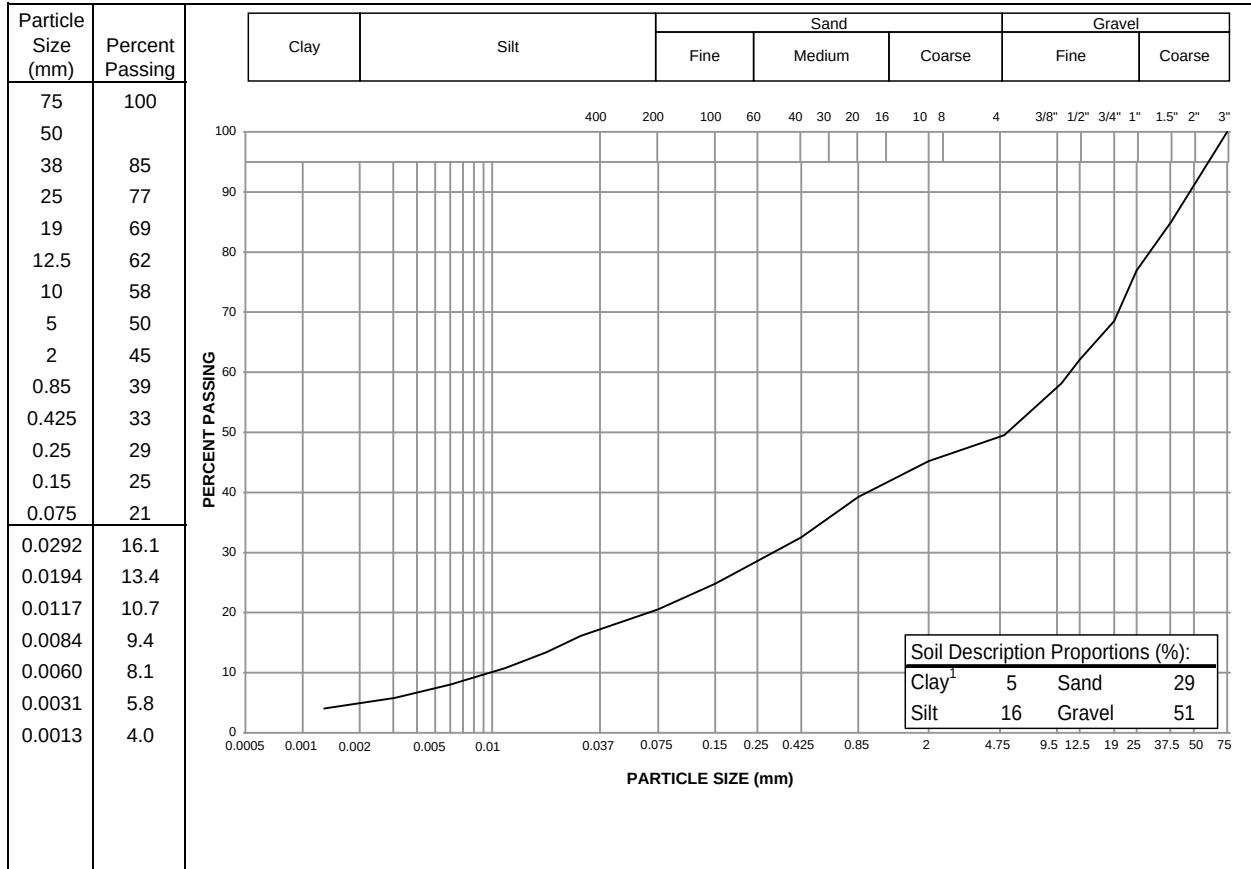
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA02
 Sample Loc.: BH18
 Sample Depth: 2.2 - 2.4 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: GRAVEL - sandy, some silt, trace clay
 USC Classification: Cu: 1133.5
 Cc: 0.9
 Moisture Content: 0.0



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

Specification:

Remarks:

Reviewed By:

C. J. Dwyer

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PARTICLE SIZE ANALYSIS TEST REPORT

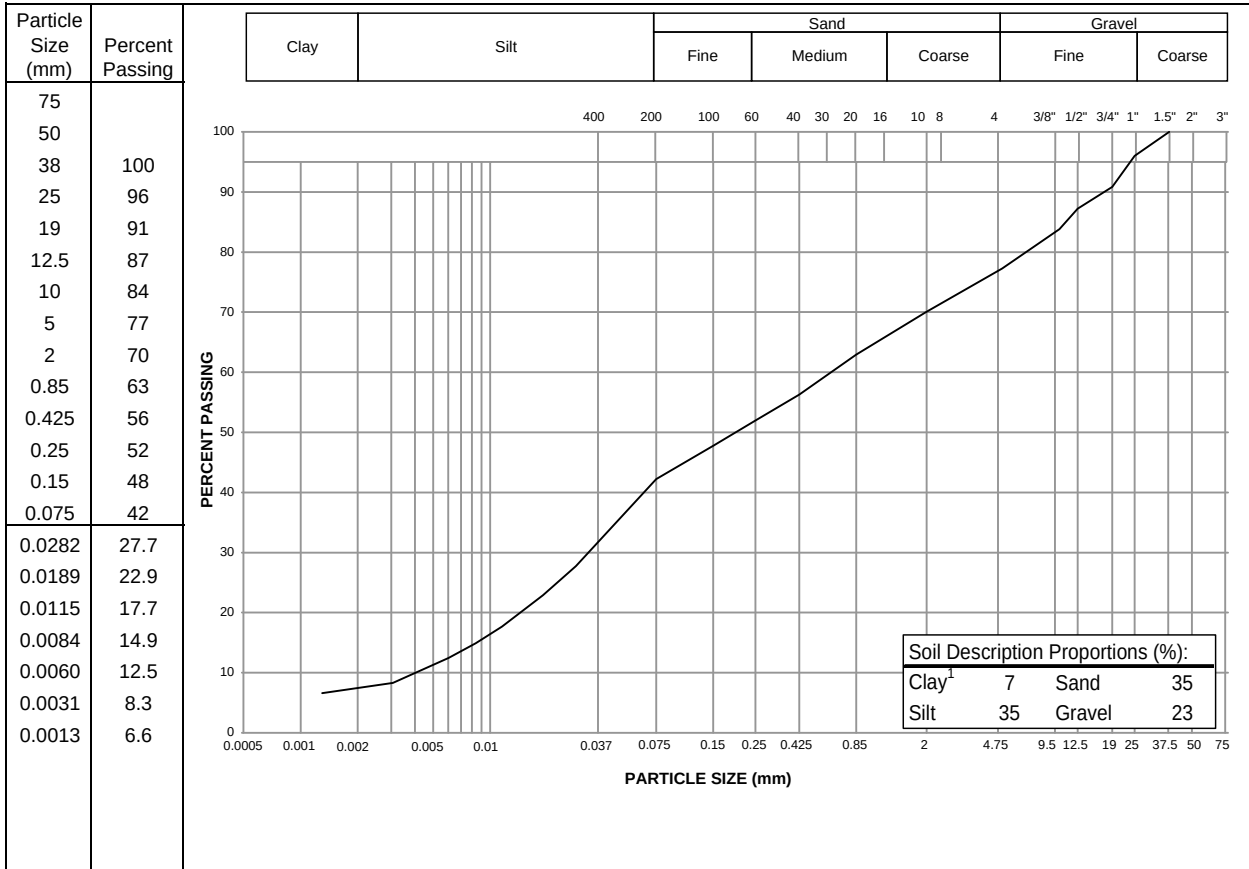
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA06
 Sample Loc.: BH18
 Sample Depth: 5.1 - 5.4
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: SAND AND SILT - some gravel, trace clay
 USC Classification: Cu: 155.7
 Cc: 0.4
 Moisture Content: 27.1



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:

C. J. Dwyer

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Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Dry Stack Tailings Facility		DRILL: Mini-Sonic		W14101178.003-BH19		
Keno City, YT						
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Depth (ft)
0	MOSS COVER - peat, black				UNFROZEN	0
	SILT (TILL) - sandy, some gravel, trace clay, non-plastic, massive grey				FROZEN Vr (10%)	
1			SA01			
			SA02			
			SA03		Vr (40%)	5
2						
	END OF BOREHOLE 2.4 m (REFUSAL)					
3						10
4						15
5						20
6						25
7						30
8						33
9						
10						

EBA Engineering Consultants Ltd.	LOGGED BY: JSB	COMPLETION DEPTH: 2.4m
	REVIEWED BY:	COMPLETE: 9/2/2009
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

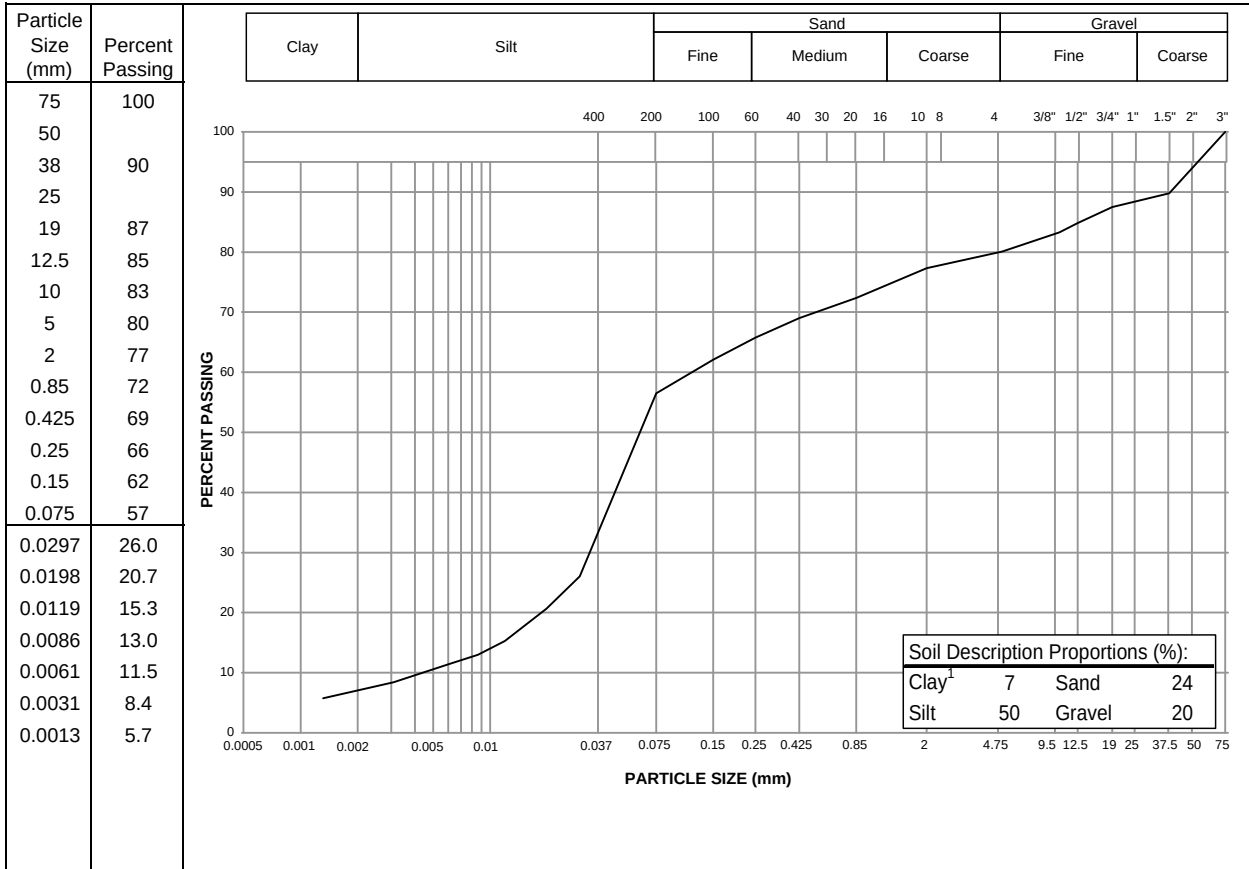
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA02
 Sample Loc.: BH19
 Sample Depth: 1.0 - 1.2
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: SILT - sandy, some gravel, trace clay

USC Classification: Cu: 26.2
 Cc: 2.2
 Moisture Content: 47.4



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: *C. J. Dwyer*

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Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Dry Stack Tailings Facility		DRILL: Mini-Sonic		W14101178.003-BH20		
Keno City, YT						
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Depth (ft)
0	GRAVEL - sandy, trace silt, well graded, sand and gravel angular to subangular, compact, damp, brown		SA01		UNFROZEN	0
1	- gravel content increases from 0.5 to 1.2 m - becomes moist around 0.8 m - shale particles below 1.2 m to 1.7 m		SA02			5
2	SILT (TILL) - sandy, some gravel, trace clay, well graded sand, fine to medium grained, subrounded gravel, stiff, moist, grey		SA03			
	END OF BOREHOLE 2.4 m - hard drilling at 2.4 m, possible boulder or bedrock		SA04			
3						10
4						15
5						20
6						25
7						30
8						33
9						
10						

EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 2.4m
	REVIEWED BY:	COMPLETE: 9/1/2009
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

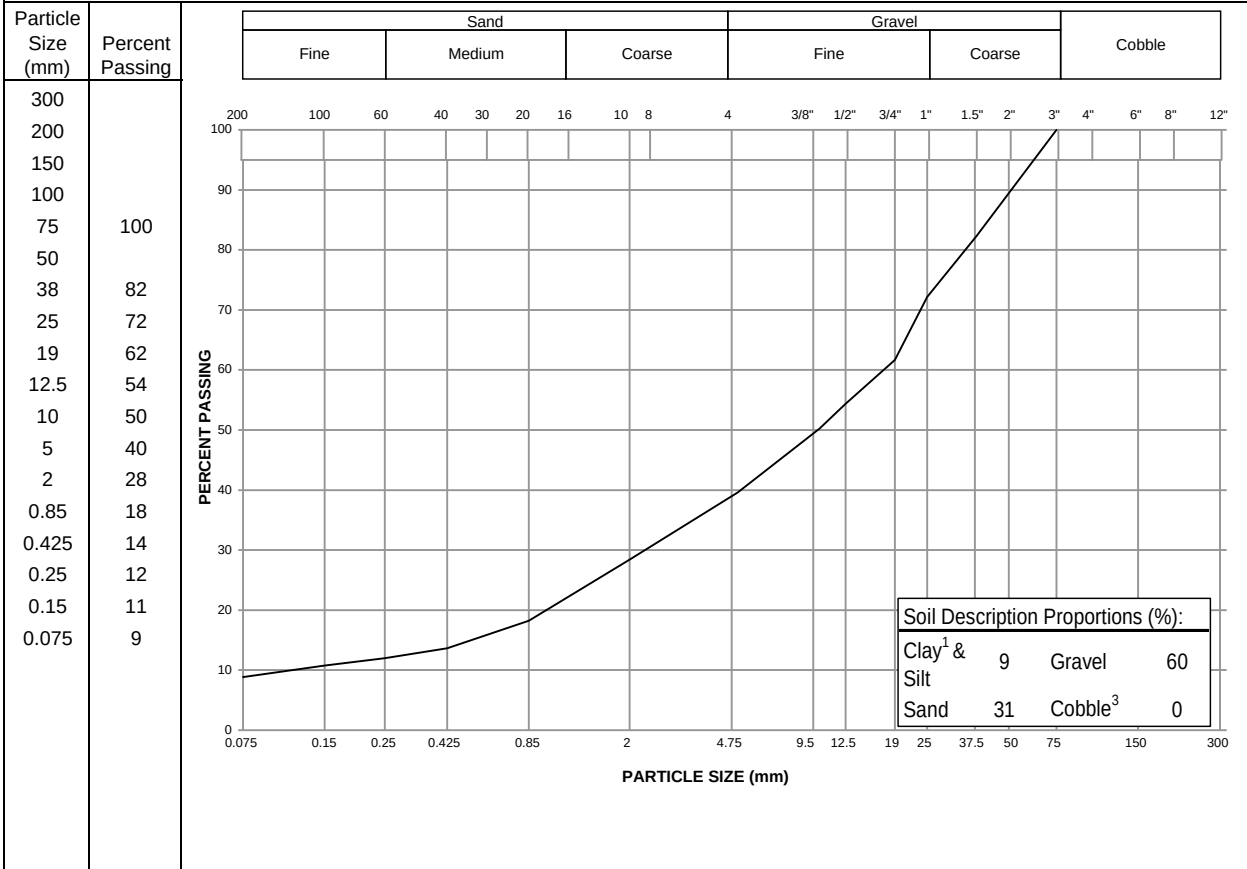
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA01
 Sample Loc.: BH20
 Sample Depth: 0.3 - 0.5 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: GRAVEL - sandy, trace silt

USC Classification: Cu: 145.6
 Cc: 2.8
 Moisture Content: 5.7



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:

C. J. Dixon

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Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Dry Stack Tailings Facility		DRILL: Mini-Sonic		W14101178.003-BH21		
Keno City, YT						
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Depth (ft)
0	SILT - sandy, some gravel, trace clay, stiff, fine grained, gap graded, damp, light brown, organic inclusions, subrounded to subangular		SA01	20	UNFROZEN	0
1	GRAVEL - sandy, trace silt, coarse grained, well graded, damp, brown, subrounded to subangular					5
2	- cobbles and boulders from 2.0 to 3.0 m		SA02	20		10
3	SAND AND GRAVEL (TILL) - silty, compact, damp, brown					15
4	NOTE: Very slow drilling, bit replaced, still very slow. 1.5 hrs to retrieve bit, skid steer, also back on site					20
5	END OF BOREHOLE 4.2 m - very slow drilling					25
6						30
7						35
8						40
9						45
10						50



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LOGGED BY: CJD

REVIEWED BY:

DRAWING NO:

COMPLETION DEPTH: 4.2m

COMPLETE: 9/1/2009

Page 1 of 1

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

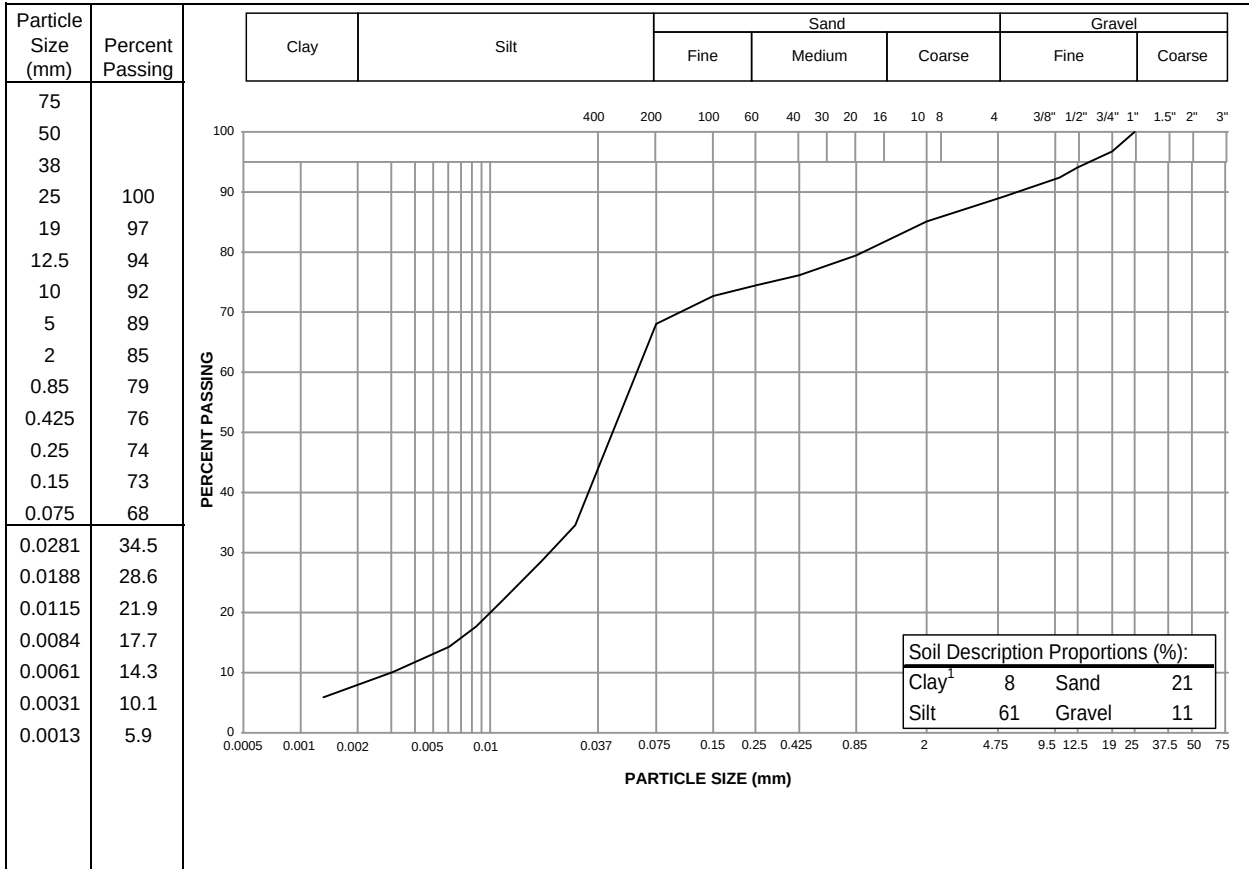
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA01
 Sample Loc.: BH21
 Sample Depth: 0.2 - 0.4 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 22-Oct-2009 By: SMS
 Soil Description²: SILT - sandy, some gravel, trace clay

USC Classification: Cu: 21.1
 Cc: 2.3
 Moisture Content: 17.9



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

Specification: _____

Remarks:

Reviewed By:

C. J. Dixon

Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Dry Stack Tailings Facility		DRILL: Mini-Sonic		W14101178.003-BH22		
Keno City, YT						
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	 PLASTIC M.C. LIQUID 	GROUND ICE DESCRIPTION	Depth (ft)
0	MOSS COVERED - peat, black				UNFROZEN	0
	SILT -sandy, trace clay, brownish black		SA01		FROZEN - Nbe (25%), well bonded	
1			SA02		- visible ice inclusions, < 5 %	
	SAND (TILL) - gravelly, silty, compact (est.), well graded, brown frozen		SA03		- visible ice inclusions 50%, well bonded - visible ice inclusions 50%, poorly bonded	5
2	- very hard slow drilling 2.4 m					
	END OF BOREHOLE 2.4 m					
3						10
4						15
5						20
6						25
7						30
8						33
9						
10						

EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 2.4m
	REVIEWED BY:	COMPLETE: 9/1/2009
	DRAWING NO:	Page 1 of 1

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

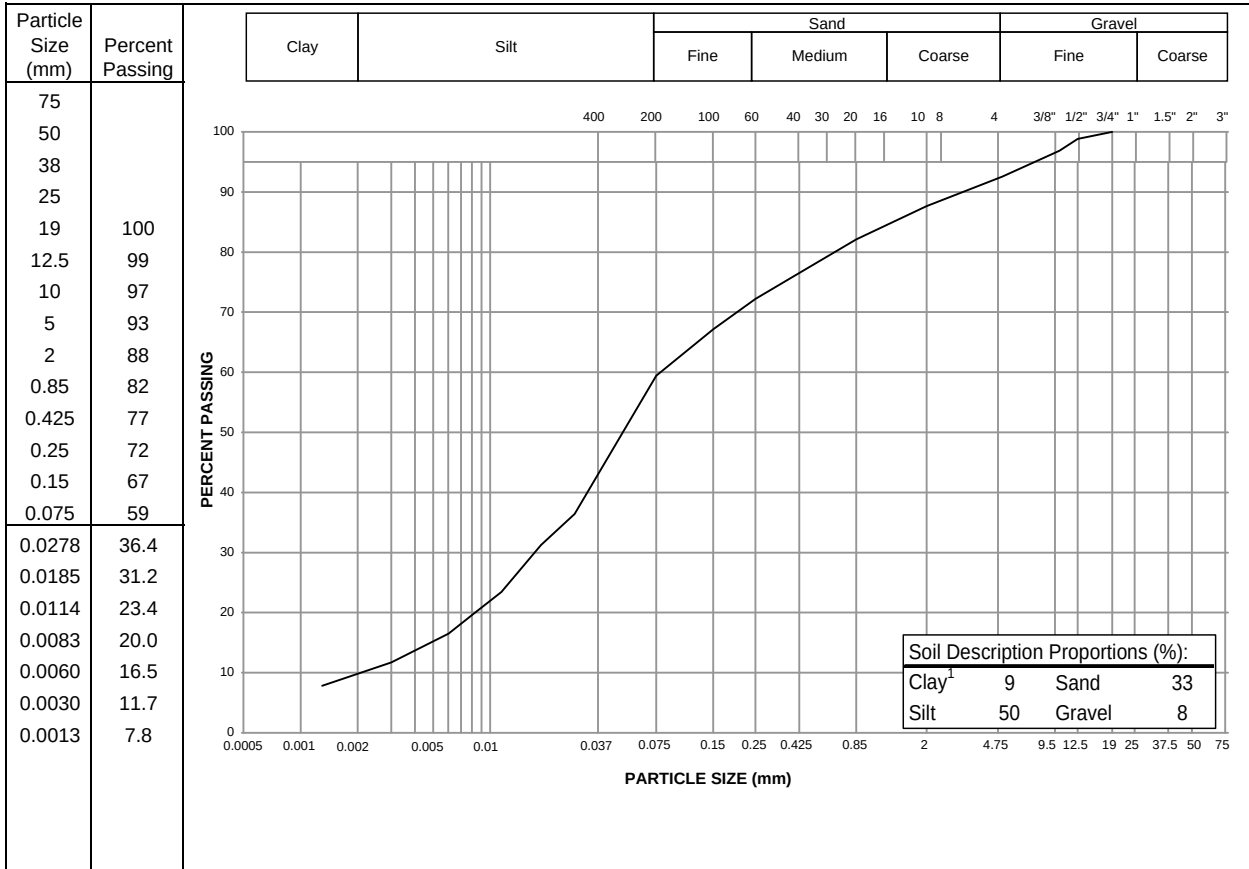
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA03
 Sample Loc.: BH22
 Sample Depth: 1.3 - 1.5 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 23-Oct-2009 By: SMS
 Soil Description²: SILT - sandy, trace clay, trace gravel

USC Classification: Cu: 35.7
 Cc: 1.7
 Moisture Content: 71.5



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:

C. J. Dwyer

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Flame & Moth DSTF Drilling			CLIENT: Alexco Resources			PROJECT NO. - BOREHOLE NO.				
Dry Stack Tailings Facility			DRILL: Mini-Sonic			W14101178.003-BH23				
Keno City, YT						ELEVATION: 908.2m				
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	TEMP (°C)	STANDARD PENETRATION (N)			GROUND ICE DESCRIPTION	Thermistor	Elevation (m)
					20 40 60 80 ▲ POCKET PEN. (kPa)▲ 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80					
0	PEAT - amorphous, granular, moist to wet		SA01					UNFROZEN		908.0
1	SILT AND SAND (TILL) - trace gravel , trace clay, low plastic, olive grey		SA02	-3.4				FROZEN - Vr (20%)		
										907.0
								Vr (10%)		
								Vr (15%)		906.0
2			SA03							
										906.0
3	SAND - silty, trace gravel, trace clay, well graded, brown		SA04	-0.4						
			SA05					Vr (35%) Vc (10%) Vr (10%), becomes Vs		905.0
4			SA06	-0.4						
			SA07							904.0
5			SA08	-0.4						
			SA09							903.0
6	SILT AND SAND (TILL) - trace clay, low plastic, olive grey									
			SA10	-0.4				Vs 10%		902.0
			SA11	-0.4						
7										
			SA12							901.0
			SA13	-0.4						
8	GRAVEL - silty, some cobbles, some sand, well graded, greyish brown									
	SILT (TILL) - sandy, gravelly, trace clay, non plastic, damp, olive grey (not frozen in core)		SA14	-0.3						900.0
9			SA15							
	GRAVEL - some sand, trace silt, compact (est.), well graded, coarse grained, damp, brown		SA16	-0.3						899.0
10	SILT (TILL) - gravelly, sandy, trace clay, stiff, low to non-plastic, massive, damp, olive grey									
				LOGGED BY: CJD			COMPLETION DEPTH: 10.15m			
				REVIEWED BY:			COMPLETE: 8/29/2009			
				DRAWING NO:			Page 1 of 2			



EBA Engineering Consultants Ltd.



EBA Engineering Consultants Ltd.

Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.				
Dry Stack Tailings Facility		DRILL: Mini-Sonic		W14101178.003-BH23				
Keno City, YT				ELEVATION: 908.2m				
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80		GROUND ICE DESCRIPTION	Thermistor	Elevation (m)
10	GRAVEL - silty, sandy, some cobbles, dense (est.), well graded, coarse grained, damp, brownish grey END OF BOREHOLE - refusal in cobbly soil		SA17					898.0
11								897.0
12								896.0
13								895.0
14								894.0
15								893.0
16								892.0
17								891.0
18								890.0
19								889.0
20								

 EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 10.15m
	REVIEWED BY:	COMPLETE: 8/29/2009
	DRAWING NO:	Page 2 of 2

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

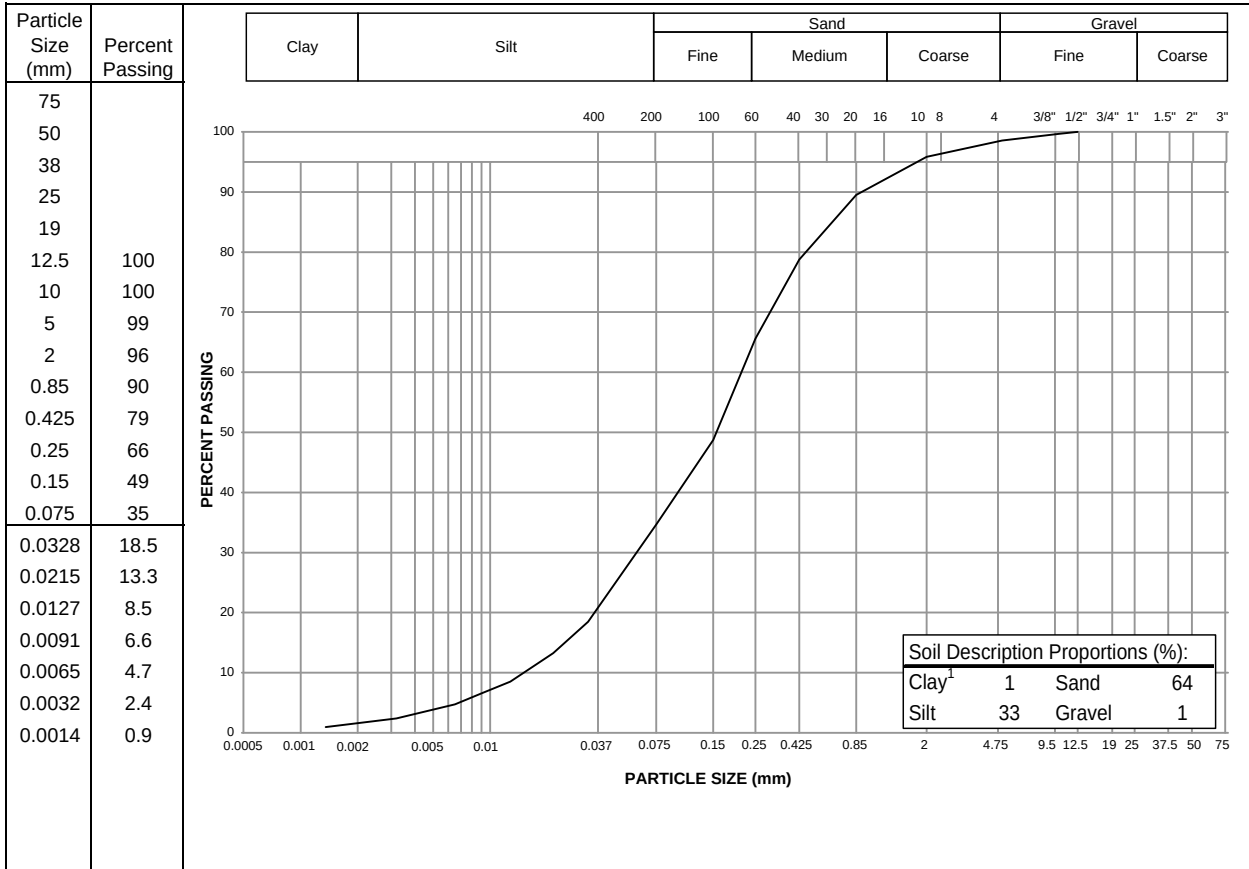
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA07
 Sample Loc.: BH23
 Sample Depth: 4.0 - 4.15 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 23-Oct-2009 By: SMS
 Soil Description²: SAND - silty, trace clay, trace gravel

USC Classification: Cu: 14.1
 Cc: 1.2
 Moisture Content: 22.6



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:

C. J. Dixon

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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

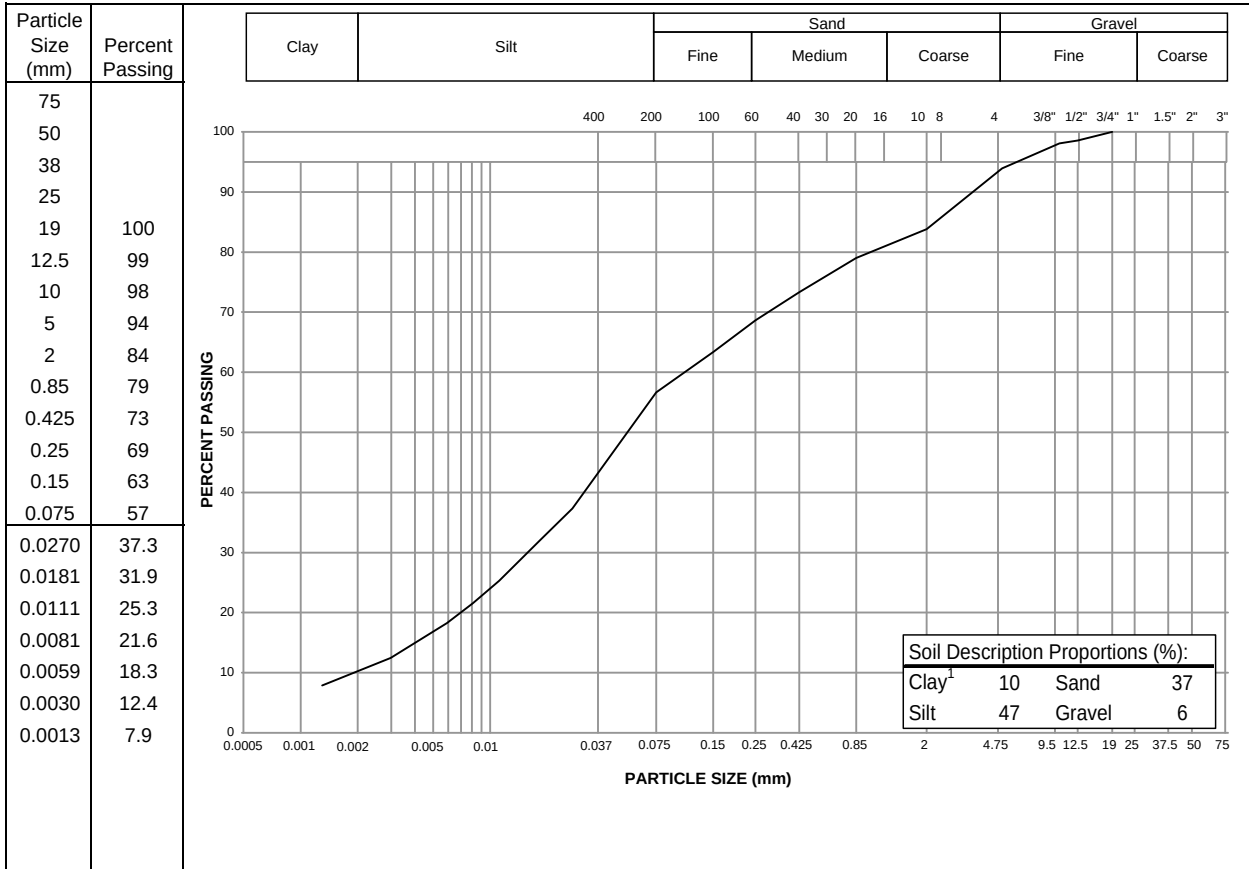
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA11
 Sample Loc.: BH23
 Sample Depth: 6.4 - 6.55
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 23-Oct-2009 By: SMS
 Soil Description²: SILT AND SAND - trace clay, trace gravel

USC Classification: Cu: 54.1
 Cc: 1.1
 Moisture Content: 17.1



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:

C. J. Dwyer

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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

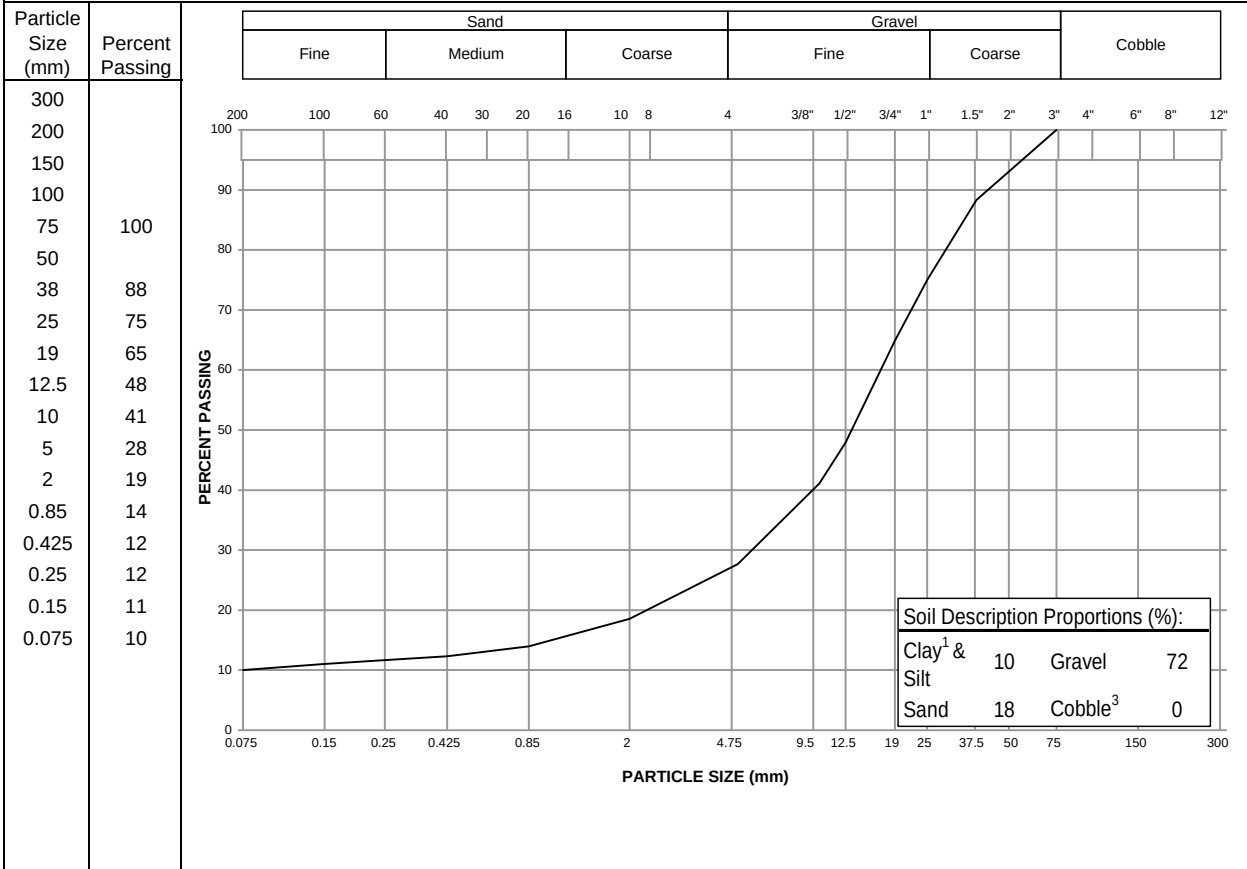
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA16
 Sample Loc.: BH23
 Sample Depth: 9.3 - 9.5 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 23-Oct-2009 By: SMS
 Soil Description²: GRAVEL - some sand, trace silt

USC Classification: Cu: 229.0
 Cc: 26.9
 Moisture Content: 4.0



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: *C. J. Dixon*

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Flame & Moth DSTF Drilling			CLIENT: Alexco Resources			PROJECT NO. - BOREHOLE NO.			
Water Retention Pond			DRILL: Mini-Sonic			W14101178.003-BH24			
Keno City, YT						ELEVATION: 894.1m			
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)	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Monitoring well	Elevation (m)
					POCKET PEN. (kPa)				
					PLASTIC	M.C. LIQUID			
0	SILT (FILL) - gravelly, sandy, non-plastic, damp, dark brown, organic inclusions				20 40 60 80	100 200 300 400			894.0
1	GRAVEL (FILL) - sandy, some silt, loose to compact (est.), fine grained, well graded, damp, light brown to grey, subangular		SA01						893.0
2	- no recovery from 1.7 - 2.8 m		SA02						892.0
3	SILT (TILL) - gravelly, some sandy, trace clay, very stiff, low to non-plastic, massive, damp to moist, olive grey, gravel particles, subangular			36					891.0
4									890.0
5			SA03						889.0
6			SA04	48					888.0
7	SAND - fine sand lens								
	BOULDER AND SILT TILL (as above)								
	- no recovery from 6.6 - 6.9 m		SA05						887.0
8	GRAVEL - sandy, some silt, compact, fine grained, well graded, damp to moist, greyish brown, oxide staining		SA06						886.0
9	SILT (TILL) - sandy, gravelly, some cobbles, trace clay, stiff (est.), non-plastic, massive, damp, olive grey		SA07						885.0
	END OF BOREHOLE 9.15 m - target depth								
10									
EBA Engineering Consultants Ltd.				LOGGED BY: CJD		COMPLETION DEPTH: 9.15m			
				REVIEWED BY:		COMPLETE: 8/29/2009			
				DRAWING NO:		Page 1 of 1			

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

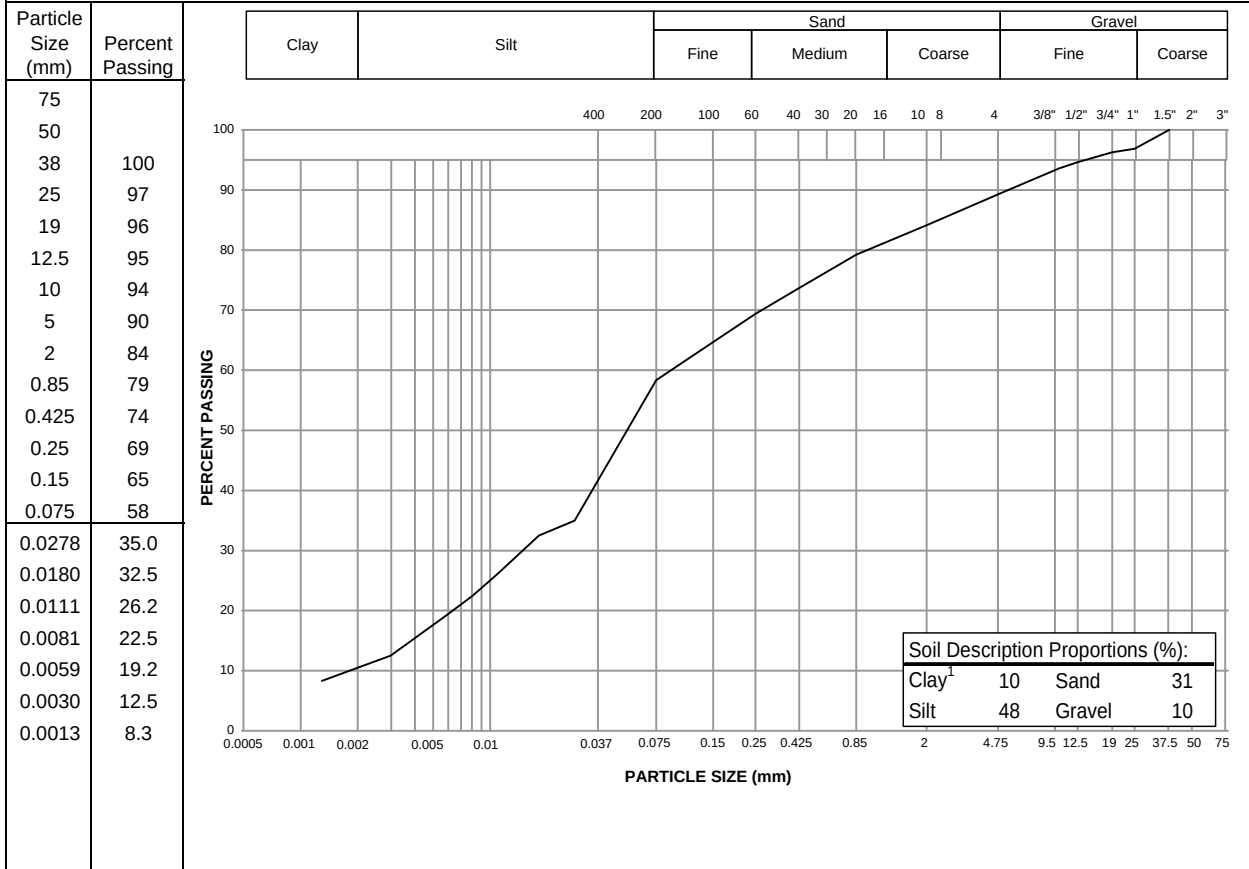
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA03
 Sample Loc.: BH24
 Sample Depth: 5.4 - 5.6 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 23-Oct-2009 By: SMS
 Soil Description²: SILT - sandy, trace clay, trace gravel

