January 26, 2006 EBA File: 1100060.004

Tahera Diamond Corporation
Suite 803, 121 Richmond Street West
Toronto, Ontario M5H 2K1

Attention: Dan Johnson

Subject: Jericho Diamond Mine
Processed Kimberlite Containment Area
East and Southeast Dam – Reply to INAC – Nunavut Regional Office

1.0 INTRODUCTION

The following addresses technical questions raised in the letter from INAC – Nunavut Regional Office, dated November 14, 2005 regarding EBA's Jericho East and Southeast Dams Design Report and construction drawings and specification.

In order to facilitate more efficient technical discussions, TDC and INAC recommended direct communication amongst the technical parties and plan reviewers. EBA had discussions with Mr. H. Hartmaier of BGC Engineering Inc. The following addresses the issues raised by and discussed with Mr Hartmaier.

2.0 GEOLOGIC CONDITIONS

Surficial geology consists of bedrock outcrops at the abutments of the East Dam and Southeast Dam and till deposits in the valleys. The estimated surficial geology of the East and Southeast Dam is shown in attached design drawing ED-2. The surficial geology has been updated from that shown in the original design drawing.

Two boreholes drilled at the East Dam and one borehole was drilled at the Southeast Dam as shown in Drawing ED-3. Borehole BH-03-10 (SRK 2003) drilled near the centre of the East Dam alignment encountered thin organics (0.1 m) overlying 23 m of silty sand till with cobbles and boulders. Ice descriptions were not logged during drilling; and based on core photos, it appears that most of the core thawed during drilling. Three till samples had moisture contents ranging from 8 to 9% indicating relatively low excess ice contents; however, photos of core indicate some of the material was very wet upon thaw which indicates that zones of the till may be ice rich. Ground temperatures below 10 m in September ranged from –5°C to –7°C. Granite bedrock was encountered at a depth of 23 m with a 2 m thick layer of broken rock overlying competent rock.

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Borehole 00SRKGeotech1 was drilled on the north abutment of the East Dam. The drill hole encountered approximately 7.6 m of silty sand till overlying fractured rock with bedrock at 8.5 m. No details were provided in the borehole log on the ice characteristics of the overburden.

Borehole 01-Geotech5 was drilled near the centre of the Southeast Dam alignment. The drill hole encountered approximately 4.1 m of overburden over granite.

The valleys that contain the East Dam and Southeast dam have minimal amounts of surface water flowing across the sites; however, there is intermittent surface water flow during precipitation events. Permafrost was observed in the cored drill hole in the area of the East Dam with ground temperatures in the range of –5 to –7°C. Taliks are not expected in the dam footprints given the measured ground temperatures, and lack of significant surface water.

Ground conditions were further observed in the fall of 2005 during dam foundation preparations through percolation drill hole tests and key trench excavation. The key trench was excavated to frozen ground throughout the till sections as specified. No evidence of a talik was observed. The site observations were similar to that assumed during design phase; however, the key trench was excavated deeper than shown on the design drawings. In soil areas the key trench was founded in frozen ground. In bedrock areas the key trench was founded below the depth of "tight" rock as indicated by percolation test holes.

Minimal surface organics were observed during foundation preparation at the East Dam. Surface organics below the Southeast Dam footprint were removed.

3.0 DESIGN INTENT

The design criteria for the East and Southeast Dams are as follows:

- The dams will retain fine PK solids.
- The water in the PKCA is planned to be maintained a low level; therefore, water will not be impounded against the East and Southeast Dams for long periods of time. However, the dams have been designed as water retaining structures since water may pond against the dams for short periods of time.
- The dams will remain physically stable during the operational life of the mine and following mine closure.

The main water retention element in the dams is a geomembrane liner. The liner is keyed into the ground using frozen saturated fill. Additional water retention will be provided by the fine processed, coarse processed kimberlite and till placed upstream of the liner. The dam foundation is designed to remain in a frozen condition thereby minimizing or eliminating seepage through the dam foundation.

It is planned to construct the dams as shown on the drawings to the full height in 2006. If there is a requirement to raise the dam, a design will be prepared and submitted for regulatory approval.

4.0 THERMAL ANALYSES

A thermal analysis of the dams was carried out to evaluate the thermal behaviour of the frozen liner key and dam foundation. The thermal analyses were carried using EBA's proprietary finite element software program "Geotherm." The thermal analysis and results are described in a memo attached to this letter.

The thermal analysis is very conservative, since it assumed that water was impounded against the dams on a continual basis until the tailings level reaches the maximum water level. The water management of the facility includes annual discharge of the PKCA; therefore, it is currently planned that water will not be impounded against the dam. The thermal behaviour is anticipated to be colder than thermal analysis estimates due to the lack of water impounded against the dams.

The thermal analyses of the East Dam estimates that the active layer thickness below the dam centreline is 2.8 m during a mean year and 3.4 m following two consecutive 1:100 warm years. The minimum rockfill cover over the frozen fill is specified to be 3.5 m. The temperature at the base of the geomembrane liner is estimated to be less –2°C at the dam centre.

Thermal monitoring will be carried out to verify that the liner remains keyed into permafrost.

5.0 SEEPAGE ANALYSES

Seepage through the dam is designed to be minimal through the use of a geomembrane liner frozen into frozen ground.

A seepage analyses would indicate minimal seepage through the dam due to normally assumed liner defects. The upstream till layer will eventually saturate and freeze thereby reducing or eliminating water flow through the dam. No seepage analyses have been carried out for the dams.

It is recognized that there is a risk of seepage from the dam. If excessive seepage is observed, a collection system can be constructed downstream of the dam, and the seepage returned to the PKCA. An unexpected amount of significant seepage flow through the dam would not be expected to have an impact on the dam structural integrity as the rockfill structure would remain stable.

6.0 SLOPE STABILITY

The analyzed slope stability sections as requested by INAC are shown in the attached memo.

Strength properties of the till in the dam bodies have been assumed to equal the "ice poor till" strengths presented in the design report. The strength values are considered to be conservative, reflecting the loose condition of winter placed fill.

The siesmicity study by NRCan for the site is attached. The horizontal ground acceleration of 0.06 g is assumed for design as suggested by NRCan. This is considered to be a conservative value for design.

7.0 POND OPERATING LEVELS AND DAM FREEBOARD

The "maximum operating water level" for the PKCA has been defined as elevation 523 m. The water level may rise above this level while flood waters are discharged and will also be higher due to waves and wave run-up. The "maximum water level" which includes waves and a temporary rise during flood routing has been defined as 524 m for the PKCA. The difference between the "maximum operating water level" and "maximum water level" is the freeboard. The top liner elevation of the dam has been increased to 524 m such that the water retention element in the dam is equal to the maximum water level. The dam crest will be 0.5 m higher than this to provide cover over the liner. The dam section is shown in the attached drawing ED – 4.

Settlement of the dam foundation is expected to be minimal, as the foundation is anticipated to remain frozen. Settlement of the rockfill below the liner is also expected to be minimal as observed at similar dams at the EKATI Diamond Mine. No additional allowance in the dam crest has been included for settlement.

8.0 DURABILITY TESTING OF THE COARSE PK

Coarse processed kimberlite will be placed on the upstream side of the dams. The dam integrity is not sensitive to the performance of the coarse ore material. This is illustrated in the "end of construction" stability analyses described in the design report. The end of construction case did not have coarse ore on the dam face. The factors of safety were greater than 1.5. Nevertheless, slake durability tests will be carried out on the processed kimberlite after plant startup to assess the materials performance for other uses on site.

9.0 ACID ROCK DRAINAGE

Tahera warrants that the coarse PK and dam fill materials are not susceptible to Acid Rock Drainage or metal leaching.