USC Classification: Cu: 47.9
 Cc: 1.3
 Moisture Content: 10.5



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:

C. J. Dwyer

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Flame & Moth DSTF Drilling		CLIENT: Alexco Resources			PROJECT NO. - BOREHOLE NO.		
Water Retention Pond		DRILL: Mini-Sonic			W14101178.003-BH25		
Keno City, YT					ELEVATION: 894.9m		
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	Elevation (m)
				■ STANDARD PENETRATION (N) 20 40 60 80 ▲ POCKET PEN. (kPa)▲ 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80			
0	GRAVEL (FILL) - silty, some sand, loose, gap graded, damp, brown/green, organic inclusions		SA01				894.0
1							
2	GRAVEL (glaciofluvial) - sandy, some silt, compact, medium grained, well graded, damp, brown, subrounded to subangular		SA02				893.0
3							
3	SAND AND GRAVEL (glaciofluvial) - trace silt, compact, medium grained, well graded, damp, brown, rounded to sub rounded		SA03				892.0
4				21			
4			SA04				891.0
5							
5	- no recovery from 7.4 - 6.3 m						
6	GRAVEL - sandy, some cobbles, trace silt, dense, coarse grained, well graded, moist, brown, subangular to subrounded						890.0
7							889.0
7	- SPT on boulder						888.0
8			SA05				
8	SILT (TILL) - gravelly, some sand, trace clay, very stiff to hard, low-non plastic, massive, moist, olive grey		SA06				887.0
9							
9			SA07				886.0
10				28			885.0

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LOGGED BY: CJD

REVIEWED BY:

DRAWING NO:

COMPLETION DEPTH: 15.25m

COMPLETE: 8/28/2009

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LOGGED BY: CJD

REVIEWED BY:

DRAWING NO:

COMPLETION DEPTH: 15.25m

COMPLETE: 8/28/2009

Page 1 of 2

Flame & Moth DSTF Drilling		CLIENT: Alexco Resources		PROJECT NO. - BOREHOLE NO.		
Water Retention Pond		DRILL: Mini-Sonic		W14101178.003-BH25		
Keno City, YT				ELEVATION: 894.9m		
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	Elevation (m)
10			SA08	●		884.0
11	SILT (TILL) - gravelly, some sand, trace clay, stiff to hard, massive, damp grey					
	GRAVEL - cobbly, sandy, trace silt, compact, coarse grained, gap graded, damp, rust to grey, oxidation		SA09	●		
12			SA10	●		883.0
	- no recovery from 12.5 - 15.0 m			39	■	882.0
13						
14						881.0
15	- boulder of possible bedrock					880.0
	END OF BOREHOLE 15.25 m - target depth					879.0
16						
17						878.0
18						877.0
19						876.0
20						875.0



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LOGGED BY: CJD

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DRAWING NO:

COMPLETION DEPTH: 15.25m

COMPLETE: 8/28/2009

Page 2 of 2

PARTICLE SIZE ANALYSIS TEST REPORT

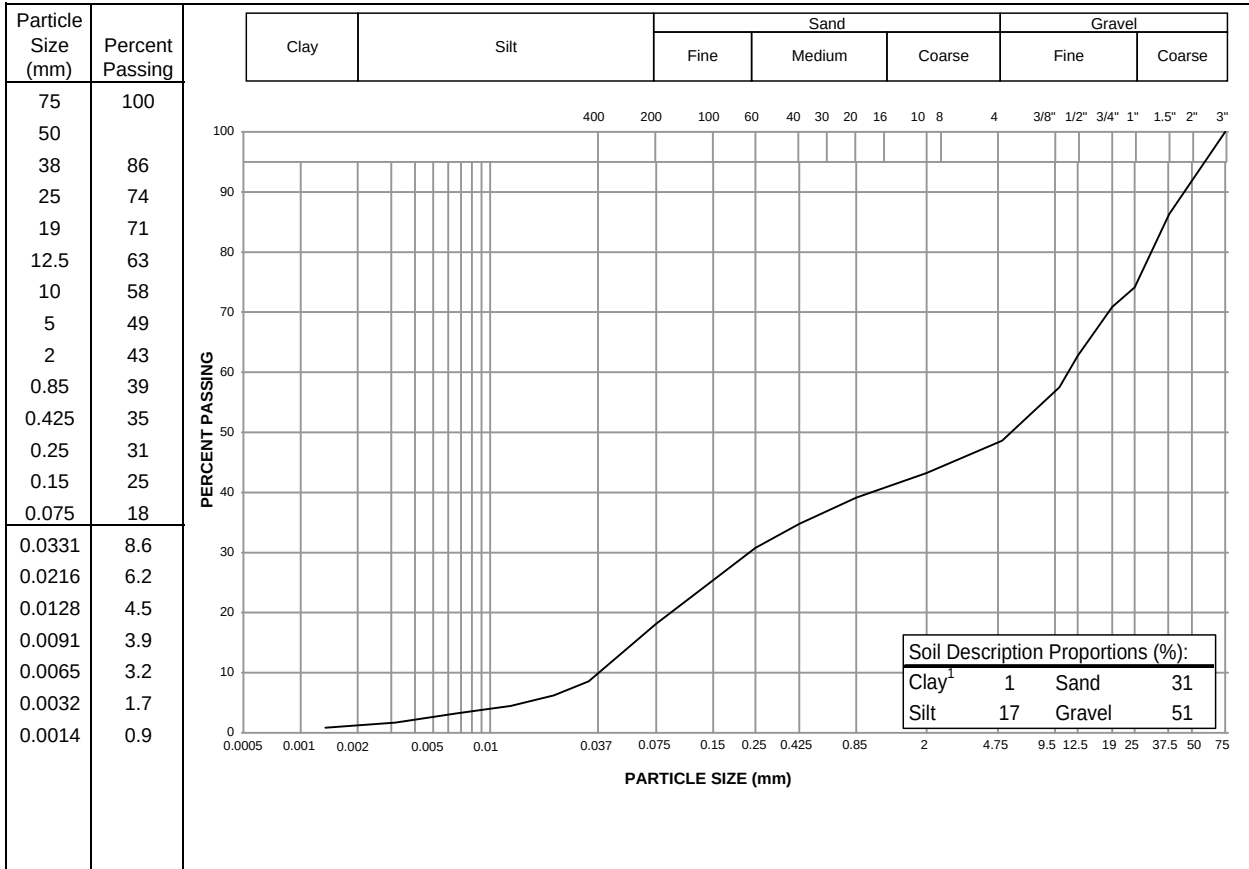
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA02
 Sample Loc.: BH25
 Sample Depth: 1.8 - 2.1 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 25-Oct-2009 By: SMS
 Soil Description²: GRAVEL - sandy, some silt, trace clay
 USC Classification: Cu: 284.4
 Cc: 0.1
 Moisture Content: 3.6



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: *C. J. Dixon*

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PARTICLE SIZE ANALYSIS TEST REPORT

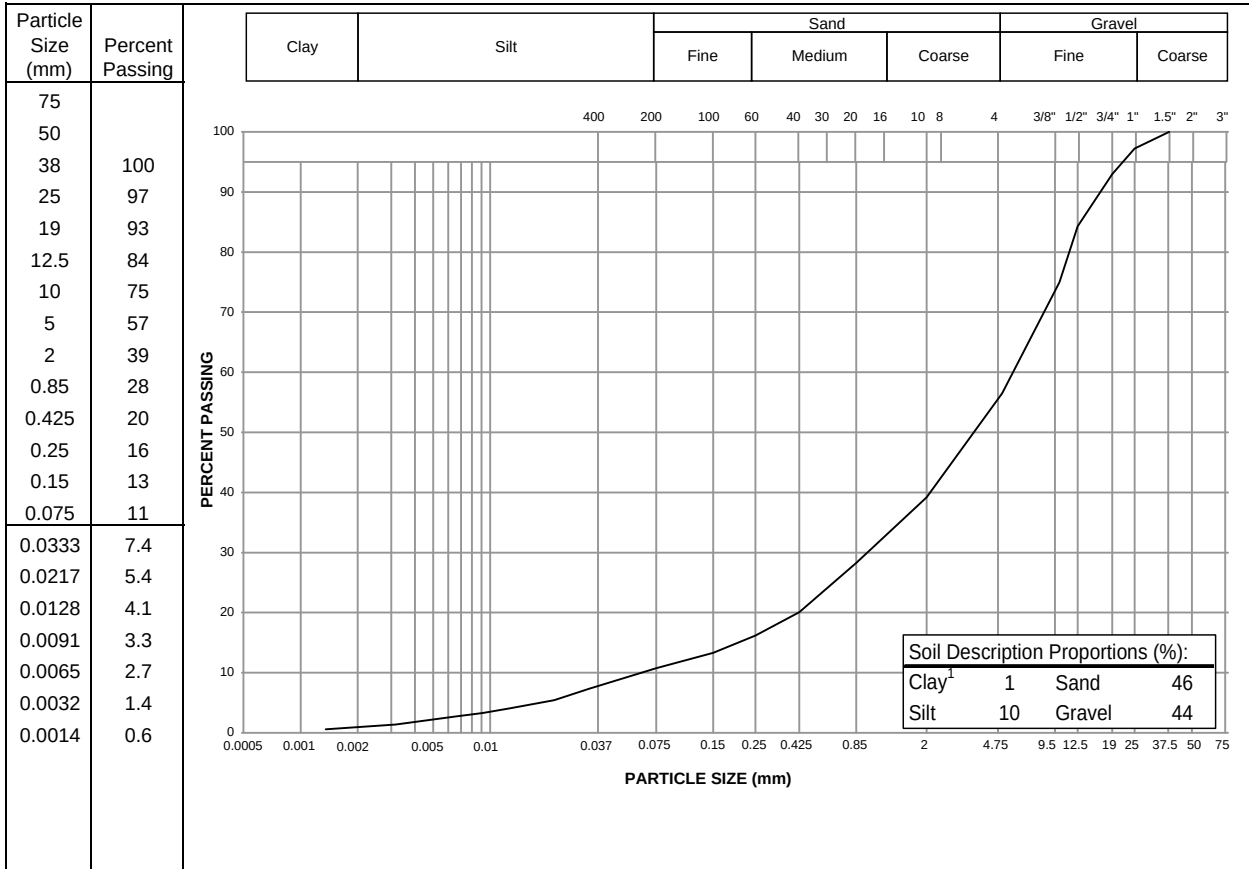
ASTM D422 & C136

Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA04
 Sample Loc.: BH25
 Sample Depth: 3.3 - 3.7
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 25-Oct-2009 By: SMS
 Soil Description²: SAND AND GRAVEL - trace silt,
 trace clay
 USC Classification: Cu: 90.3
 Cc: 2.7
 Moisture Content: 2.5



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:

C. J. Dwyer

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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

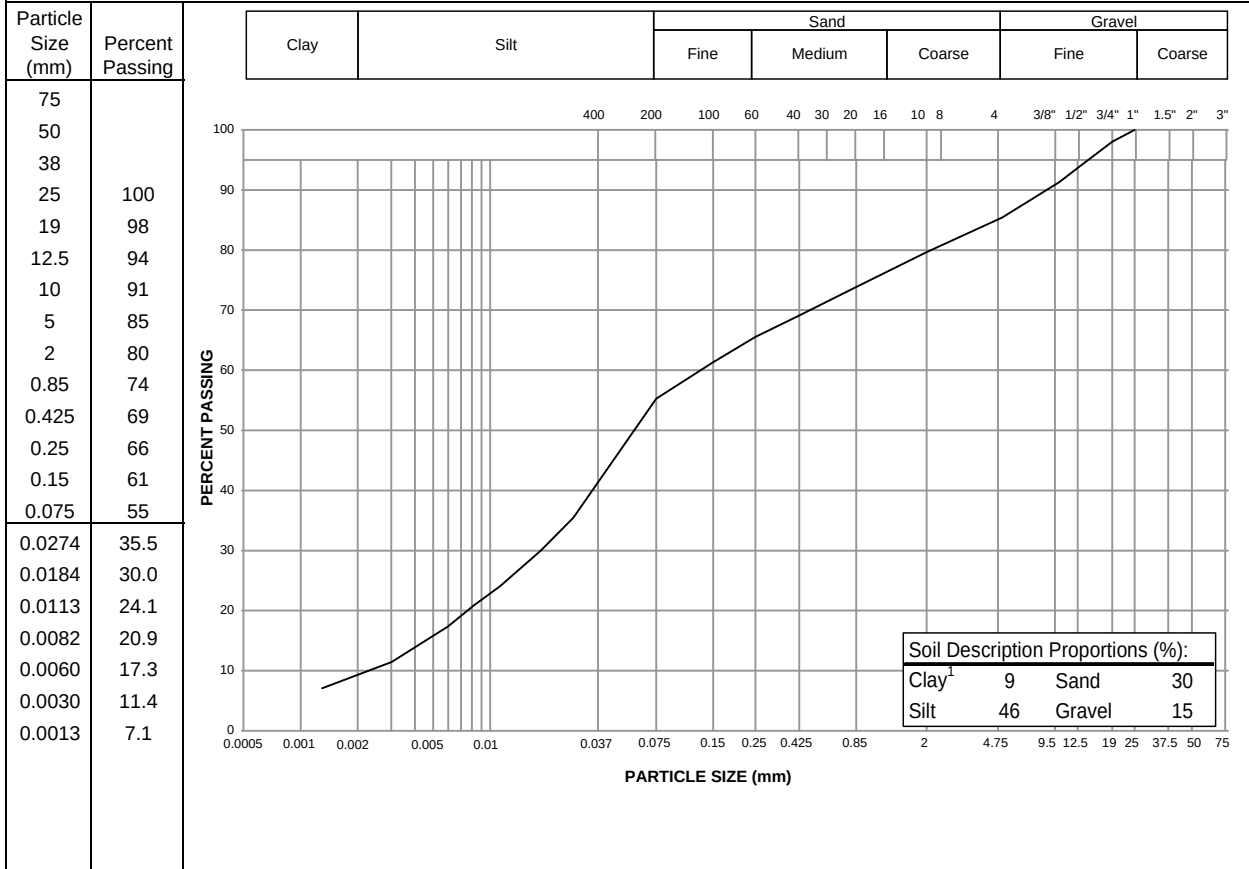
Project: Flame & Moth DSTF Drilling
 Project No.: W14101178.003
 Site: Keno City, YT

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: SA07
 Sample Loc.: BH25
 Sample Depth: 8.7 - 8.95 m
 Sampling Method:
 Date sampled: Sep-09

Date Tested: 25-Oct-2009 By: SMS
 Soil Description²: SILT - sandy, some gravel, trace clay

USC Classification: Cu: 54.4
 Cc: 1.0
 Moisture Content: 9.7



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:

C. J. Dixon

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Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.		
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP01		
near Keno City, YT		7086907N; 483901E; Zone 8		ELEVATION: 906.4m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - woody, some silt, roots, organics				Frozen	
	GRAVEL (FILL) - sandy - some silt, compact (est.), medium grained, well graded, frozen, sub-rounded, brown		SA01		Nbe	906.0
1	GRAVEL - sandy, some cobbles, trace silt, compact (est.), coarse grained, well graded, damp, brown, sub-rounded				Unfrozen	
						905.0
2			SA02			904.0
3	- becomes loose					903.0
4	SILT - sandy, some gravel, some clay, stiff, low plastic, massive, damp, olive grey		SA03			902.0
5	EOH - refusal, possible bedrock (quartzite)					901.0
6						
EBA Engineering Consultants Ltd.		LOGGED BY: CJD		COMPLETION DEPTH: 5m		
		REVIEWED BY: JRT		COMPLETE: 5/6/2009		
		DRAWING NO: Figure 2		Page 1 of 1		

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP02			
near Keno City, YT		7086862N; 483957E; Zone 8		ELEVATION: 908.3m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - silty, woody, fibrous, roots, organics					Frozen	
	SAND - silty, some gravel, trace clay, loose (est.), low plastic, massive, frozen, organic inclusions					Vr, Vs (35%) ice lens up to 10cm thick	908.0
1		SA01					907.0
	-becomes some clay	SA02		-0.6		Vx (5%)	
2						Vx, Vs (10%)	906.0
		SA03					
3							905.0
	EOH - target depth						
4							904.0
5							903.0
6							
 EBA Engineering Consultants Ltd.				LOGGED BY: CJD		COMPLETION DEPTH: 3.1m	
				REVIEWED BY: JRT		COMPLETE: 5/6/2009	
				DRAWING NO: Figure 2		Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP03	
near Keno City, YT		7086760N; 484004E; Zone 8		ELEVATION: 907.4m	
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	TEMP (°C)	STANDARD PENETRATION (N)		POCKET PEN. (kPa)	GROUND ICE DESCRIPTION	Elevation (m)
					20 40 60 80				
					100 200 300 400				
					PLASTIC	M.C. LIQUID			
0	PEAT - amorphous granular, roots, organics, black and brown, frozen							Frozen	907.0
1			SA01				354		906.0
2			SA02				1158		905.0
3	SILT - some sand, trace clay, soft (est.), low-plastic, massive, frozen, olive grey		SA03	-1.7			H	Vs (35%) ice lens up to 10cm thick	904.0
4	SAND - silty, gravelly, trace clay, firm (est.), non-plastic, massive, frozen, olive grey		SA04					Vs and Vc (5%)	903.0
EOH - target depth									902.0

EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 4m
	REVIEWED BY: JRT	COMPLETE: 5/6/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP04			
near Keno City, YT		7086712N; 483906E; Zone 8		ELEVATION: 903.8m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - roots, organic mat, woody, black					Frozen	
	SAND - silty, some gravel, compact (est.), medium grained, well graded, frozen, light brown, sub-rounded						
	GRAVEL - sandy, silty, some cobbles, compact (est.), coarse grained, well graded, moist, dark brown, pockets of silt, sub-rounded					Unfrozen	
1		SA01					903.0
		SA02					902.0
2						Frozen Nbn	
							901.0
3		SA03		-0.3		Vc (10%)	
	EOH - refusal in frozen gravel						900.0
4							
							899.0
5							
							898.0
6							
 EBA Engineering Consultants Ltd.				LOGGED BY: CJD		COMPLETION DEPTH: 3.5m	
				REVIEWED BY: JRT		COMPLETE: 5/6/2009	
				DRAWING NO: Figure 2		Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP05			
near Keno City, YT		7086736N; 483899E; Zone 8		ELEVATION: 903.4m			
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	STANDARD PENETRATION (N) POCKET PEN. (kPa) 20 40 60 80 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80		GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - roots, organics SAND AND GRAVEL - silty, trace cobbles, compact (est.), coarse grained, well graded, frozen, medium brown, sub-rounded		SA01	●		Frozen	903.0
1	0.1 m thick silt lens - frozen, light brown		SA02	●		Unfrozen	902.0
2	SAND - some gravel, some silt, trace cobbles, loose (est.), coarse grained, well graded, damp, dark brown, sub-angular						901.0
3	SAND AND GRAVEL - trace silt, trace cobbles, compact (est.), medium grained, well graded, damp, dark brown, sub-rounded		SA03	●			900.0
4			SA04	●			899.0
5	EOH - target depth						898.0
6							
EBA Engineering Consultants Ltd.		LOGGED BY: CJD		COMPLETION DEPTH: 4.5m			
		REVIEWED BY: JRT		COMPLETE: 5/3/2009			
		DRAWING NO: Figure 2		Page 1 of 1			

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP06			
near Keno City, YT		7086719N; 483925E; Zone 8		ELEVATION: 905.1m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - wood, roots, organic SAND - silty, some gravel, compact (est.), gap graded, coarse grained, moist, brown, organic inclusions, frozen	☒	SA01			Frozen	905.0
1	GRAVEL AND SAND - some silt, trace cobbles, compact to dense (est), coarse grained, well graded, frozen, dark brown, sub-rounded	☒	SA02			Nbn	904.0
2							903.0
3		☒	SA03	-0.2			902.0
4		☒	SA04	0.7		Unfrozen	901.0
5		☒	SA05				900.0
6	EOH - target depth						



EBA Engineering Consultants Ltd.

LOGGED BY: CJD

REVIEWED BY: JRT

DRAWING NO: Figure 2

COMPLETION DEPTH: 5.5m

COMPLETE: 5/6/2009

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Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP07			
near Keno City, YT		7086712N; 483955E; Zone 8		ELEVATION: 906.7m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 ▲ POCKET PEN. (kPa) ▲ 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - some silt, woody, roots, black SILT - sandy, some gravel, medium, non-plastic, frozen, brown, organics, roots SAND - gravelly, trace cobbles, trace silt., compact (est.), medium grained, well graded, damp to moist, brown, sub-rounded		SA01			Frozen	906.0
1			SA02			Unfrozen	905.0
2	- seepage					Frozen Nbn	904.0
3	SILT - sandy, some gravel, trace clay, stiff (est.), low plastic, massive, olive grey		SA03	-0.1	H	Vx, Vc (<5%)	903.0
4			SA04	1.5	▲	Unfrozen	902.0
5							901.0
6	EOH - refusal at probable bedrock (quartzite)						



EBA Engineering Consultants Ltd.

LOGGED BY: CJD

REVIEWED BY: JRT

DRAWING NO: Figure 2

COMPLETION DEPTH: 5.4m

COMPLETE: 5/6/2009

Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP08			
near Keno City, YT		7086741N; 483974E; Zone 8		ELEVATION: 908.6m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - silty, woody, organics, roots, frozen SAND - gravelly, some silt, loost (est.), well graded, coarse grained, frozen					Frozen	
1		SA01		-0.5		Vc, Vr (25%)	908.0
2	BEDROCK - laminated, moderately weathered	SA02				Vs (10%)	907.0
	EOH refusal, frozen bedrock	SA03					906.0
3							905.0
4							904.0
5							903.0
6							
 EBA Engineering Consultants Ltd.				LOGGED BY: CJD		COMPLETION DEPTH: 2.2m	
				REVIEWED BY: JRT		COMPLETE: 5/6/2009	
				DRAWING NO: Figure 2		Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.		
Detention Berm		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP09		
near Keno City, YT		7086737N; 483797E; Zone 8		ELEVATION: 895.8m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - woody, organic, dark brown, frozen				Frozen	
	GRAVEL AND SAND - some cobbles, trace silt, compact to dense (est.), coarse grained, well graded, damp, medium brown, sub-rounded					
1	- unfrozen				Unfrozen	895.0
			SA01			
2						894.0
	BOULDERS - cobbley, some gravel, some silt, dense (est.), coarse grained, gap graded, damp, bluish grey, sub-rounded					
3	SILT (till) - gravelly, sandy, trace clay, stiff, low plastic, damp, olive grey, massive		SA02			893.0
4			SA03			892.0
5			SA04			891.0
	EOH - target depth					
6						890.0
EBA Engineering Consultants Ltd.		LOGGED BY: CJD		COMPLETION DEPTH: 5.2m		
		REVIEWED BY: JRT		COMPLETE: 5/5/2009		
		DRAWING NO: Figure 2		Page 1 of 1		

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP11			
near Keno City, YT		7086737N; 484046E; Zone 8		ELEVATION: 912.4m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 ▲ POCKET PEN. (kPa) ▲ 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - silty, woody, organic, roots, silt is brown, peat is black -seepage					Unfrozen	
	SILT - some sand, some gravel, trace clay, soft (est), high plastic, massive, frozen, olive grey					Frozen	912.0
1		SA01		-0.6		Vs, Vc (25%)	911.0
2		SA02				Vs, Vc (20%)	910.0
3	EOH- target depth	SA03				Vs, Vc (30%)	909.0
4							908.0
5							907.0
6							
 EBA Engineering Consultants Ltd.				LOGGED BY: CJD REVIEWED BY: JRT DRAWING NO: Figure 2		COMPLETION DEPTH: 3m COMPLETE: 5/6/2009 Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP12			
near Keno City, YT		7086942N; 483955E; Zone 8		ELEVATION: 913.8m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - woody, roots, organics					Frozen	
	SILT - sandy, some gravel, trace clay, stiff (est.), non-plastic, frozen, light brown, organic, roots						
	GRAVEL AND SAND - some cobbles, trace silt, compact (est.), medium grained, well graded, brown					unfrozen	913.0
1		SA01					
							912.0
2	SILT and BOULDERS - sandy, trace clay, trace gravel, non-plastic, bedded, frozen, brown	SA02		-0.3		Frozen, Vs (<5%)	
	EOH - refusal at possible bedrock (quartzite)						
							911.0
3							
							910.0
4							
							909.0
5							
							908.0
6							

 EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 2.1m
	REVIEWED BY: JRT	COMPLETE: 5/7/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.		
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP13		
near Keno City, YT		7086811N; 483912E; Zone 8		ELEVATION: 905m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	GRAVEL - (waste rock) - cobbly, some sand, trace silt, loose to compact (est.), coarse grained, well graded, damp to moist, reddish-brown, angular				Unfrozen	905.0
1	-hole sloughing		SA01			904.0
2	BEDROCK (quartzite), moderately weathered, oxidized, blocky					903.0
3	EOH - target depth and sloughing					902.0
4						901.0
5						900.0
6						899.0
EBA Engineering Consultants Ltd.		LOGGED BY: CJD		COMPLETION DEPTH: 3m		
		REVIEWED BY: JRT		COMPLETE: 5/7/2009		
		DRAWING NO: Figure 2		Page 1 of 1		

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP14			
near Keno City, YT		7086986N; 483897E; Zone 8		ELEVATION: 901.4m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - amorphous granular, organic, roots and rootlets					Frozen	901.0
1	SILT - sandy, some gravel, non-plastic, massive, frozen, olive grey	SA01				Vs (10%)	900.0
	SAND - gravelly, some cobbles, trace silt, dense (est.), well graded, coarse grained, sub-rounded, brown, frozen	SA02				Vc, Vx (10%)	
2		SA03		-0.2		Vc, Vx (5%)	899.0
		SA04				Nbn	
3	EOH - target depth						898.0
4							897.0
5							896.0
6							
 EBA Engineering Consultants Ltd.				LOGGED BY: CJD REVIEWED BY: JRT DRAWING NO: Figure 2		COMPLETION DEPTH: 3m COMPLETE: 5/7/2009 Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP15			
near Keno City, YT		7086939N; 483873E; Zone 8		ELEVATION: 900.4m			
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	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)
				POCKET PEN. (kPa)			
				20 40 60 80			
				100 200 300 400			
				PLASTIC M.C. LIQUID			
				20 40 60 80			
0	PEAT - organic, rootlets, black, frozen					Frozen	900.0
1	GRAVEL - sandy, some cobbles, some silt, compact (est.), medium grained, well graded, frozen, brown		SA01			Nbn	899.0
2							
3	EOH - refusal at possible bedrock (quartzite)						898.0
4							897.0
5							896.0
6							895.0
 EBA Engineering Consultants Ltd.			LOGGED BY: CJD		COMPLETION DEPTH: 2.3m		
			REVIEWED BY: JRT		COMPLETE: 5/7/2009		
			DRAWING NO: Figure 2		Page 1 of 1		

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.		
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP16		
near Keno City, YT		7086887N; 483836E; Zone 8		ELEVATION: 900.1m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT -amorphous granular, some silt, frozen				Frozen, visible ice wedges 10 cm wide at top	900.0
1	SAND - gravelly, silty, some cobbles, dense (est.), medium grained, well graded, frozen, brown		SA01		Nbn	899.0
2	BOULDERS - some cobbles, some gravel, trace sand, trace silt, frozen				Vc (5%)	
	EOH - refusal in frozen boulders					898.0
3						897.0
4						896.0
5						895.0
6						
 EBA Engineering Consultants Ltd.			LOGGED BY: CJD		COMPLETION DEPTH: 2m	
			REVIEWED BY: JRT		COMPLETE: 5/7/2009	
			DRAWING NO: Figure 2		Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.		
DSTF		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP17		
near Keno City, YT		7086807N; 483838E; Zone 8		ELEVATION: 902.5m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	GRAVEL AND SAND (fill) - some cobbles, some silt, coarse grained, well graded, sub-rounded, damp, brown, roots, trees, peat inclusions, frozen				Frozen	902.0
1	- becomes loose to compact (est.), damp		SA01		Unfrozen	901.0
2			SA02			900.0
	PEAT - woody, roots, black					
	SILT - sandy, some gravel, firm (est.), non-plastic, massive, damp, brown					
	GRAVEL AND SAND- some cobbles, trace silt, coarse grained, compact (est.), well graded, sub-rounded, damp, brown					
3			SA03			899.0
4			SA04			898.0
5	EOH - target depth					897.0
6						
EBA Engineering Consultants Ltd.		LOGGED BY: CJD		COMPLETION DEPTH: 4.8m		
		REVIEWED BY: JRT		COMPLETE: 5/7/2009		
		DRAWING NO: Figure 2		Page 1 of 1		

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.			
Mill Pad		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP18			
near Keno City, YT		7086816N; 483953E; Zone 8		ELEVATION: 908.7m			
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	TEMP (°C)	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	PEAT - woody, fine fibrous, some silt, roots, rootlets, organics					Frozen	
1	SILT AND SAND - some gravel, trace clay, non-plastic, massive, frozen, gravel angular, light brown	☒	SA01			Vx (<5%)	908.0
		☒	SA02	-0.3		Vs, Vc (5%)	907.0
2	EOH - target depth						
3							906.0
4							905.0
5							904.0
6							903.0
 EBA Engineering Consultants Ltd.				LOGGED BY: CJD REVIEWED BY: JRT DRAWING NO: Figure 2		COMPLETION DEPTH: 1.8m COMPLETE: 5/7/2009 Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Case Rubber Tired Backhoe		W14101178.002-TP19	
near Keno City, YT		7086795N; 483932E; Zone 8		ELEVATION: 905.4m	
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400	GROUND ICE DESCRIPTION	Elevation (m)
			PLASTIC M.C. LIQUID 20 40 60 80		
0	GRAVEL (FILL/WASTE ROCK) - sandy, some silt, well graded sub-rounded gravel, coarse to medium grained sand, brown - cobbles, trace of silt below 0.3 m				905.0
1					904.0
2					903.0
3	END OF TESTPIT @ 2.5 m (REFUSAL) - hard solid ground, probable bedrock				902.0
4					901.0
5					900.0
6					

 EBA Engineering Consultants Ltd.	LOGGED BY: JSB	COMPLETION DEPTH: 2.5m
	REVIEWED BY: JRT	COMPLETE: 6/29/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Case Rubber Tired Backhoe		W14101178.002-TP20	
near Keno City, YT		7086798N; 483942E; Zone 8		ELEVATION: 905.9m	
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400	GROUND ICE DESCRIPTION	Elevation (m)
			PLASTIC M.C. LIQUID 20 40 60 80		
0	GRAVEL (FILL/WASTE ROCK) - sandy, some silt, well graded rounded to angular particles, coarse to medium grained sand, compact, dark, damp, greyish brown				
	BEDROCK - highly fractured, some weathering, friable stratified				
1					905.0
	END OF TESTPIT @ 1.2 m (REFUSAL)				
2					904.0
3					903.0
4					902.0
5					901.0
6					900.0
 EBA Engineering Consultants Ltd.		LOGGED BY: JSB REVIEWED BY: JRT DRAWING NO: Figure 2		COMPLETION DEPTH: 1.2m COMPLETE: 6/29/2009 Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Case Rubber Tired Backhoe		W14101178.002-TP21	
near Keno City, YT		7086816N; 483930E; Zone 8		ELEVATION: 905.7m	
SAMPLE TYPE		☒ DISTURBED	☐ NO RECOVERY	☒ SPT	☐ A-CASING
BACKFILL TYPE		☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
				☐ SHELBY TUBE	☐ CORE
				☐ DRILL CUTTINGS	☐ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)
			POCKET PEN. (kPa)			
			100	200		
			300	400		
0	GRAVEL (FILL/WASTE ROCK) - sandy, trace of silt, well graded angular gravel, coarse to medium grained sand, compact, mottled reddish brown and grey BEDROCK - moderately weathered, highly fractured, friable to competent particles					905.0
1	- becomes more competent with depth					904.0
2	END OF TESTPIT @ 2.0 m (REFUSAL)					903.0
3						902.0
4						901.0
5						900.0
6						

 EBA Engineering Consultants Ltd.	LOGGED BY: JSB	COMPLETION DEPTH: 2m
	REVIEWED BY: JRT	COMPLETE: 6/29/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Case Rubber Tired Backhoe		W14101178.002-TP22	
near Keno City, YT		7086801N; 483914E; Zone 8		ELEVATION: 904.8m	
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	BEDROCK - highly fractured, weathered, friable to competent particles, blocky stratigraphy				904.0
1	- becomes more competent with depth				
	END OF TESTPIT @ 1.2 m (REFUSAL)				903.0
2					902.0
3					901.0
4					900.0
5					899.0
6					
EBA Engineering Consultants Ltd.		LOGGED BY: JSB		COMPLETION DEPTH: 1.2m	
		REVIEWED BY: JRT		COMPLETE: 6/29/2009	
		DRAWING NO: Figure 2		Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Case Rubber Tired Backhoe		W14101178.002-TP23	
near Keno City, YT		7086808N; 483906E; Zone 8		ELEVATION: 904.6m	
SAMPLE TYPE		☒ DISTURBED	☐ NO RECOVERY	☒ SPT	☐ A-CASING
BACKFILL TYPE		☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
				☐ SHELBY TUBE	☐ CORE
				☐ DRILL CUTTINGS	☐ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)
			POCKET PEN. (kPa)			
			PLASTIC	LIQUID		
			M.C.			
0	ORGANIC ROOT MATERIAL					
	GRAVEL (FILL) - sandy, trace of silt, well graded angular gravel, coarse to medium grained gravel, compact, damp, dark brown and grey - cobbles, some boulders below 0.3 m					904.0
1	becomes coarser with depth					
						903.0
2						
						902.0
3	END OF TESTPIT @ 2.5 m NOTE: Possible bedrock, but could not confirm due to sloughing sidewalls of testpit					
						901.0
4						
						900.0
5						
						899.0
6						



EBA Engineering Consultants Ltd.

LOGGED BY: JSB

REVIEWED BY: JRT

DRAWING NO: Figure 2

COMPLETION DEPTH: 2.5m

COMPLETE: 6/29/2009

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Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Case Rubber Tired Backhoe		W14101178.002-TP24	
near Keno City, YT		7086827N; 483902E; Zone 8		ELEVATION: 904m	
SAMPLE TYPE		☐ DISTURBED	☐ NO RECOVERY	☐ SPT	☐ A-CASING
BACKFILL TYPE		☐ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ DRILL CUTTINGS	☐ SAND	☐ SHELBY TUBE	☐ CORE

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)
			POCKET PEN. (kPa)			
			100	200		
			300	400		
0	ORGANIC ROOT MATERIAL					904.0
	GRAVEL (FILL/WASTE ROCK) - sandy, trace to some silt, well graded sub-rounded and angular particles, compact, damp, dark brownish and grey					
1						903.0
2	- organic layer, rootlets, black					902.0
	GRAVEL - sandy, some silt, well graded sub-rounded gravel, medium to coarse grained sand, damp, brownish grey					
	BEDROCK - friable, weathered					
	- becomes more competent with depth					
3	END OF TESTPIT @2.8 m (REFUSAL)					901.0
4						900.0
5						899.0
6						898.0

 EBA Engineering Consultants Ltd.	LOGGED BY: JSB	COMPLETION DEPTH: 2.8m
	REVIEWED BY: JRT	COMPLETE: 6/29/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP25	
near Keno City, YT		7086790N; 483933E; Zone 8		ELEVATION: 904.5m	
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400	GROUND ICE DESCRIPTION	Elevation (m)
			PLASTIC M.C. LIQUID 20 40 60 80		
0	GRAVEL - sandy, some silt, compact, damp, sub-rounded to sub-angular, well graded, brown				904.0
1					903.0
2	SILT (TILL) - gravelly, sandy, trace clay, firm (est.), organic inclusions, damp, olive grey				902.0
3	EOH - Target Depth				901.0
4					900.0
5					899.0
6					

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP26	
near Keno City, YT		7086788N; 483951E; Zone 8		ELEVATION: 903.4m	
SAMPLE TYPE		☐ DISTURBED	☐ NO RECOVERY	☐ SPT	☐ A-CASING
BACKFILL TYPE		☐ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ DRILL CUTTINGS	☐ SAND	☐ CORE	

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)	
			POCKET PEN. (kPa)				
			PLASTIC	LIQUID			
			M.C.				
0	PEAT - amorphous, granular, roots, organics, black		20	40	60	80	903.0
	SILT (TILL) - gravelly, sandy, trace clay, firm, organic inclusions, damp, olive grey						
1	GRAVEL - sandy, some silt, compact, sub-rounded to sub-angular, brown						
	EOH - Target Depth						902.0
2							901.0
3							900.0
4							899.0
5							898.0
6							

 EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 1.2m
	REVIEWED BY: JRT	COMPLETE: 7/16/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP27	
near Keno City, YT		7086783N; 483947E; Zone 8		ELEVATION: 902.9m	
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400	GROUND ICE DESCRIPTION	Elevation (m)
			PLASTIC M.C. LIQUID 20 40 60 80		
0	GRAVEL - sandy, some silt, compact, well graded, sub-rounded to sub-angular, damp, brown - becomes silty				902.0
1	- becomes some silt				
2	EOH -Refusal, probable quartzite bedrock				901.0
3					900.0
4					899.0
5					898.0
6					897.0
 EBA Engineering Consultants Ltd.		LOGGED BY: CJD		COMPLETION DEPTH: 1.8m	
		REVIEWED BY: JRT		COMPLETE: 7/16/2009	
		DRAWING NO: Figure 2		Page 1 of 1	

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP28	
near Keno City, YT		7086795N; 483934E; Zone 8		ELEVATION: 903.8m	
SAMPLE TYPE		☒ DISTURBED	☐ NO RECOVERY	☒ SPT	☐ A-CASING
BACKFILL TYPE		☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
				☐ SHELBY TUBE	☐ CORE
				☐ DRILL CUTTINGS	☐ SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)
			POCKET PEN. (kPa)			
			100	200		
			300	400		
0	GRAVEL - sandy, some silt, compact, well graded, sub-rounded to sub-angular, damp, brown					903.0
1	EOH - Target Depth					902.0
2						901.0
3						900.0
4						899.0
5						898.0
6						

 EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 1m
	REVIEWED BY: JRT	COMPLETE: 7/16/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP29	
near Keno City, YT		7086797N; 483912E; Zone 8		ELEVATION: 902.3m	
SAMPLE TYPE		☒ DISTURBED	☐ NO RECOVERY	☐ SPT	☐ A-CASING
BACKFILL TYPE		☐ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ DRILL CUTTINGS	☐ SAND	☐ CORE	

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	STANDARD PENETRATION (N)		GROUND ICE DESCRIPTION	Elevation (m)	
			POCKET PEN. (kPa)				
			PLASTIC	LIQUID			
			M.C.				
0	GRAVEL - sandy, some silt, compact, well graded, sub-rounded to sub-angular, damp, brown		20	40	60	80	902.0
	Refusal, probable weathered quartzite bedrock						
1							901.0
2							900.0
3							899.0
4							898.0
5							897.0
6							

 EBA Engineering Consultants Ltd.	LOGGED BY: CJD	COMPLETION DEPTH: 0.5m
	REVIEWED BY: JRT	COMPLETE: 7/16/2009
	DRAWING NO: Figure 2	Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.	
Mill Building		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP30	
near Keno City, YT		N; E; Zone 8		ELEVATION: 903.2m	
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400	GROUND ICE DESCRIPTION	Elevation (m)
			PLASTIC M.C. LIQUID 20 40 60 80		
0	GRAVEL - sandy, some silt, compact, well graded, sub-rounded to sub-angular, damp, brown				903.0
1	SILT (TILL) - gravelly, sandy, trace clay, firm, organic inclusions, damp, olive grey				902.0
2	EOH - Target Depth Note: End of bedrock knob				901.0
3					900.0
4					899.0
5					898.0
6					



EBA Engineering Consultants Ltd.

LOGGED BY: CJD

REVIEWED BY: JRT

DRAWING NO: Figure 2

COMPLETION DEPTH: 1.3m

COMPLETE: 7/16/2009

Page 1 of 1

Flame and Moth Mill & DSTF		CLIENT: Alexco		PROJECT NO. - TESTPIT NO.		
Borrow Pit		EXCAVATOR: Hitachi 270 LC		W14101178.002-TP31		
near Keno City, YT		7086832N; 483866E; Zone 8		ELEVATION: 903.9m		
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	STANDARD PENETRATION (N) 20 40 60 80 POCKET PEN. (kPa) 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	GROUND ICE DESCRIPTION	Elevation (m)
0	GRAVEL - cobbly, sandy, some to trace silt, compact, well graded, sub-rounded to sub-angular, damp, brown					
1			1			903.0
2	EOH - Target Depth					902.0
3						901.0
4						900.0
5						899.0
6						898.0
 EBA Engineering Consultants Ltd.		LOGGED BY: CJD REVIEWED BY: JRT DRAWING NO: Figure 2		COMPLETION DEPTH: 2m COMPLETE: 7/16/2009 Page 1 of 1		

APPENDIX B

APPENDIX B TEST RESULTS

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

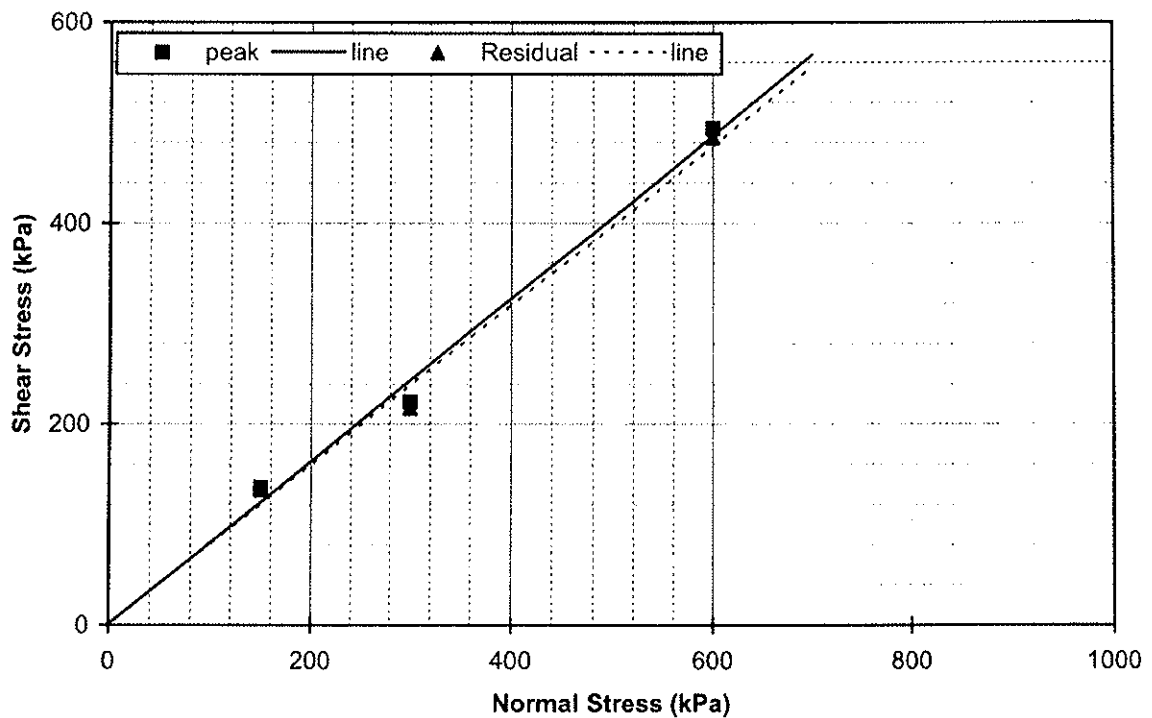
Summary of Direct Shear Test Results

Project : Flame and Moth BSTF Drilling and Design

Project No. : W14101178.003

Test Hole : BH11-
BH23 Depth: 0.7-2.9 m

Date : 09-11-03



Inferred Shear Strength Parameters :-

	Cohesion Intercept (kPa)	Inferred Angle of Shearing Resistance (Degrees)
Peak Strength	1.0	39.0
Residual Strength	0.5	38.5



EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003

Borehole No.: ~~17~~ 23

Date Tested: 09-10-19

Depth (m): 0.7-0.9

Test Number: DS-5

Initial Sample Conditions

Moisture Content (%): 59.2

Wet Density (Mg/m^3): 1.401

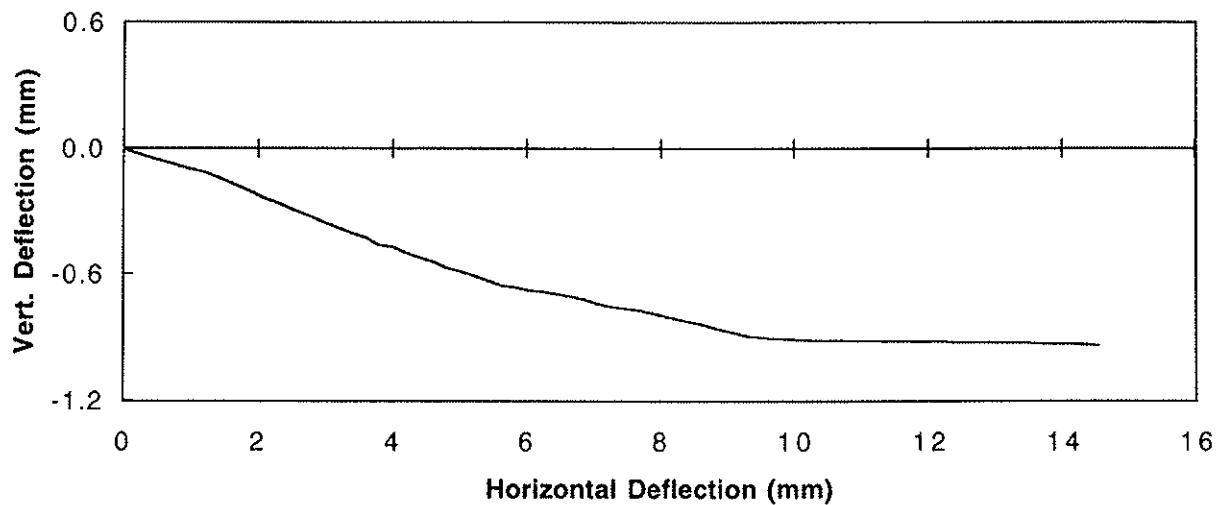
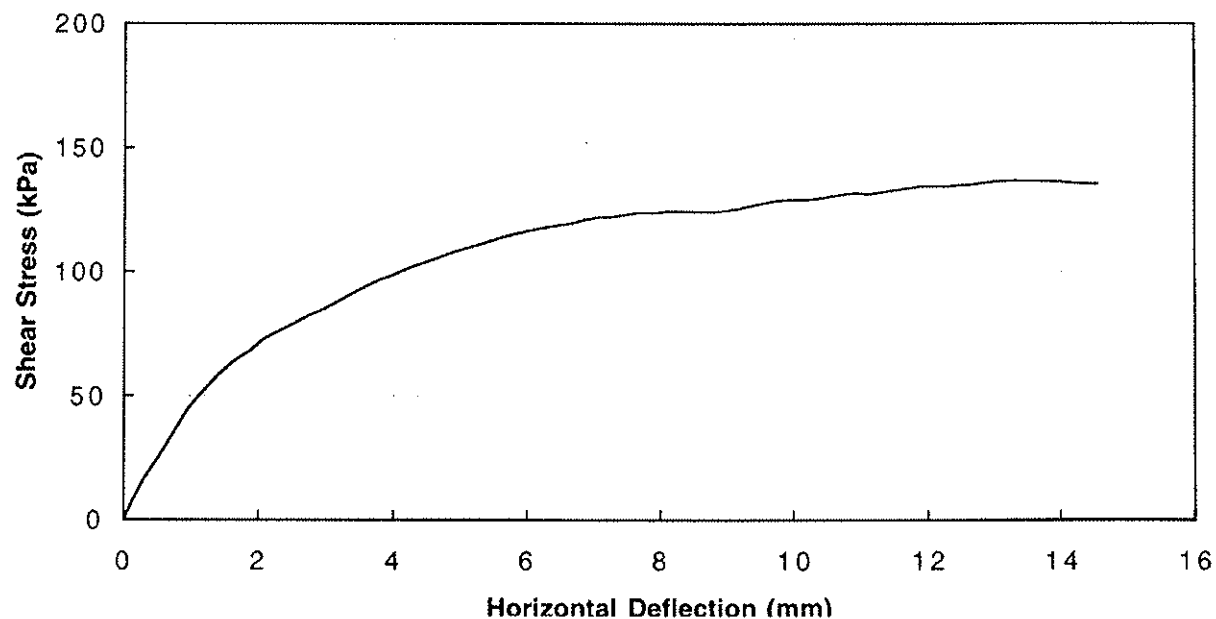
Dry Density (Mg/m^3): 0.880

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	7.90	-0.787	123.7
0.13	-0.019	8.0	8.11	-0.802	124.4
0.30	-0.037	16.7	8.31	-0.818	124.4
0.52	-0.056	25.7	8.59	-0.835	124.2
0.75	-0.076	35.5	8.79	-0.852	124.0
0.96	-0.095	44.9	8.97	-0.867	124.6
1.19	-0.114	52.2	9.15	-0.882	125.4
1.41	-0.139	58.4	9.34	-0.897	126.4
1.64	-0.170	64.1	9.76	-0.905	128.8
1.87	-0.203	67.9	9.94	-0.910	128.8
2.09	-0.236	72.9	10.14	-0.913	128.9
2.32	-0.263	76.3	10.36	-0.914	129.5
2.53	-0.295	79.1	10.76	-0.917	131.1
2.76	-0.320	82.4	10.93	-0.918	131.5
2.98	-0.352	84.9	11.13	-0.919	131.3
3.40	-0.402	91.2	11.33	-0.919	132.0
3.60	-0.423	94.2	11.51	-0.920	132.9
3.78	-0.458	96.7	11.89	-0.921	134.4
4.01	-0.471	98.8	12.08	-0.921	134.3
4.21	-0.498	101.3	12.27	-0.922	134.4
4.61	-0.540	105.1	12.45	-0.923	134.8
4.81	-0.571	107.0	12.63	-0.924	135.1
5.02	-0.588	108.9	12.99	-0.925	136.2
5.22	-0.608	110.5	13.17	-0.924	136.5
5.62	-0.652	113.9	13.32	-0.926	136.7
5.83	-0.662	115.3	13.50	-0.927	136.6
6.03	-0.677	116.6	13.69	-0.929	136.4
6.25	-0.682	117.7	14.01	-0.931	136.2
6.66	-0.706	119.5	14.19	-0.933	135.9
6.86	-0.719	120.9	14.37	-0.936	135.6
7.05	-0.739	122.0	14.55	-0.938	135.3
7.26	-0.755	122.2			
7.69	-0.770	123.8			

EBA Engineering Consultants Ltd.

Direct Shear Test

Peak Stress = 137 kPa



Borehole Number: F23
Depth (m): 0.7-0.9
Normal Stress(kPa): 150
Displ. Rate(mm/min.): 0.005
Test No.: DS-5

EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003

Date Tested: 09-10-19

Borehole No.: 1423

Depth (m): 0.7-0.9

Test Number: DS-6

Initial Sample Conditions

Moisture Content (%): 93.3

Wet Density (Mg/m^3): 1.323

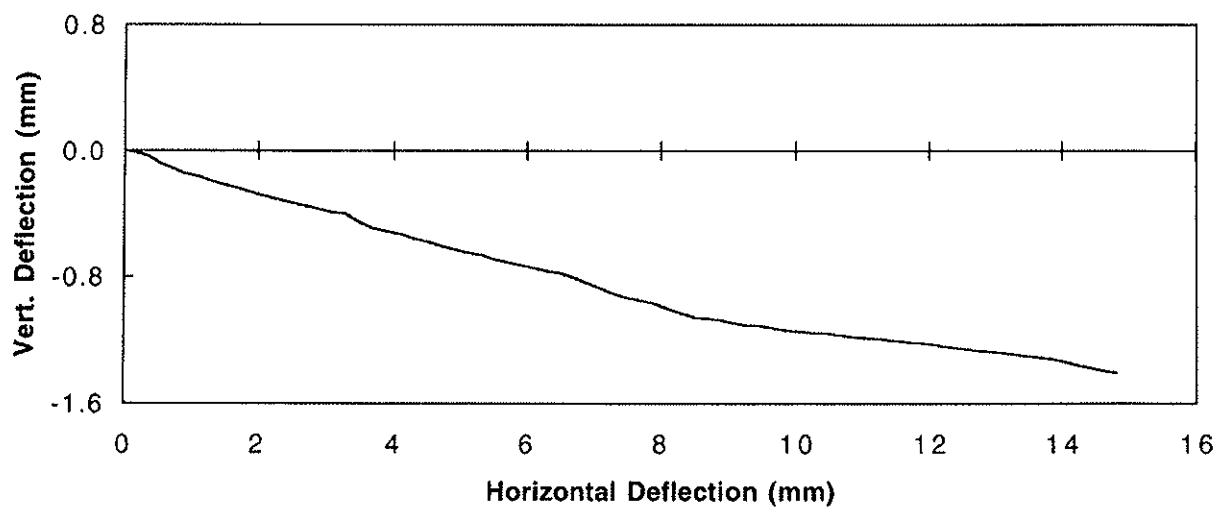
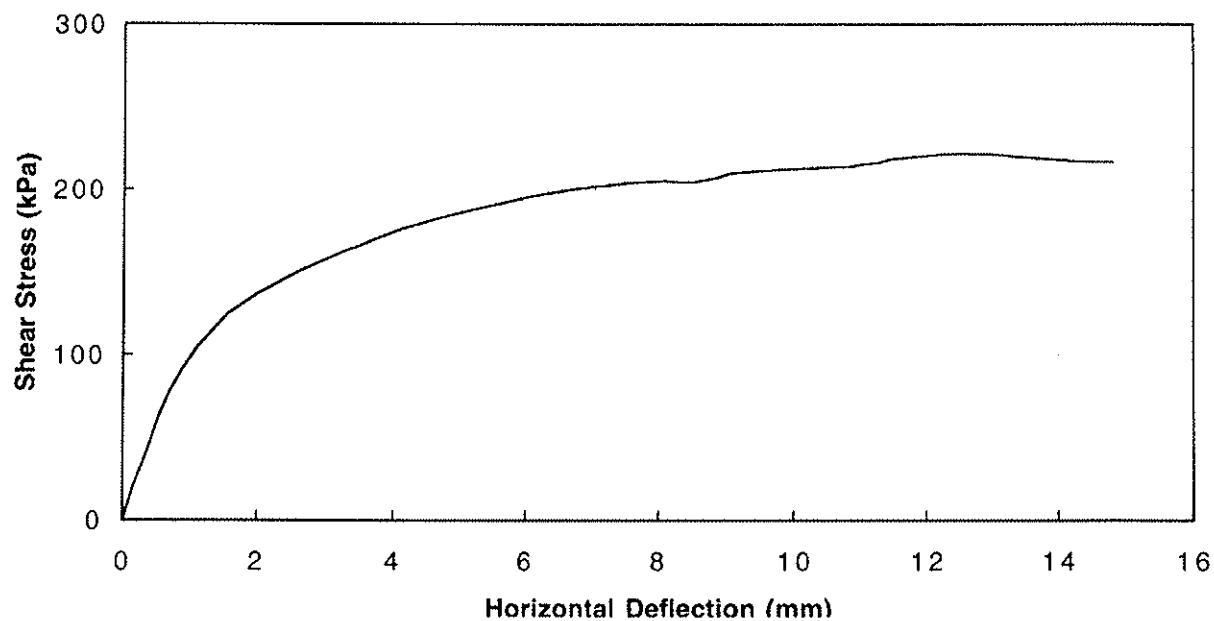
Dry Density (Mg/m^3): 0.685

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	7.90	-0.968	204.7
0.16	-0.010	20.3	8.10	-1.002	205.1
0.35	-0.030	40.1	8.32	-1.033	204.3
0.54	-0.084	62.9	8.53	-1.061	204.4
0.71	-0.108	77.8	8.86	-1.070	207.1
0.90	-0.144	91.6	9.06	-1.089	209.3
1.12	-0.167	105.1	9.25	-1.107	210.1
1.34	-0.198	114.3	9.47	-1.109	211.0
1.57	-0.222	124.7	9.86	-1.141	212.2
1.79	-0.250	131.0	10.06	-1.149	212.4
2.01	-0.276	136.9	10.27	-1.155	212.7
2.22	-0.301	141.6	10.47	-1.159	213.1
2.44	-0.322	146.8	10.87	-1.181	213.7
2.66	-0.347	151.4	11.07	-1.190	215.3
3.07	-0.387	158.8	11.27	-1.194	216.2
3.28	-0.402	162.7	11.46	-1.206	218.1
3.49	-0.454	165.8	11.85	-1.222	219.6
3.69	-0.491	169.2	12.05	-1.229	220.6
4.11	-0.529	175.8	12.23	-1.243	221.3
4.31	-0.558	178.3	12.41	-1.250	221.6
4.52	-0.577	180.7	12.79	-1.270	221.4
4.71	-0.605	182.8	12.98	-1.278	221.2
5.11	-0.643	186.8	13.17	-1.285	220.8
5.31	-0.659	188.7	13.35	-1.297	219.8
5.50	-0.688	190.5	13.54	-1.305	219.3
5.70	-0.708	192.2	13.91	-1.325	218.4
6.11	-0.744	195.8	14.09	-1.344	218.0
6.30	-0.766	197.3	14.27	-1.363	217.1
6.50	-0.776	198.5	14.43	-1.378	216.8
6.68	-0.803	199.9	14.60	-1.393	216.6
7.08	-0.868	201.8	14.81	-1.409	216.3
7.27	-0.901	202.7			
7.50	-0.934	203.6			

EBA Engineering Consultants Ltd.

Direct Shear Test

Peak Stress = 222 kPa



Borehole Number: 123
Depth (m): 0.7-0.9
Normal Stress(kPa): 300
Displ. Rate(mm/min.): 0.005
Test No.: DS-6

EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003

Date Tested: 09-10-22

Borehole No.: ~~1123~~

Depth (m): 2.7-2.9

Test Number: DS-7

Initial Sample Conditions

Moisture Content (%): 17.3

Wet Density (Mg/m^3): 2.084

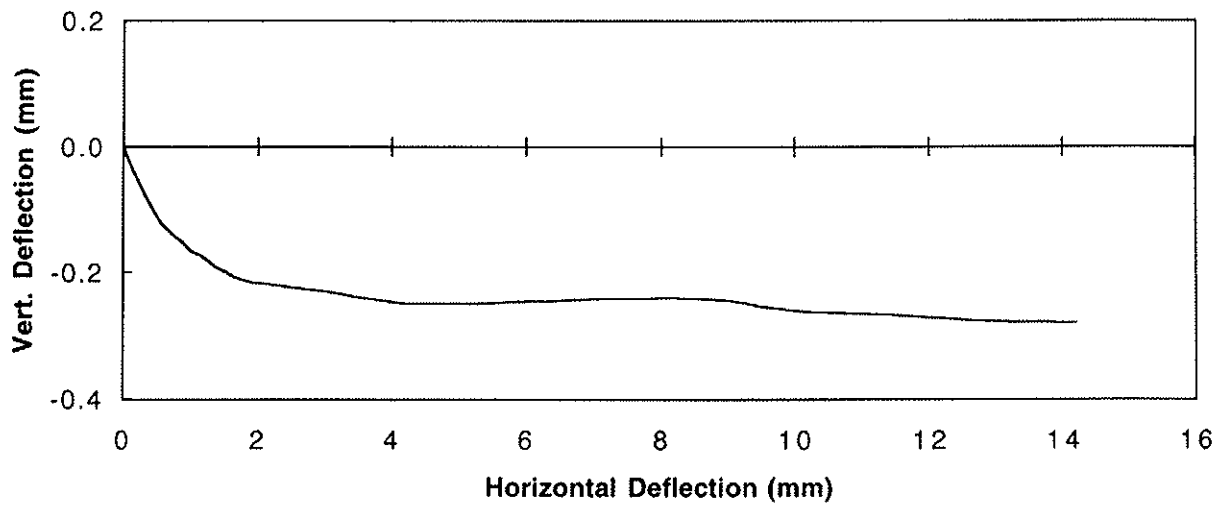
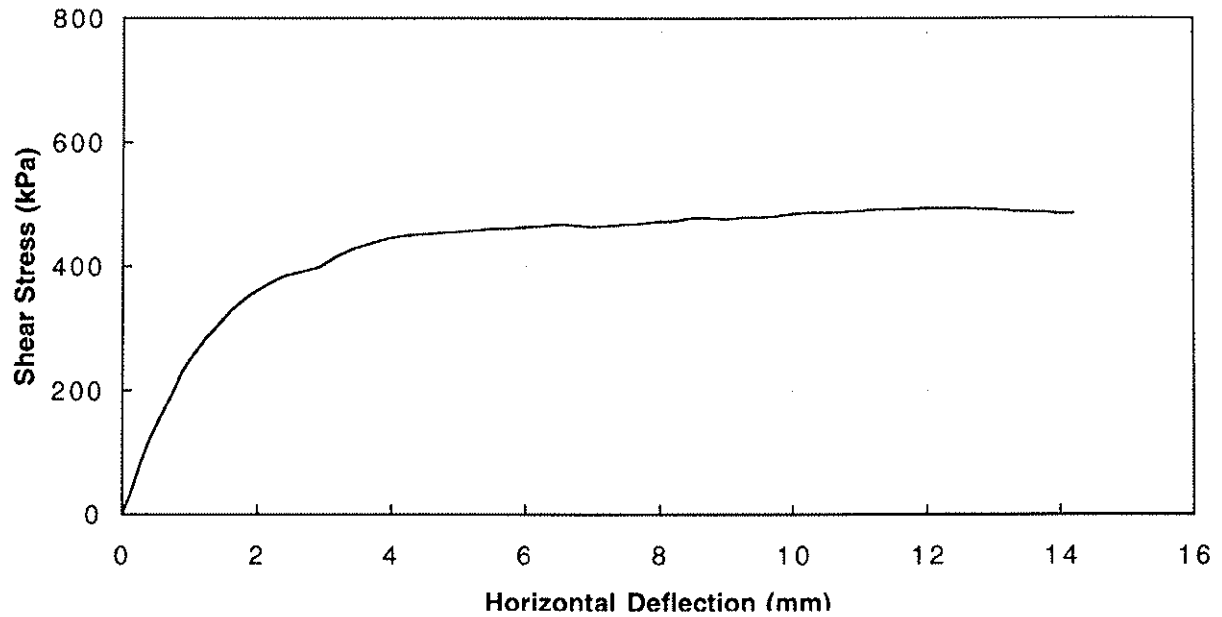
Dry Density (Mg/m^3): 1.776

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	6.98	-0.242	463.0
0.13	-0.033	34.0	7.23	-0.241	465.5
0.27	-0.065	81.3	7.48	-0.241	466.8
0.41	-0.093	121.0	7.74	-0.241	468.9
0.57	-0.122	157.9	7.97	-0.240	472.4
0.76	-0.142	197.0	8.23	-0.240	472.9
0.88	-0.151	228.6	8.47	-0.241	477.6
1.01	-0.166	251.0	8.74	-0.242	478.1
1.14	-0.172	269.6	9.00	-0.244	475.8
1.26	-0.181	284.9	9.24	-0.247	478.3
1.37	-0.191	298.8	9.50	-0.253	479.2
1.51	-0.198	315.8	9.74	-0.257	481.2
1.64	-0.207	330.5	10.00	-0.260	484.4
1.89	-0.215	353.4	10.24	-0.262	486.2
2.15	-0.218	371.0	10.50	-0.263	487.1
2.40	-0.221	384.1	10.75	-0.264	487.8
2.67	-0.226	391.5	10.99	-0.264	489.5
2.92	-0.229	398.2	11.24	-0.266	491.0
3.18	-0.233	415.3	11.47	-0.267	491.9
3.45	-0.238	428.5	11.71	-0.269	492.7
3.70	-0.242	437.3	11.95	-0.270	493.3
3.96	-0.246	445.0	12.18	-0.272	493.8
4.21	-0.250	449.9	12.39	-0.274	493.5
4.47	-0.250	451.6	12.62	-0.275	493.1
4.73	-0.250	453.2	12.85	-0.276	492.4
4.97	-0.250	455.3	13.07	-0.277	491.3
5.23	-0.250	457.2	13.30	-0.278	490.0
5.47	-0.248	460.5	13.54	-0.279	488.5
5.74	-0.247	459.9	13.76	-0.279	487.2
6.00	-0.246	462.9	13.97	-0.279	486.1
6.24	-0.245	464.3	14.21	-0.279	485.4
6.48	-0.244	466.7			
6.73	-0.243	466.1			

EBA Engineering Consultants Ltd.

Direct Shear Test

Peak Stress = 494 kPa



Borehole Number: 4423
Depth (m): 2.7-2.9
Normal Stress(kPa): 600
Displ. Rate(mm/min.): 0.012
Test No.: DS-7

SAMPLE INFORMATION

Project: Flame & Moth BSTF Drilling and Borehole Number: #23

Address: _____ Design Depth: 0.7 - 0.9 m

Test Number: TS-1

Project Number: W14101178.003

Sample Description: _____

Date Tested: 09/10/15 By: S.K.

Test Apparatus: Thaw Strain

Machine Number: 89128

Rate of Strain: _____ mm% / minute

Normal Stress: 150 kPa

Cell Pressure: _____ kPa

Back Pressure: _____ kPa

Head Differential: _____ kPa

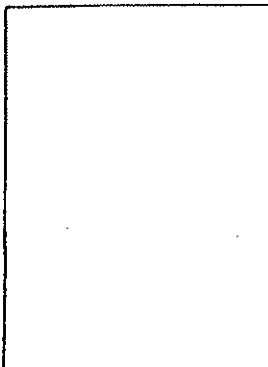
Swelling Pressure: _____ kPa

Sample Description		
	Diameter (mm)	Height (mm)
1	75.48	113.36
2	75.29	113.30
3	75.46	113.54
4	75.44	113.86
Mean	75.41	113.52

$$V = 507.02 \text{ cm}^3$$

	Trimming	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		556.20	330.25
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g			
Mass of Moisture g			
Moisture Content %			
Wet Density Mg/m ³		1.097	1.654
Dry Density Mg/m ³			

Sketch and Remarks:



$$150 \text{ kPa} = 21.75 \text{ psi} \times 6.92 \text{ in}^2 = 150.5 \text{ lbs} - \text{hanger}$$

$$= 147.2 \text{ lbs. on hanger}$$

$$\text{Strain} = \frac{\Delta h}{\Sigma H} = \frac{68.81 \text{ mm}}{113.52 \text{ m}} \times 100 = 60.6 \%$$

Angle of Shear: _____

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.



Machine No.: _____

[illegible]

SAMPLE INFORMATION

Project: Flame & Moth BSTF Drilling and Design Borehole Number: #23
 Address: _____ Depth: 2.7 - 2.9 m (3.2 - 3.4 m) marked on bag
 Test Number: TS-2

Project Number: W14101178.003

Date Tested: 09.10.19 By: S.K.

Test Apparatus: Thaw Strain

Machine Number: 89128

Rate of Strain: _____ mm% / minute

Normal Stress: 150 kPa

Cell Pressure: _____ kPa

Back Pressure: _____ kPa

Head Differential: _____ kPa

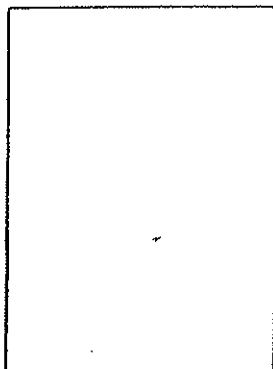
Swelling Pressure: _____ kPa

Sample Description		
	Diameter	Height
1	75.14	114.42
2	75.22	113.30
3	75.16	112.52
4	75.08	113.46
Mean	75.15	113.43

$$V = 503.13 \text{ cm}^3$$

	Trimblings	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		607.85	396.57
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g			
Mass of Moisture g			
Moisture Content %			
Wet Density Mg/m ³		1.208	2.152
Dry Density Mg/m ³			

Sketch and Remarks:



$$\text{Strain} = \frac{\Delta h}{\Sigma H} = \frac{71.08 \text{ mm}}{113.43 \text{ mm}} \times 100 = 63.4 \%$$

Angle of Shear: _____

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Machine No.: _____

[illegible]

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Summary of Direct Shear Test Results

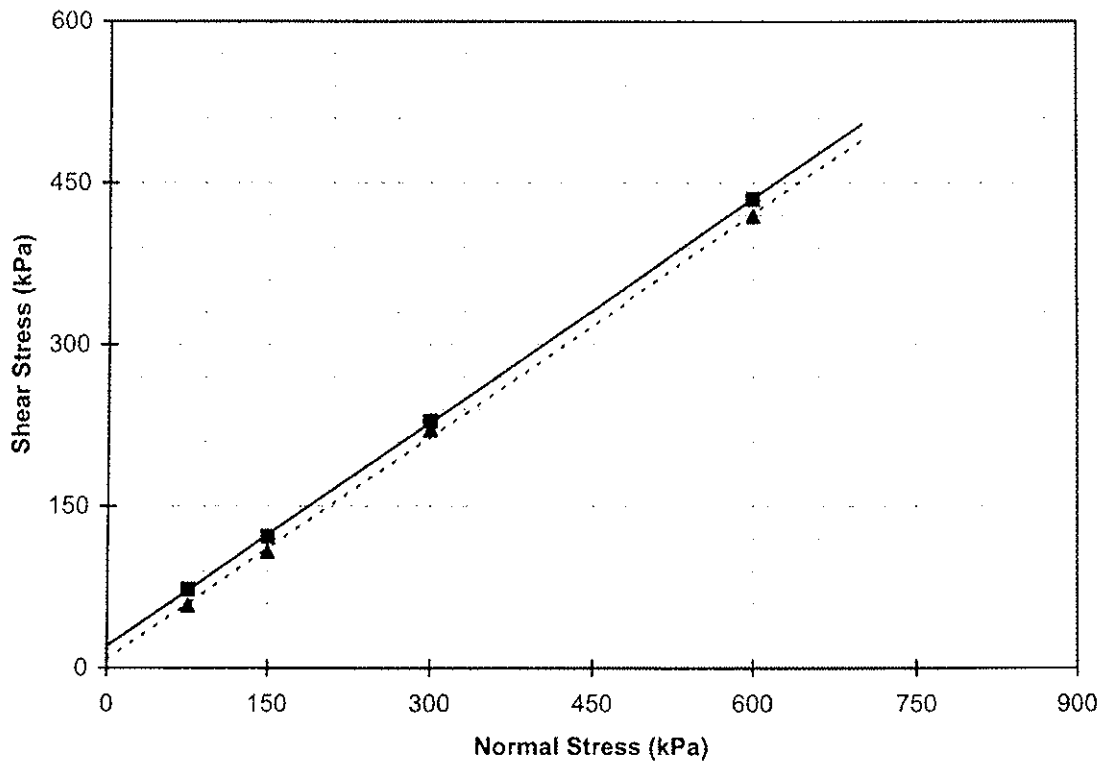
ASTM D 3080-04

Project : Flame and Moth BSTF Drilling and Design

Project No. : W14101178.003

Sample No.: Tailings 001

Date : 09-10-16



Inferred Shear Strength Parameters :-

	Cohesion Intercept (kPa)	Inferred Angle of Shearing Resistance (Degrees)
Peak Strength	20.2	35.2
Residual Strength	7.5	34.7



EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003

Sample No.: Tailings 001

Date Tested: 09-10-09

Test Number: DS-1

Initial Sample Conditions

Moisture Content (%): 16.3

Wet Density (Mg/m^3): 1.959

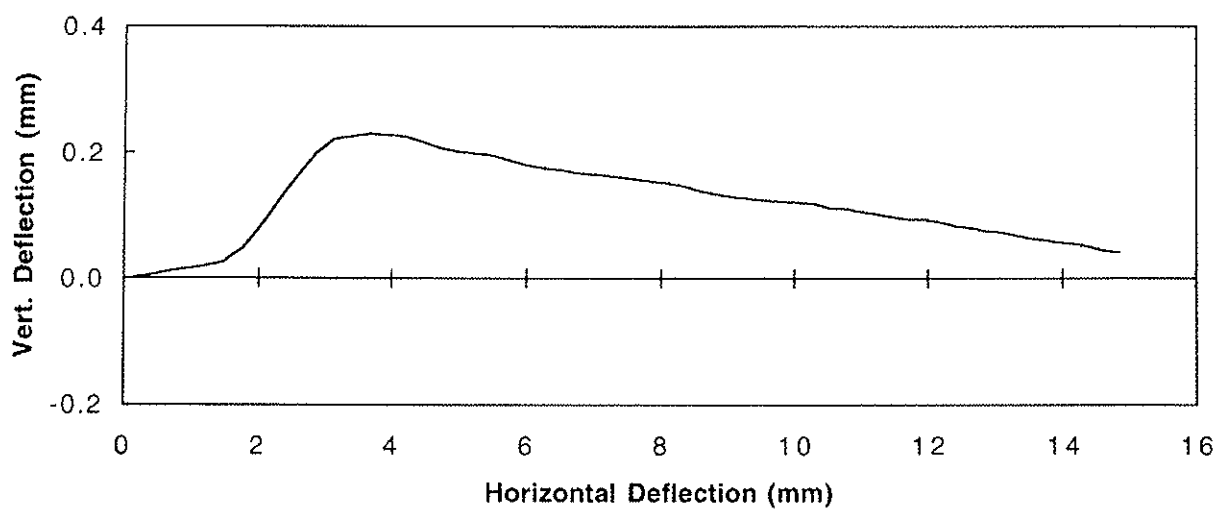
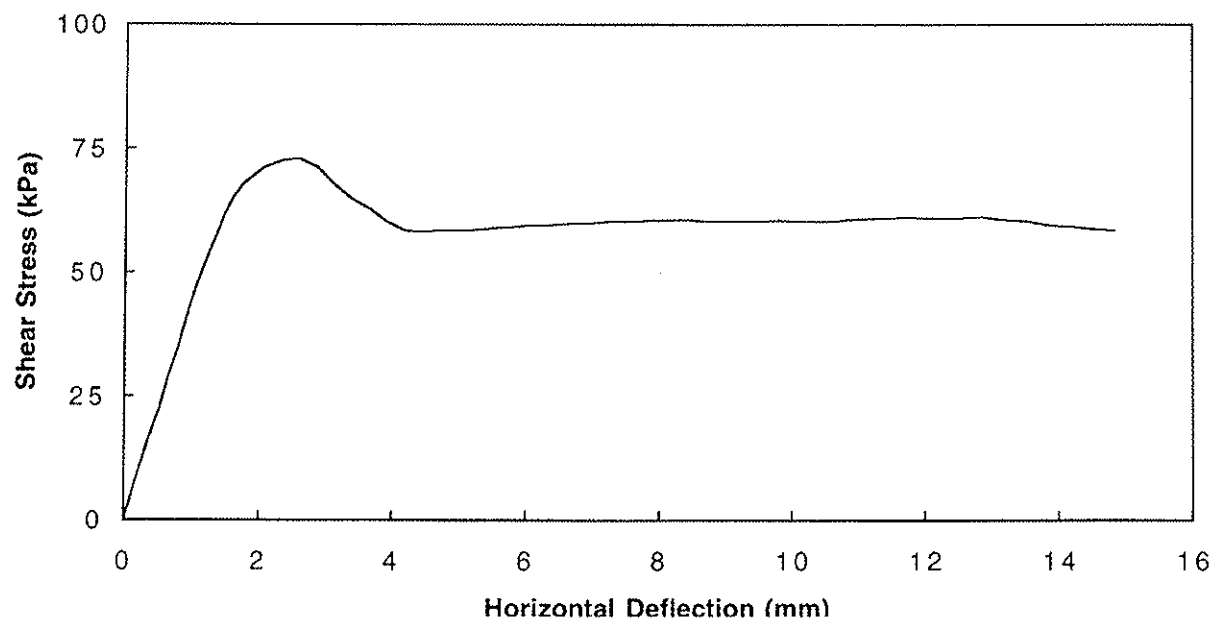
Dry Density (Mg/m^3): 1.683

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	7.57	0.159	60.2
0.18	0.003	8.5	7.82	0.154	60.4
0.38	0.005	17.0	8.07	0.151	60.5
0.52	0.008	22.2	8.33	0.147	60.6
0.64	0.011	28.4	8.56	0.139	60.4
0.79	0.014	34.7	8.80	0.135	60.3
0.93	0.016	41.3	9.06	0.130	60.3
1.07	0.018	47.8	9.31	0.127	60.3
1.22	0.021	53.2	9.55	0.124	60.3
1.36	0.023	57.8	9.82	0.122	60.4
1.48	0.027	61.9	10.30	0.119	60.2
1.61	0.038	65.3	10.53	0.111	60.2
1.75	0.047	67.8	10.78	0.110	60.4
2.06	0.087	71.1	11.01	0.106	60.7
2.33	0.129	72.5	11.26	0.102	60.9
2.60	0.166	72.8	11.50	0.097	61.0
2.87	0.200	71.2	11.74	0.094	61.1
3.14	0.221	67.6	11.98	0.093	60.9
3.41	0.226	64.8	12.22	0.089	60.9
3.67	0.229	62.7	12.43	0.083	60.8
3.92	0.227	60.3	12.66	0.080	61.0
4.19	0.226	58.4	12.87	0.075	61.2
4.45	0.217	58.1	13.10	0.073	60.8
4.71	0.208	58.4	13.31	0.068	60.5
4.98	0.202	58.4	13.53	0.063	60.4
5.24	0.199	58.5	13.76	0.060	59.8
5.50	0.195	58.9	13.98	0.057	59.4
6.01	0.180	59.3	14.20	0.055	59.3
6.27	0.175	59.4	14.42	0.050	58.8
6.53	0.172	59.7	14.62	0.045	58.6
6.77	0.167	59.8	14.85	0.041	58.4
7.04	0.165	60.0			
7.30	0.162	60.3			

EBA Engineering Consultants Ltd.

Direct Shear Test

Peak Stress = 73 kPa



Sample Number: Tailings 001
Normal Stress(kPa): 75
Displ. Rate(mm/min.): 0.012
Test No.: DS-1

SAMPLE INFORMATION

Project: Flame & Moth BSTF Drilling Borehole Number: Tailings 001

Address: _____ Design Depth: _____

Project Number: WK401178.003

Test Number: DS-1

Date Tested: 09.10.09 By: S.K.

Sample Description: _____

Test Apparatus: Direct Shear

Machine Number: 1

Rate of Strain: .012 mm / minute

Normal Stress: 75 kPa

Cell Pressure: _____ kPa

Back Pressure: _____ kPa

Head Differential: _____ kPa

Swelling Pressure: _____ kPa

Sample Description		
	Diameter (mm)	Height (mm)
1		
2		
3		
4		
Mean	63.50	19.06

$\rho_{max} = 1.770 \text{ Mg/m}^3$ @ 16.8 % Opt. m.c.

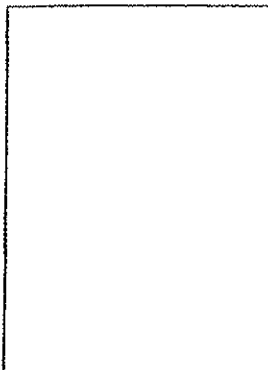
$V = 60.36 \text{ cm}^3$

	Trimblings	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		194.16	(125.24) 129.07
Mass of Dry Soil & Tare g			(101.61) 105.98
Mass of Tare g		75.94	6.68
Mass of Dry Soil g			
Mass of Moisture g			
Moisture Content %		16.35	23.25
Wet Density Mg/m^3		1.959	
Dry Density Mg/m^3		1.683	

8.96
6.65
2.31

95.1 % SPD

Sketch and Remarks:



$75 \text{ kPa} = 10.9 \text{ psi} \times 4.91 \text{ in}^2 = 53.4 \text{ lbs.} - \text{hanger}$
 $= 38.4 \text{ lbs. on hanger}$

Angle of Shear: _____

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EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003

Sample No.: Tailings 001

Date Tested: 09-10-09

Test Number: DS-2

Initial Sample Conditions

Moisture Content (%): 16.8

Wet Density (Mg/m^3): 1.959

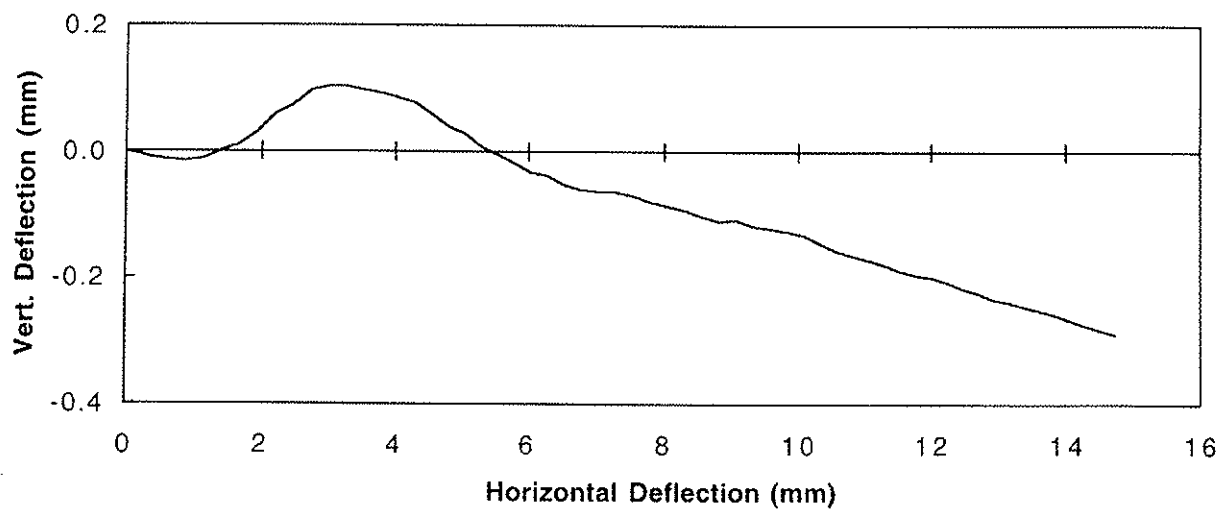
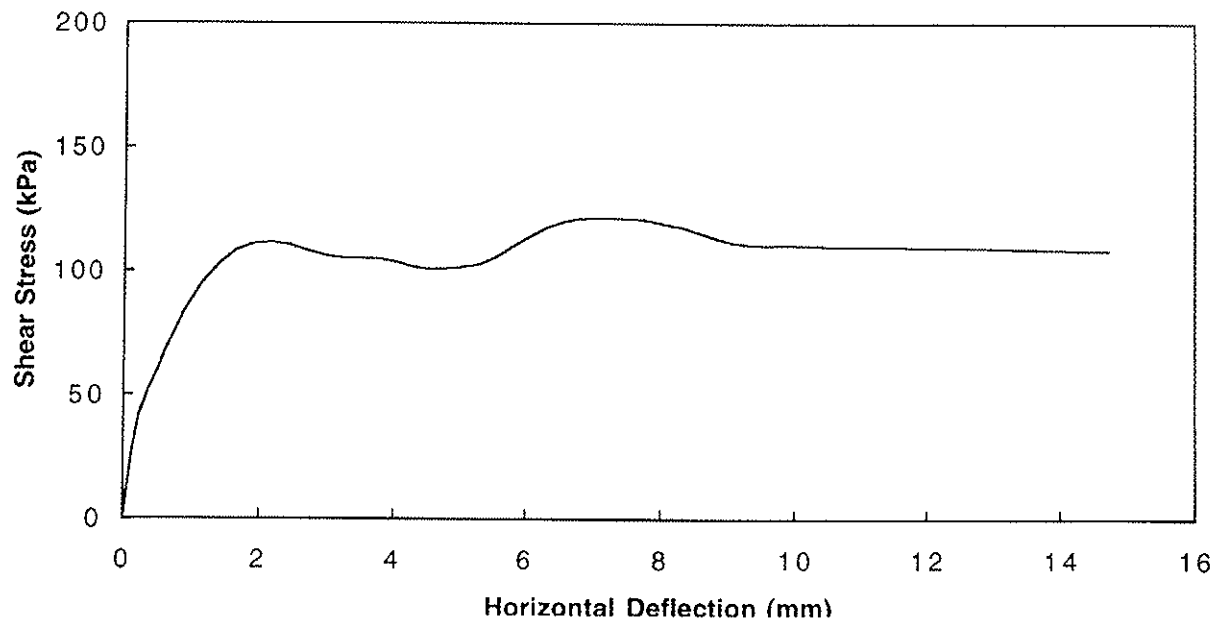
Dry Density (Mg/m^3): 1.678

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	7.55	-0.071	121.2
0.11	-0.003	26.0	7.80	-0.080	120.6
0.23	-0.005	41.4	8.06	-0.086	119.1
0.35	-0.010	50.8	8.32	-0.093	117.9
0.51	-0.012	60.0	8.57	-0.103	115.6
0.62	-0.014	68.1	8.82	-0.111	113.4
0.75	-0.015	75.7	9.08	-0.109	111.5
0.88	-0.016	83.3	9.34	-0.118	110.7
1.15	-0.012	94.9	9.59	-0.122	110.6
1.41	0.002	103.1	9.85	-0.126	110.8
1.65	0.010	108.2	10.10	-0.133	110.5
1.92	0.029	111.1	10.34	-0.146	110.4
2.19	0.059	111.6	10.58	-0.158	109.9
2.45	0.073	110.4	10.82	-0.165	110.1
2.74	0.097	108.1	11.07	-0.172	109.9
3.00	0.103	106.1	11.31	-0.180	110.1
3.27	0.103	105.2	11.54	-0.190	109.9
3.52	0.098	105.1	11.79	-0.196	109.8
3.79	0.092	105.0	12.03	-0.200	109.6
4.04	0.085	103.7	12.26	-0.207	109.6
4.29	0.077	101.7	12.49	-0.217	109.7
4.55	0.058	100.7	12.71	-0.224	109.4
4.80	0.039	101.0	12.94	-0.234	109.4
5.05	0.027	101.7	13.18	-0.239	109.2
5.29	0.007	102.6	13.41	-0.246	109.0
5.54	-0.005	105.6	13.63	-0.252	108.9
5.78	-0.018	109.7	13.86	-0.259	108.7
6.03	-0.033	113.6	14.08	-0.268	108.7
6.28	-0.039	117.2	14.31	-0.276	108.4
6.53	-0.053	119.7	14.52	-0.283	108.3
6.78	-0.060	121.2	14.72	-0.290	108.2
7.03	-0.064	121.5			
7.30	-0.064	121.4			

EBA Engineering Consultants Ltd.

Direct Shear Test

Peak Stress = 122 kPa



Sample Number: Tailings 001
Normal Stress(kPa): 150
Displ. Rate(mm/min.): 0.012
Test No.: DS-2

SAMPLE INFORMATION

Project: Flame & Moth BSTF Drilling & Borehole Number: Tailings 001

Address: _____ Design Depth: _____

Test Number: DS-2

Project Number: W14101178,003 Sample Description: _____

Date Tested: 09.10.09 By: S.K.