10.0 TILL MATERIAL IN DAM BODY

Till will be placed in the upstream portion of the dam. A portion of the till comes from the key trench excavation from the East and Southeast Dams. This material is predominately from the active layer; therefore, it contains little or no excess ice content. The remainder of the till will come from the till from the open pit operation. The till is variable in the open pit operation; however,observations to date indicate that the till has little excess ice. The till is generally well graded with varying proportions of boulders, cobbles gravel and sand. Much of the till on site has between 5 to 10% fines; where as some of the tills from the pit have 15 to 20% fines. The finer grained materials will be directed to the East Dam and South East Dams. The material will be placed as specified in 0.3 m lifts or less. Care must be taken in the winter months to break up the frozen chunks and compact the material. Winter placed material may settle if it thaws. The settlement of the material is not anticipated to effect dam performance, and will not affect the dam freeboard. Settled areas will be topped up with additional till or coarse processed material.

11.0 SPECIFICATIONS AND DRAWINGS

Revised drawings are attached. The drawing changes include an increase a crest elevation to 524.5 m, a top of liner elevation of 524 m, and a minimum thickness of rockfill above the frozen saturated fill of 3.5 m.

12.0 QUALITY ASSURANCE TESTING

Tahera has retained EBA Engineering to carry out the quality control testing during construction. The quality control testing will be carried as specified in the construction specifications.

The liner integrity will be visual examined as it is placed and quality assurance testing carried out. Personal will be assigned to observe the fill placement nearby to the liner. Equipment operators will be instructed to report any possible liner damage.

The specification states that the survey monuments will be installed as directed by the engineer. It is intended that the monuments consist of pipes anchored in the dam fill as shown on the West Dam drawings.

13.0 CONSTRUCTION STATUS

The current dam construction schedule is as follows:

- In Progress - Dam foundation investigation and preparation
    - (a) Foundation preparation

(b) Key trench excavation

(c) East Dam Key trench cleaned, and levelling course placed

- January through April – Dam Construction

(a) Key Trench Liner placement

(b) Key trench backfill

(c) Run of Mine placement

(d) Dam Liner Placement

(e) Till Placement

(f) Coarse Kimberlite Placement

We trust this addresses the questions posed. Please contact the undersigned if you have any questions.

Yours truly,
EBA Engineering Consultants Ltd.

W.T. Horne

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Appendix A: Stability Analysis Memo
Appendix B: Thermal Analysis Memo
Appendix C: Revised Construction Drawings
Appendix D: NRCan Seismicity Memo

APPENDIX

APPENDIX A STABILITY ANALYSIS MEMO

TO:	File	DATE:	January 26, 2006
FROM:	Bill Horne	FILE:	1100060.004
SUBJECT:	**Stability Analysis of East and South Dams Jericho Diamond Mine, Nunavut**		

1.0 INTRODUCTION

This memo describes an update to the stability analysis EBA's report "Jericho Project East and Southeast Dam Design Report" dated August 2005. An update was required as the liner material for the dam was changed from a polypropylene liner to an HDPE liner. Additional analyses are also presented as requested by INAC 2005.

2.0 ANALYSES METHODOLOGY

Limit equilibrium analyses have been carried out to determine the factors of safety for slope stability during construction and operation of the East and Southeast Dams.

All analyses were conducted using the commercial, two-dimensional, slope stability computer program, SLOPE-W. The factors of safety have been computed using the Morgenstern - Price Method.

The dams are designed to meet Canadian Dam Association guidelines (CDA, 1999). The design criteria for computed minimum factors of safety are given in Table 1.

TABLE 1: SLOPE STABILITY DESIGN CRITERIA

Loading Conditions	Minimum Factor of Safety	Slope
Static Loading, full reservoir	1.5	Downstream and Upstream
Full or partial rapid drawdown	1.2 to 1.3	Upstream
Earthquake, full reservoir	1.1	Downstream and Upstream

The stability analyses were carried out for the deepest dyke cross-section, which is considered to be the worst cases in evaluating intermediate dyke stability.

3.0 MATERIAL PROPERTIES

The material properties chosen for the embankment and foundation materials in the stability analysis are presented in Table 2. The properties for granular materials were selected based on experience with similar materials used and encountered by EBA in dam designs at other sites across the Arctic.

TABLE 2: MATERIAL PROPERTIES USED IN STABILITY ANALYSES			
Material	Angle of Internal Friction (º)	Cohesion (kPa)	Unit Weight (kN/m³)
Run-of-Mine	42	--	20
200 mm Material	35	--	21
20 mm Material	32	--	20
Composite Liner System (Interface)	8	--	18
Ice-Poor Till Foundation	30	--	18.5
Ice-Rich Till Foundation	0	75	16.5
Upstream Till Fill	30	0	18.5
Coarse Processed Kimberlite	30	--	18.5
Fine Processed Kimberlite	0	0	15.0

The friction angle presented in Table 2 for the run-of-mine material is conservative for shallow depths where confining stresses are low (Jansen, 1988). The friction angle presented in Table 2 for rockfill is applicable for higher confining stresses that would be found at depth below the dam crest. The friction angle for similar rockfill under low confining stresses may approach 55º. The interface friction angle between the HDPE geomembrane and the nonwoven geotextile was based on published test results (Koerner, 1990).

3.1 PORE WATER PRESSURE CONDITIONS

Pore water conditions for individual analyses are shown on the attached analyses schematics (Figures A.1 through A.17). The following further describes the assumed pore water conditions.

3.1.1 Coarse Tailings

The pore pressures assigned to the coarse tailings on the upstream face of the dam correspond to the pool level. It was assumed that phreatic surface would drop approximately 0.5 m from the dam face during rapid drawdown.

3.1.2 Till

The pore water pressures assigned to the till on the upstream side of the liner corresponded to the pond elevation for the static and seismic full reservoir stability analyses. Intermediate water levels were also analyzed to determine the minimum factor of safety for the upstream analyses. Pore pressures were conservatively assumed to remain approximately at the original level during rapid drawdown situations.

3.1.3 Rockfill

Pore water pressures assigned to the downstream rockfill equalled the original ground elevation. The liner is not expected to leak significant volumes of water and, furthermore, the rockfill is free draining and will not sustain a rising water level within it.

3.1.4 Liner System

The pore water pressures assigned to the nonwoven geotextile/HDPE interfaces corresponded to the maximum pond levels for the static, seismic, and rapid drawdown stability analyses.

3.1.5 Foundation Till

It was assumed that negligible excess pore water pressures would be generated due to thaw of the till under the upstream or downstream portions of the dams. This is considered to be appropriate for the following reasons:

- thaw progresses relatively slowly into the foundation, and
- the till is non-plastic and has a significant sand and gravel content, which increases permeability.

Given these conditions, the thaw consolidation parameter (Morgenstern and Nixon, 1971) will be low, indicating that excess pore water pressures generated in the till during thaw will be negligible. Furthermore, the permeability of the coarse-grained till is expected to prevent the build-up of excess pore water pressures during rapid drawdown.

3.2 SEISMICITY

The project area lies in a region of low seismicity, but magnitude 4+ earthquakes have recently occurred within a similar part of the shield. NRCan (NRCan 2003a and NRCan 2003b) recommends that a probabilistic approach should be adopted to estimate the peak ground accelerations (PGA).

The CDA indicates that the usual minimum criterion for the design earthquake for a dam, which coincides with the "low" consequence category, would be an earthquake with an annual exceedance with return periods of 100 to 1,000 years. NRCan (2003a and 2003b) indicates that the 1,000-year event has a peak acceleration of 0.016 g. However, in conjunction with proposed changes to the NBCC, NRCan indicates that performance of the Jericho dams be designed for an earthquake with a 2,475 year return period which has a peak ground acceleration of 0.06 g. This has been adopted as the design earthquake.

3.3 ANALYSES RESULTS

Table 3 summarizes the factors of safety under static, rapid drawdown and seismic conditions for different failure surfaces on the upstream and downstream slopes.