Test Apparatus: Direct Shear

Machine Number: 2

Rate of Strain: .012 mm / minute

Normal Stress: 150 kPa

Cell Pressure: _____ kPa

Back Pressure: _____ kPa

Head Differential: _____ kPa

Swelling Pressure: _____ kPa

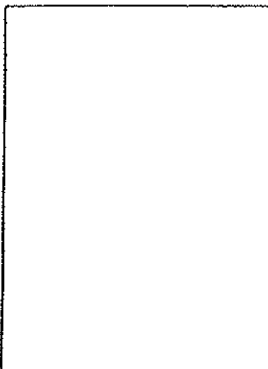
Sample Description		
	Diameter (mm)	Height (mm)
1		
2		
3		
4		
Mean	63.50	19.06

$\rho_{max} = 1.770 \text{ Mg/m}^3 @ 16.8 \% \text{ opt. m.c.}$ $V = 60.36 \text{ cm}^3$

	Trimblings	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		194.18	(125.90) 129.77
Mass of Dry Soil & Tare g			(101.27) 105.69
Mass of Tare g		75.94	6.70
Mass of Dry Soil g			
Mass of Moisture g			
Moisture Content %		16.76	24.33
Wet Density Mg/m^3		1.959	
Dry Density Mg/m^3		1.678	

8.86
6.58
2.28

Sketch and Remarks:



94.8 % SPD

$150 \text{ kPa} = 21.75 \text{ psi} \times 4.91 \text{ in}^2 = 106.8 \text{ lbs.}$
 $= 2.6 \text{ lbs. on Lv. Hanger}$

Angle of Shear: _____

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EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003

Sample No.: Tailings 001

Date Tested: 09-10-09

Test Number: DS-3

Initial Sample Conditions

Moisture Content (%): 16.4

Wet Density (Mg/m^3): 1.959

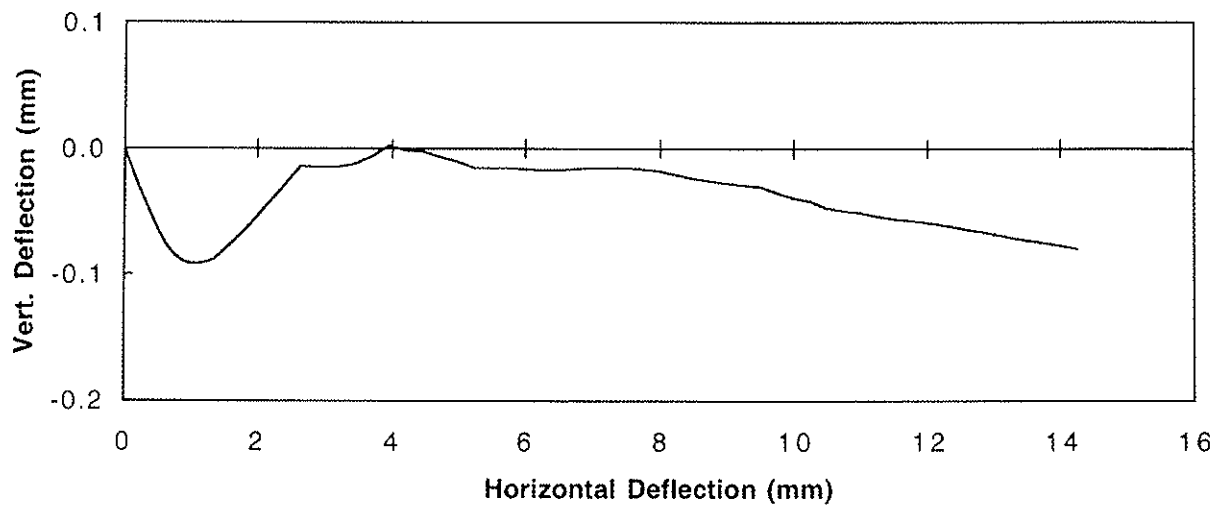
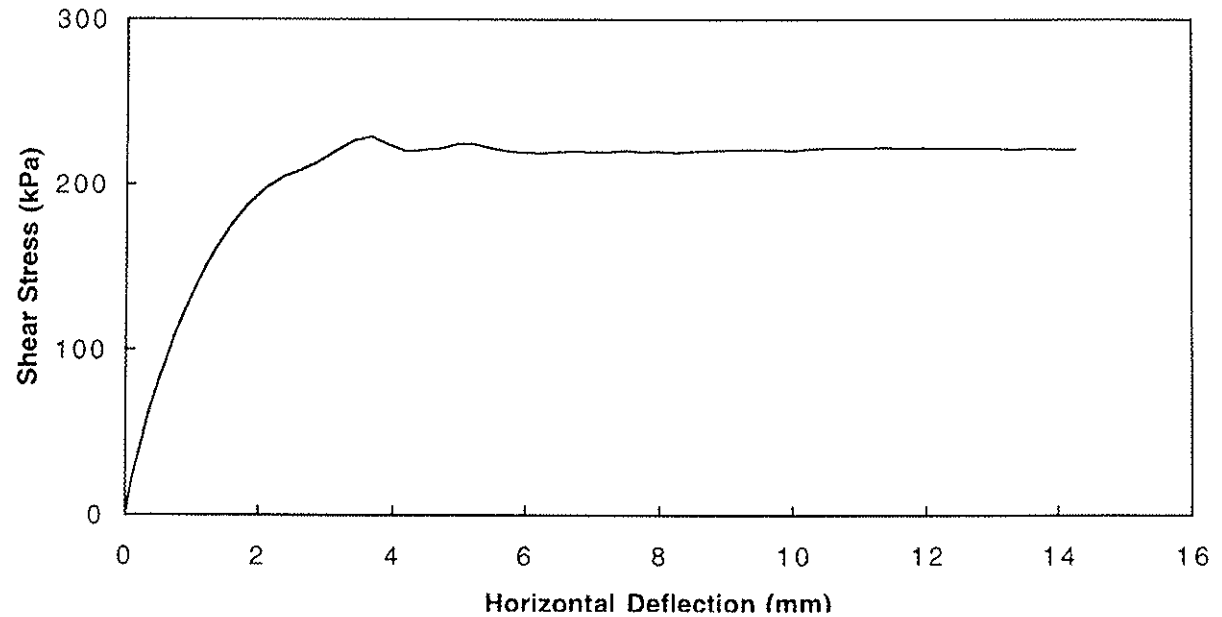
Dry Density (Mg/m^3): 1.682

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	6.98	-0.016	219.8
0.11	-0.015	23.4	7.24	-0.016	219.8
0.22	-0.031	42.1	7.49	-0.016	220.3
0.34	-0.046	61.3	7.74	-0.016	219.8
0.49	-0.063	80.3	7.99	-0.018	219.9
0.63	-0.076	95.1	8.24	-0.021	219.5
0.74	-0.084	109.3	8.50	-0.024	220.2
0.87	-0.089	121.7	8.74	-0.026	220.6
0.99	-0.091	133.0	9.00	-0.027	220.7
1.11	-0.091	142.8	9.26	-0.029	221.2
1.23	-0.090	152.2	9.50	-0.030	221.0
1.35	-0.088	160.5	9.76	-0.035	221.2
1.59	-0.076	175.4	10.01	-0.039	220.5
1.84	-0.063	188.0	10.25	-0.042	221.4
2.11	-0.047	197.8	10.49	-0.047	221.9
2.38	-0.031	204.8	10.75	-0.049	221.9
2.64	-0.014	208.8	10.99	-0.051	221.9
2.90	-0.015	213.8	11.24	-0.054	222.1
3.16	-0.015	220.5	11.47	-0.056	222.4
3.42	-0.013	226.8	11.72	-0.057	221.7
3.69	-0.006	228.9	11.96	-0.059	222.1
3.95	0.002	224.1	12.20	-0.060	221.9
4.20	-0.002	220.0	12.43	-0.062	221.9
4.45	-0.002	220.7	12.65	-0.065	221.6
4.73	-0.007	222.0	12.88	-0.067	221.6
4.97	-0.010	224.5	13.11	-0.069	221.4
5.22	-0.015	224.5	13.34	-0.071	221.3
5.48	-0.015	221.9	13.57	-0.073	221.6
5.76	-0.016	219.9	13.82	-0.075	221.4
5.98	-0.016	219.2	14.04	-0.077	221.3
6.25	-0.017	219.1	14.26	-0.080	221.3
6.49	-0.017	219.6			
6.74	-0.016	219.9			

EBA Engineering Consultants Ltd.

Direct Shear Test

Peak Stress = 229 kPa



Sample Number: Tailings 001
Normal Stress(kPa): 300
Displ. Rate(mm/min.): 0.012
Test No.: DS-3

SAMPLE INFORMATION

Project: Flame & Moth BSTF Drilling & Design Borehole Number: Tailings 001

Address: _____ Depth: _____

Project Number: W/14101178.003 Test Number: DS-3

Date Tested: 09.10.09 By: S.K. Sample Description: _____

Test Apparatus: Direct Shear

Machine Number: 3

Rate of Strain: 1.012 mm/min

Normal Stress: 300 kPa

Cell Pressure: _____ kPa

Back Pressure: _____ kPa

Head Differential: _____ kPa

Swelling Pressure: _____ kPa

Sample Description		
	Diameter (mm)	Height (mm)
1		
2		
3		
4		
Mean	63.50	19.06

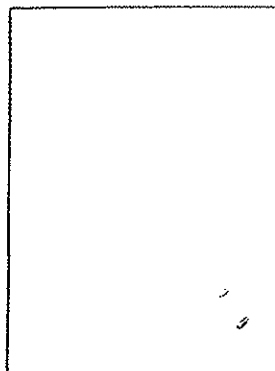
$\rho_{max} = 1.770 \text{ Mg/m}^3$ @ 16.8 % Opt. m.c. $V = 60.36 \text{ cm}^3$

	Trimmlings	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		194.17	(126.65) 129.90
Mass of Dry Soil & Tare g			(101.53) 105.46
Mass of Tare g		75.94	6.67
Mass of Dry Soil g			
Mass of Moisture g			
Moisture Content %		16.45	24.74
Wet Density Mg/m^3		1.959	
Dry Density Mg/m^3		1.682	

9.30
6.56
2.74

95.0 % SPD

Sketch and Remarks:



$300 \text{ kPa} = 43.5 \text{ psi} \times 4.91 \text{ in}^2 = 213.6 \text{ lbs.}$
 $= 13.2 \text{ lbs. on Lv. hanger}$

Angle of Shear: _____

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EBA Engineering Consultants Ltd.

Direct Shear Test

Flame and Moth BSTF Drilling and Design

Project No.: W14101178.003
Date Tested: 09-10-13

Sample No.: Tailings 001
Test Number: DS-4

Initial Sample Conditions

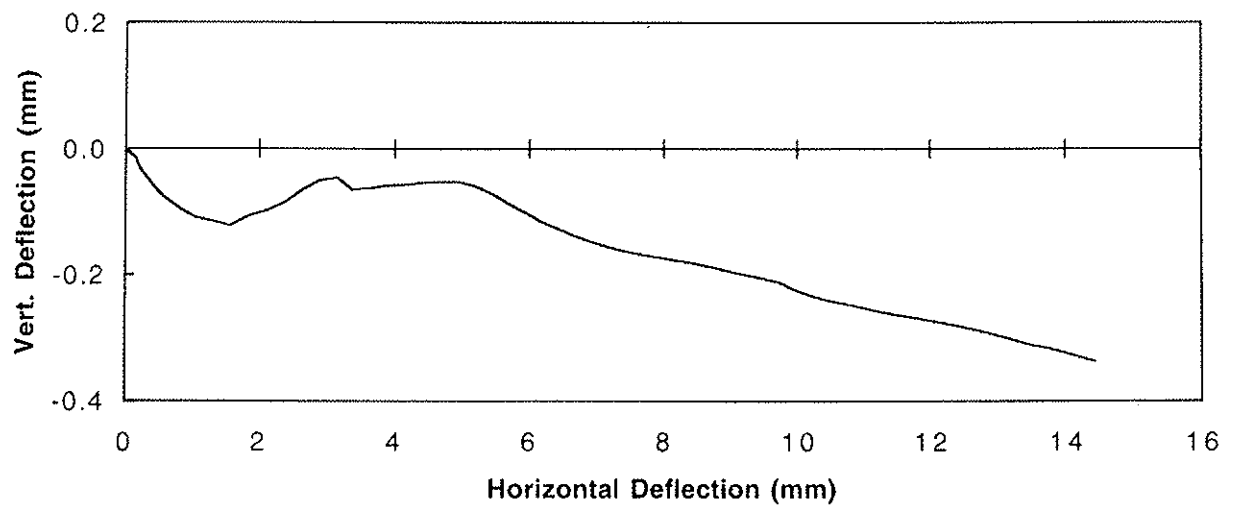
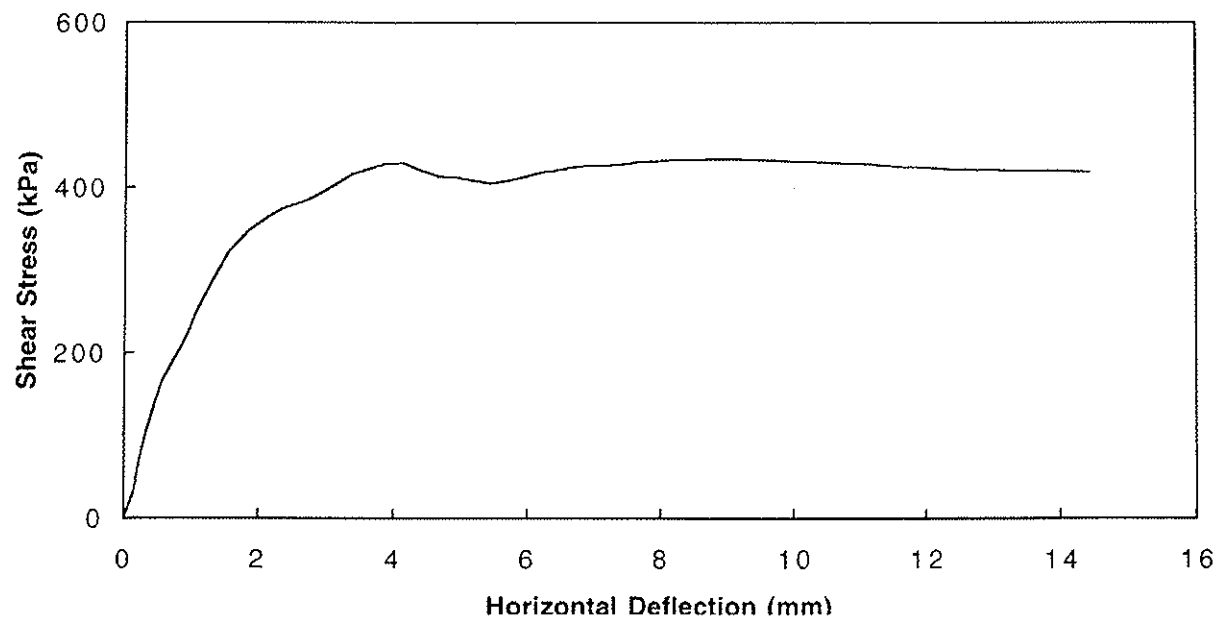
Moisture Content (%): 16.8
Wet Density (Mg/m^3): 1.959
Dry Density (Mg/m^3): 1.678

Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)	Horiz. Disp. (mm)	Vert Disp. (mm)	Shear Stress (kPa)
0.00	0.000	0.0	7.19	-0.157	427.1
0.15	-0.015	34.5	7.45	-0.163	428.8
0.22	-0.031	65.3	7.70	-0.169	431.2
0.33	-0.046	102.4	7.95	-0.173	432.2
0.45	-0.063	136.8	8.19	-0.178	433.6
0.57	-0.076	166.0	8.45	-0.182	433.7
0.71	-0.087	185.3	8.71	-0.187	434.5
0.83	-0.096	203.9	8.97	-0.194	434.6
0.96	-0.104	223.7	9.21	-0.200	434.0
1.07	-0.110	247.3	9.47	-0.205	433.5
1.33	-0.116	287.7	9.72	-0.211	432.9
1.56	-0.122	321.6	9.96	-0.224	431.9
1.85	-0.106	347.1	10.20	-0.233	431.5
2.12	-0.098	363.7	10.46	-0.241	430.5
2.37	-0.086	374.9	10.70	-0.246	430.1
2.64	-0.064	382.8	10.95	-0.252	429.2
2.88	-0.051	391.5	11.19	-0.259	428.8
3.14	-0.047	404.6	11.45	-0.263	426.6
3.37	-0.066	415.2	11.68	-0.267	425.2
3.61	-0.063	422.2	11.93	-0.272	425.0
3.88	-0.059	428.1	12.16	-0.277	423.6
4.15	-0.058	429.8	12.40	-0.281	421.8
4.40	-0.055	421.2	12.64	-0.287	421.9
4.68	-0.053	413.6	12.87	-0.292	421.2
4.95	-0.053	412.1	13.09	-0.300	421.5
5.18	-0.059	408.4	13.31	-0.306	420.5
5.47	-0.072	404.9	13.54	-0.312	420.2
5.69	-0.088	407.9	13.78	-0.318	420.2
5.96	-0.103	412.9	14.01	-0.325	420.2
6.19	-0.117	418.0	14.22	-0.331	419.5
6.46	-0.128	421.5	14.45	-0.337	419.3
6.69	-0.139	425.2			
6.93	-0.148	426.0			

EBA Engineering Consultants, Ltd.

Direct Shear Test

Peak Stress = 435 kPa



Sample Number: Tailings 001
Normal Stress(kPa): 600
Displ. Rate(mm/min.): 0.012
Test No.: DS-4

SAMPLE INFORMATION

Project: Flame & Moth BSTF Drilling & Design

Address: _____

Borehole Number: Tailings 001

Depth: _____

Project Number: W14101178.003

Date Tested: 09.10.13 By: S.K.

Test Apparatus: Direct Shear

Machine Number: 3

Rate of Strain: .012 mm / minute

Normal Stress: 600 kPa

Cell Pressure: _____ kPa

Back Pressure: _____ kPa

Head Differential: _____ kPa

Swelling Pressure: _____ kPa

Test Number: DS-4

Sample Description: _____

Sample Description		
	Diameter (mm)	Height (mm)
1		
2		
3		
4		
Mean	63.50	19.06

$\rho_{max} = 1.770 \text{ Mg/m}^3 @ 16.8 \% \text{ Opt. m.c.}$ $V = 60.36 \text{ cm}^3$

	Trimblings	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		194.19	(126.31) 129.39
Mass of Dry Soil & Tare g			(101.28) 105.05
Mass of Tare g		75.94	6.55
Mass of Dry Soil g			
Mass of Moisture g			
Moisture Content %		16.75	24.71
Wet Density Mg/m^3		1.959	
Dry Density Mg/m^3		1.678	

94.8 % SPD

Sketch and Remarks:



$$600 \text{ kPa} = 87.0 \text{ psi} \times 4.91 \text{ in}^2 = 427.3 \text{ lbs.}$$

$$= 34.5 \text{ lbs. on Lv. hanger}$$

Angle of Shear: _____

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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

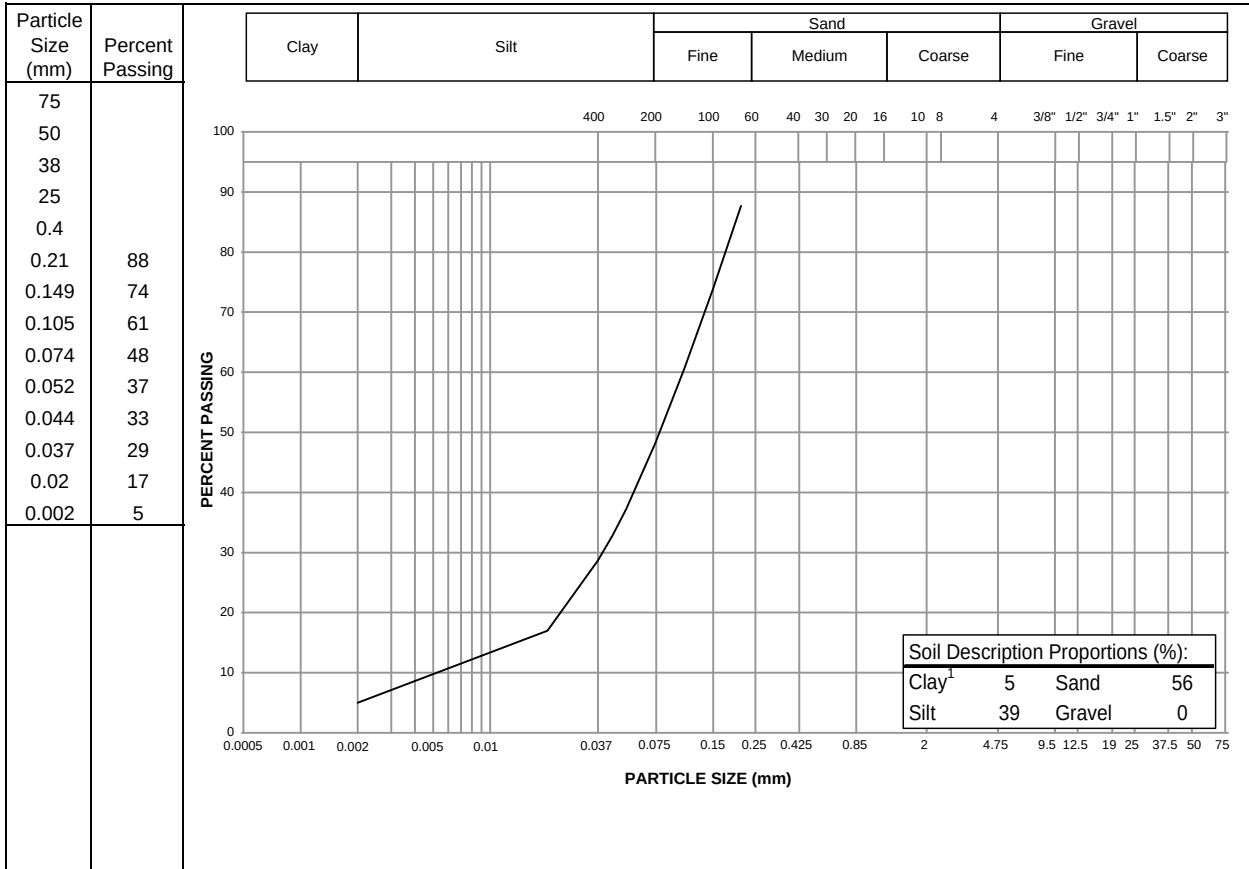
Project: Flame & Moth DSTF Design
 Project No.: W14101178.003
 Site: Bellekeno Mine Mill

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: Provided by PRA
 Sample Loc.:
 Sample Depth:
 Sampling Method:
 Date sampled:

Date Tested: By:
 Soil Description²: Sand and Silt - trace clay

USC Classification: Cu: 10.9
 Cc: 1.6
 Moisture Content: 0.0



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

Specification: _____

Remarks:

Reviewed By: _____

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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

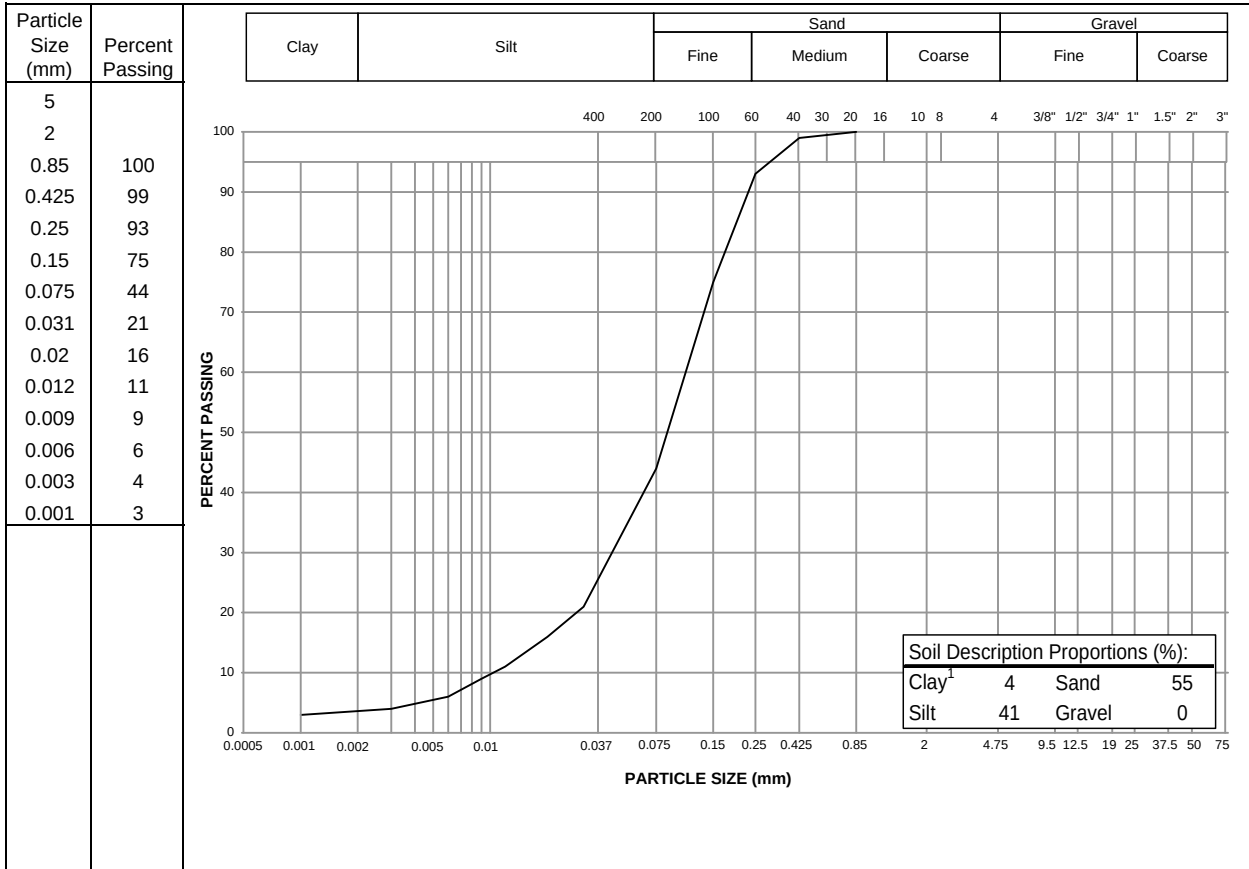
Project: Flame & Moth DSTF Design
 Project No.: W14101178.003
 Site: Bellekeno Mine Mill

Client: Alexco Resource Corp
 Client Rep.:

Material Type:
 Sample No.: Tailings 001
 Sample Loc.: Elsa Tailings Facility
 Sample Depth:
 Sampling Method:
 Date sampled:

Date Tested: Oct. 15, 2009 By:
 Soil Description²: Sand and Silt - trace clay

USC Classification: Cu: 10.8
 Cc: 1.9
 Moisture Content: 0.0



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

Specification: _____

Remarks:

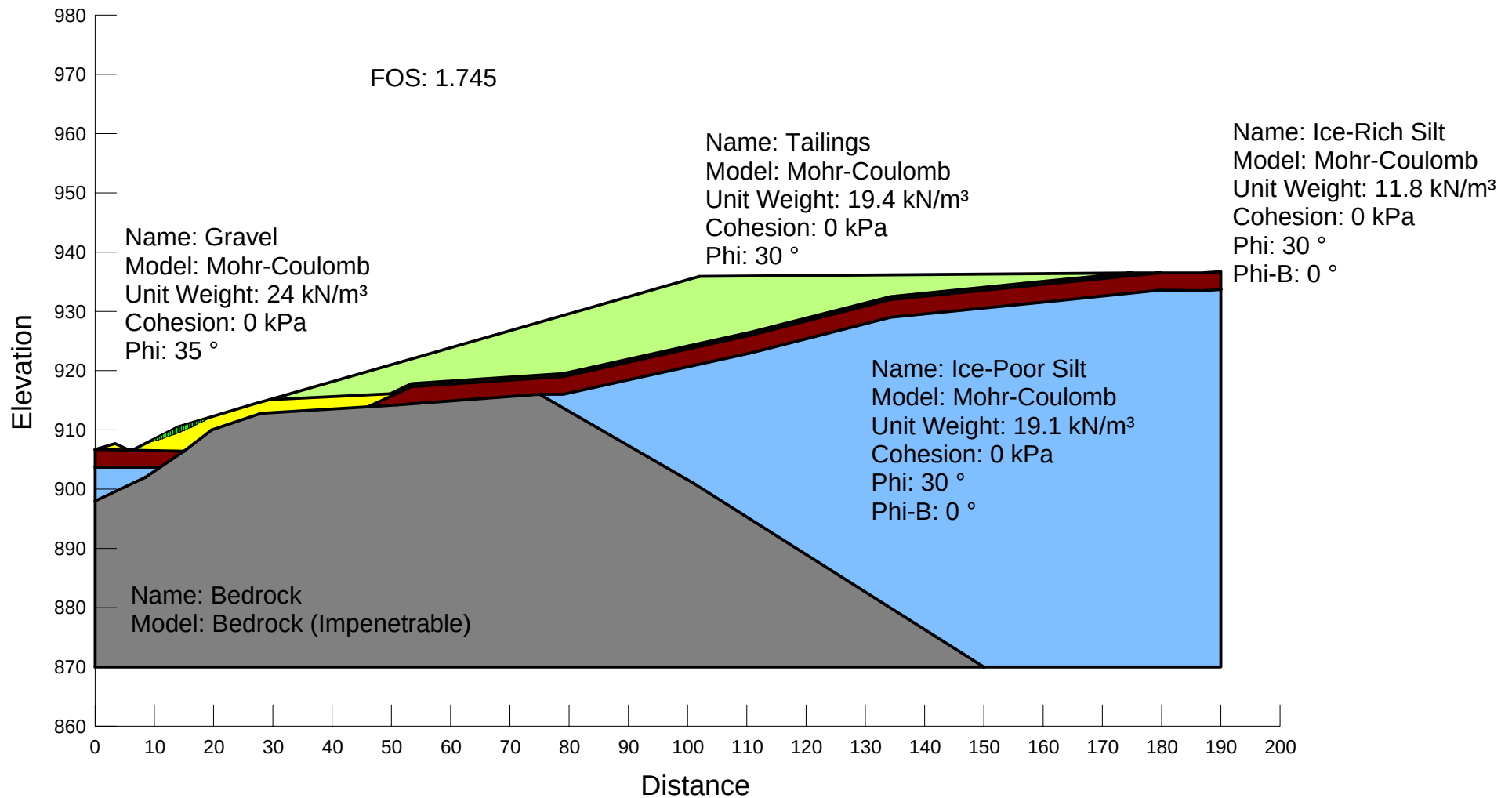
Reviewed By: _____

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

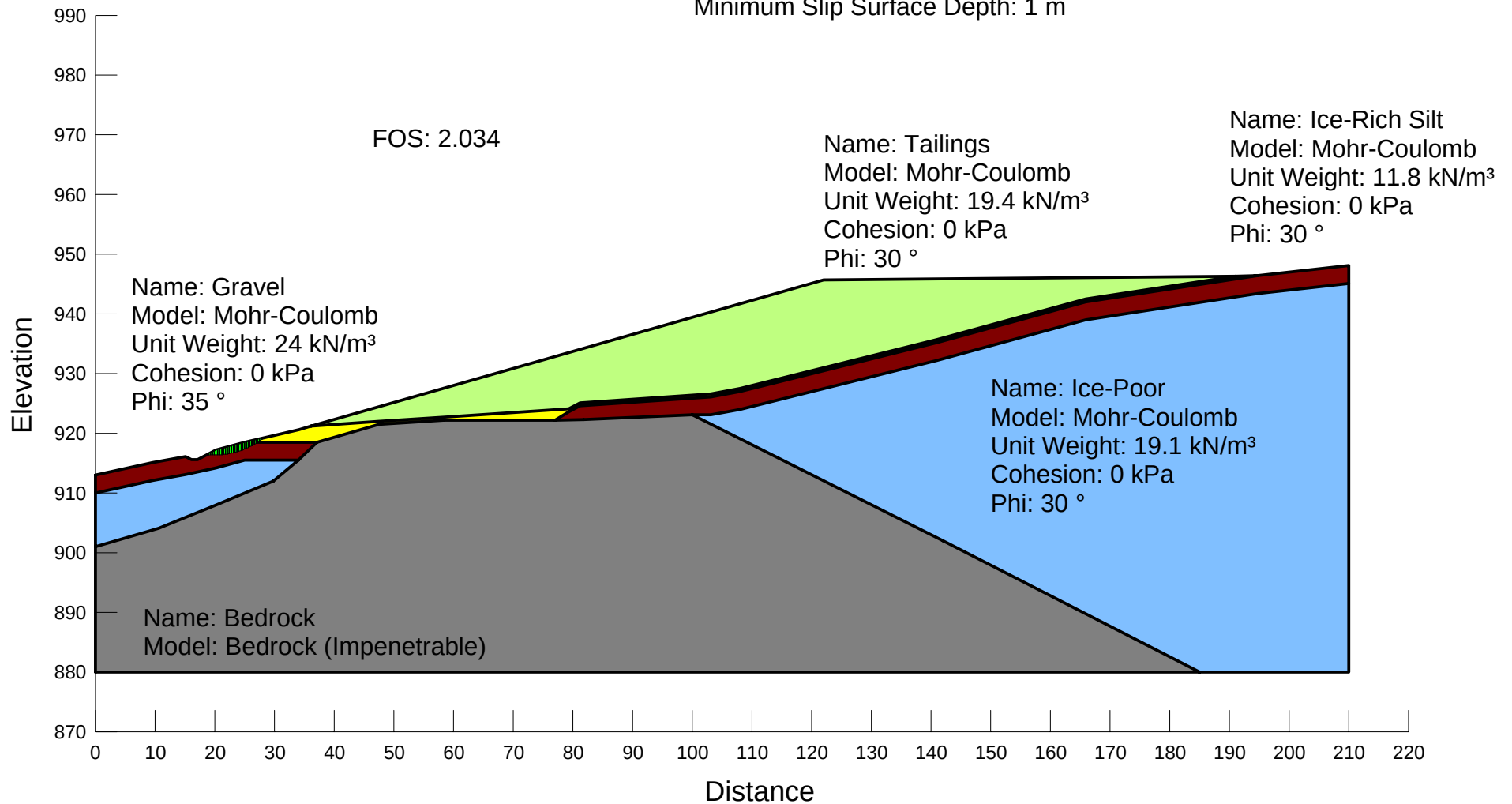
APPENDIX C

APPENDIX C SLOPE STABILITY PLOTS – FULLY FROZEN CASE

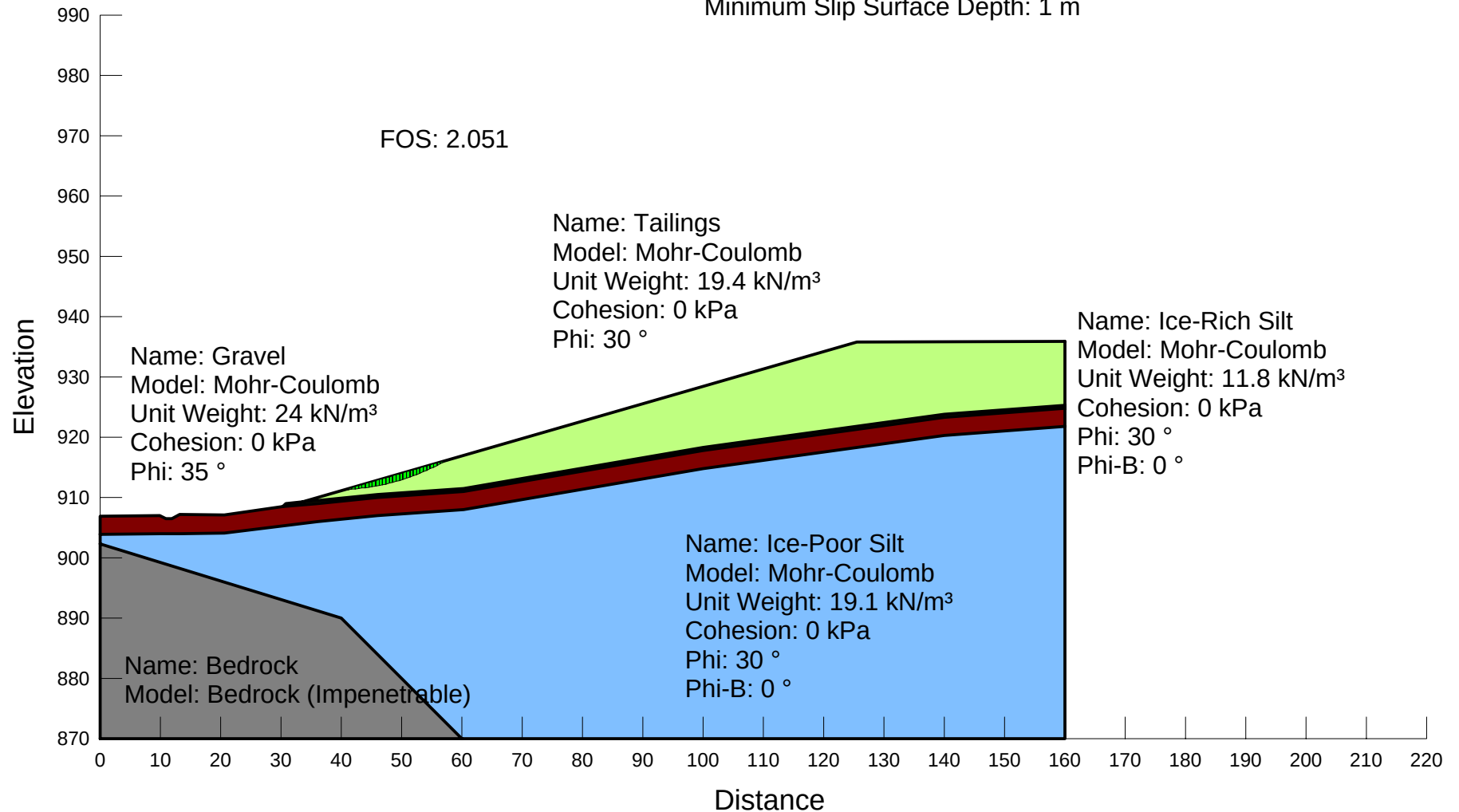
Name: Section A
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionA_R15A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



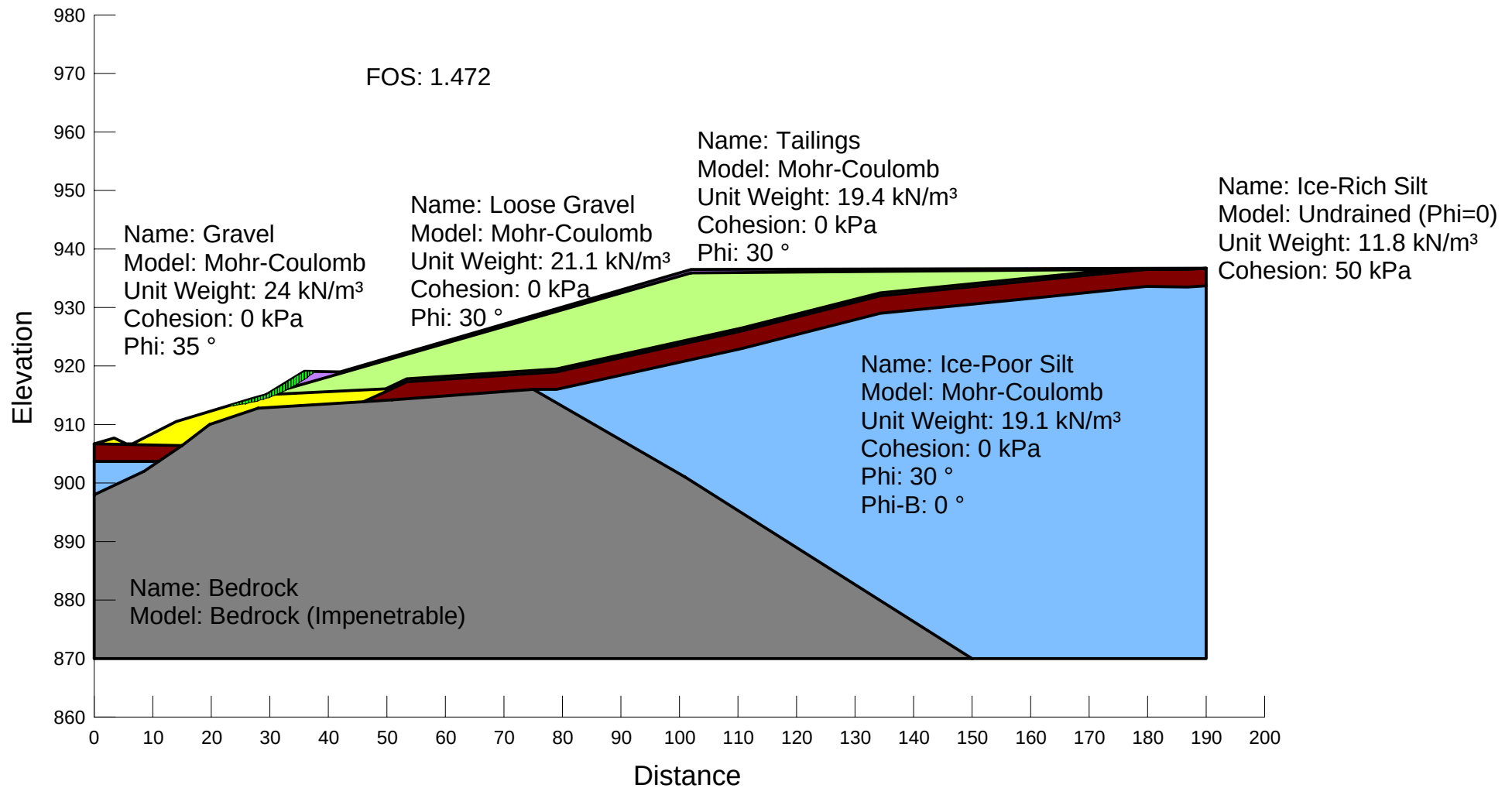
Name: Section B
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionB_R15A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



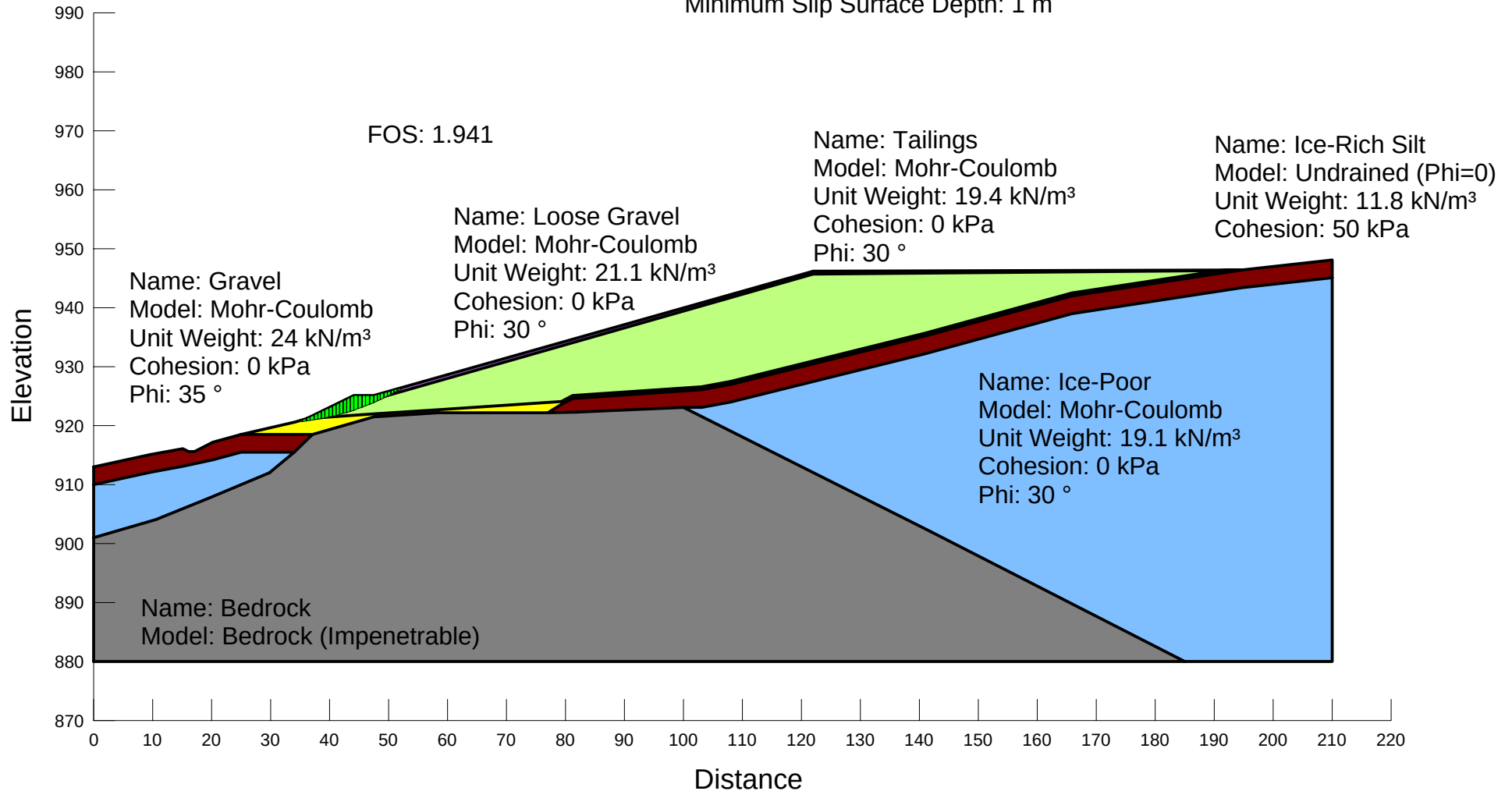
Name: Section C
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionC_R15A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



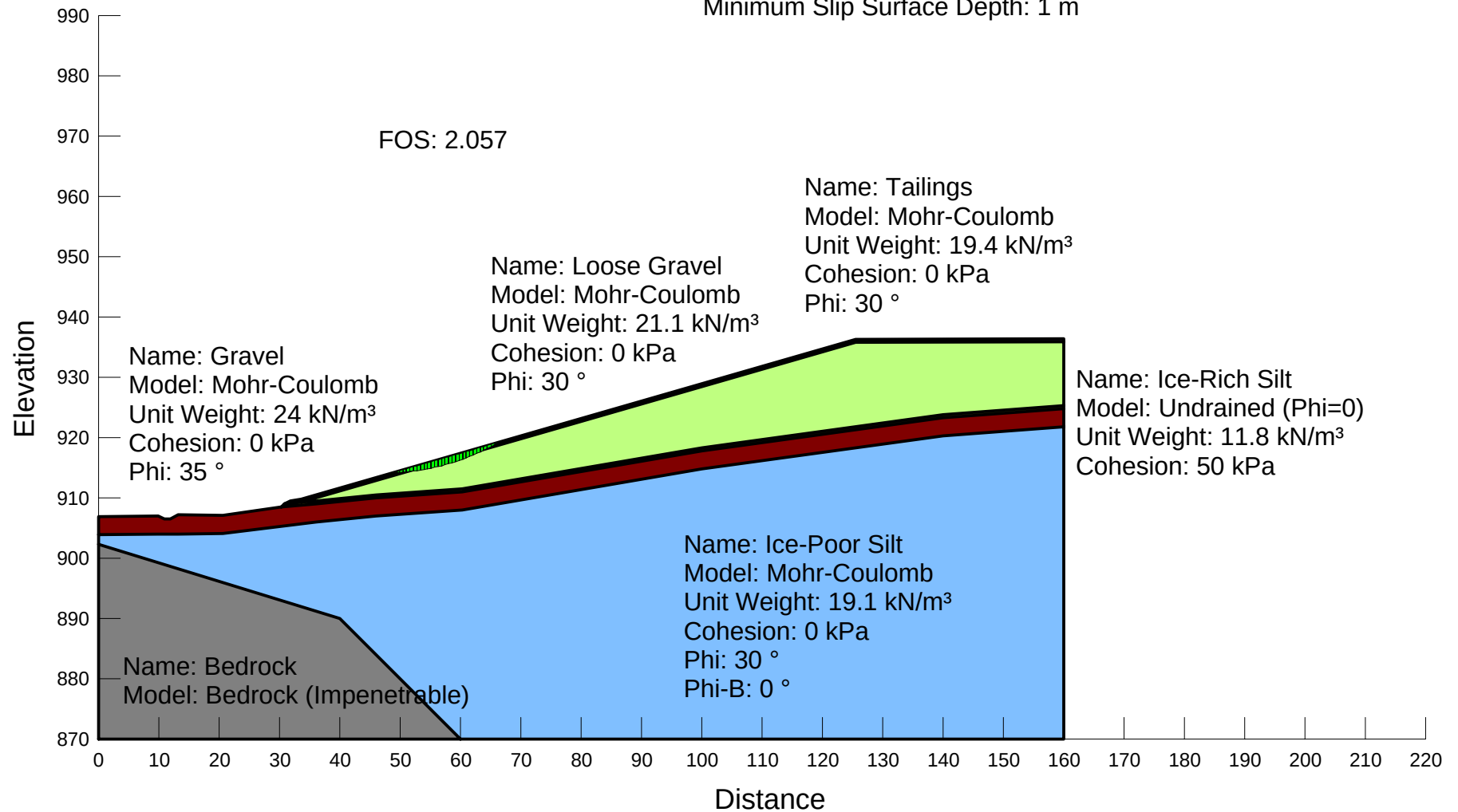
Name: Section A
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionA_R15D_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



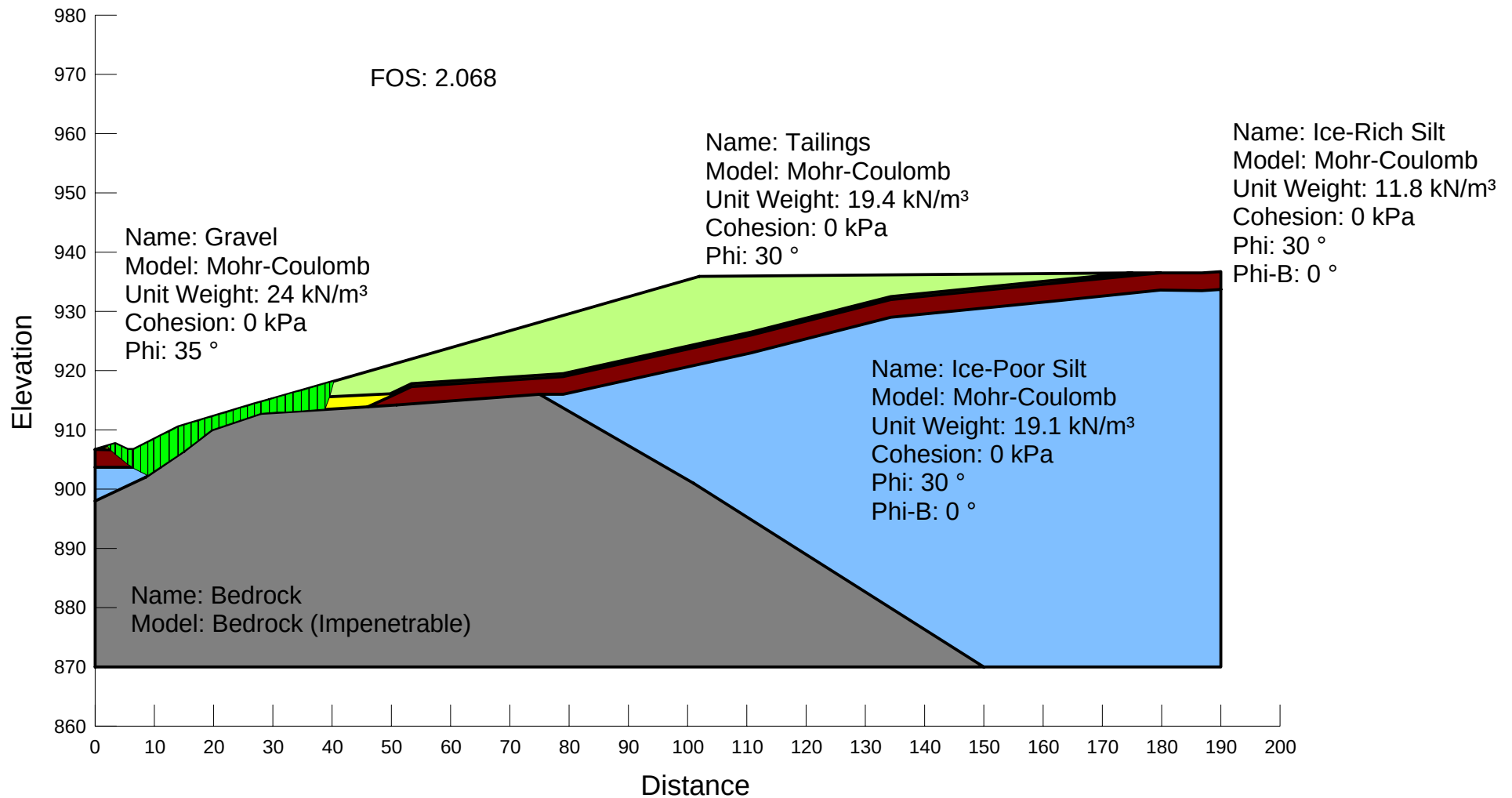
Name: Section B
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionB_R15D_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



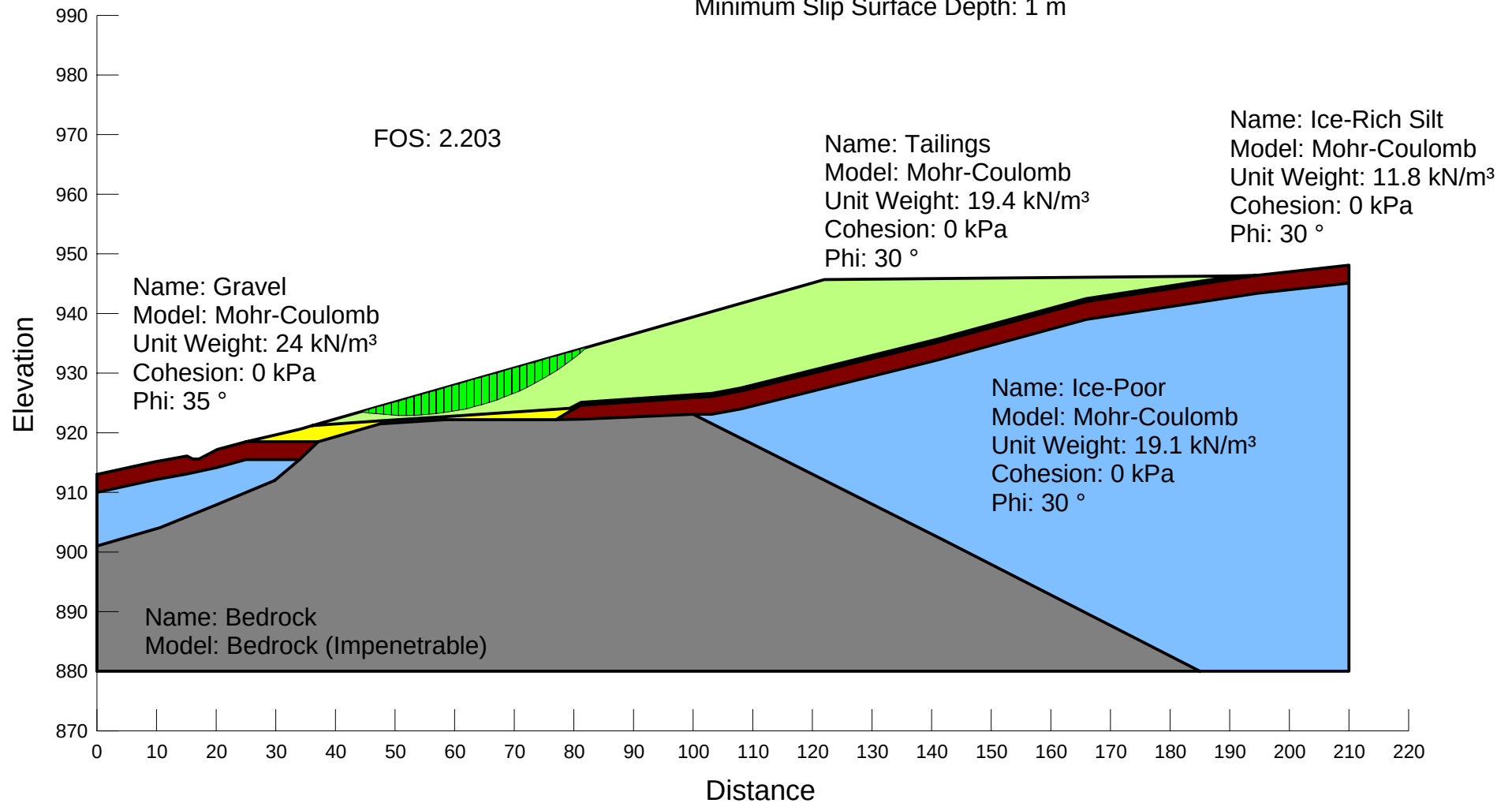
Name: Section C
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionC_R15D_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



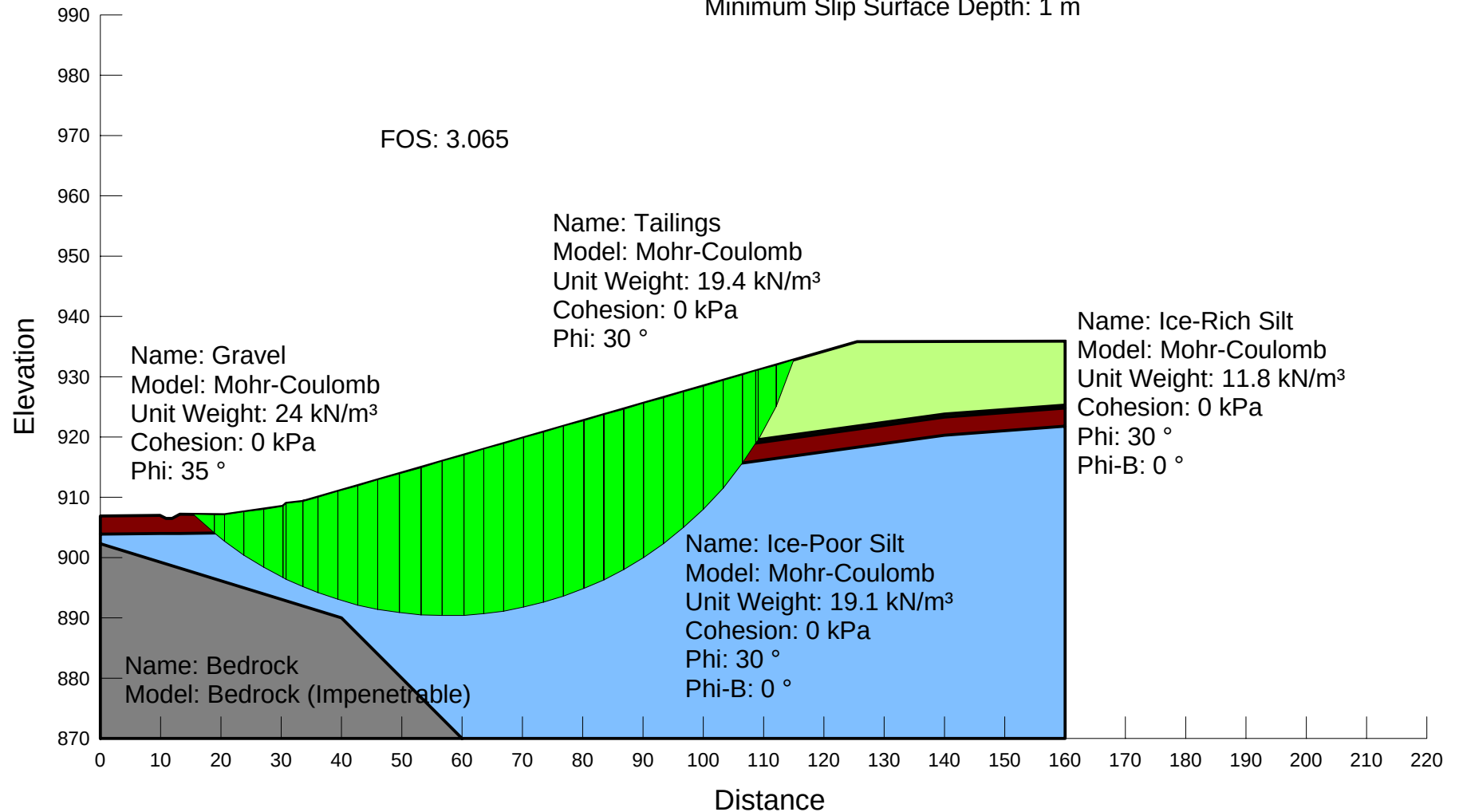
Name: Section A
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionA_R15A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



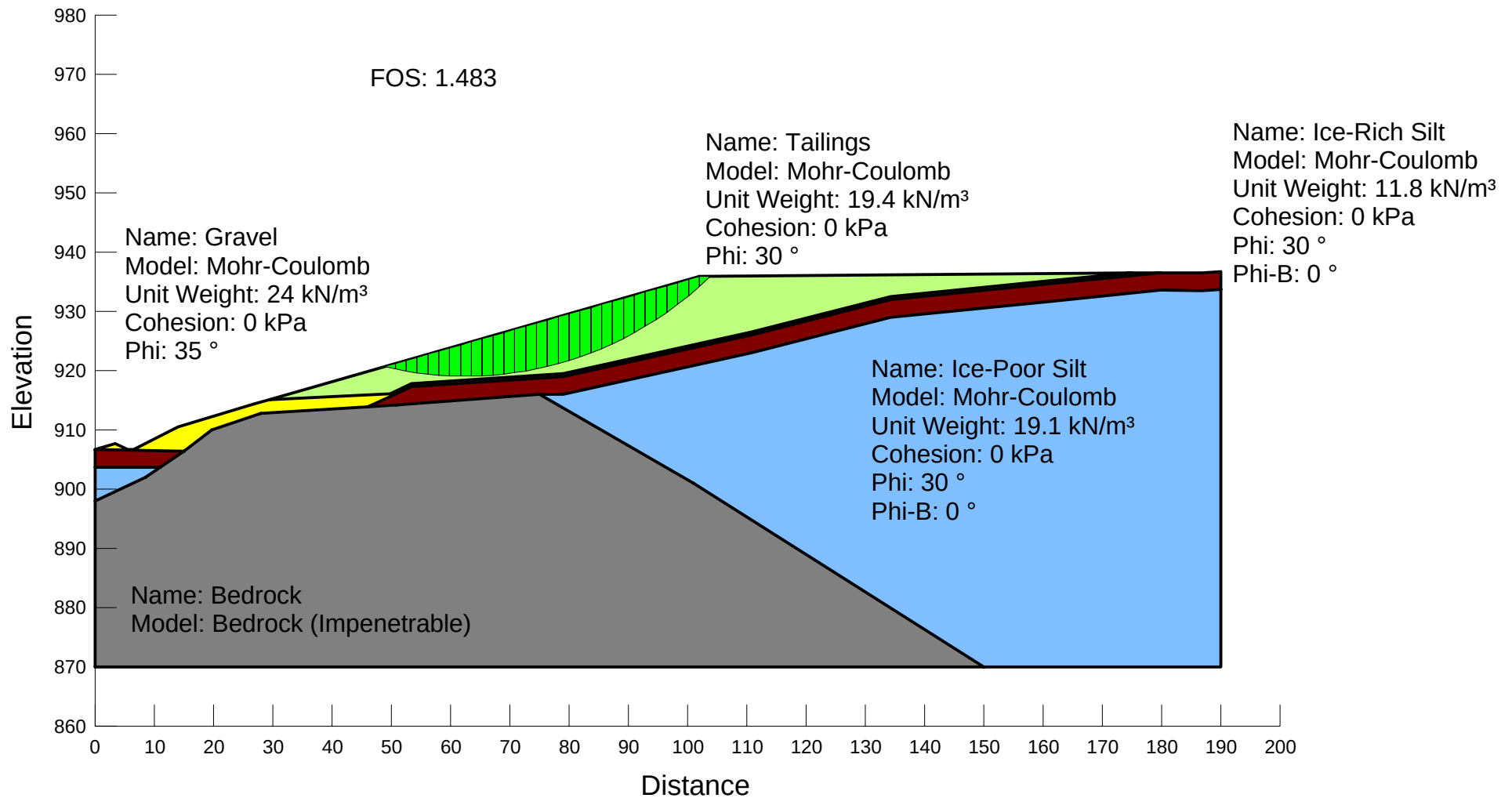
Name: Section B
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionB_R15A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



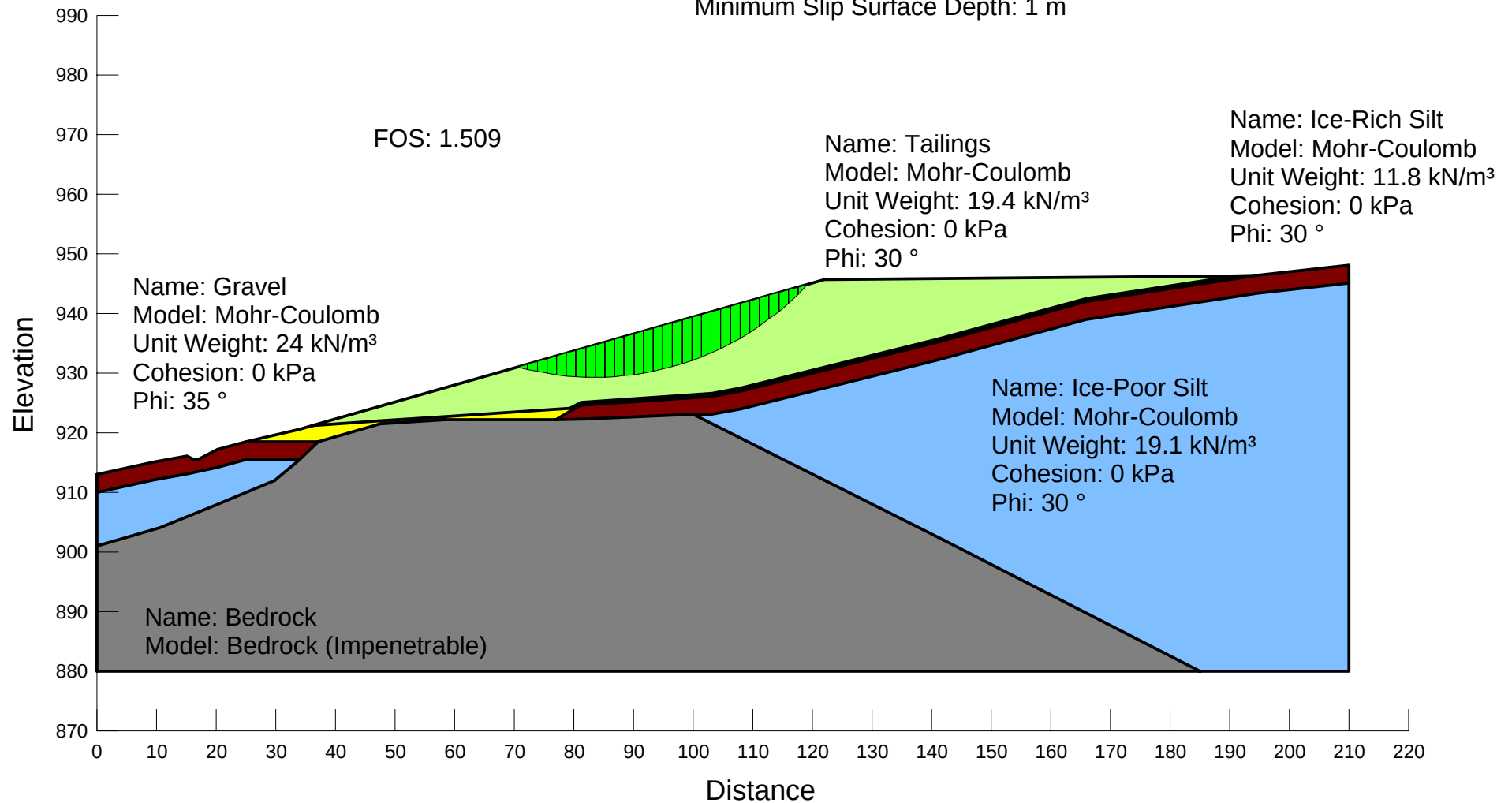
Name: Section C
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionC_R15A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



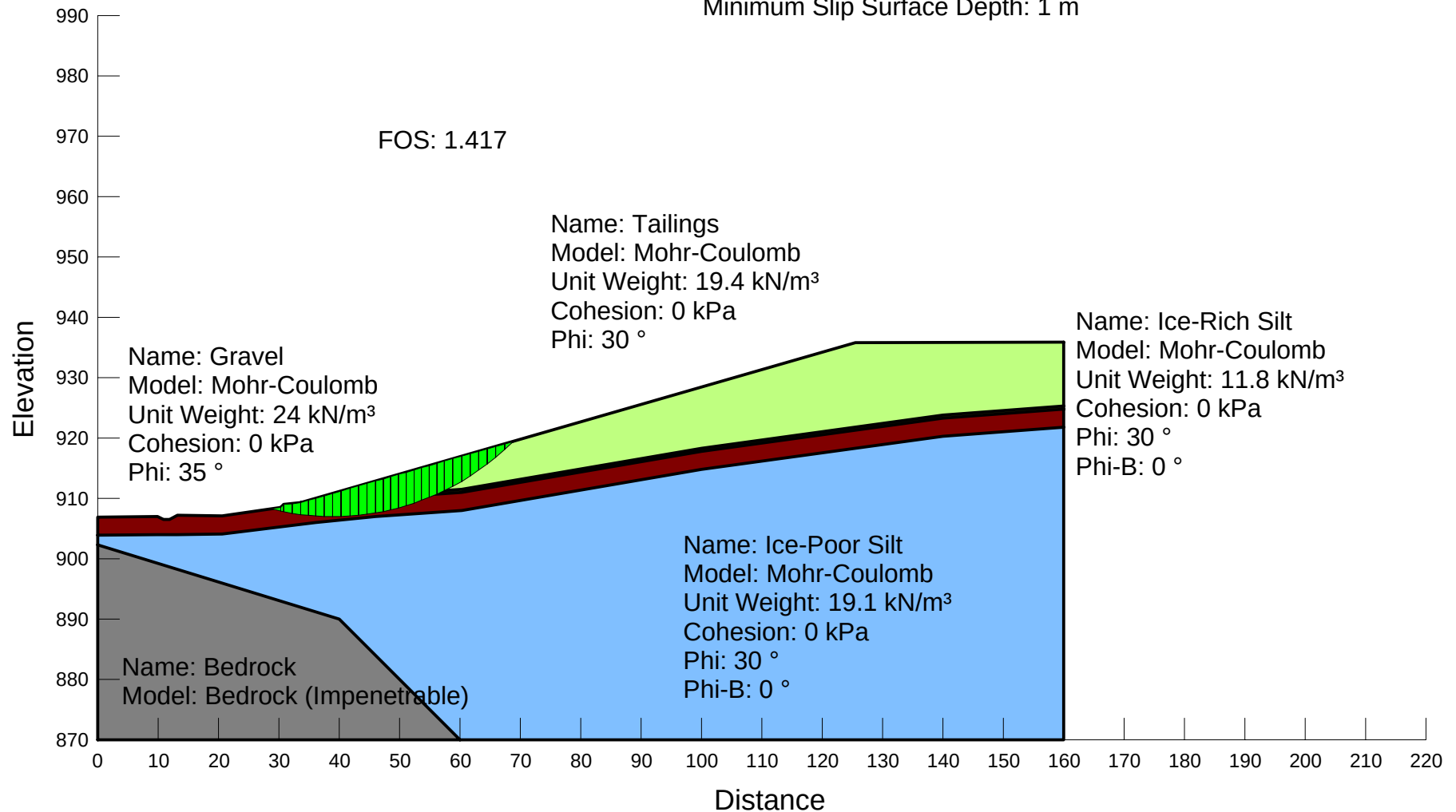
Name: Section A
Description: Dynamic (1:475) w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionA_R15C_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



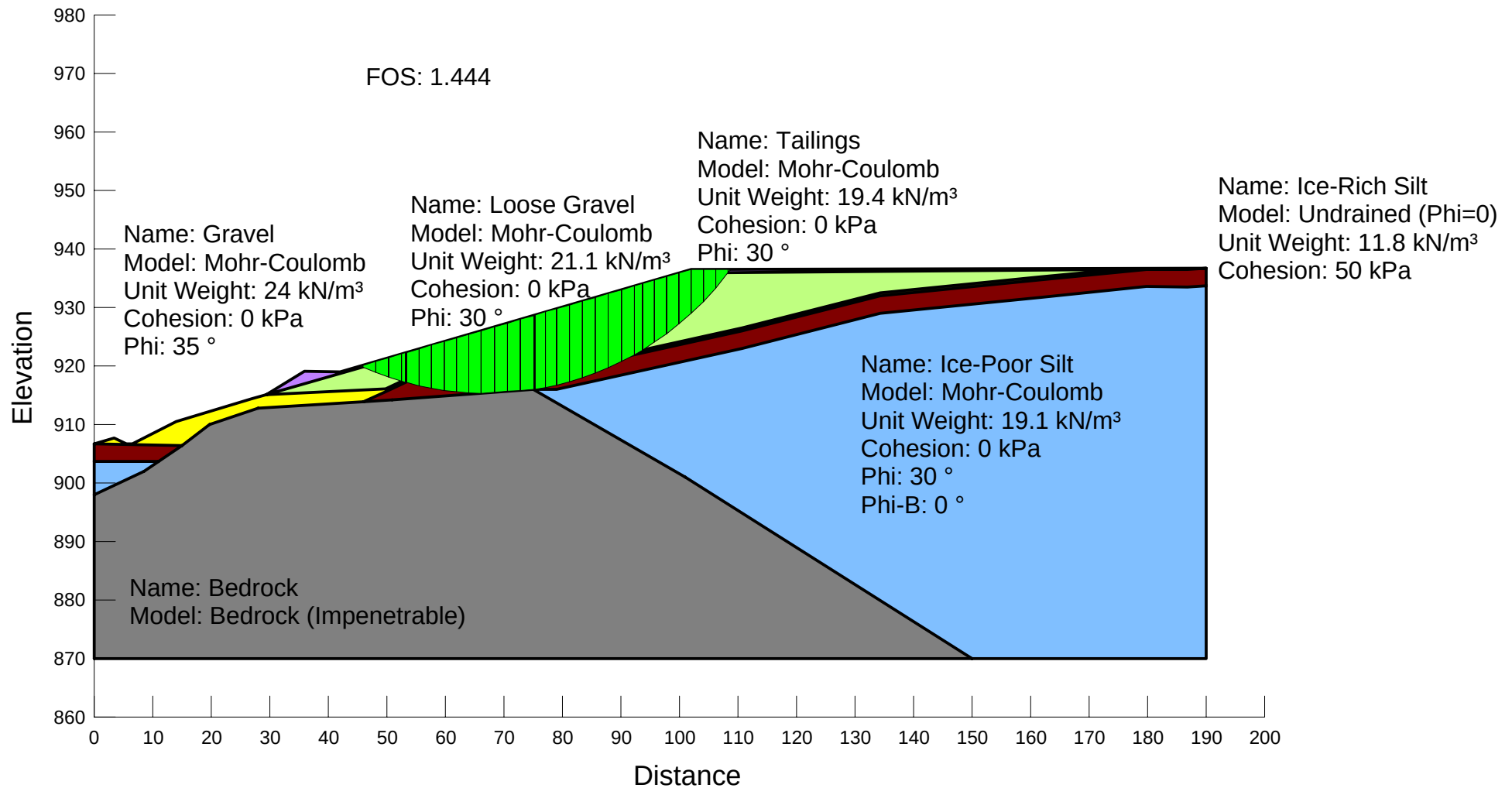
Name: Section B
Description: Dynamic (1:475) w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionB_R15C_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



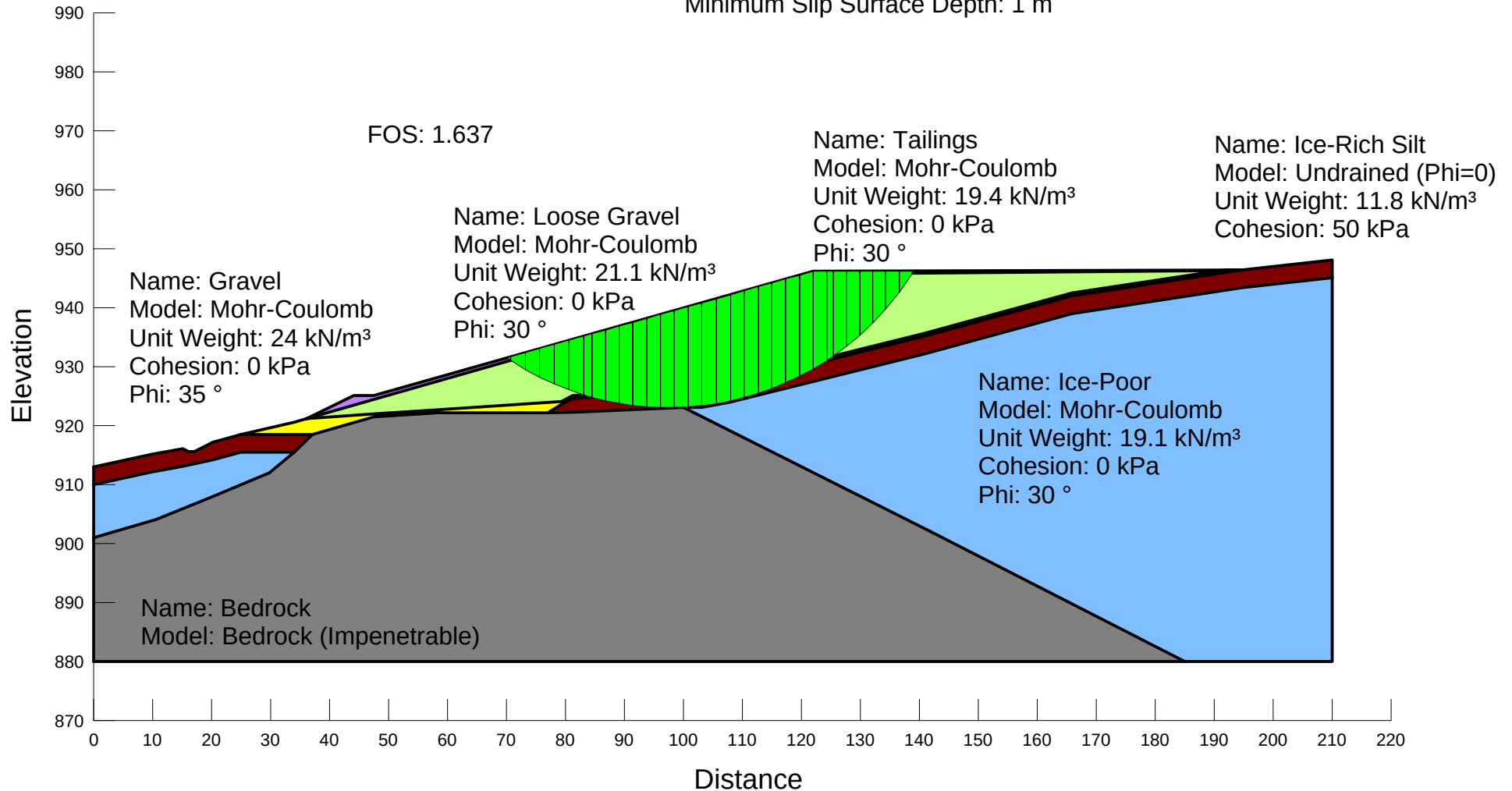
Name: Section C
Description: Dynamic (1:475) w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionC_R15C_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



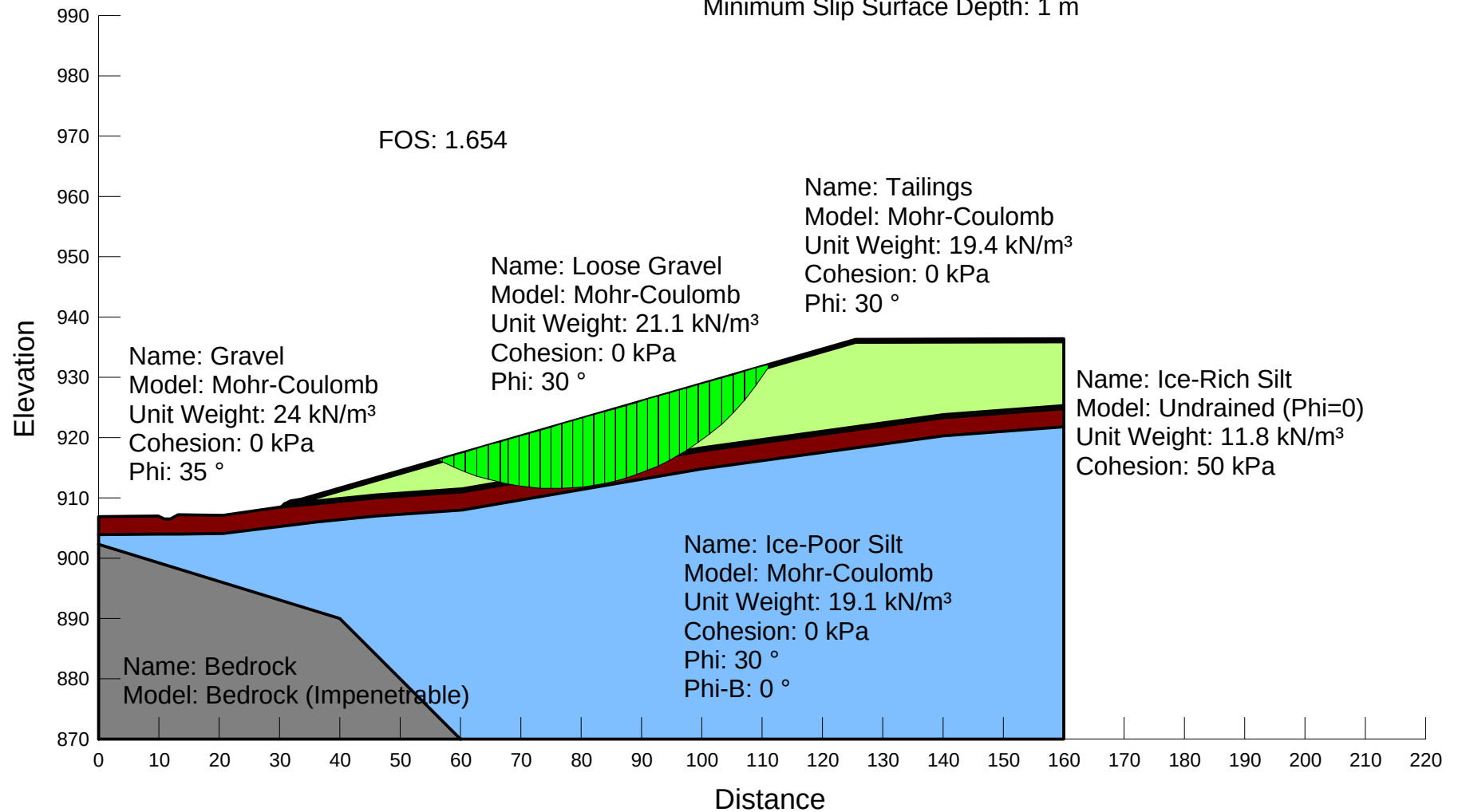
Name: Section A
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionA_R15D_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



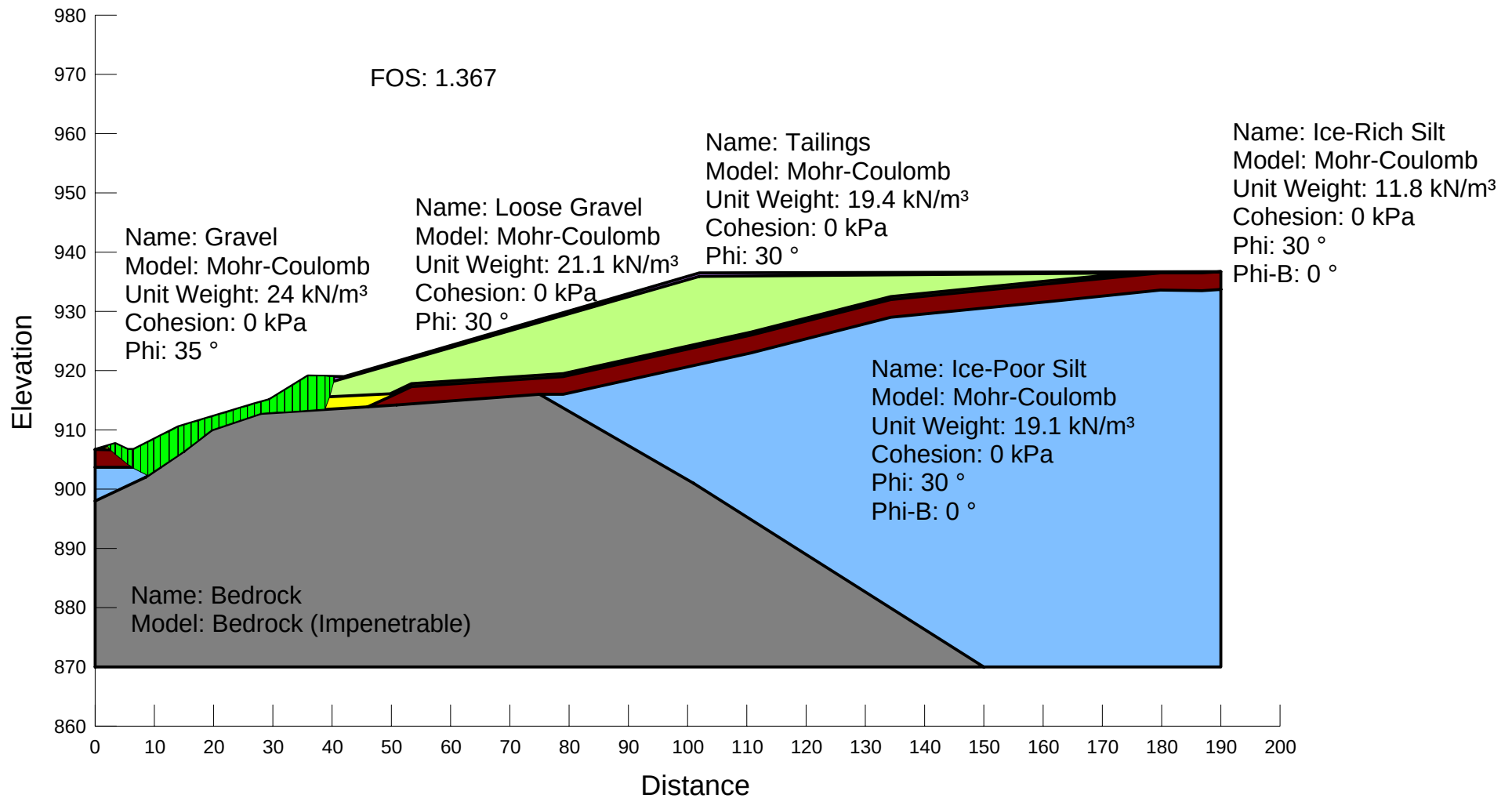
Name: Section B
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionB_R15D_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



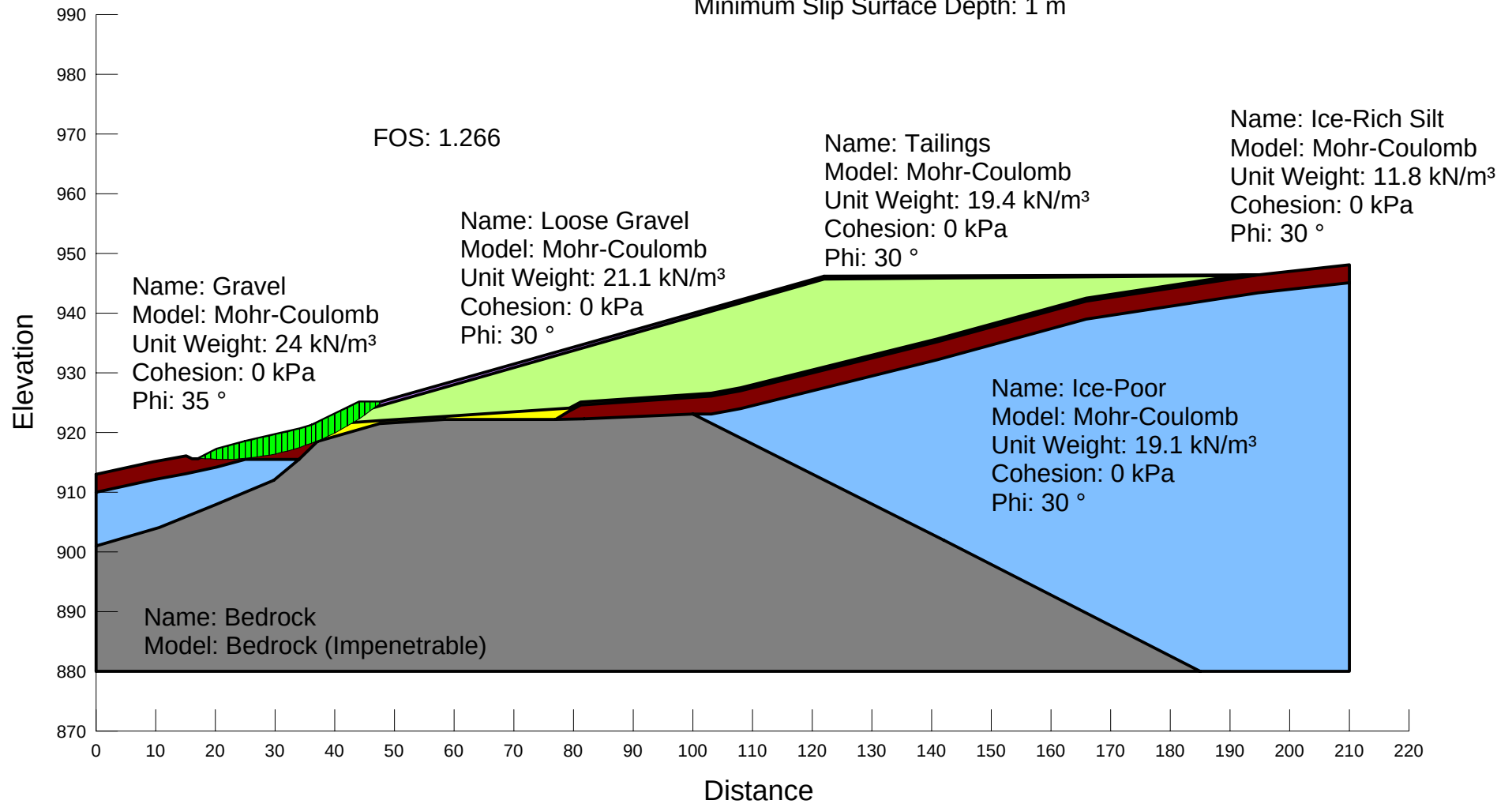
Name: Section C
Description: Static w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionC_R15D_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