TABLE 3: SUMMARY OF STABILITY ANALYSIS RESULTS					
Slip Surface	Location	Factor Safety			
		Static	Static, Rapid Drawdown of Reservoir	Seismic	End of Construction (No Coarse Tailings or Water)
1	Upstream, rotational	1.5	1.2	1.2	1.9
2	Upstream, along liner	2.0	1.4	1.5	1.4
3	Downstream rotational	1.6	1.6	1.4	1.6
4	Downstream along the liner	2.1	2.1	1.6	2.9
5	Downstream Overall Stability – Full Tailings Level	2.7	-	-	-

The computed minimum factors of safety exceed the design criteria of 1.5, 1.2 and 1.1 for static, rapid drawdown and seismic loading conditions, respectively, in accordance with the CDA, Dam Safety Guidelines (CDA 1999).

FIGURES

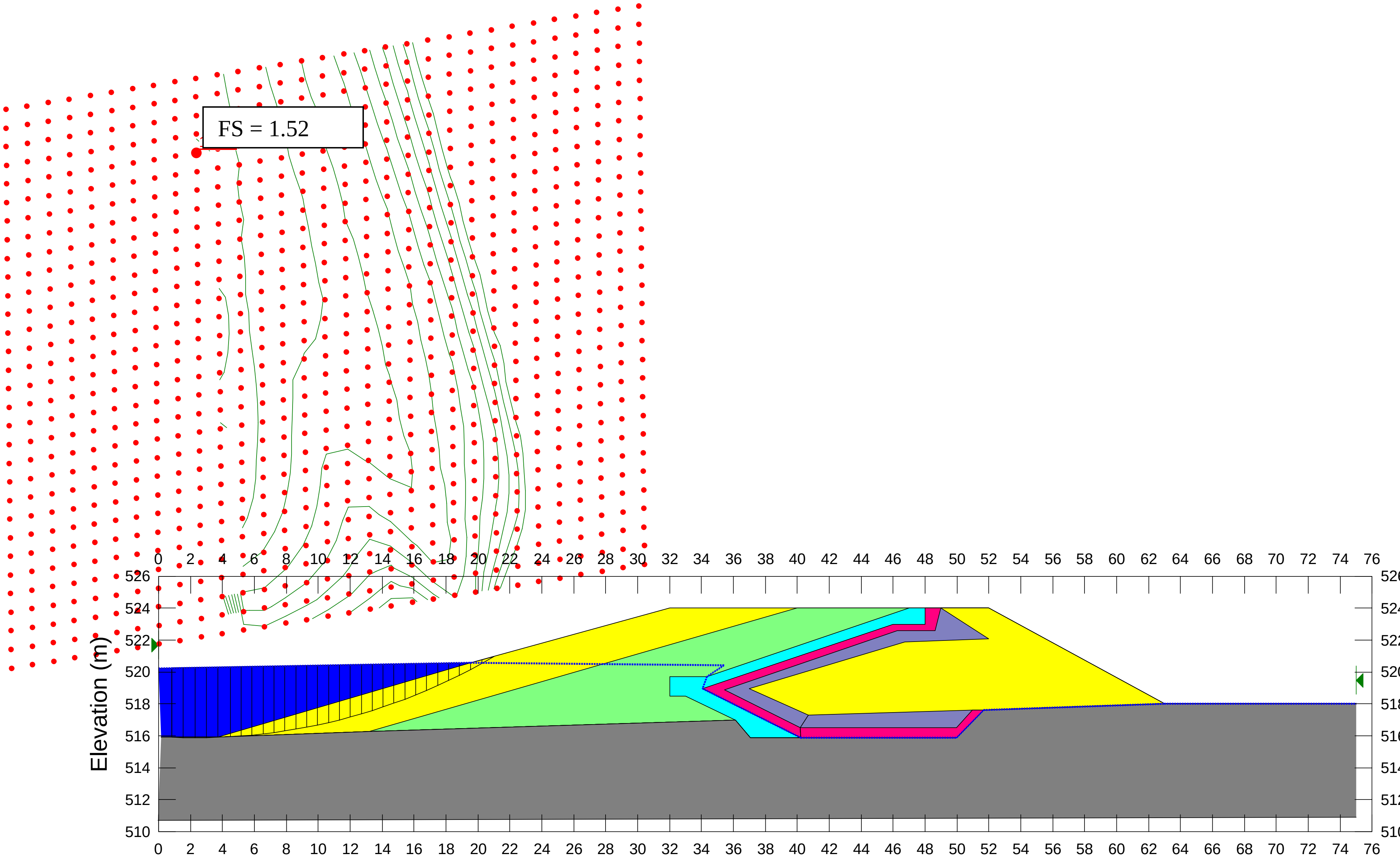

Figure A1

Stability Analysis - Upstream, Static – Rotational Slip Surface

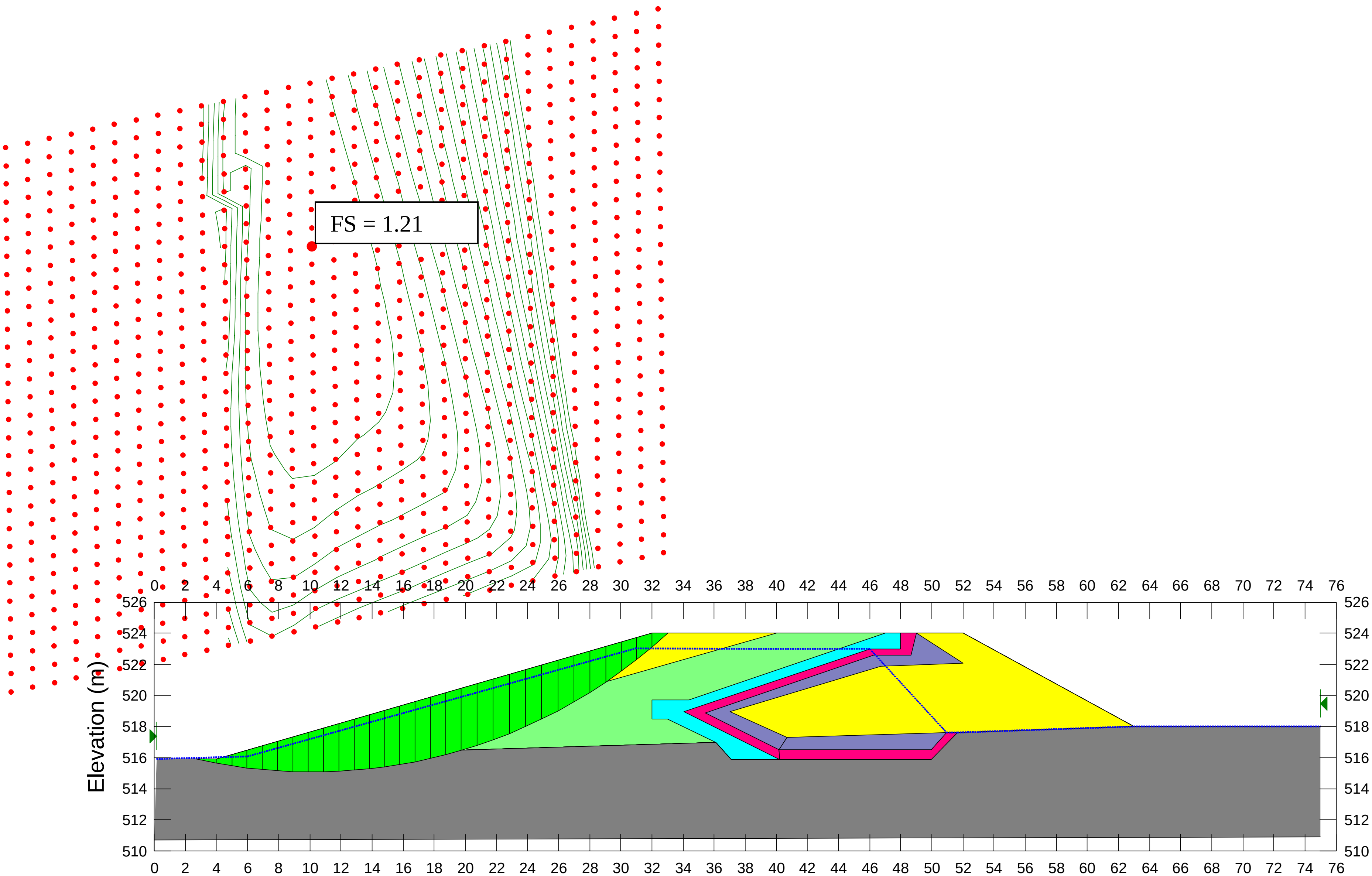

Figure A2
Stability Analysis - Upstream, Rapid Drawdown – Rotational Slip Surface