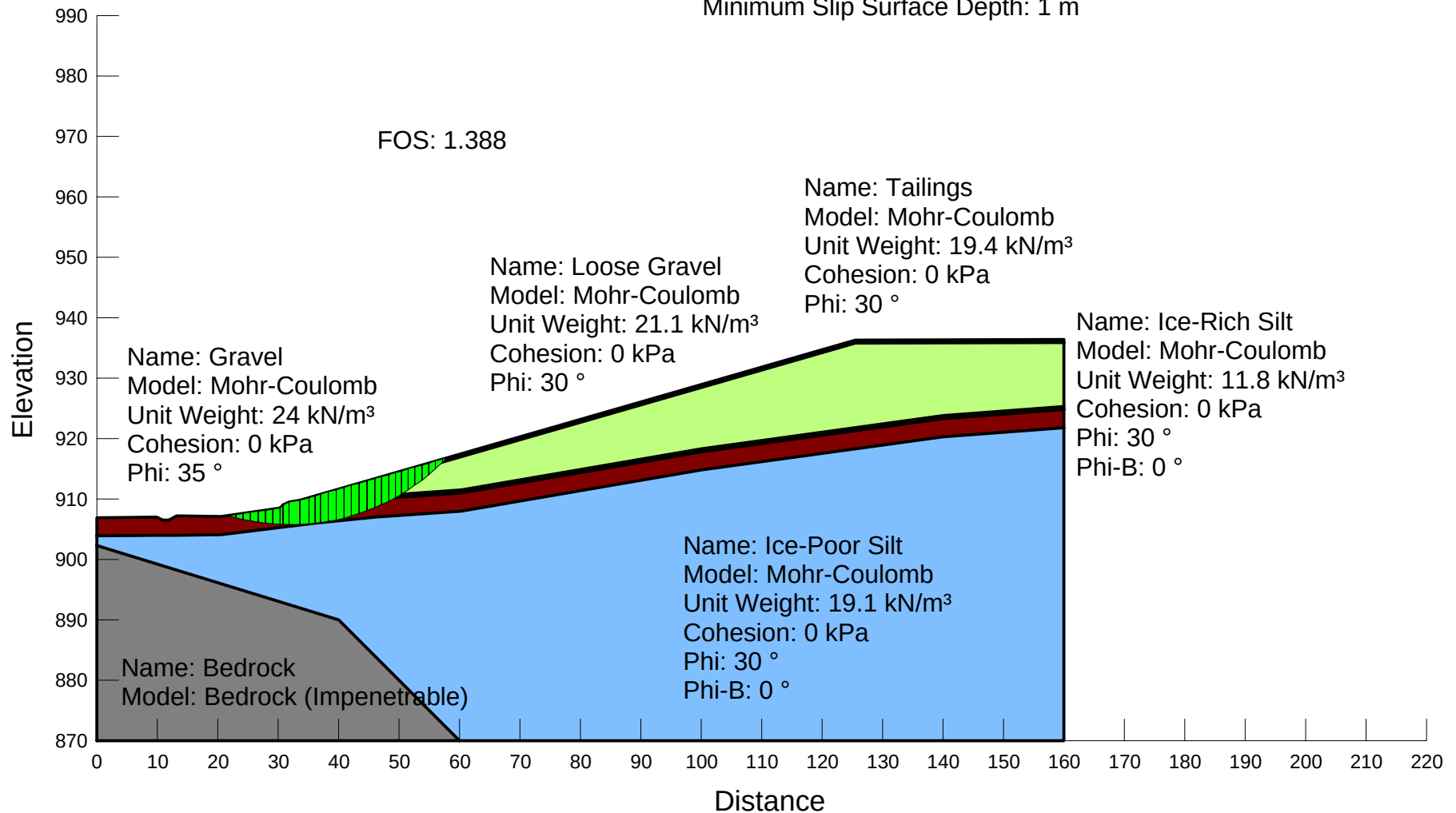
Name: Section A
Description: Dynamic (1:475) w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionA_R15E_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Dynamic (1:475) w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionB_R15E_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



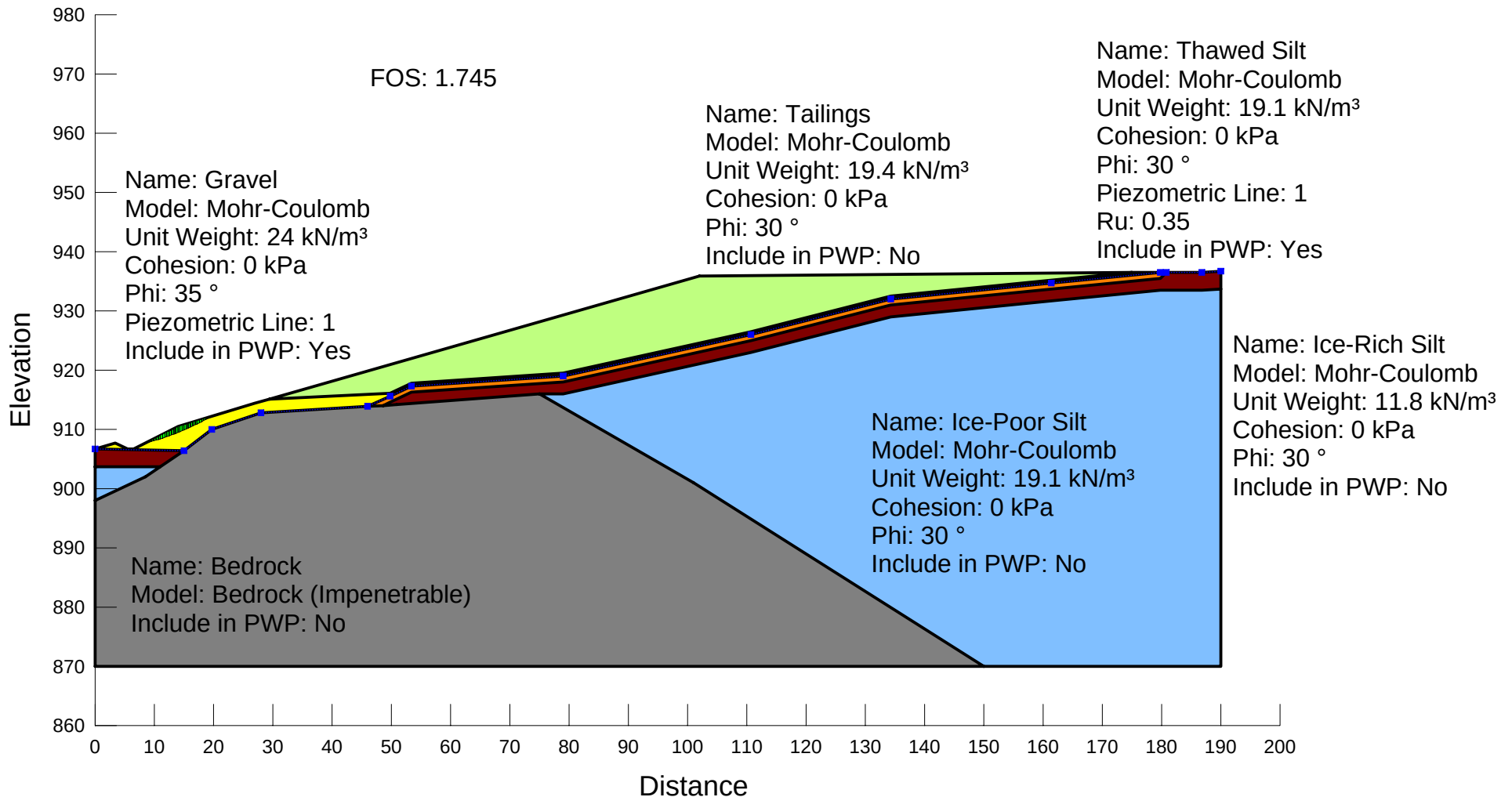
Name: Section C
Description: Dynamic (1:475) w/o PWP Conditions (Frozen State)
File Name: W14101178.003_SectionC_R15E_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



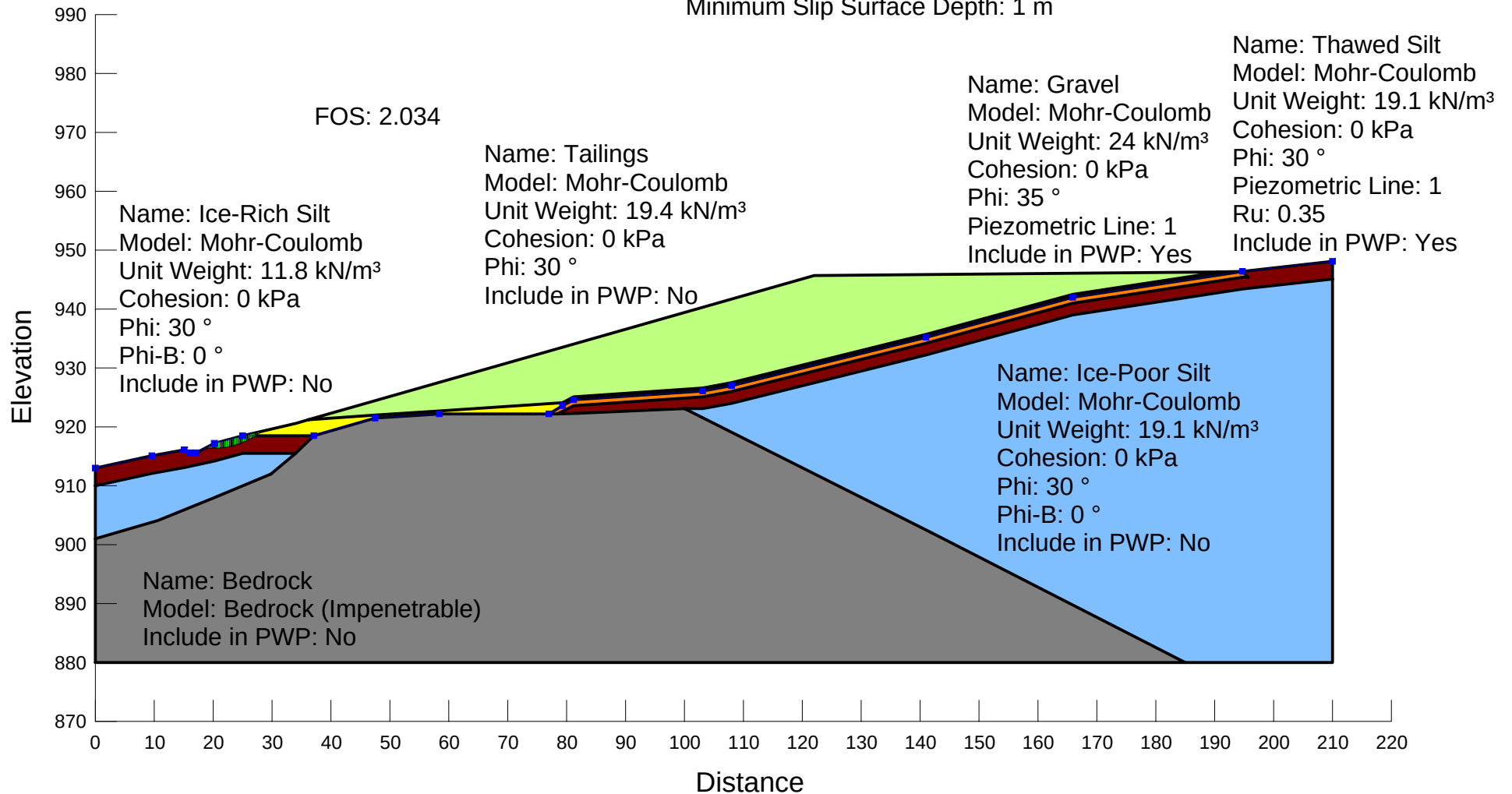
APPENDIX D

APPENDIX D SLOPE STABILITY PLOTS – 1.2 METRE THAWED CASE

Name: Section A
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionA_R16A_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionB_R16A_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section C

Description: Static w/ Ru PWP Conditions (1.2 m Thaw)

File Name: W14101178.003_SectionC_R16A_Static_RuPWP.gsz

Method: Morgenstern-Price

Horz Seismic Load: 0

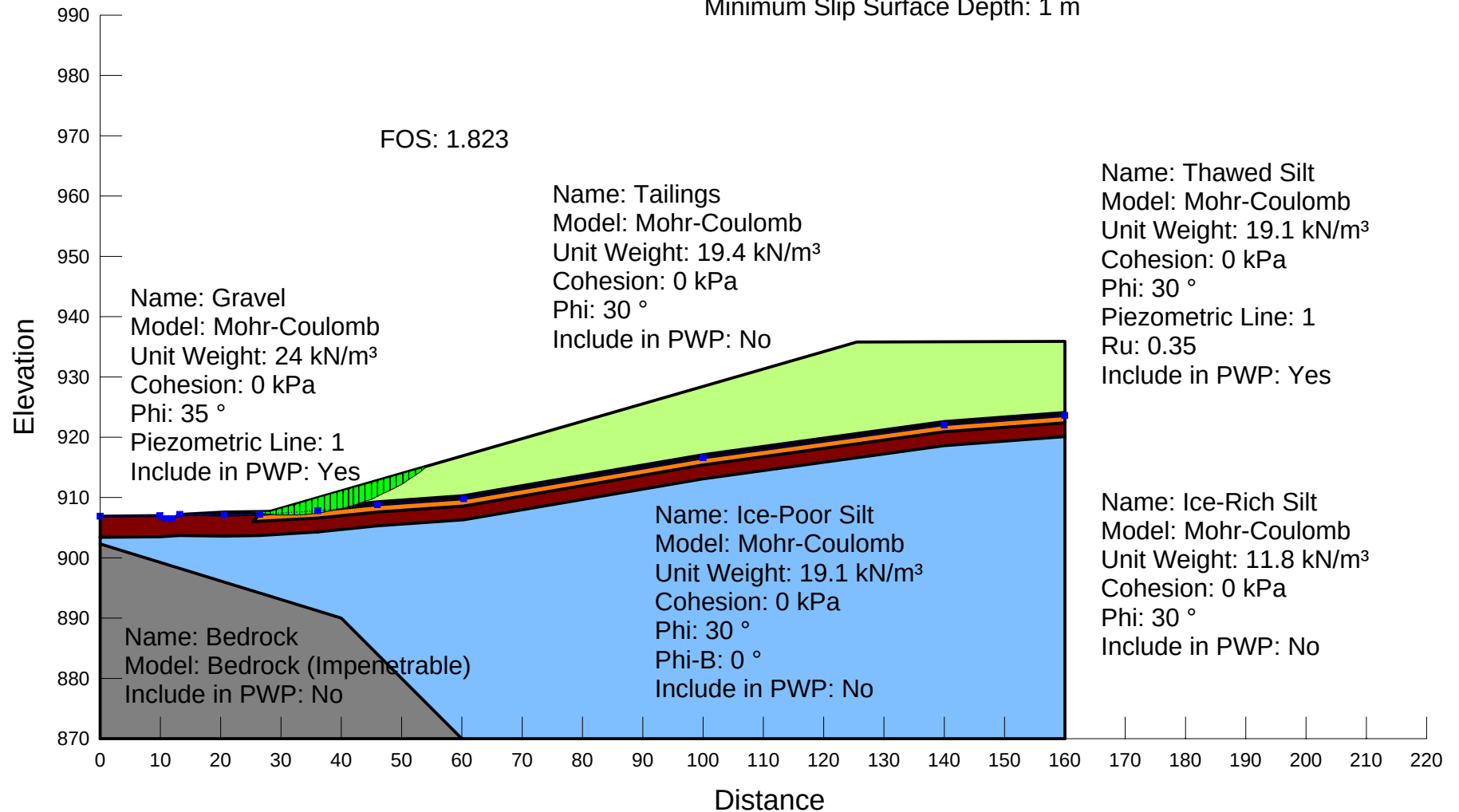
PWP Conditions Source: Piezometric Line with Ru

Length(L) Units: meters

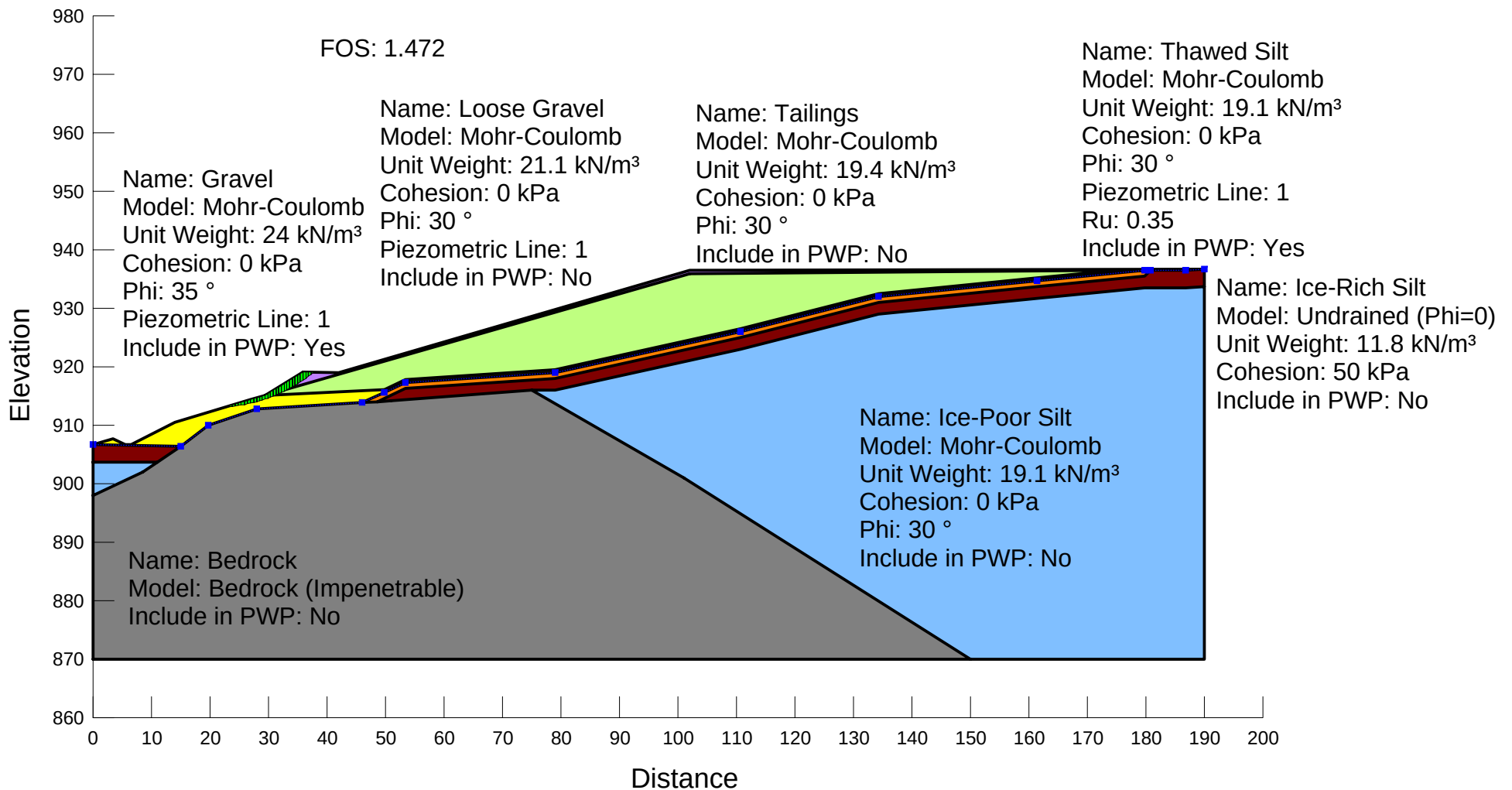
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Vertical Scale: 1000

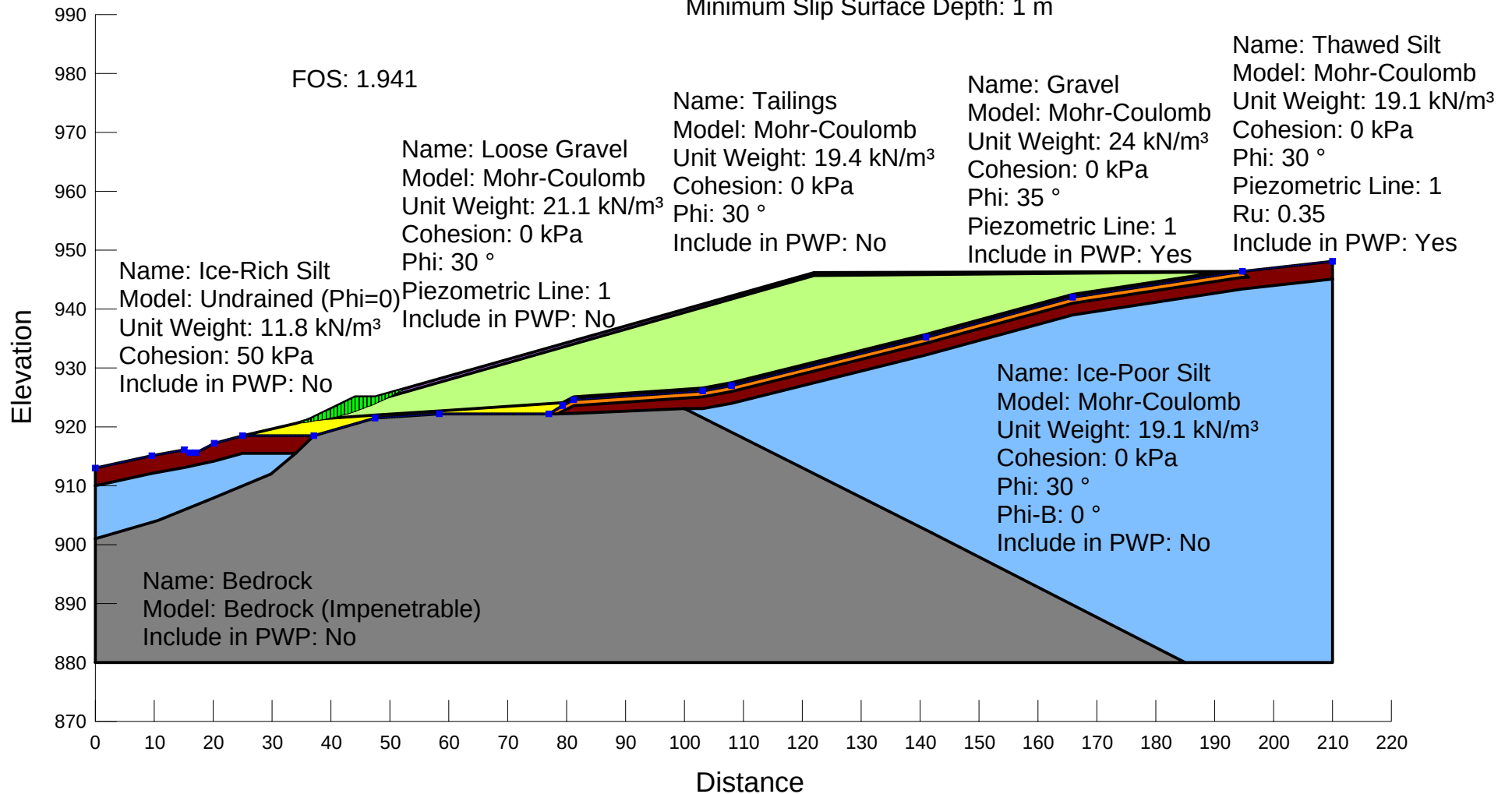
Minimum Slip Surface Depth: 1 m



Name: Section A
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionA_R16D_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionB_R16D_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section C

Description: Static w/ Ru PWP Conditions (1.2 m Thaw)

File Name: W14101178.003_SectionC_R16D_Static_RuPWP.gsz

Method: Morgenstern-Price

Horz Seismic Load: 0

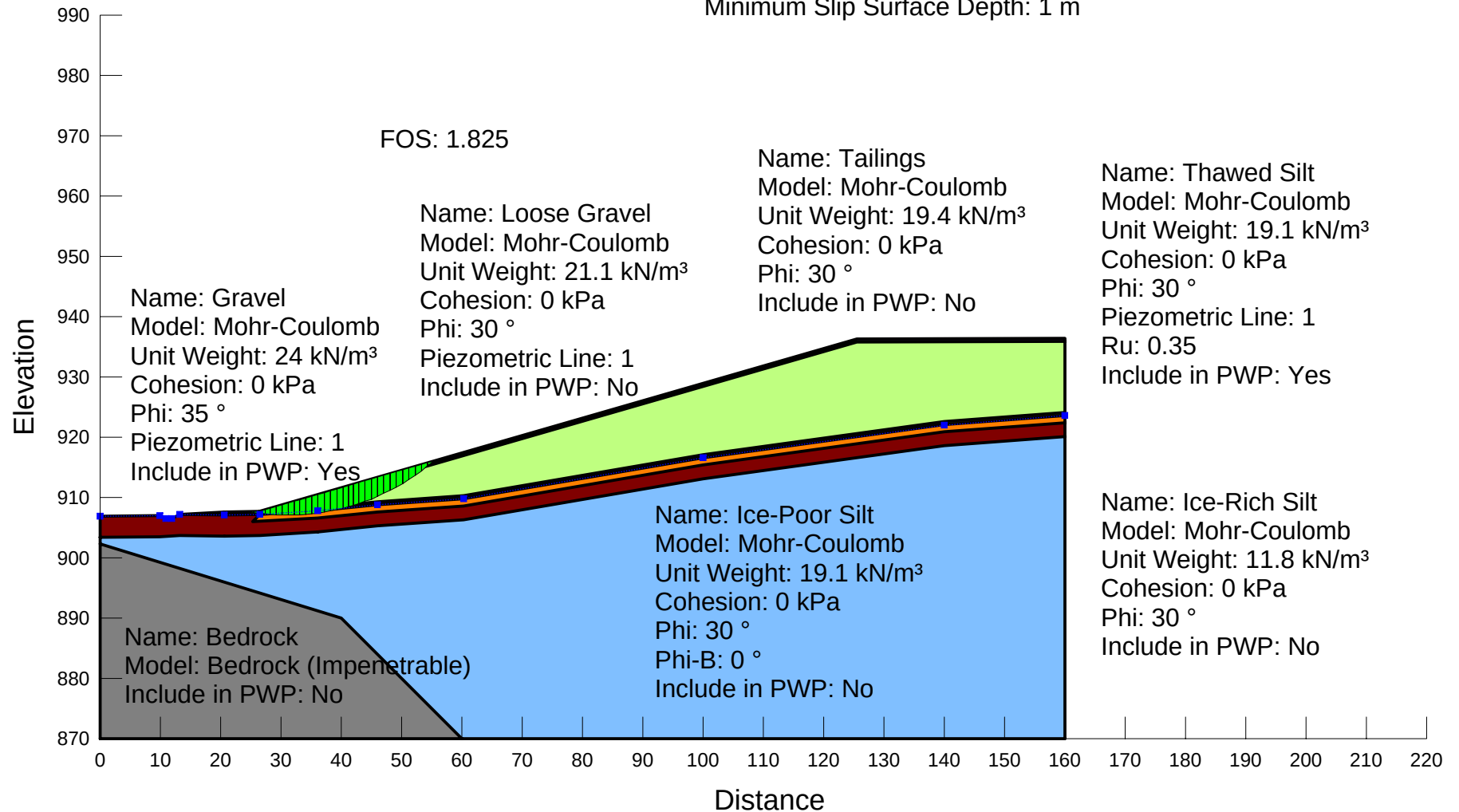
PWP Conditions Source: Piezometric Line with Ru

Length(L) Units: meters

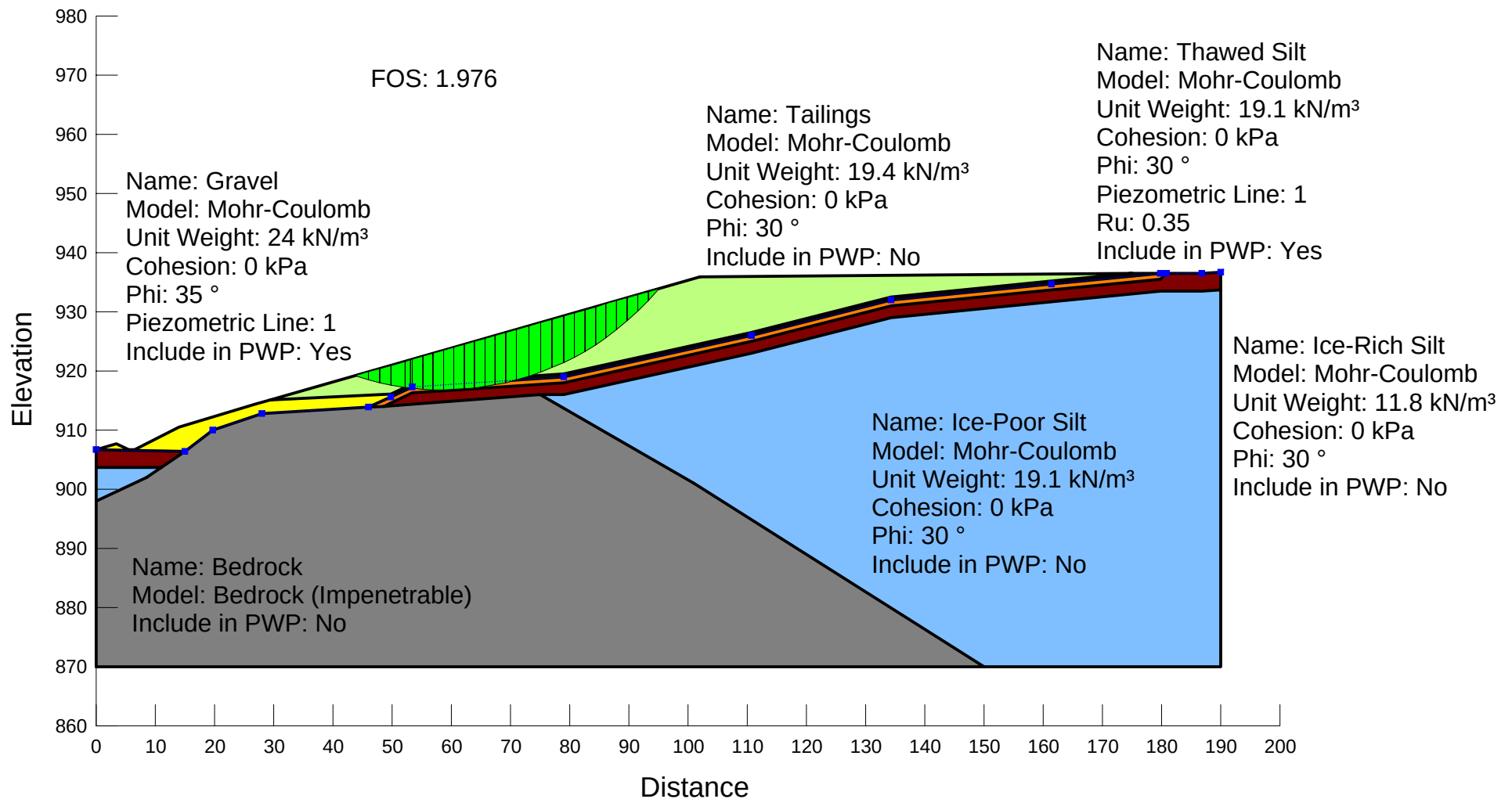
Horizontal Scale: 1000

Vertical Scale: 1000

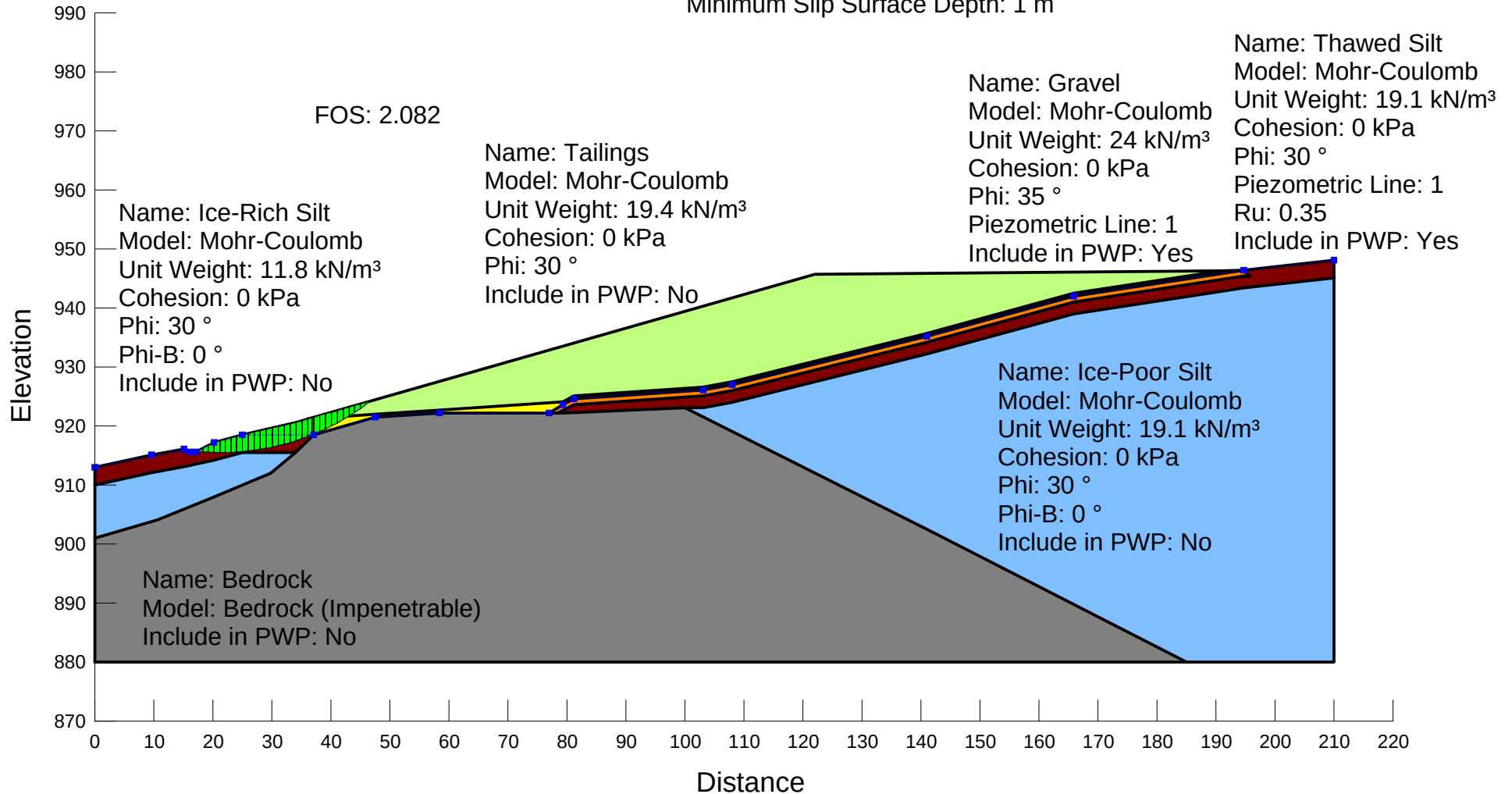
Minimum Slip Surface Depth: 1 m



Name: Section A
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionA_R16A_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionB_R16A_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section C

Description: Static w/ Ru PWP Conditions (1.2 m Thaw)

File Name: W14101178.003_SectionC_R16A_Static_RuPWP.gsz

Method: Morgenstern-Price

Horz Seismic Load: 0

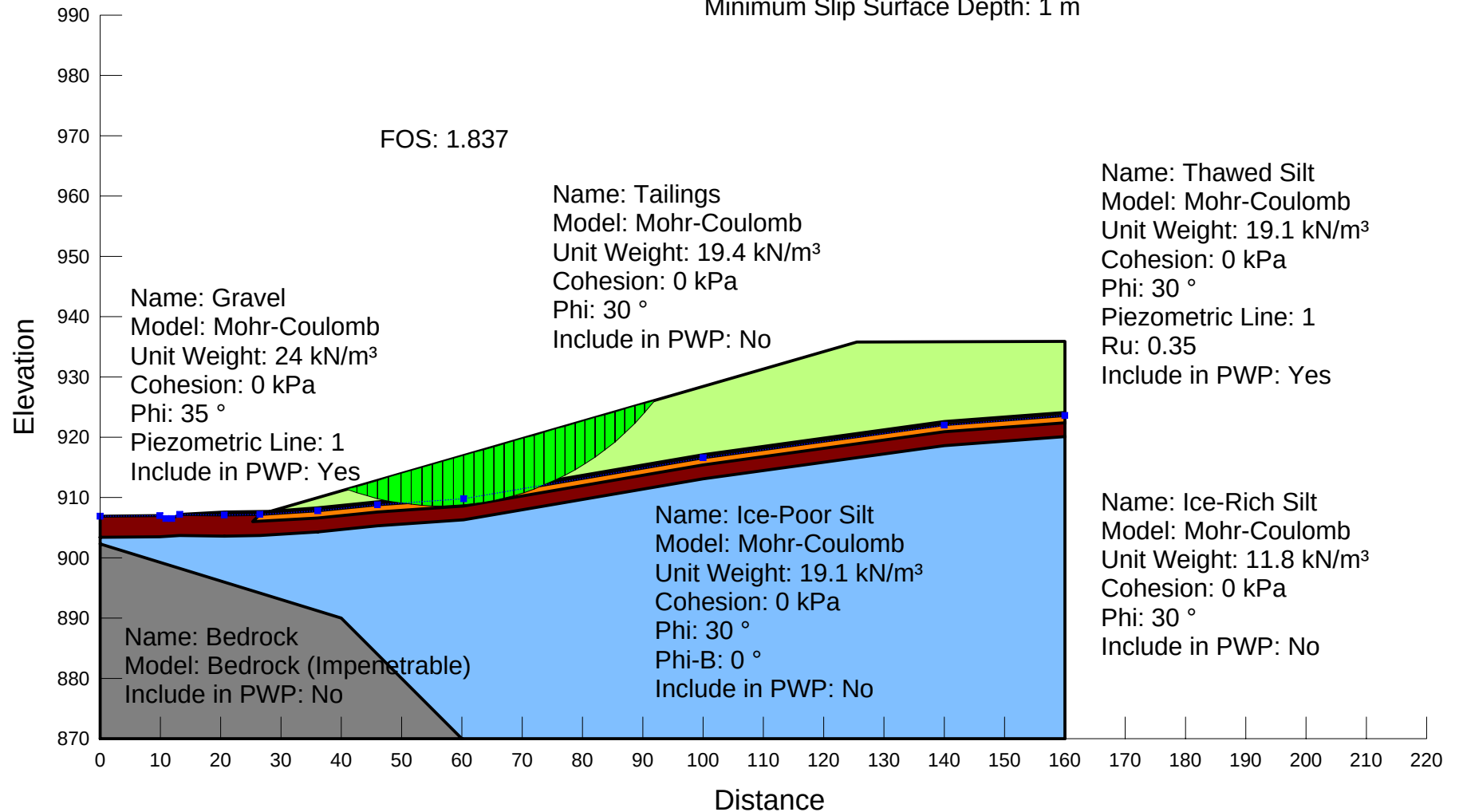
PWP Conditions Source: Piezometric Line with Ru

Length(L) Units: meters

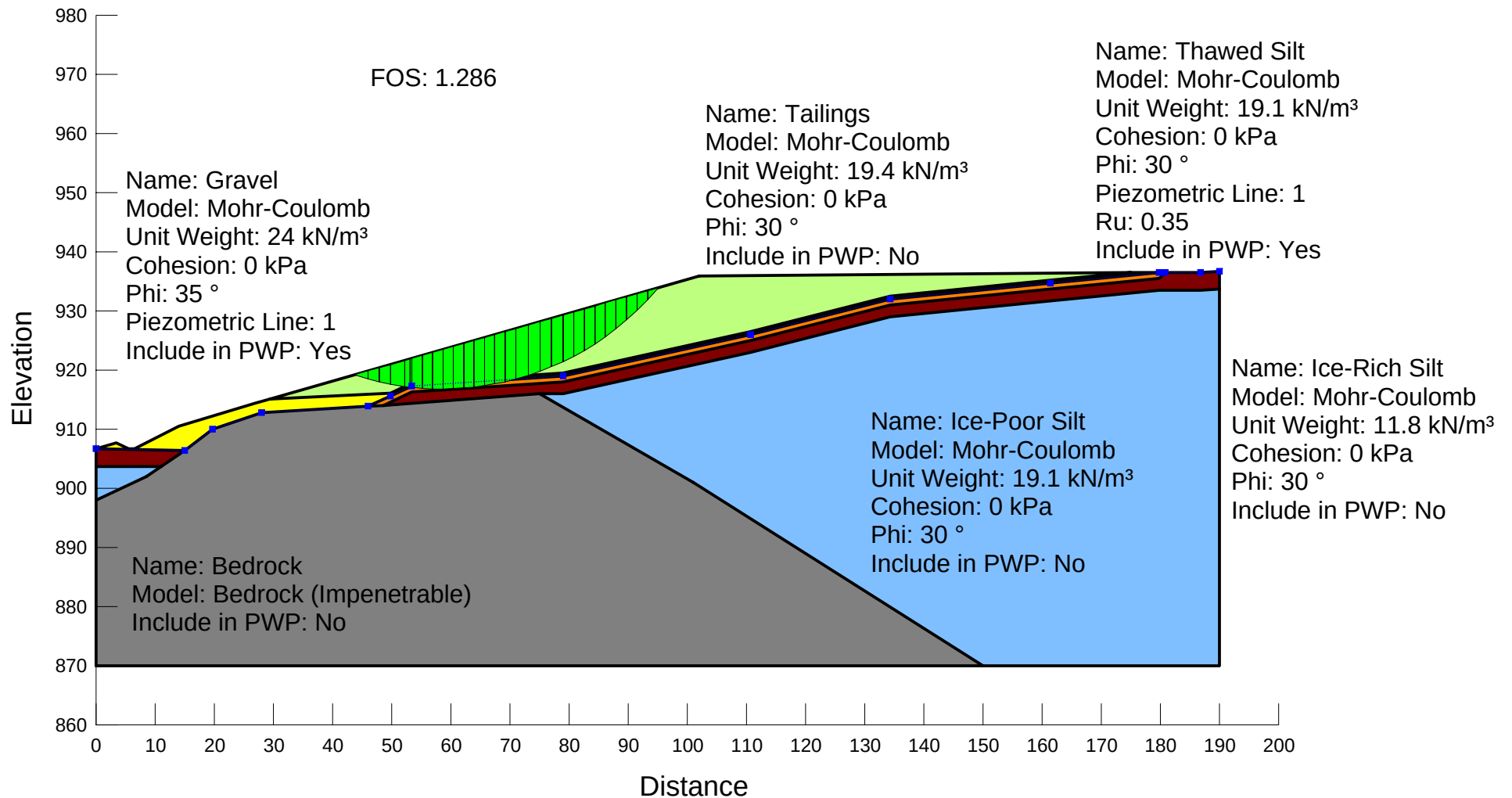
Horizontal Scale: 1000

Vertical Scale: 1000

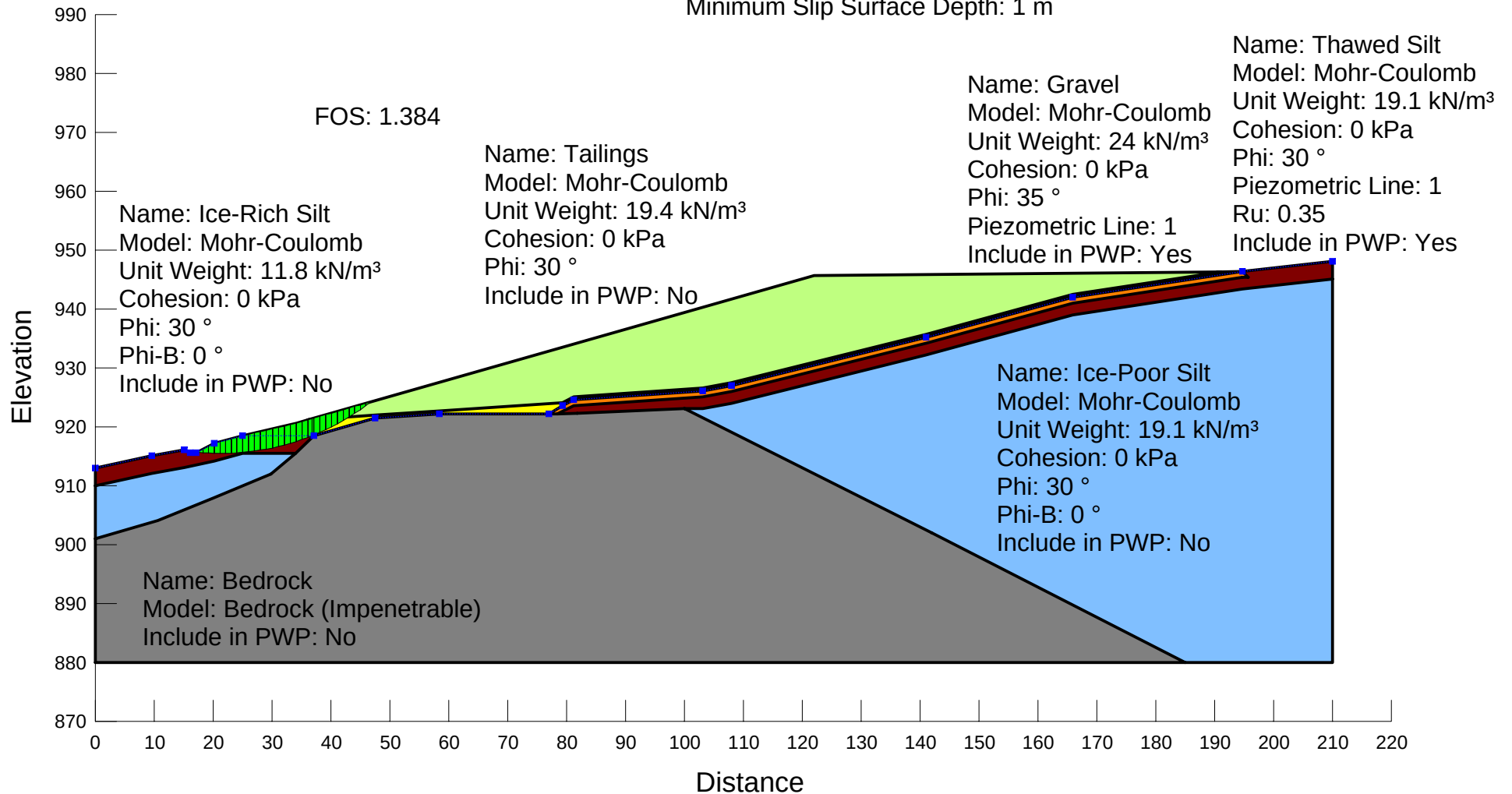
Minimum Slip Surface Depth: 1 m



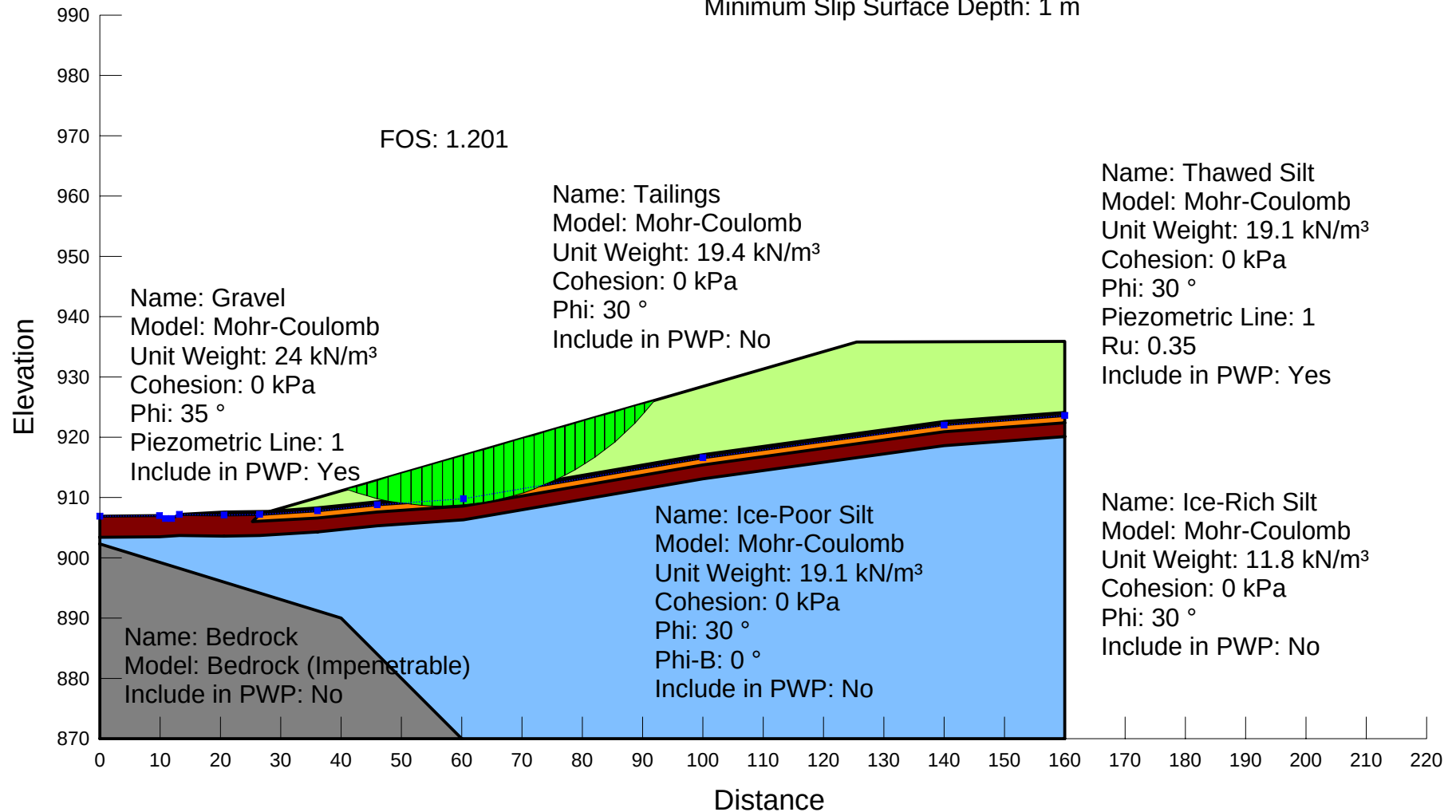
Name: Section A
Description: Dynamic (1:475) w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionA_R16C_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



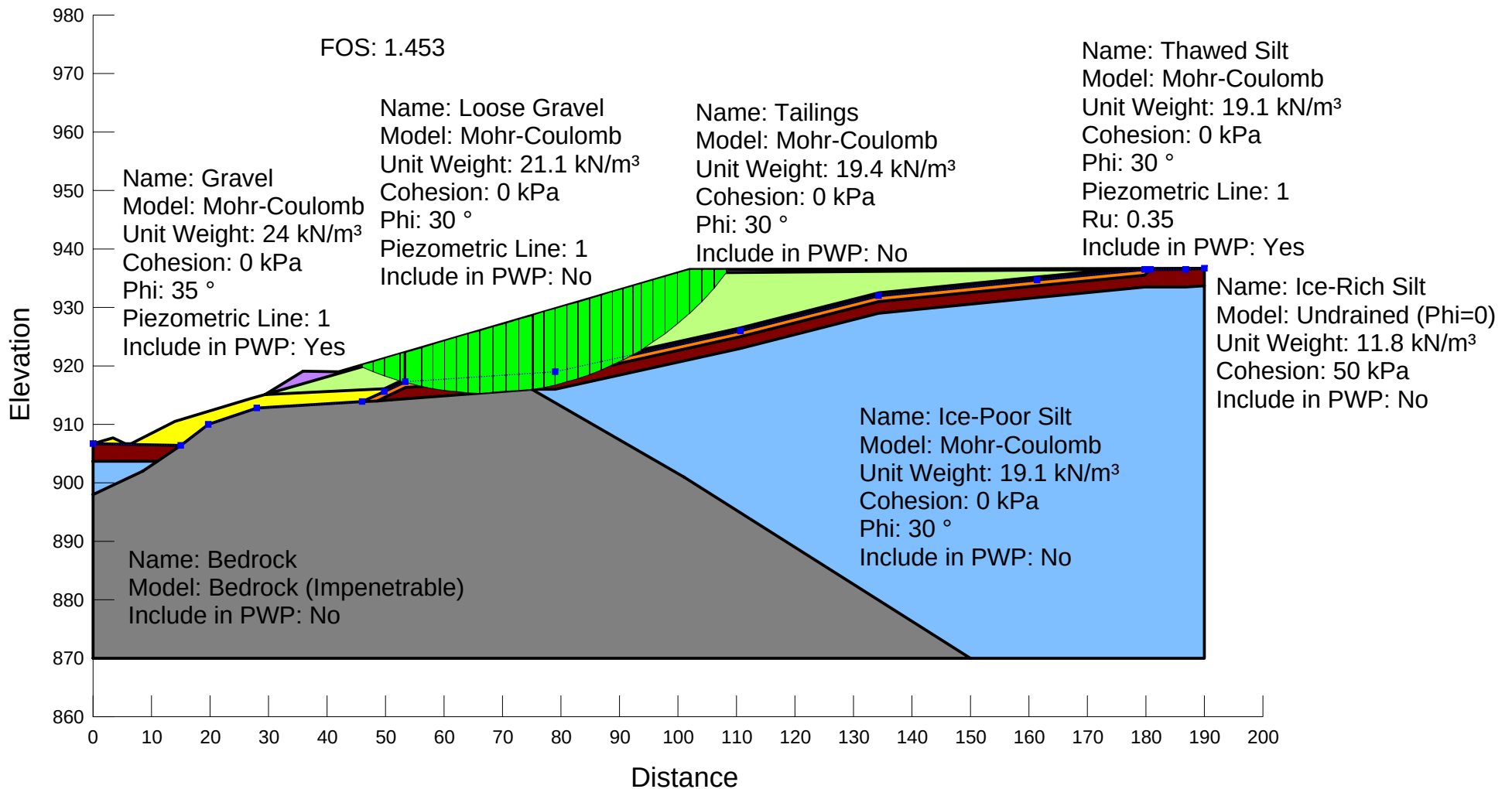
Name: Section B
Description: Dynamic (1:475) w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionB_R16C_Dynamic475_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



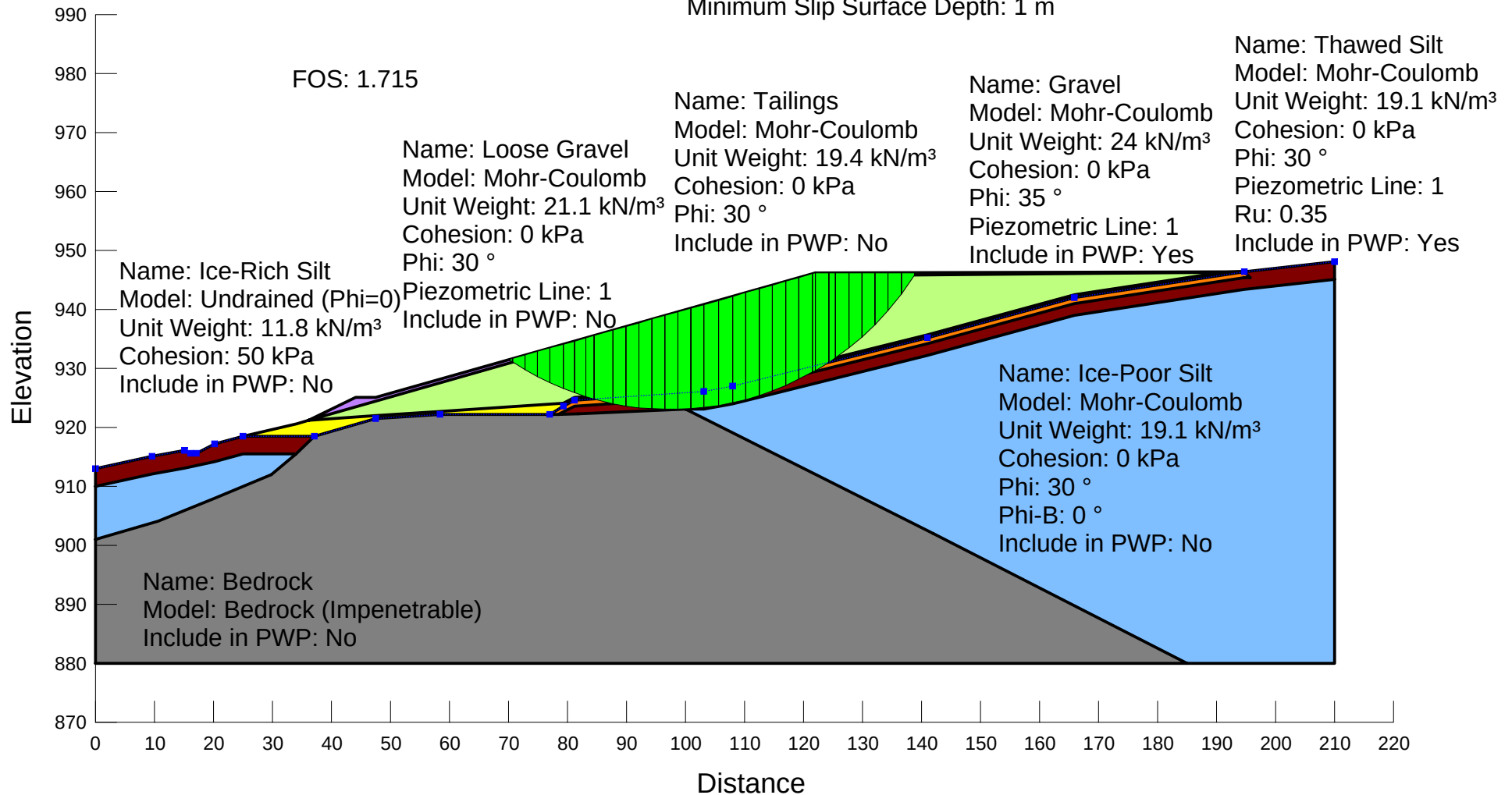
Name: Section C
Description: Dynamic (1:475) w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionC_R16C_Dynamic475_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section A
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionA_R16D_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Static w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionB_R16D_Static_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section C

Description: Static w/ Ru PWP Conditions (1.2 m Thaw)

File Name: W14101178.003_SectionC_R16D_Static_RuPWP.gsz

Method: Morgenstern-Price

Horz Seismic Load: 0

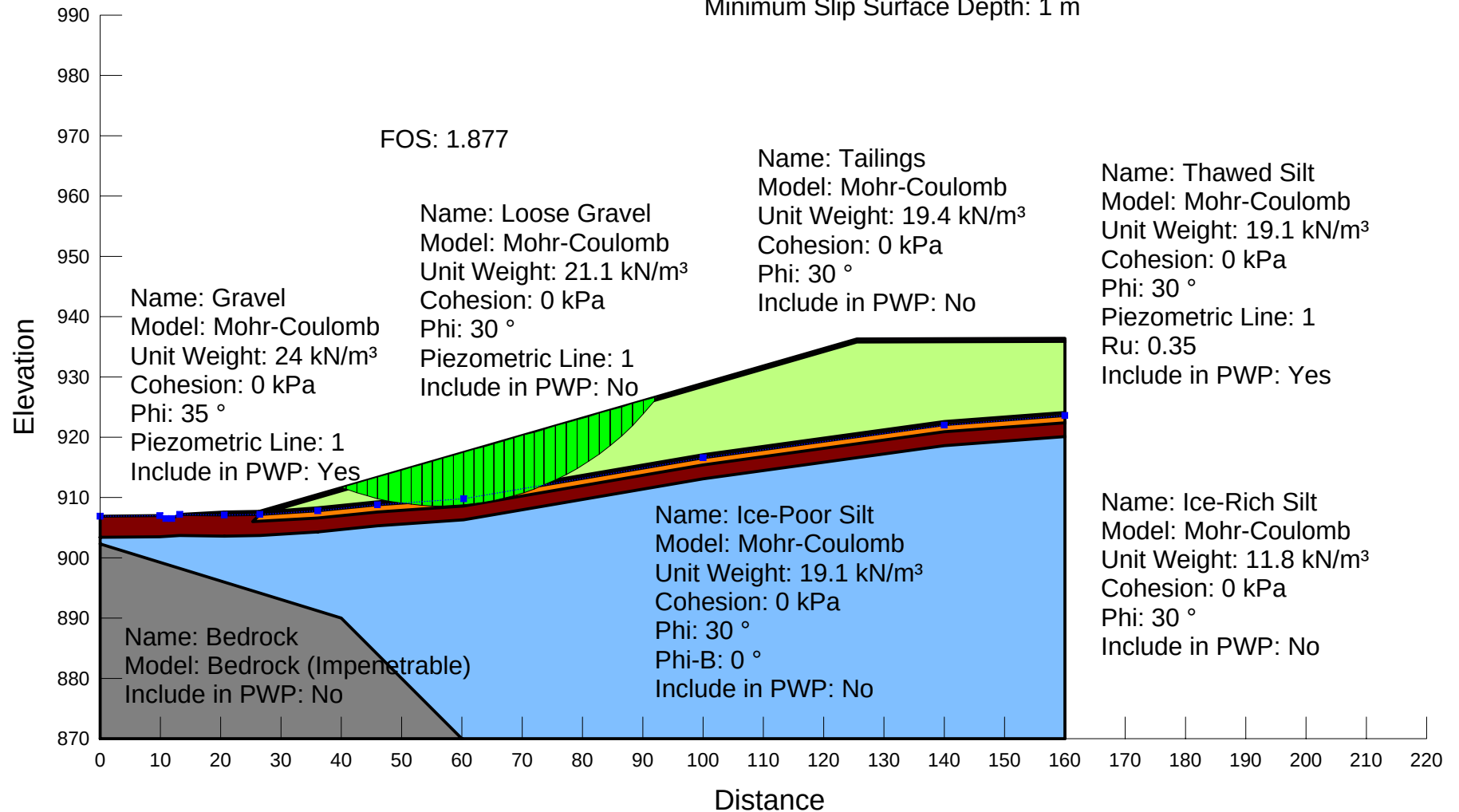
PWP Conditions Source: Piezometric Line with Ru

Length(L) Units: meters

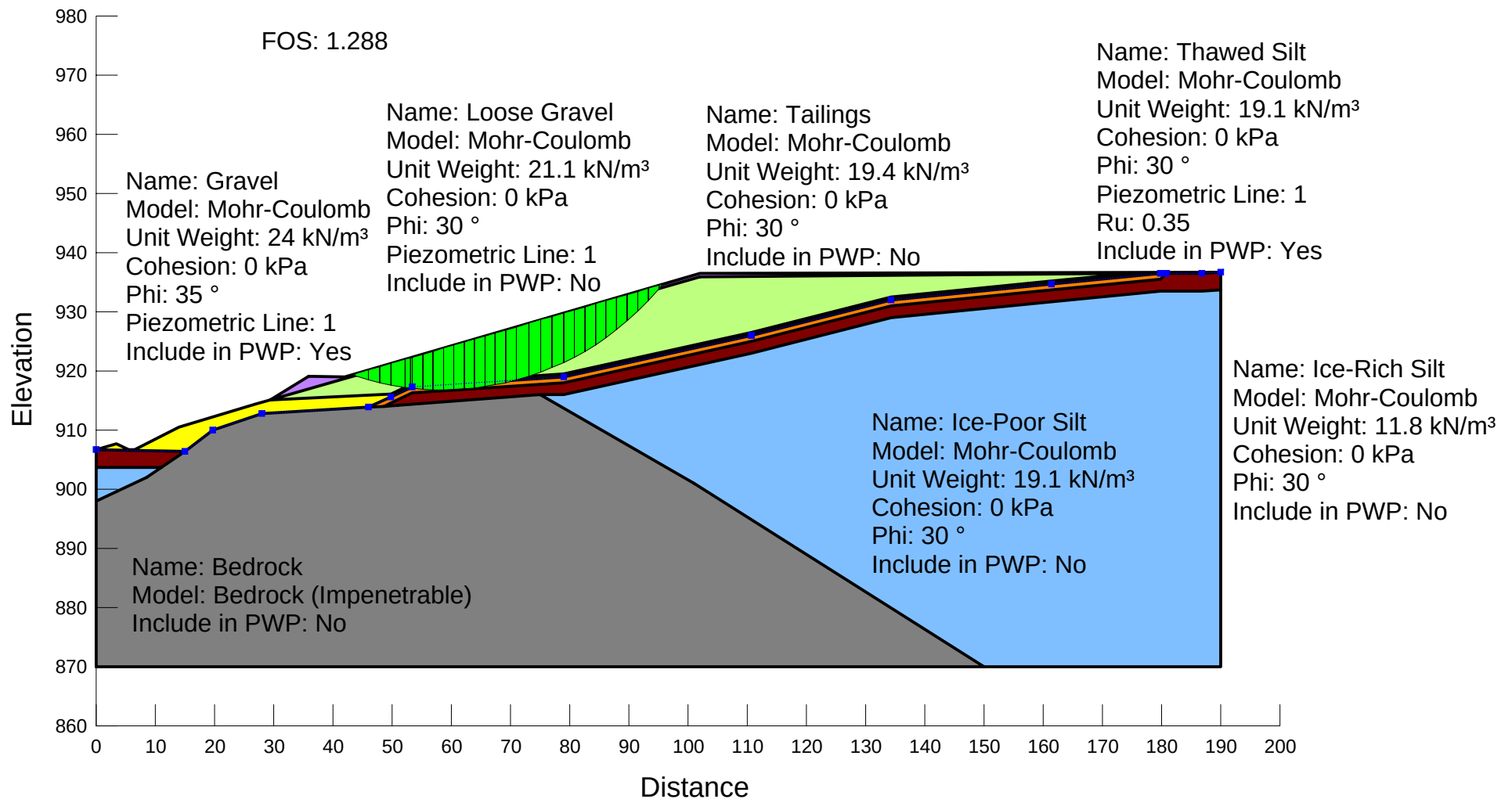
Horizontal Scale: 1000

Vertical Scale: 1000

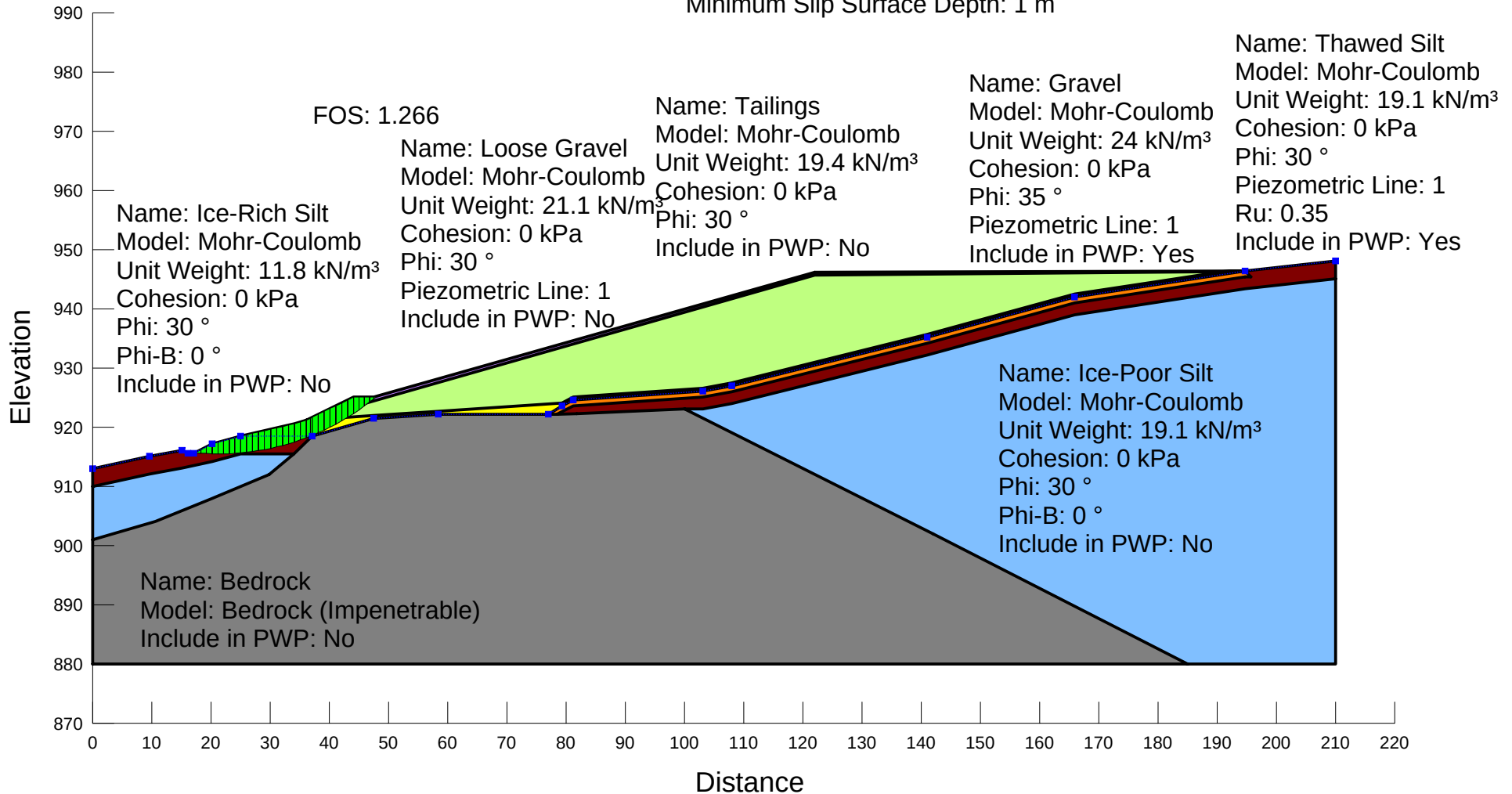
Minimum Slip Surface Depth: 1 m



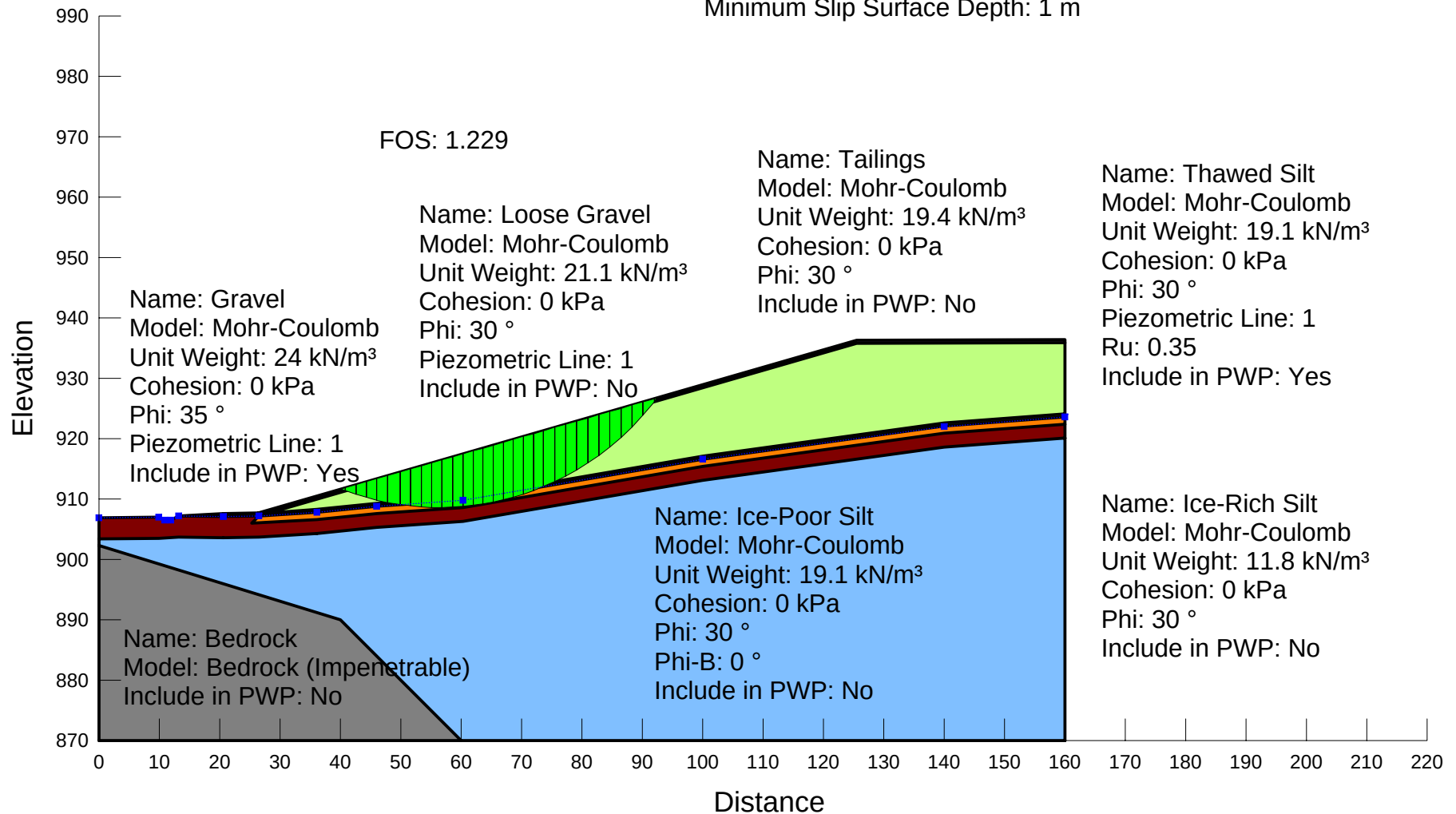
Name: Section A
Description: Dynamic (1:475) w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionA_R16E_Dynamic475_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Dynamic (1:475) w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionB_R16E_Dynamic475_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



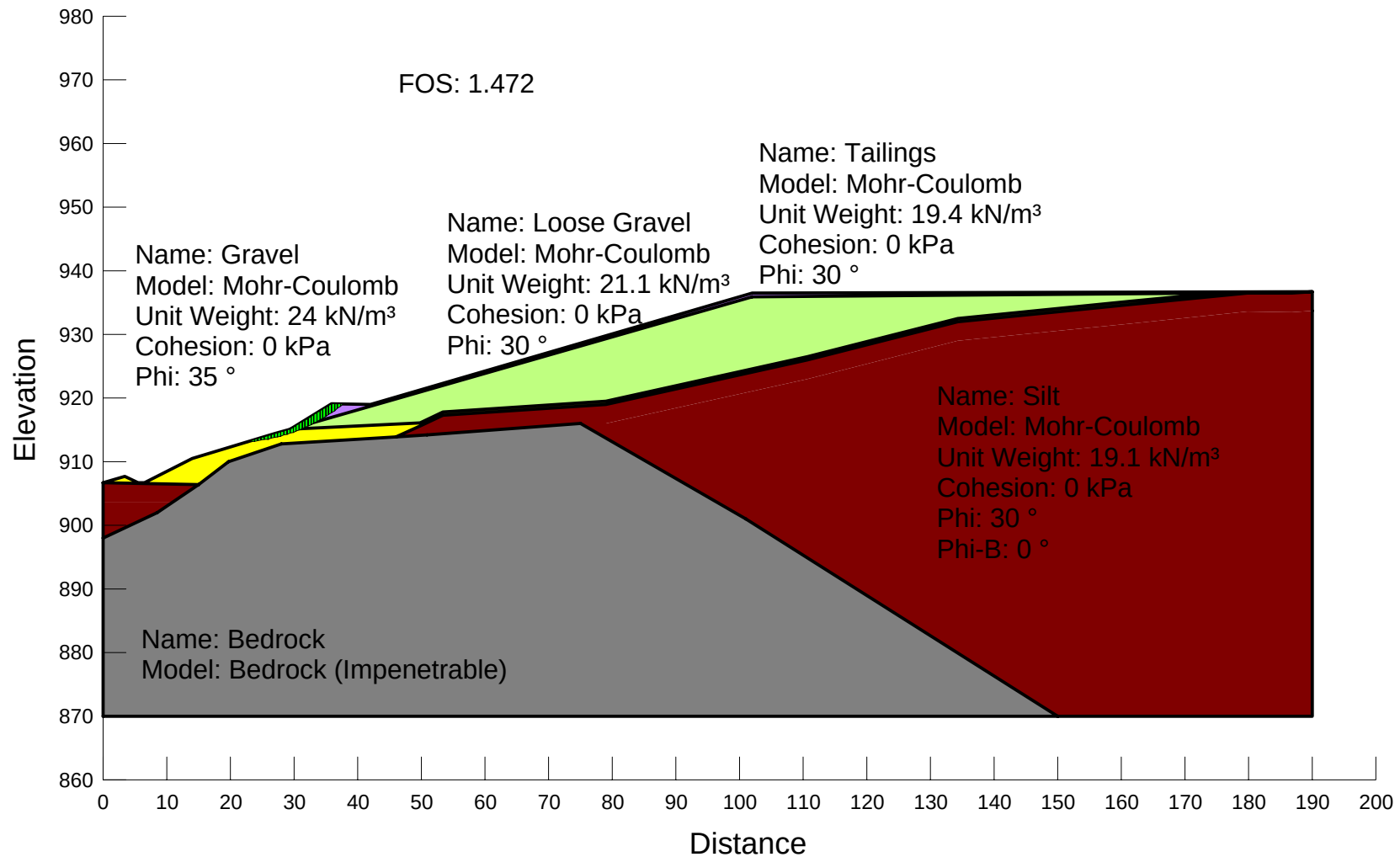
Name: Section C
Description: Dynamic (1:475) w/ Ru PWP Conditions (1.2 m Thaw)
File Name: W14101178.003_SectionC_R16E_Dynamic475_RuPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: Piezometric Line with Ru
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



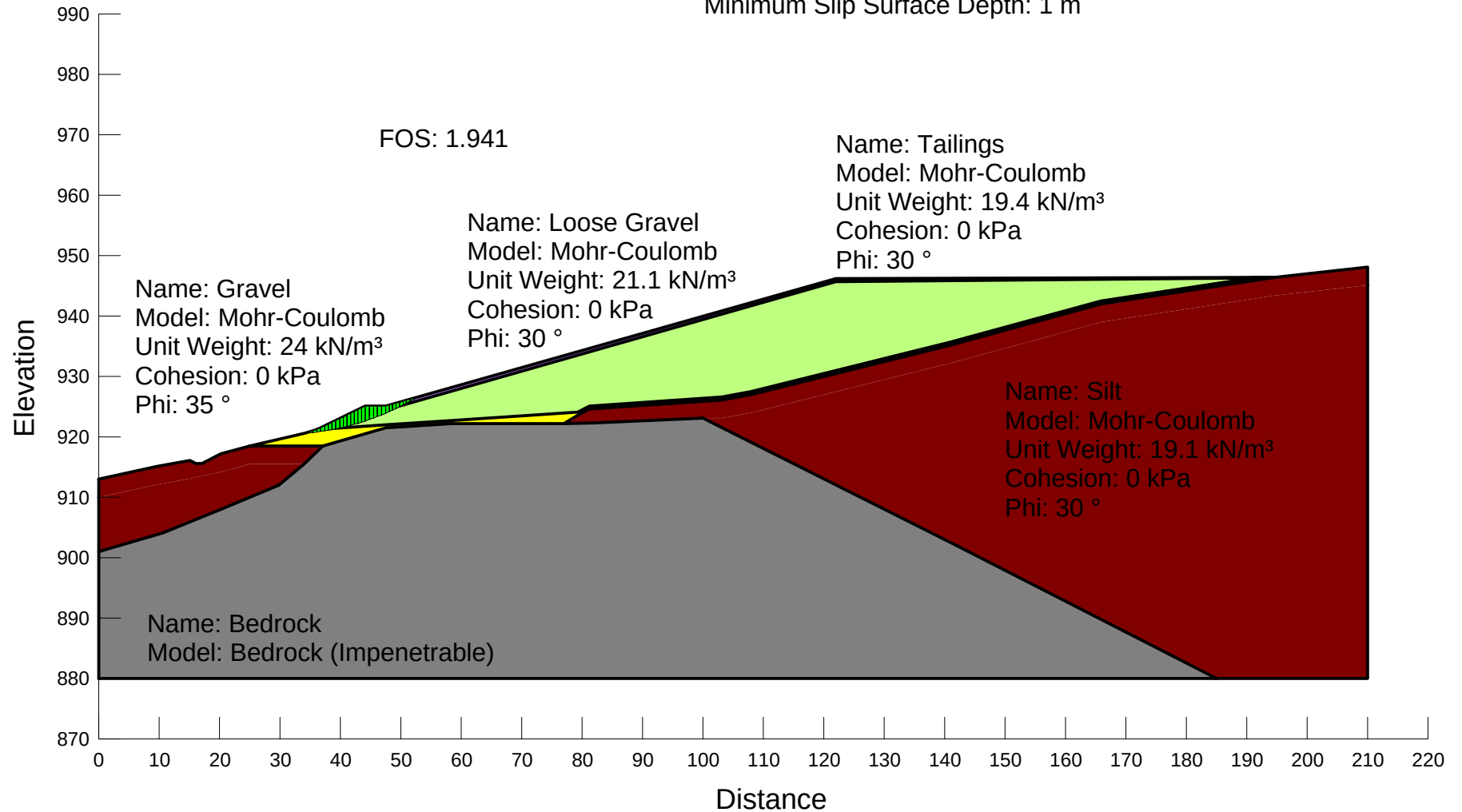
APPENDIX E

APPENDIX E SLOPE STABILITY PLOTS – FULLY THAWED CASE

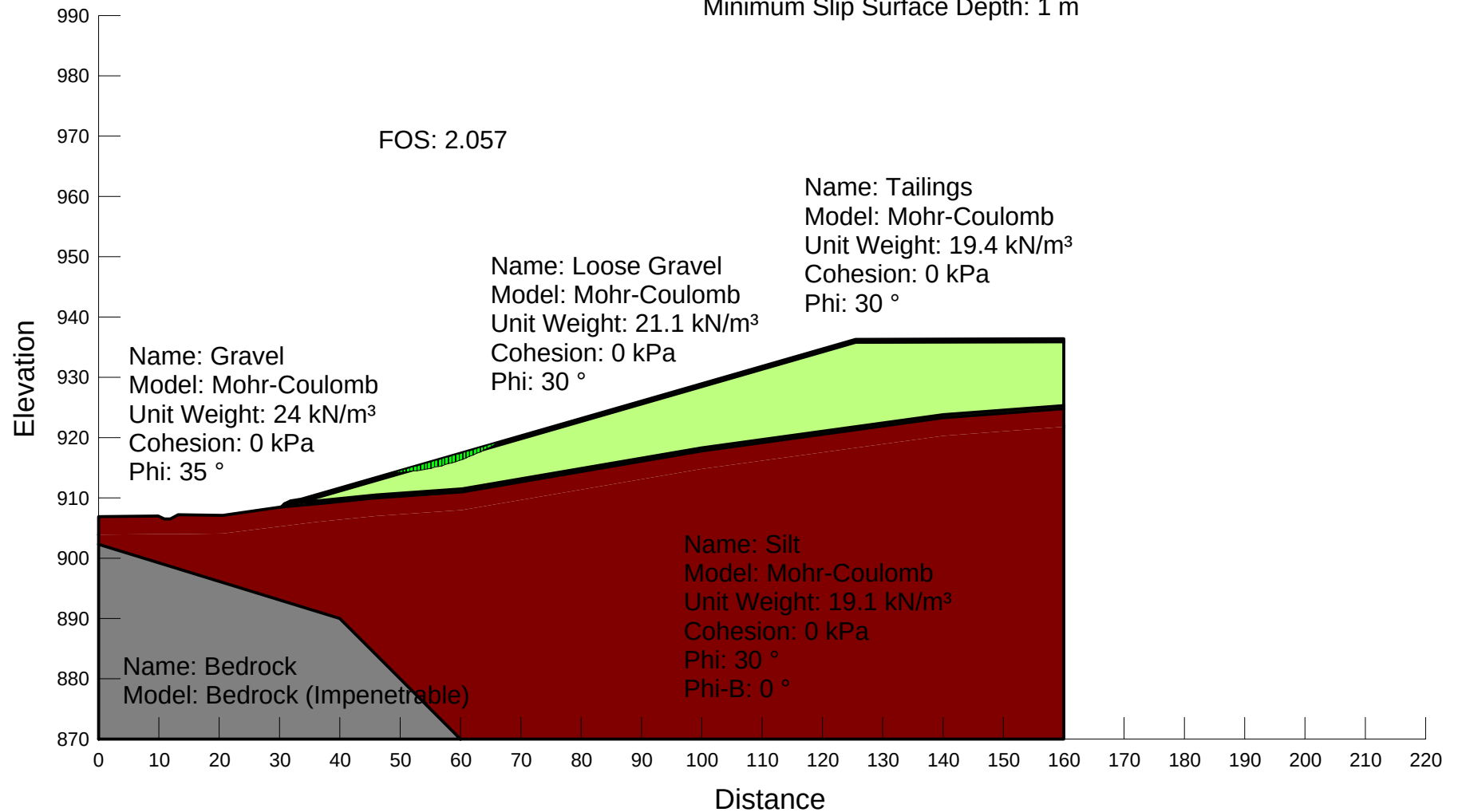
Name: Section A
Description: Static w/o PWP Conditions (Fully Thawed)
File Name: W14101178.003_SectionA_R17A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



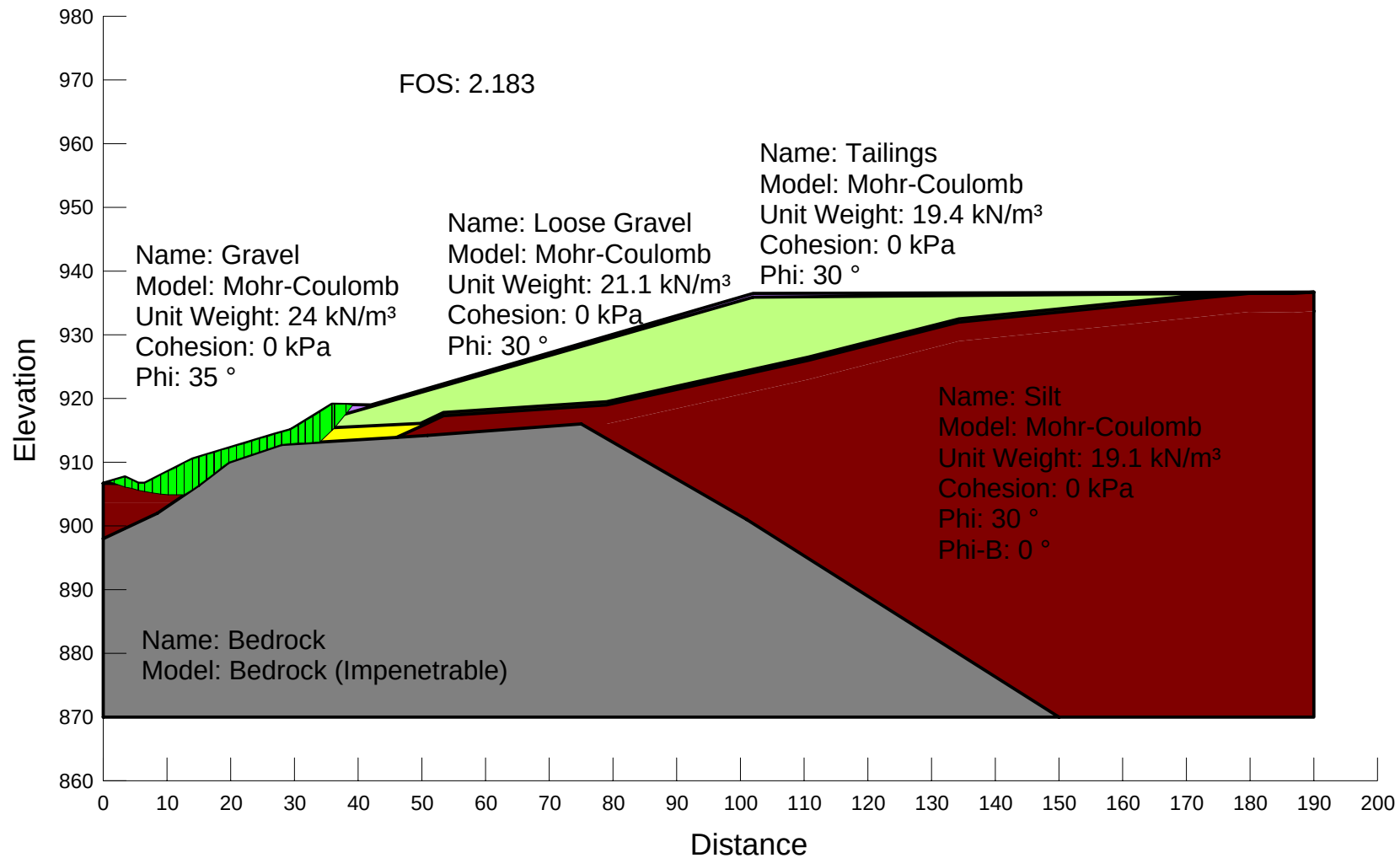
Name: Section B
Description: Static w/o PWP Conditions (Fully Thawed)
File Name: W14101178.003_SectionB_R17A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



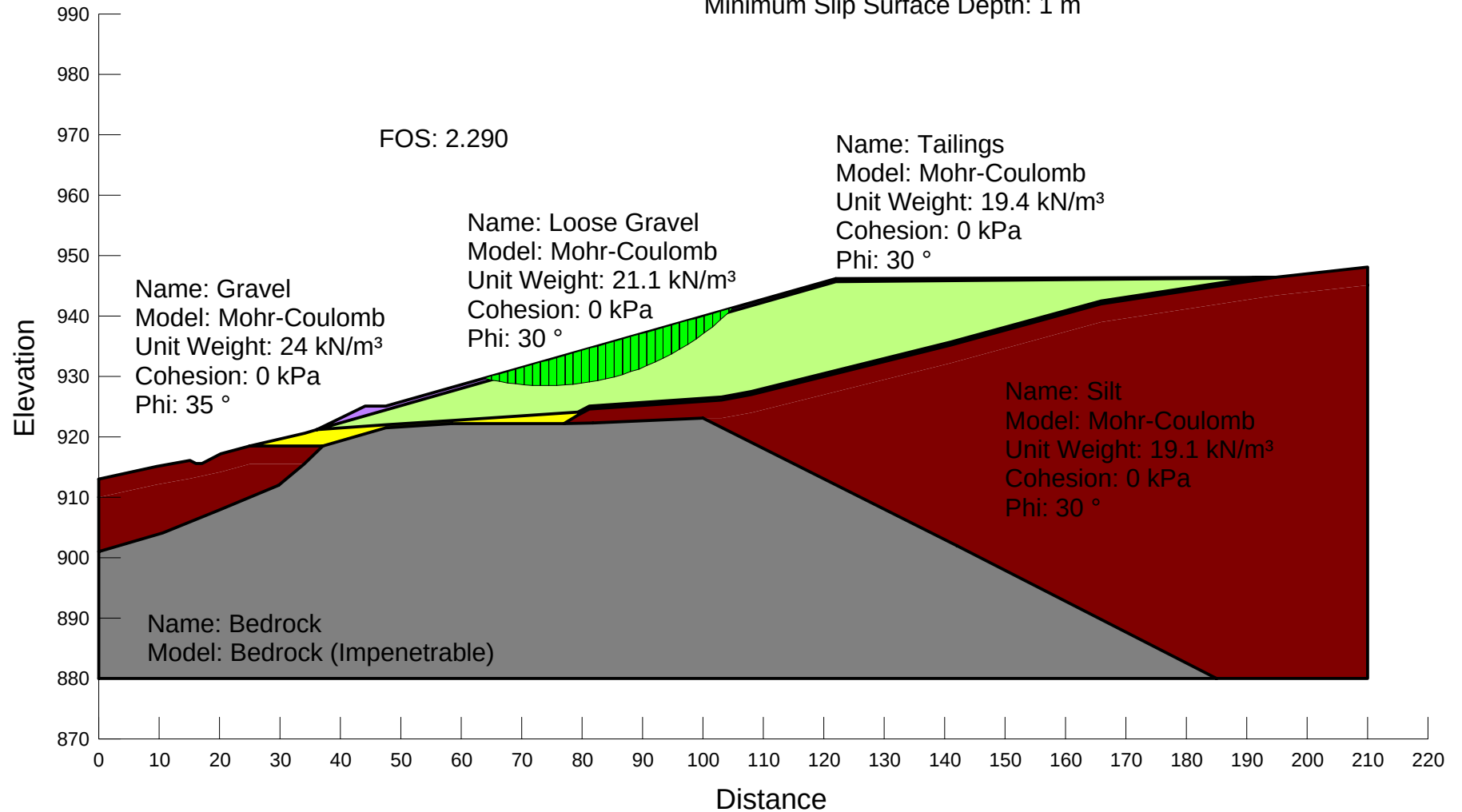
Name: Section C
Description: Static w/o PWP Conditions (Fully Thawed)
File Name: W14101178.003_SectionC_R17A_Static_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