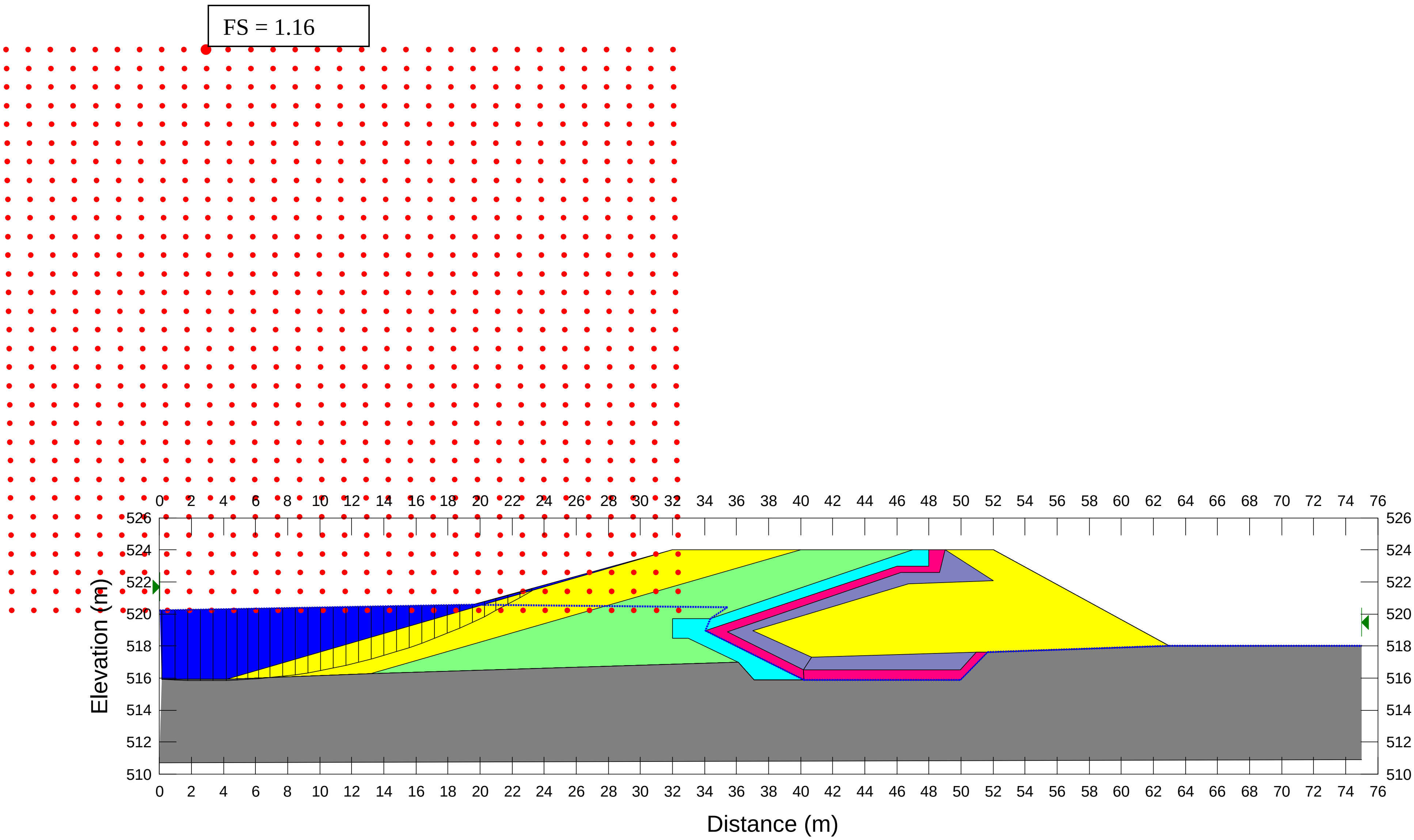

Figure A3

Stability Analysis - Upstream, Seismic Analysis – Rotational Slip Surface

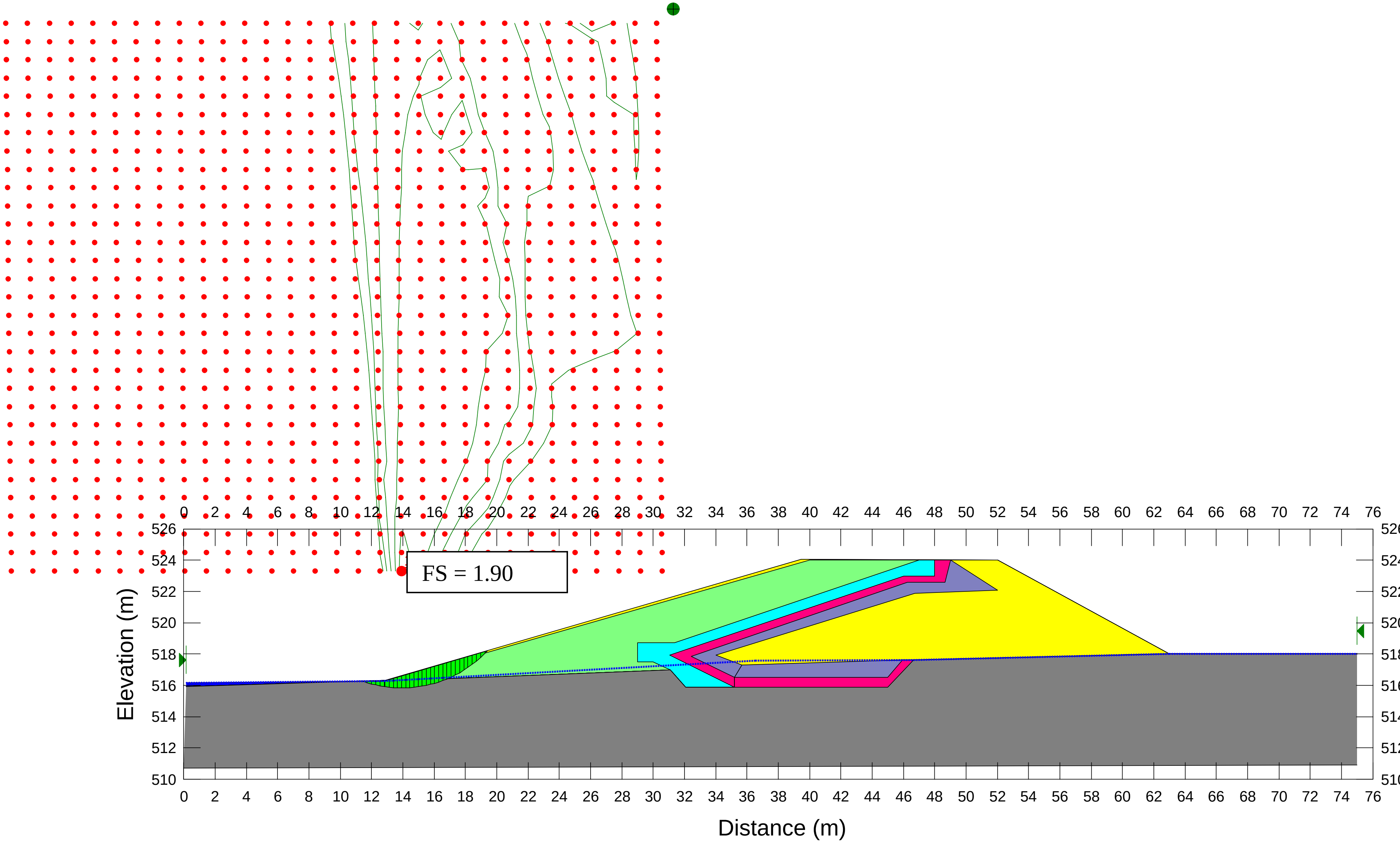

Figure A4

Stability Analysis - Upstream End of Construction – Rotational Slip Surface