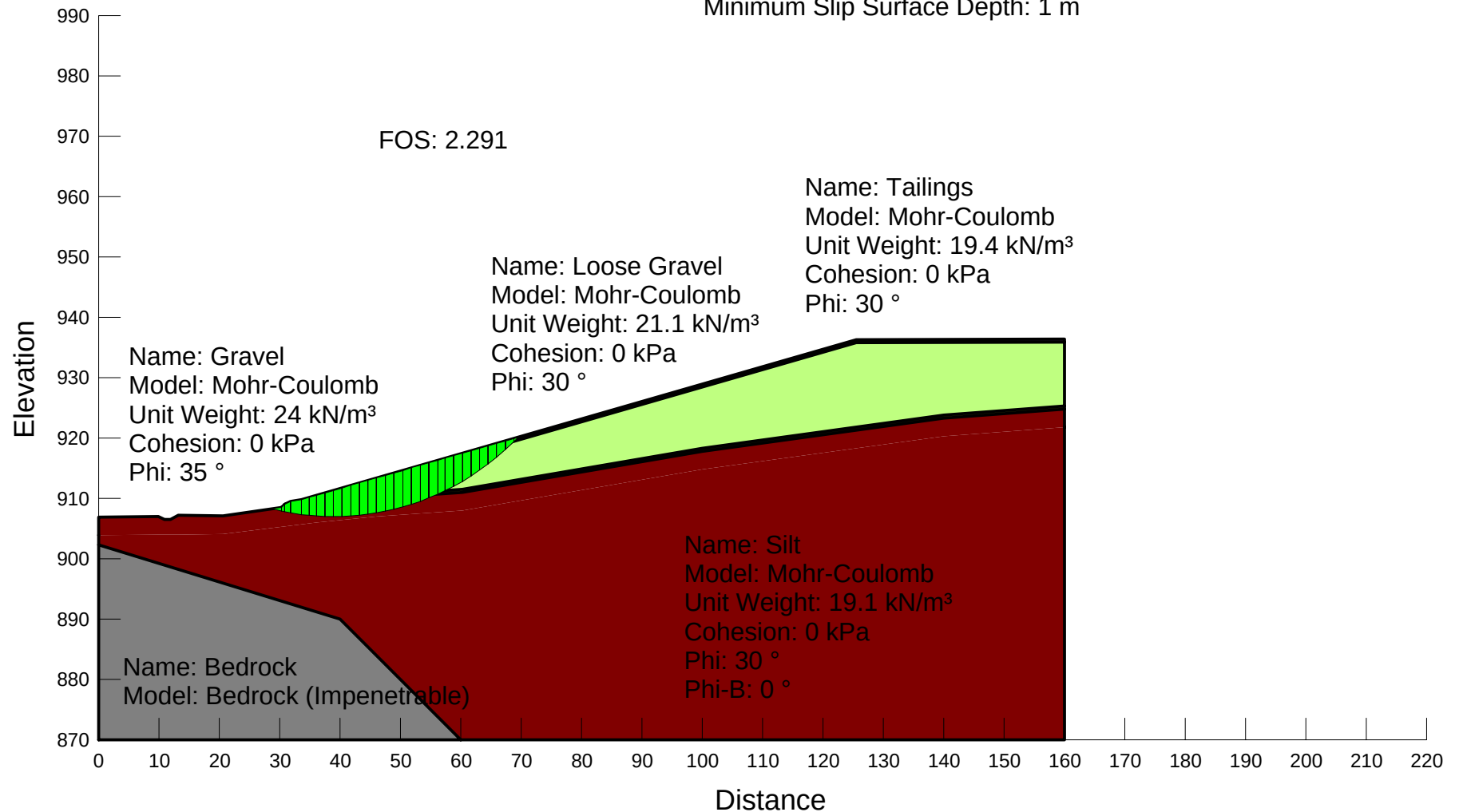
Name: Section A
Description: Static w/o PWP Conditions (Fully Thawed)
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Method: Morgenstern-Price
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PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



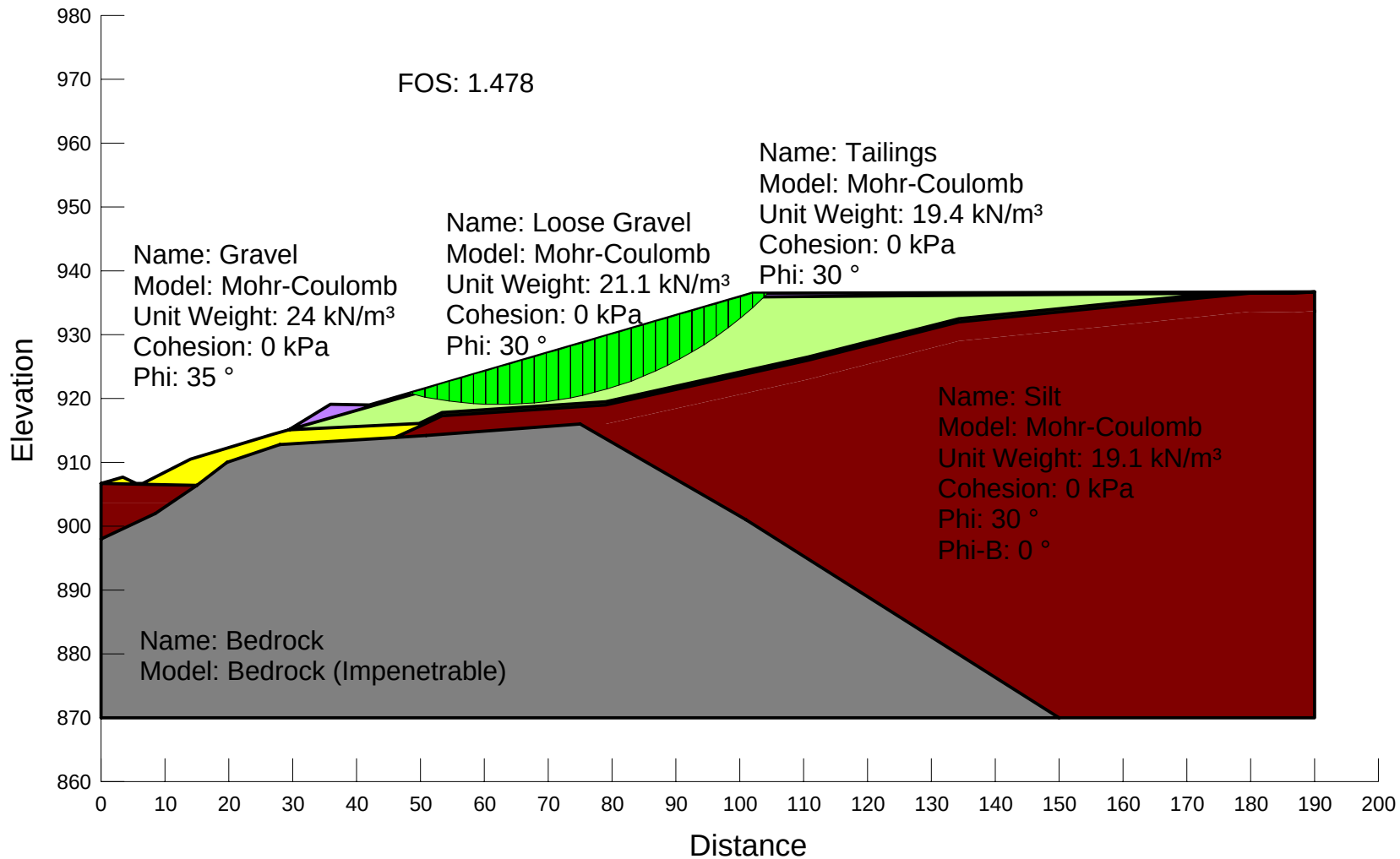
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Minimum Slip Surface Depth: 1 m



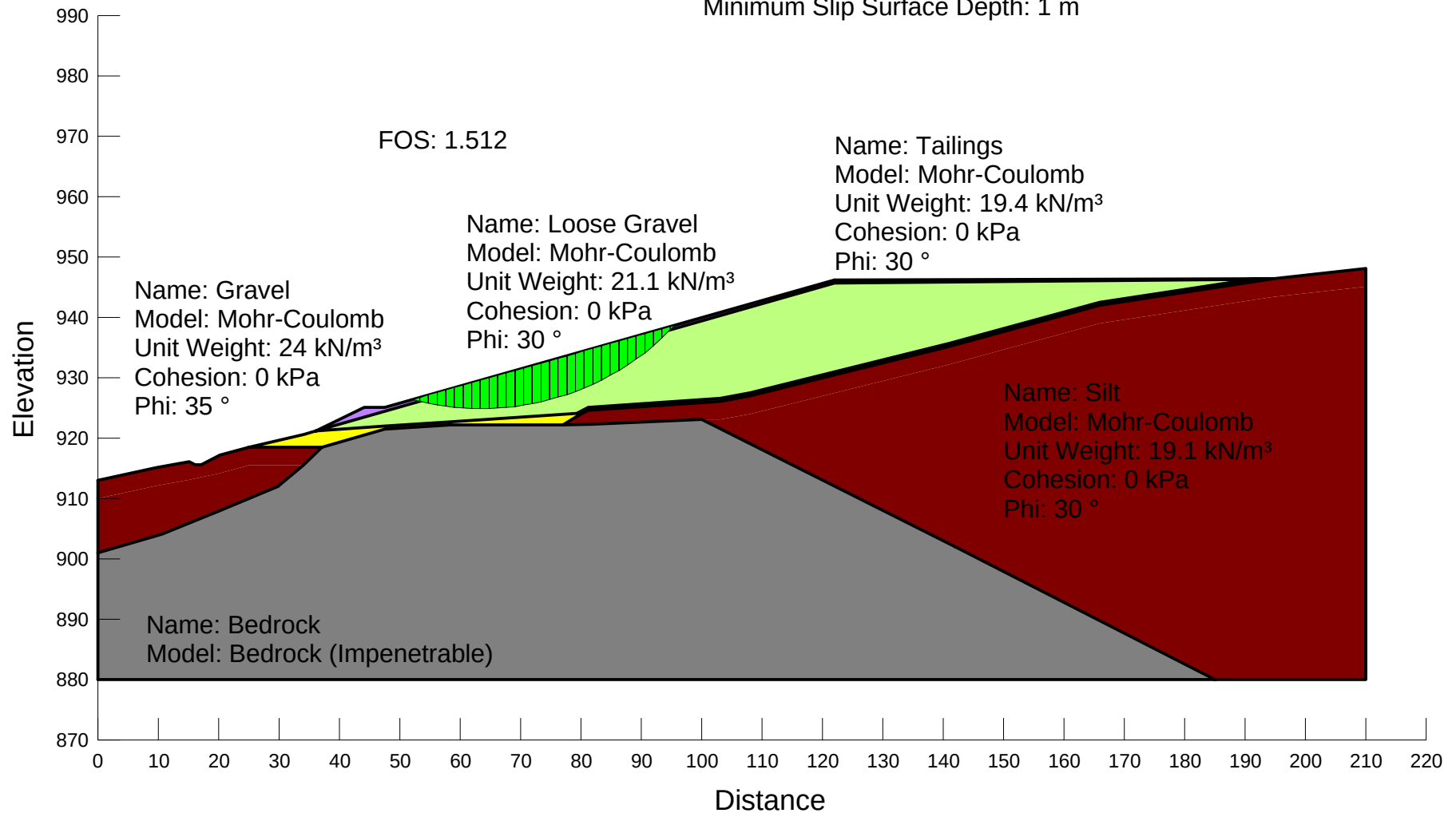
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Horizontal Scale: 1000
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Minimum Slip Surface Depth: 1 m



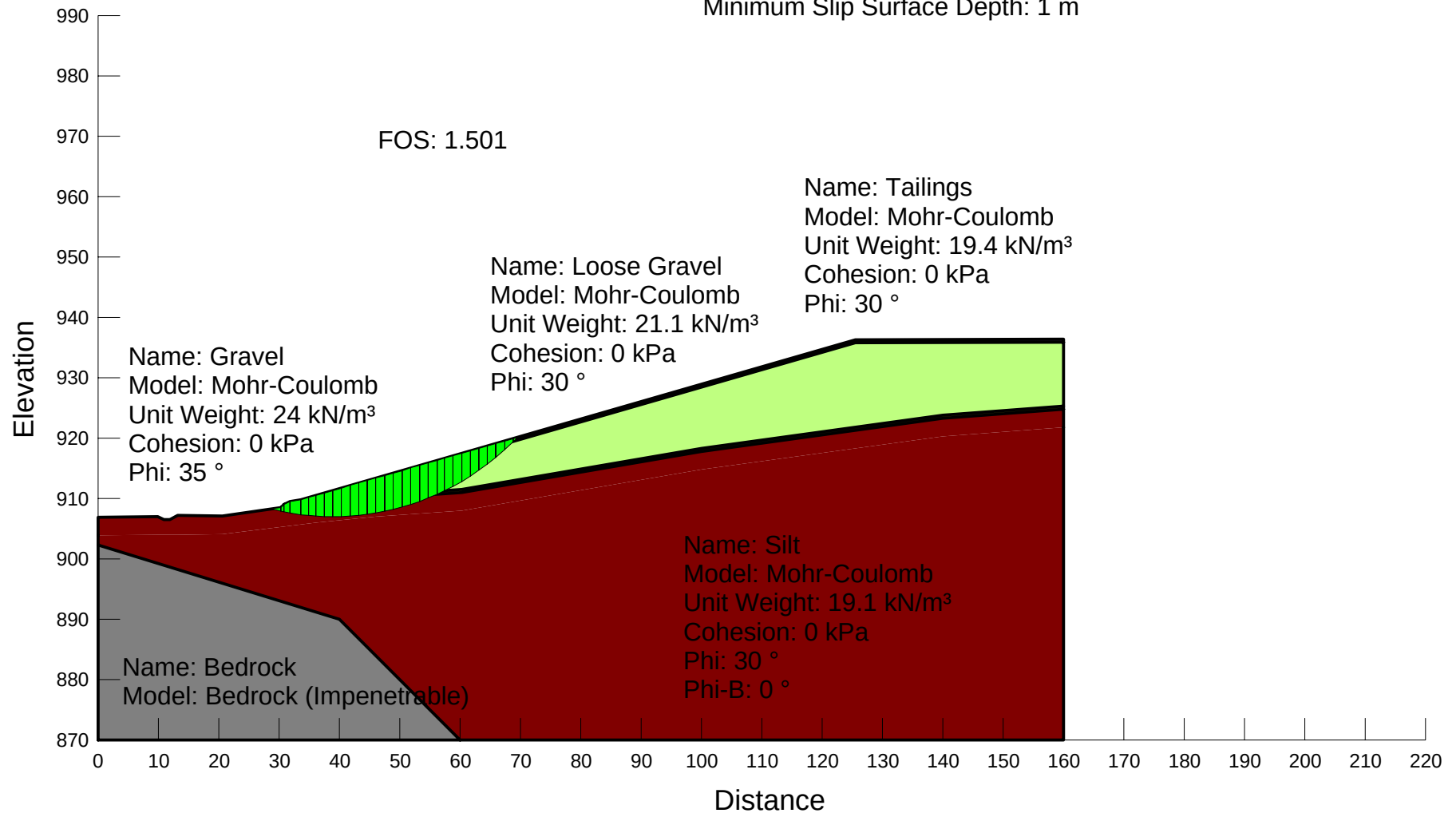
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Description: Dynamic (1:475) w/o PWP Conditions (Fully Thawed)
File Name: W14101178.003_SectionA_R17B_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section B
Description: Dynamic (1:475) w/o PWP Conditions (Fully Thawed)
File Name: W14101178.003_SectionB_R17B_Dynamic475_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



Name: Section C
Description: Dynamic (1:475) w/o PWP Conditions (Fully Thawed)
File Name: W14101178.003_SectionC_R17B_Dynamic_NoPWP.gsz
Method: Morgenstern-Price
Horz Seismic Load: 0.138
PWP Conditions Source: (none)
Length(L) Units: meters
Horizontal Scale: 1000
Vertical Scale: 1000
Minimum Slip Surface Depth: 1 m



APPENDIX F

APPENDIX F EBA'S GENERAL TERMS AND CONDITIONS

GEOTECHNICAL REPORT – GENERAL CONDITIONS

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

1.0 USE OF REPORT AND OWNERSHIP

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

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

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

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

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

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

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

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

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

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

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

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

5.0 LOGS OF TESTHOLES

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

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

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

7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

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

8.0 PROTECTION OF EXPOSED GROUND

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

9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

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

10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

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

11.0 OBSERVATIONS DURING CONSTRUCTION

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

12.0 DRAINAGE SYSTEMS

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

13.0 BEARING CAPACITY

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

14.0 SAMPLES

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

DESIGN REPORT – GENERAL CONDITIONS

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

1.0 USE OF REPORT AND OWNERSHIP

This Design Report pertains to a specific site, a specific development, and a specific scope of work. The Design Report may include plans, drawings, profiles and other support documents that collectively constitute the Design Report. The Report and all supporting documents are intended for the sole use of EBA’s Client. EBA does not accept any responsibility for the accuracy of any of the data, analyses or other contents of the Design Report when it is used or relied upon by any party other than EBA’s Client, unless authorized in writing by EBA. Any unauthorized use of the Design Report is at the sole risk of the user.

All reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

2.0 ALTERNATIVE 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 so stipulated in the Design Report, EBA was not retained to investigate, address or consider, and has not investigated, addressed or considered any environmental or regulatory issues associated with the project specific design.

4.0 CALCULATIONS AND DESIGNS

EBA has undertaken design calculations and has prepared project specific designs in accordance with terms of reference that were previously set out in consultation with, and agreement of, EBA’s client. These designs have been prepared to a standard that is consistent with industry practice. Notwithstanding, if any error or omission is detected by EBA’s Client or any party that is authorized to use the Design Report, the error or omission should be immediately drawn to the attention of EBA.

5.0 GEOTECHNICAL CONDITIONS

A Geotechnical Report is commonly the basis upon which the specific project design has been completed. It is incumbent upon EBA’s Client, and any other authorized party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the geotechnical information that was reasonably acquired to facilitate completion of the design.

If a Geotechnical Report was prepared for the project by EBA, it will be included in the Design Report. The Geotechnical Report contains General Conditions that should be read in conjunction with these General Conditions for the Design Report.



ALEXCO KENO HILL MINING CORP.

Dry Stack Tailings Facility Construction and Operation Plan

QML-0009

BELLEKENO PROJECT

KENO HILL SILVER DISTRICT

YUKON

Attachment B

May 2010

Prepared by:



www.accessconsulting.ca

April 23, 2010

EBA File: W14101178.003

Alexco Resource Corp.
#3-151 Industrial Road
Whitehorse, Yukon Y1A 2V3

Attention: Mr. Rob McIntyre, Vice President

**Subject: Response to Water Board Questions
Water Management Preliminary Designs**

1.0 INTRODUCTION

In a meeting held on April 22, 2010 between Alexco Resource Corp. (Alexco), EBA Engineering Consultants Ltd. (EBA), Yukon Water Board and their consultant, Cord Hamilton, P. Eng. (Water Board), several concerns raised by the Water Board specific to the Water License application were discussed. Alexco requested that EBA provide further information with regard to the following three items:

- Physical and flow characteristics of all channels and flumes on the mill site,
- Liner system design for the mill site pond, and
- Spillway design for the mill site pond.

The Water Board determined that they do not have sufficient information to comment on whether or not the channels and flumes were adequately designed to accept the expected flows. The Water Board also requires clarification on whether or not there is a spillway proposed for the Mill Site Pond and if so, clarify the details of the preliminary design and if not, justify the reasoning for leaving it out of the design.

2.0 CHANNELS AND FLUMES

There are two channels and one flume proposed to aid in surface water management of the site. The two channels run along the toe of the proposed Dry-Stacked Tailings Facility (DSTF) and the flume runs from the confluence of the two channels to the proposed Mill Site Pond. These features are shown in Figure 1.

The proposed channels are excavations into the existing gravel soils. Their proposed dimensions are shown in a cross-section in Figure 1. There is no liner proposed for these channels and it is expected that the existing gravel soils will be sufficient to resist the shear forces generated by the flowing water in the channels. Existing ditches observed on site,

which were also excavated into the existing gravels have been shown to be capable of conveying water during freshet and summer storm events without significant erosion.

The proposed flume is to be constructed from engineered fill, select gravel borrowed from the area. Its proposed dimensions are shown in a cross-section in Figure 1. A geosynthetic liner system is proposed for the flume. The liner system is not finalized at this time but may be High-Density Polyethylene (HDPE), low-linear-density polyethylene (LLDPE), geosynthetic clay liner (GCL) or other commercially available ditch lining product. The liner system ultimately selected will be designed and installed in accordance with the manufacturer's specifications and recommendations.

Flow depths and velocities for the channels and flumes are summarized in Table 1.

TABLE 1: FLOW CHARACTERISTIC SUMMARY			
	Northwest Ditch	Southwest Ditch	Flume
Contributing Area (ha)	2.37	1.41	3.78
Peak Flow (1:200 freshet) (m ³ /s)	0.0076	0.0044	0.012
Bottom Width (m)	1	1	1
Sideslopes (H:1V)	2	2	2
Average Gravel (%)	2	5.8	3
Mannings 'n'	0.025	0.025	0.01
Flow Depth (m)	0.02	0.01	0.01
Flow Velocity (m/s)	0.39	0.44	0.91
Minimum D ₅₀ for gravel (mm)	10	10	Not gravel lined

3.0 MILL SITE POND

The proposed Mill Site Pond is an excavation in existing soils. The preliminary design is for it to be lined with a geosynthetic liner; however, this may be reviewed in the detailed design phase of the project to determine if the native silt in the area can be effectively used to retain water. The currently proposed geosynthetic liner system is shown in Figure 2. The geosynthetic to be used has not been determined at this stage; however, it could be an HDPE, LLDPE, or GCL type of product. The liner system ultimately selected will be designed and installed in accordance with the manufacturer's specifications and recommendations.

4.0 MILL SITE POND SPILLWAY

EBA did not provide a preliminary design for a spillway at the Mill Site Pond as it is not likely to be subjected to an overtopping scenario. The pond will have an active discharge, through a water treatment plant by means of a drip emitter. The proposed design flow rate of the drip emitter is 10 L/s, which is the anticipated peak flow rate corresponding to the 1:200 year freshet. Therefore, the pond could only overtop if this discharge system was for some reason inoperative.

The pond has an operating volume of 2,524 m³. Assuming the pond was empty at the beginning of freshet, with no discharge from the pond, it would take until day 8 to fill at a conservative 1:200 year freshet inflow rate for the catchment (6.27 ha) (Clearwater, 2009). However, the pond has a 0.5 m freeboard which must be filled prior to overtopping, corresponding to a total volume of 3,150 m³. It would take until day 11 to fill this volume at a conservative 1:200 year freshet inflow rate for the catchment (Clearwater 2009). This should be sufficient time to either reactivate the existing drip emitter or install a new system of discharge.

However, should the discharge mechanism still be inoperative after day 11 and the Mill Site Pond overtops, the water will begin to flow from the pond overland to the southwest, the low point of the pond crest is shown in Figure 2. The water will most likely infiltrate into the soils west of the pond and ultimately flow in the shallow aquifer to Christal Lake, which is a similar procedure to the proposed method of discharge. The overtopping of the pond crest should not put the pond into any imminent danger of catastrophic failure; however, it may cause some erosion to the southwest and western edges of the facility which could be repaired with onsite equipment.

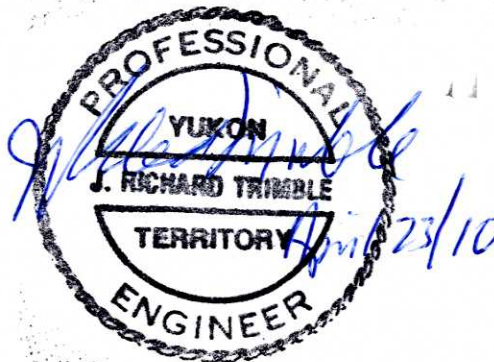
5.0 CLOSURE

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

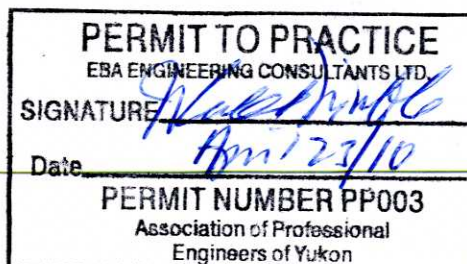
Yours truly,
EBA Engineering Consultants Ltd.

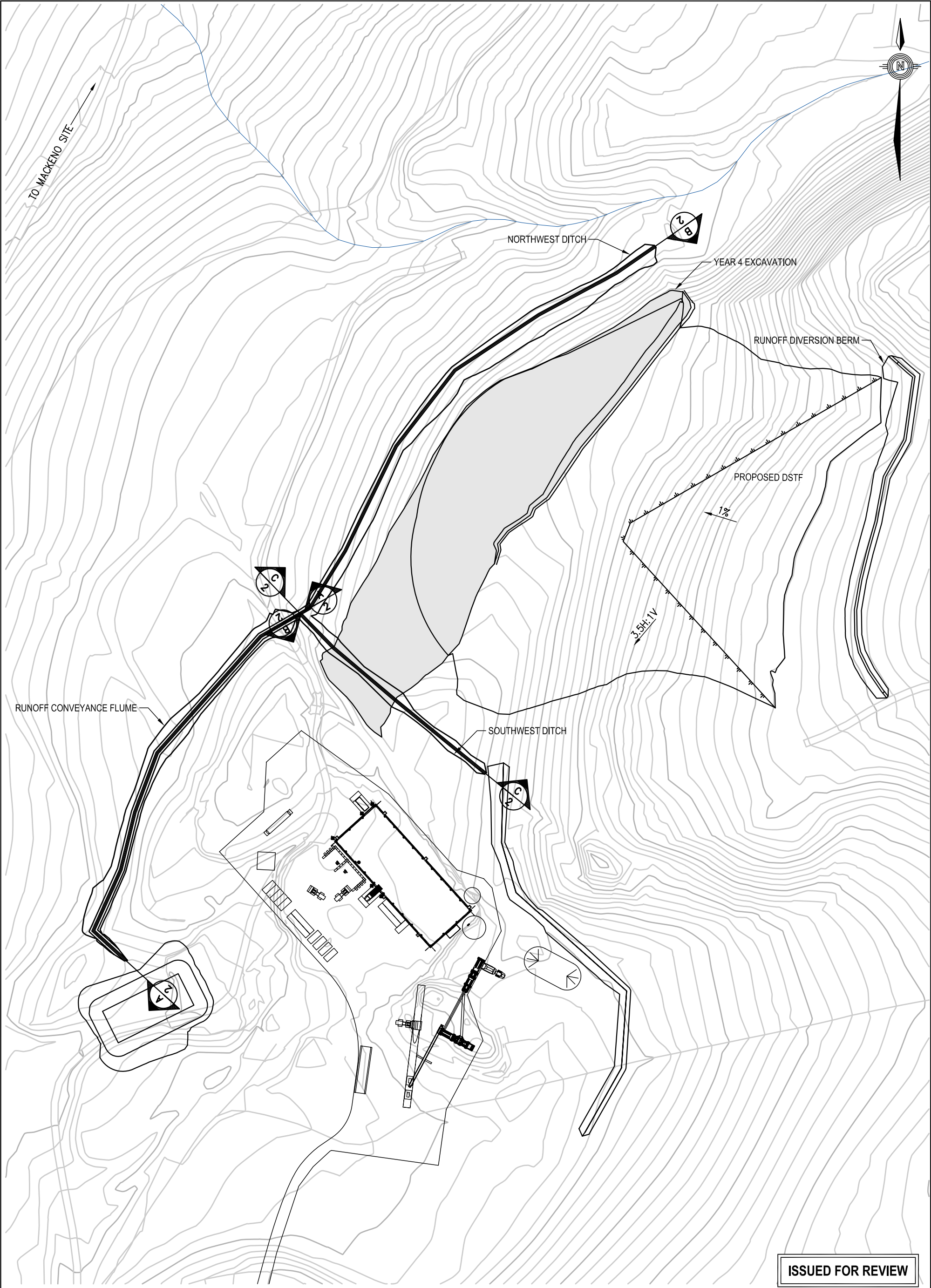


Christopher J. Dixon, P.Eng.
Project Engineer, Yukon Region
Direct Line: 867.668.2071 x241
cdixon@eba.ca



J. Richard Trimble, FEC, P.Eng.
Project Director, Yukon Region
Direct Line: 867.668.2071 ext. 222
rtrimble@eba.ca

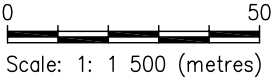




ISSUED FOR REVIEW

NOTES

- 1. NTS MAP ZONE 8 M/14 NAD 83
- 2. CONTOUR INTERVALS - 1.0 m
- 3. BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES



CLIENT



EBA Engineering
Consultants Ltd.



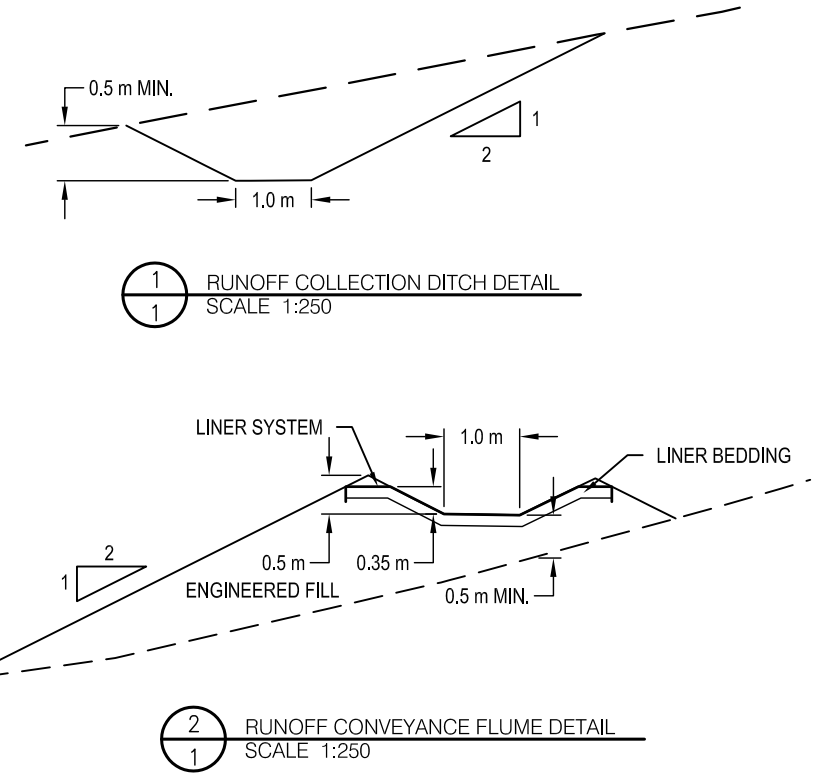
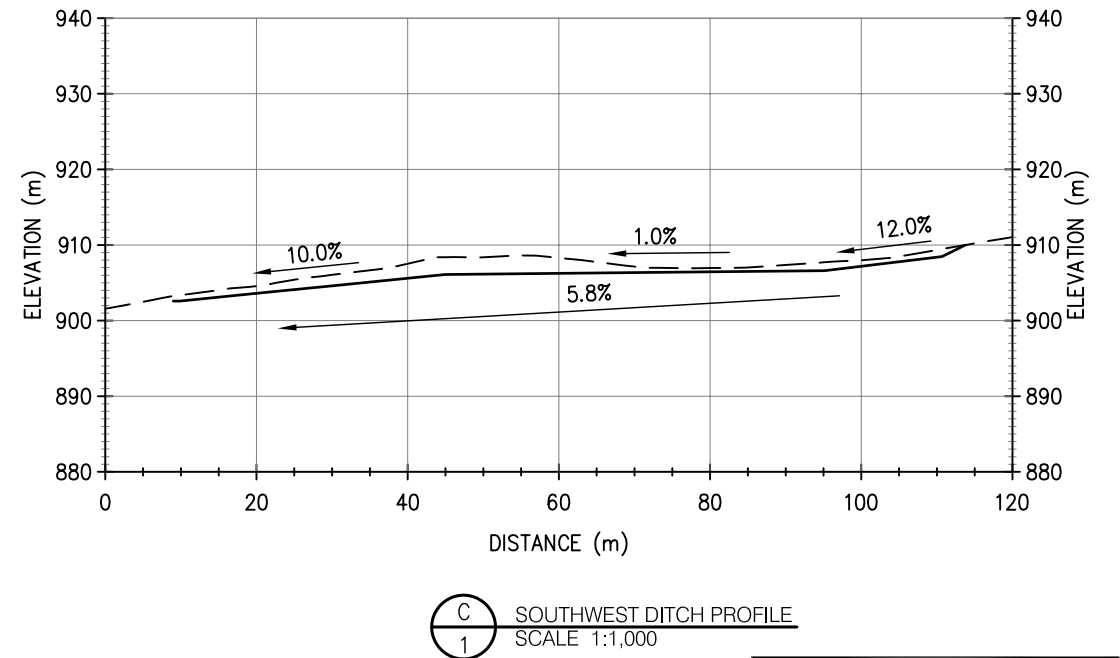
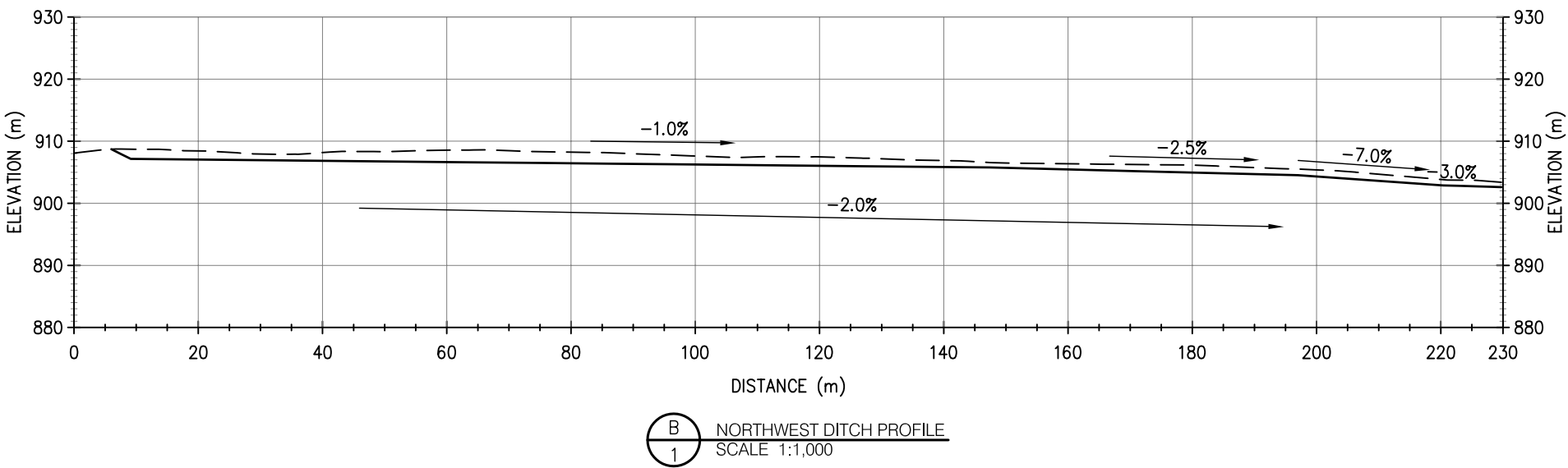
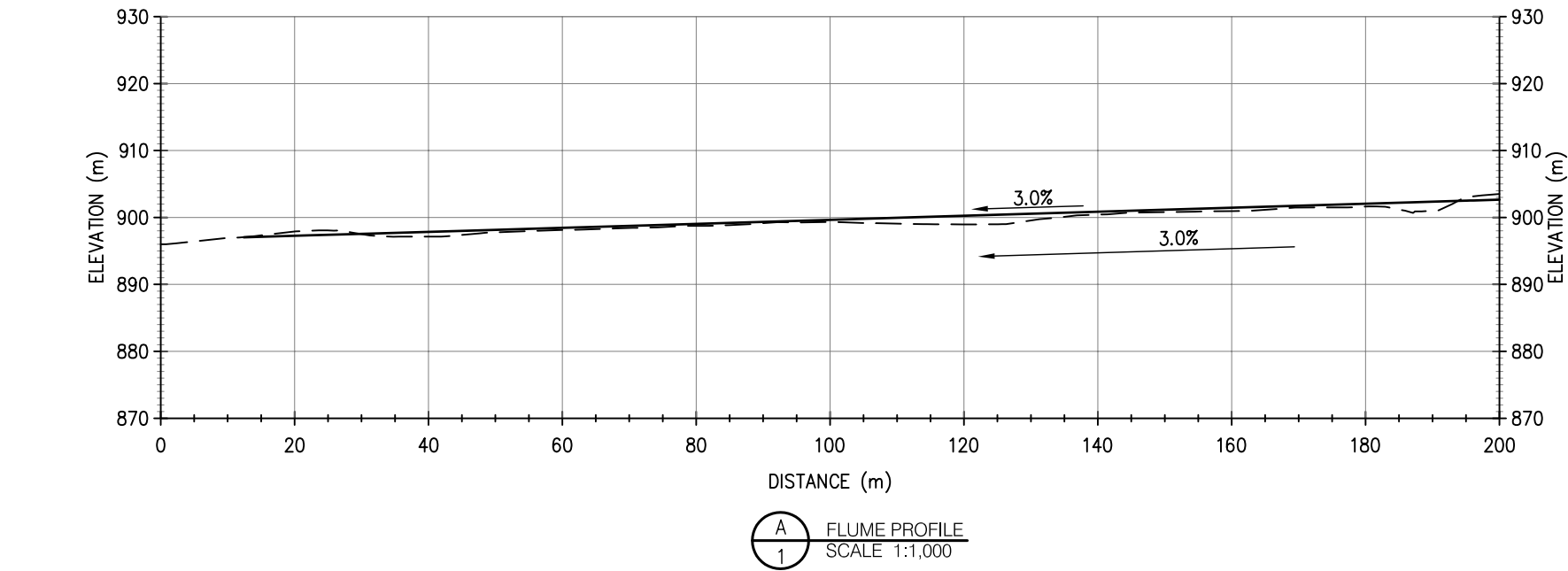
DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

CONVEYANCE NETWORK PLAN

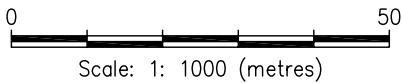
PROJECT NO. W14101178.003	DWN KJT	CKD CJD	REV 0
OFFICE EBA-WHSE	DATE April 23, 2010		

Figure 1

Q:\Whitehorse\Data\0201 drawings\Keno\W14101178 WHSE Site Search\3 Site Overview\W14101178.003 Engineering Support Services\W14101178.003 Figure 1 20100423.dwg [FIGURE 2] April 23, 2010 - 2:37:18 pm (BY: KEN TOMCZYK)



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EBA Engineering
Consultants Ltd.



DRY-STACK TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

CONVEYANCE NETWORK PROFILES & DETAILS

PROJECT NO.
W14101178.003

DWN
KJT

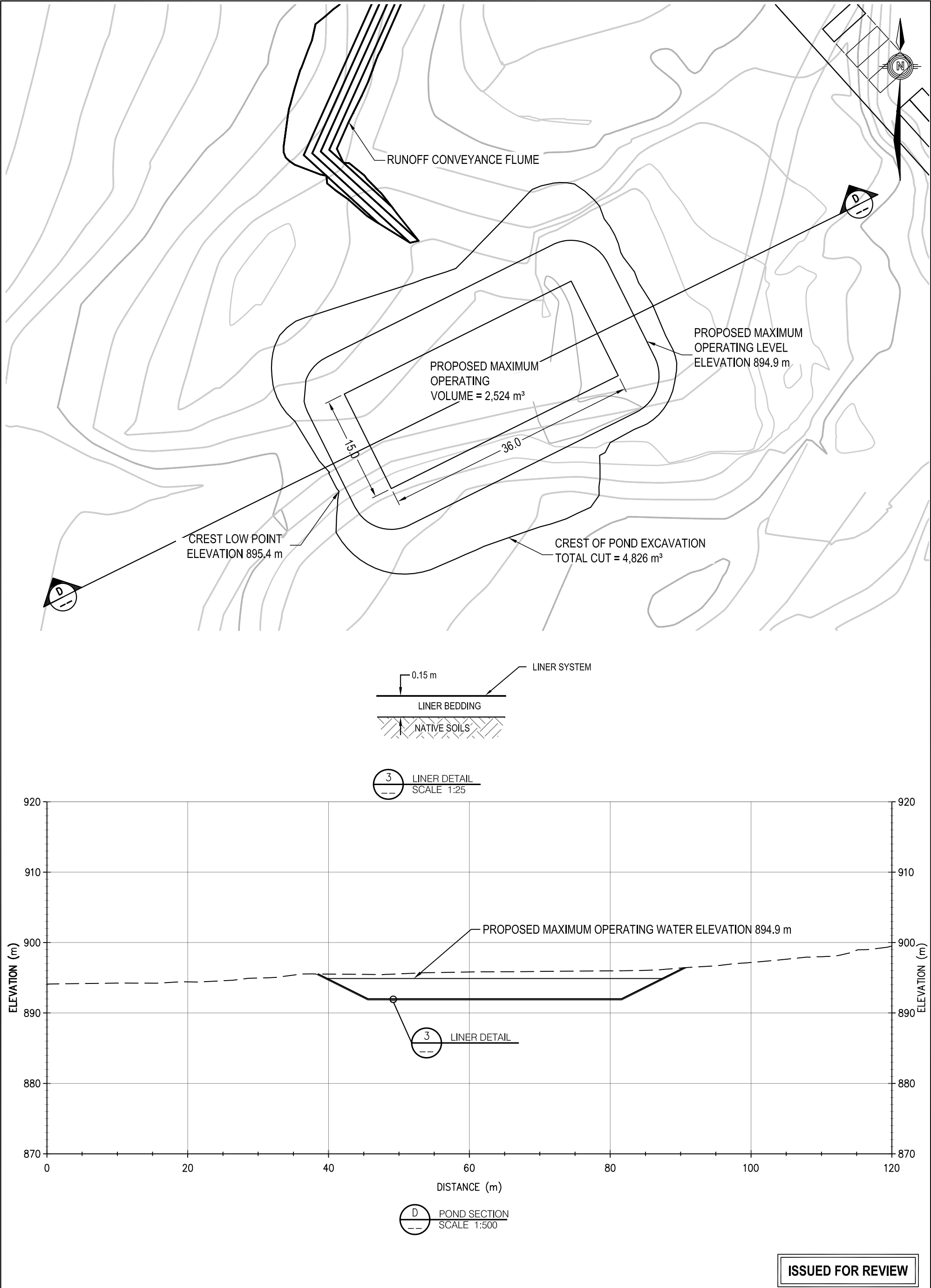
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OFFICE
WHSE

DATE
April 23, 2010

Figure 2



ISSUED FOR REVIEW

NOTES

1. NTS MAP ZONE 8 M/14 NAD 83
2. CONTOUR INTERVALS - 1.0 m
3. BASE PLAN/DRAWING PROVIDED BY ALEXCO RESOURCES

CLIENT



EBA Engineering
Consultants Ltd.



DRY-STACKED TAILINGS FACILITY DESIGN
BELLEKENO MINE MILL SITE, YUKON

WATER COLLECTION POND
PLAN AND PROFILE

PROJECT NO.
W14101178.003

DWN
KJT

CKD
CJD

REV
0

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EBA-WHSE

DATE
April 23, 2010

Figure 3