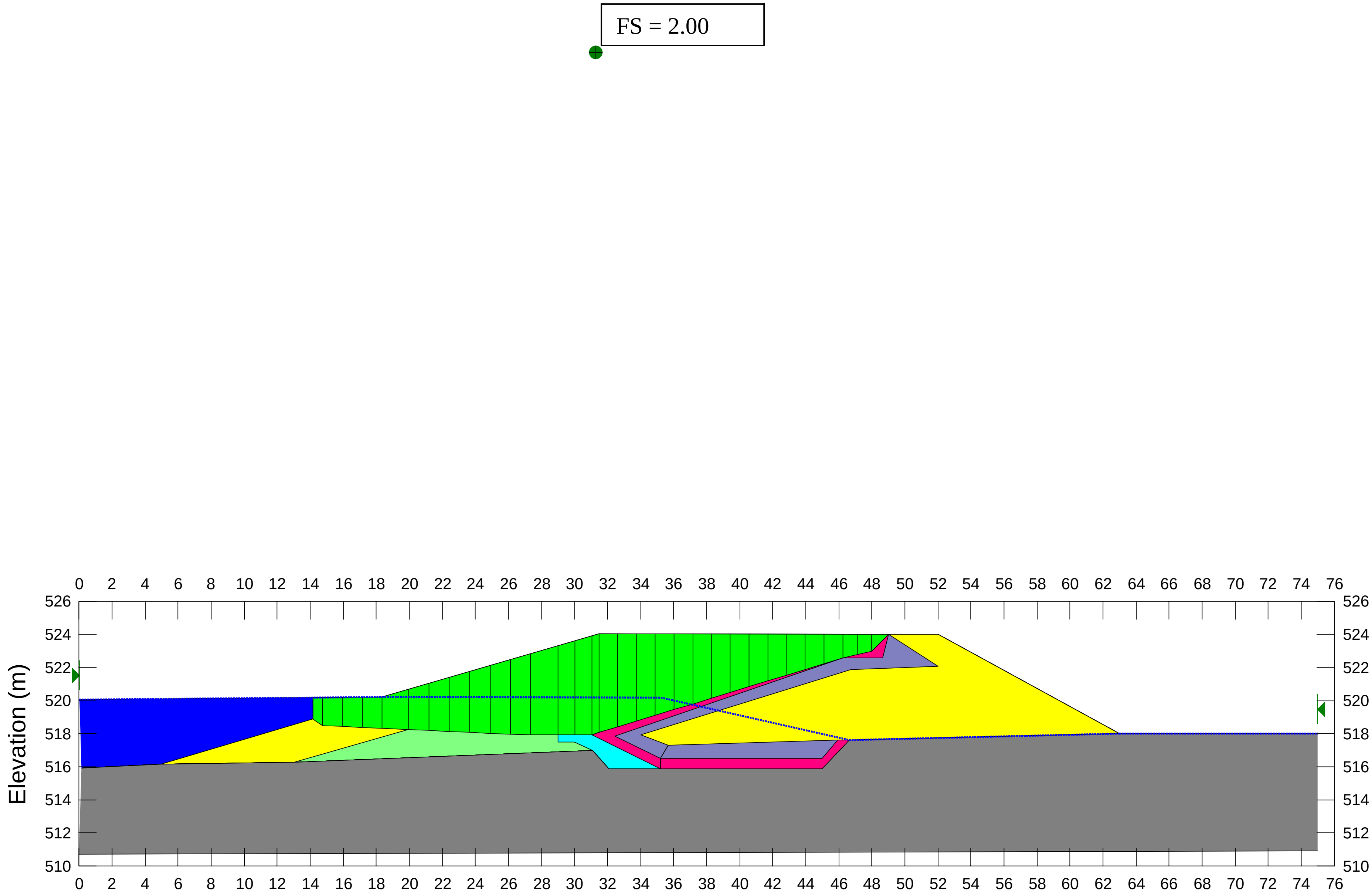

Figure A5
Stability Analysis - Upstream, Static – Slip Surface Along Liner

FS = 1.36

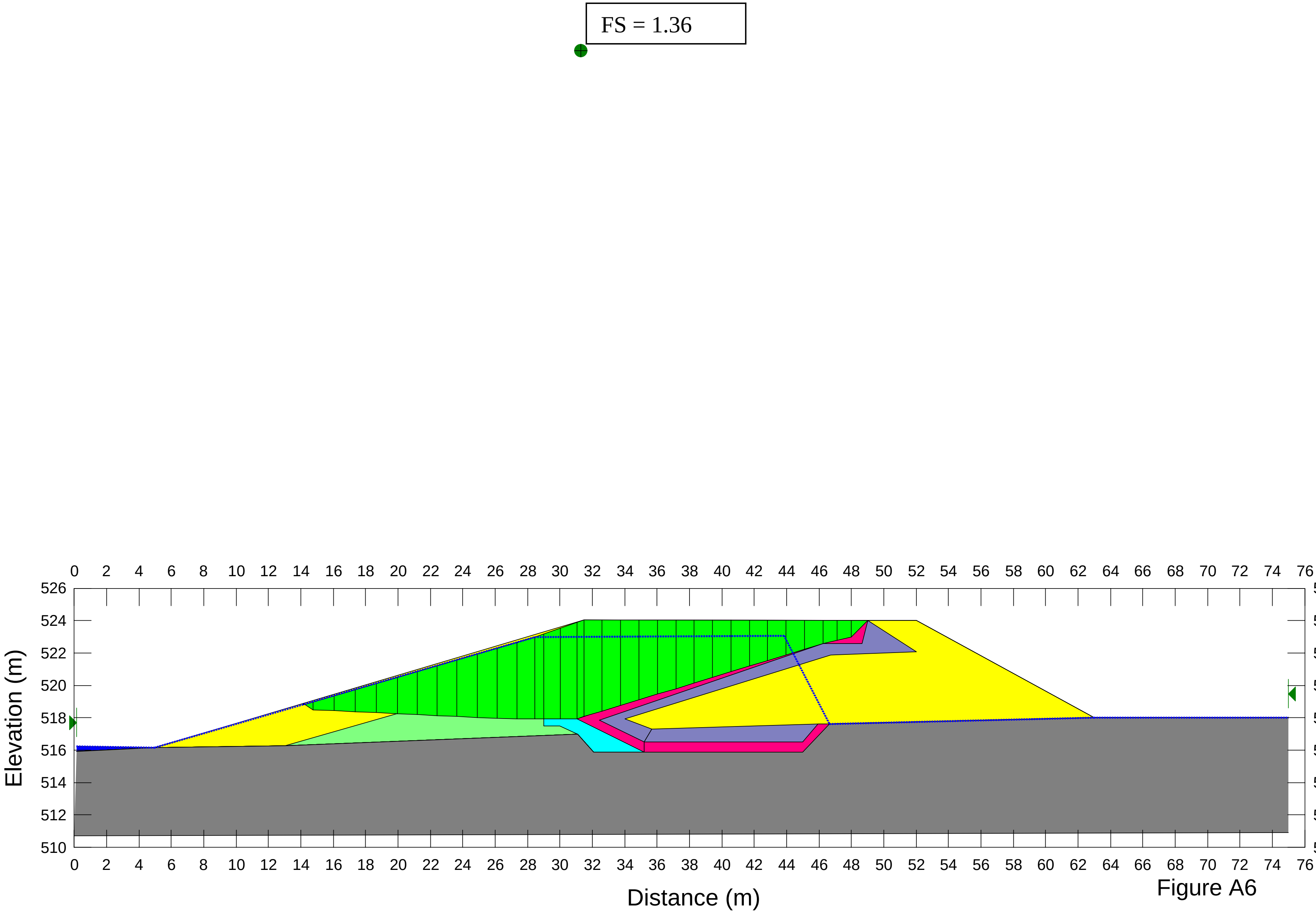

Figure A6
Stability Analysis - Upstream, Rapid Drawdown – Slip Surface Along Liner

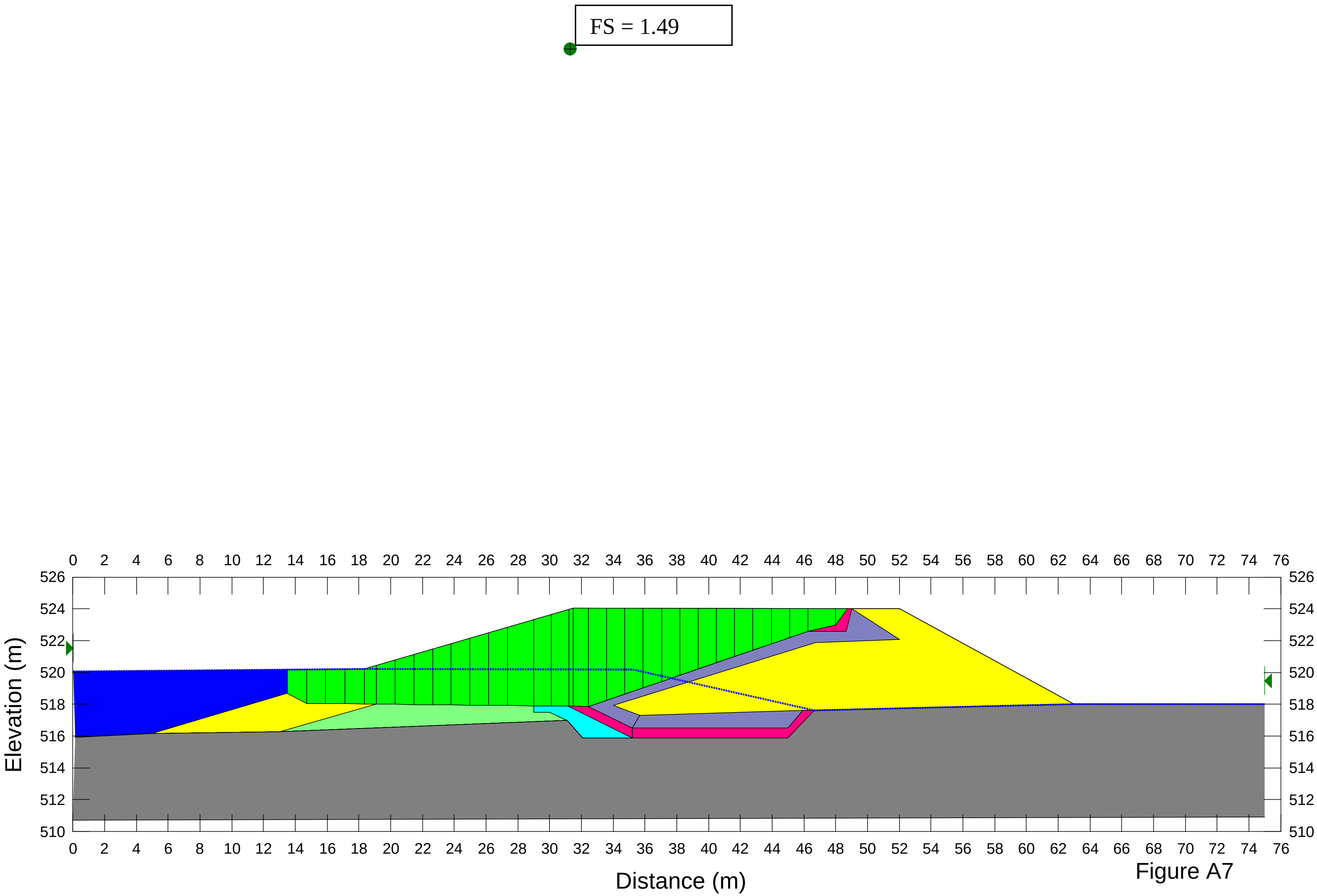

Figure A7
Stability Analysis - Upstream, Seismic Analysis – Slip Surface Along Liner

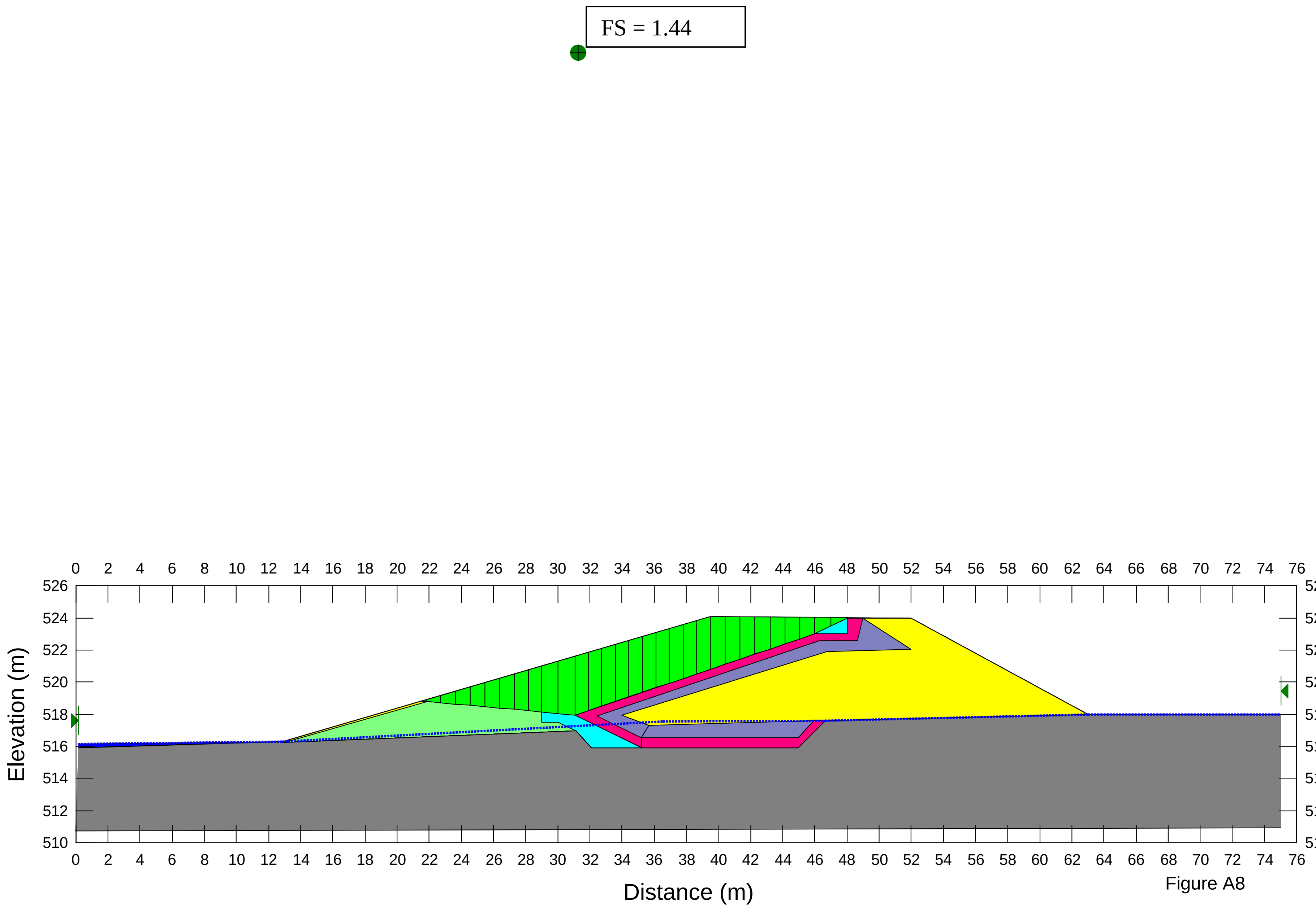

Figure A8

Stability Analysis - Upstream, Static, End of Construction – no coarse tailings

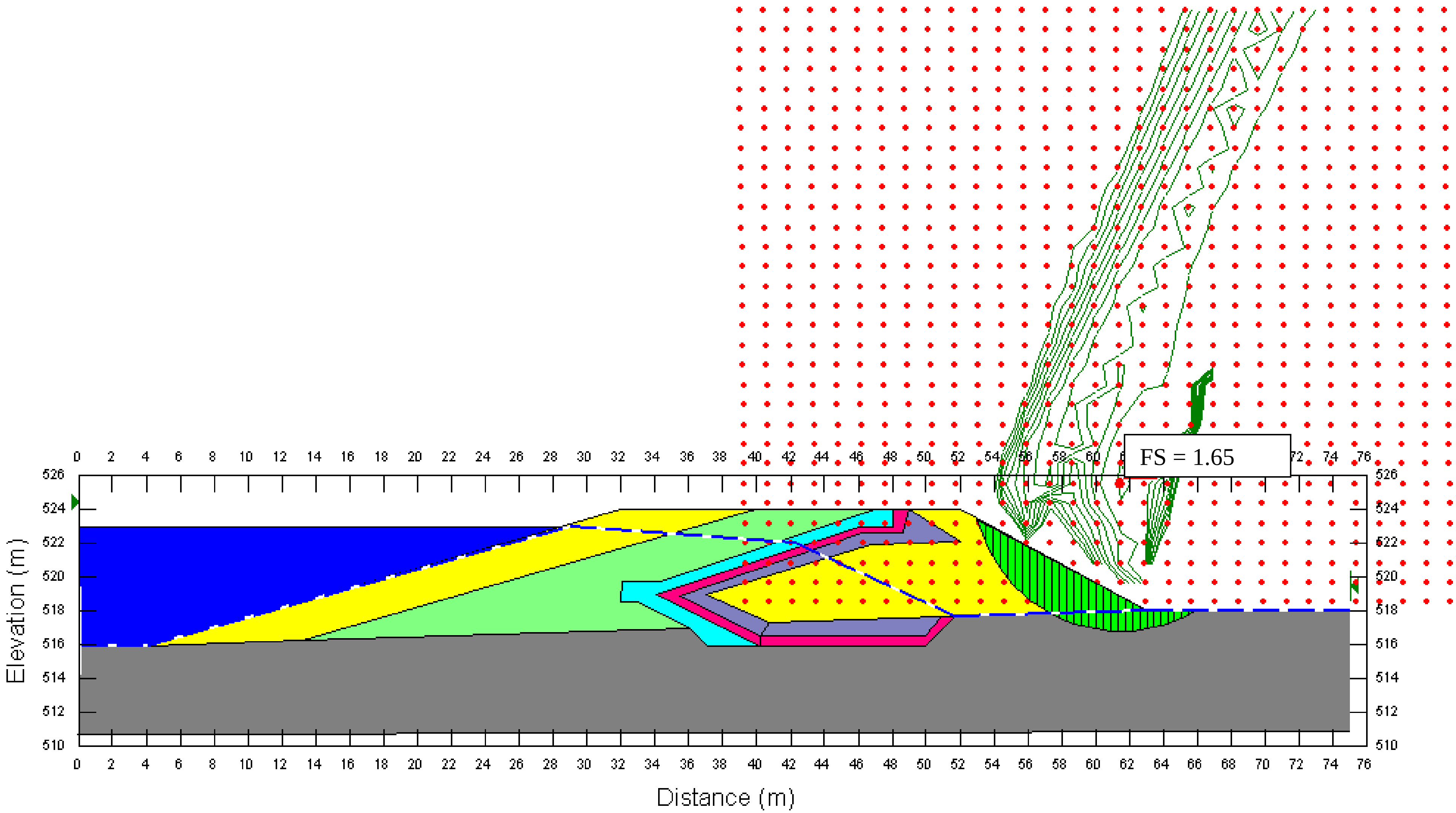

Figure A9

Stability Analysis - Downstream, Static – Rotational Slip Surface

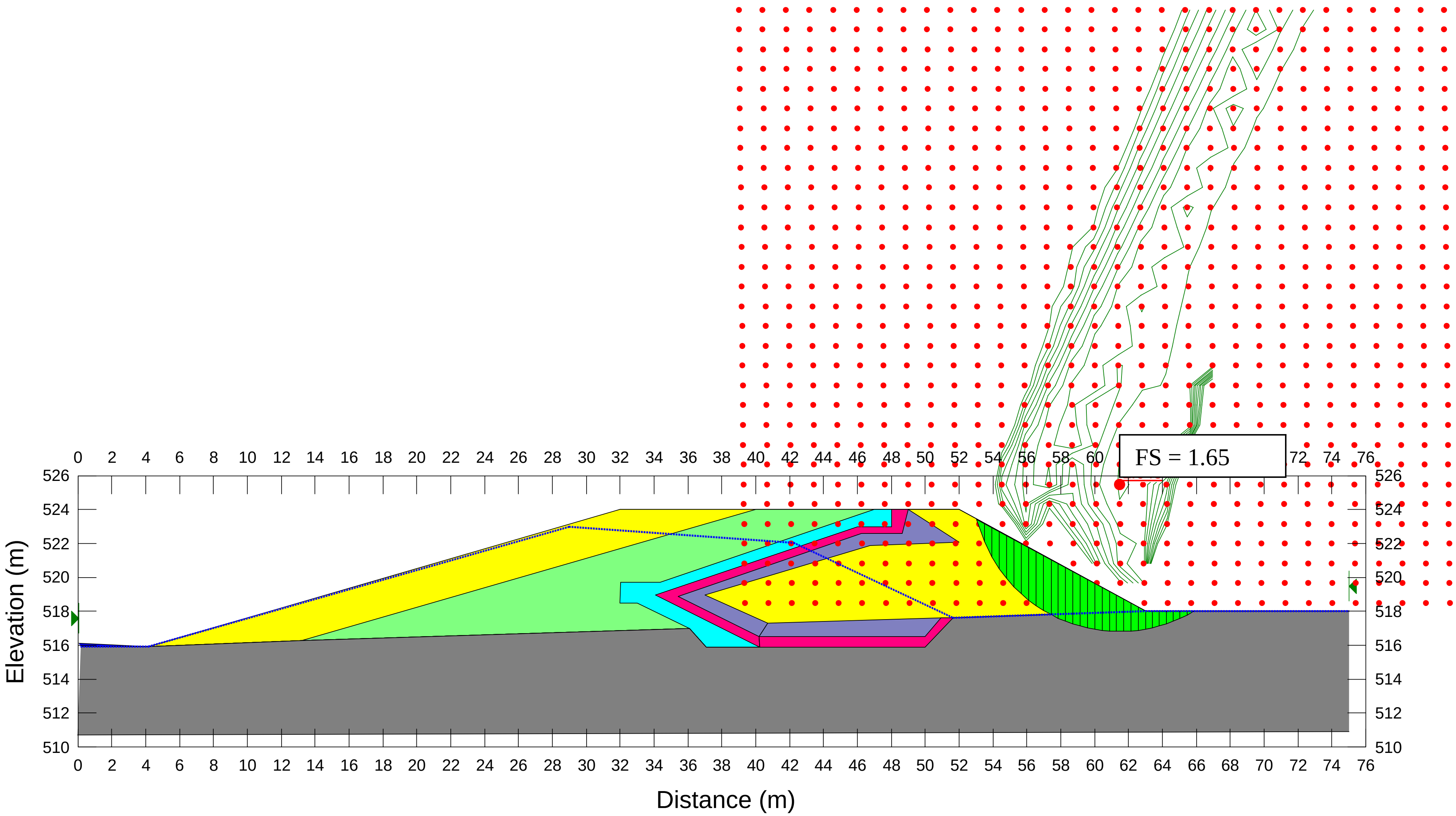

Figure A10

Stability Analysis - Downstream, Rapid Drawdown – Rotational Slip Surface

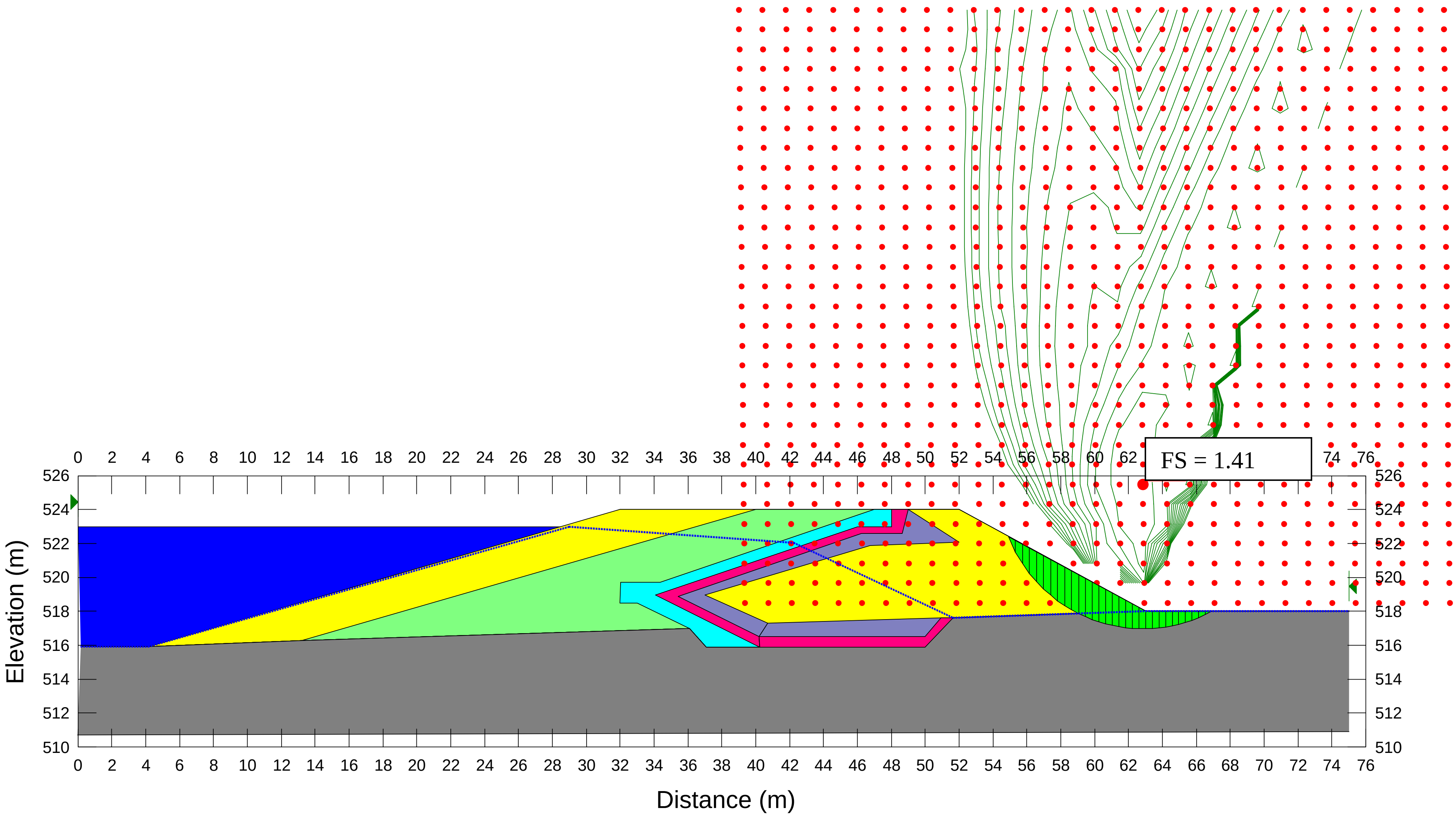

Figure A11

Stability Analysis - Downstream, Siesmic – Rotational Slip Surface

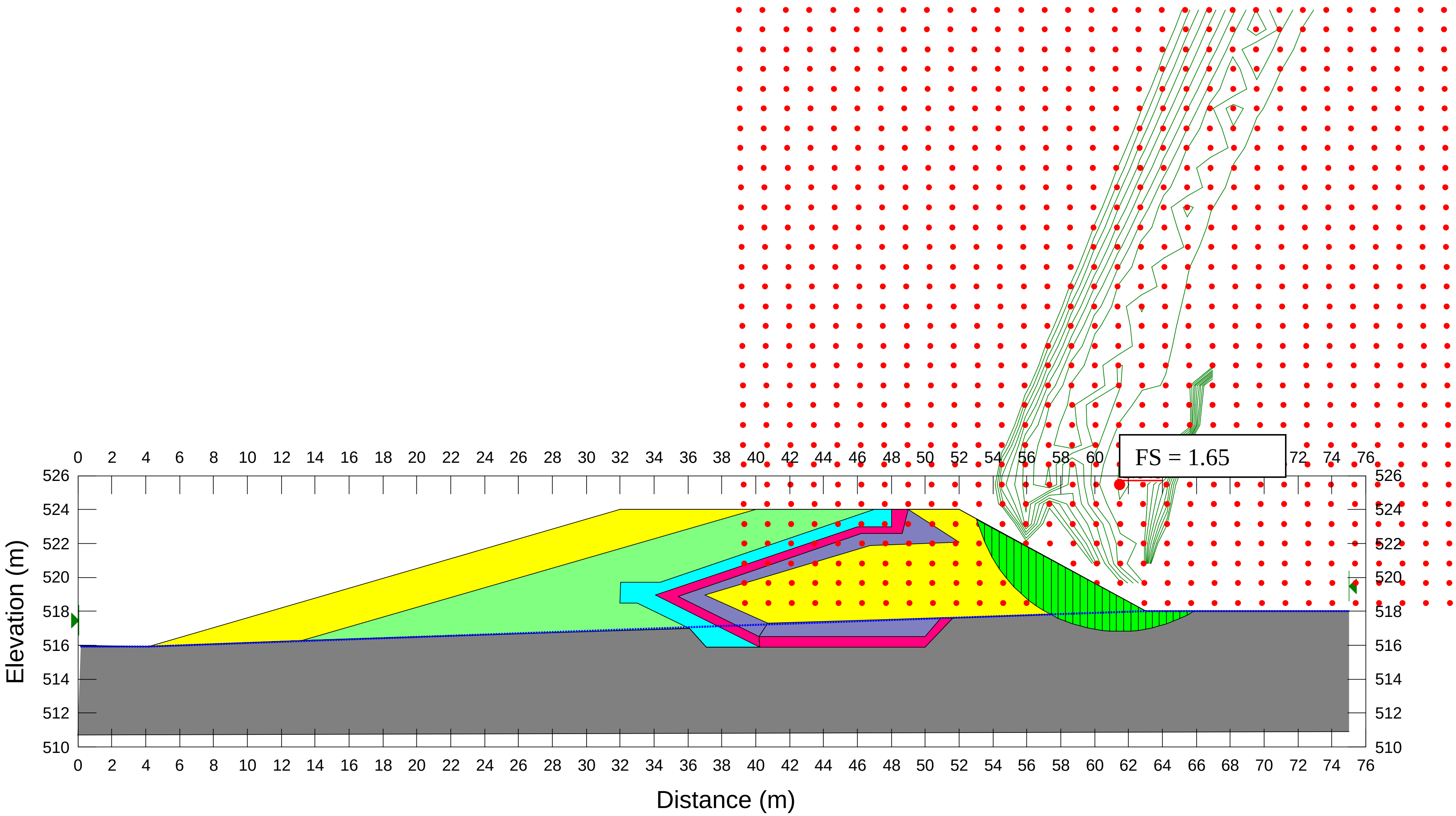

Figure A12

Stability Analysis - Downstream, End of Construction – Rotational Slip Surface

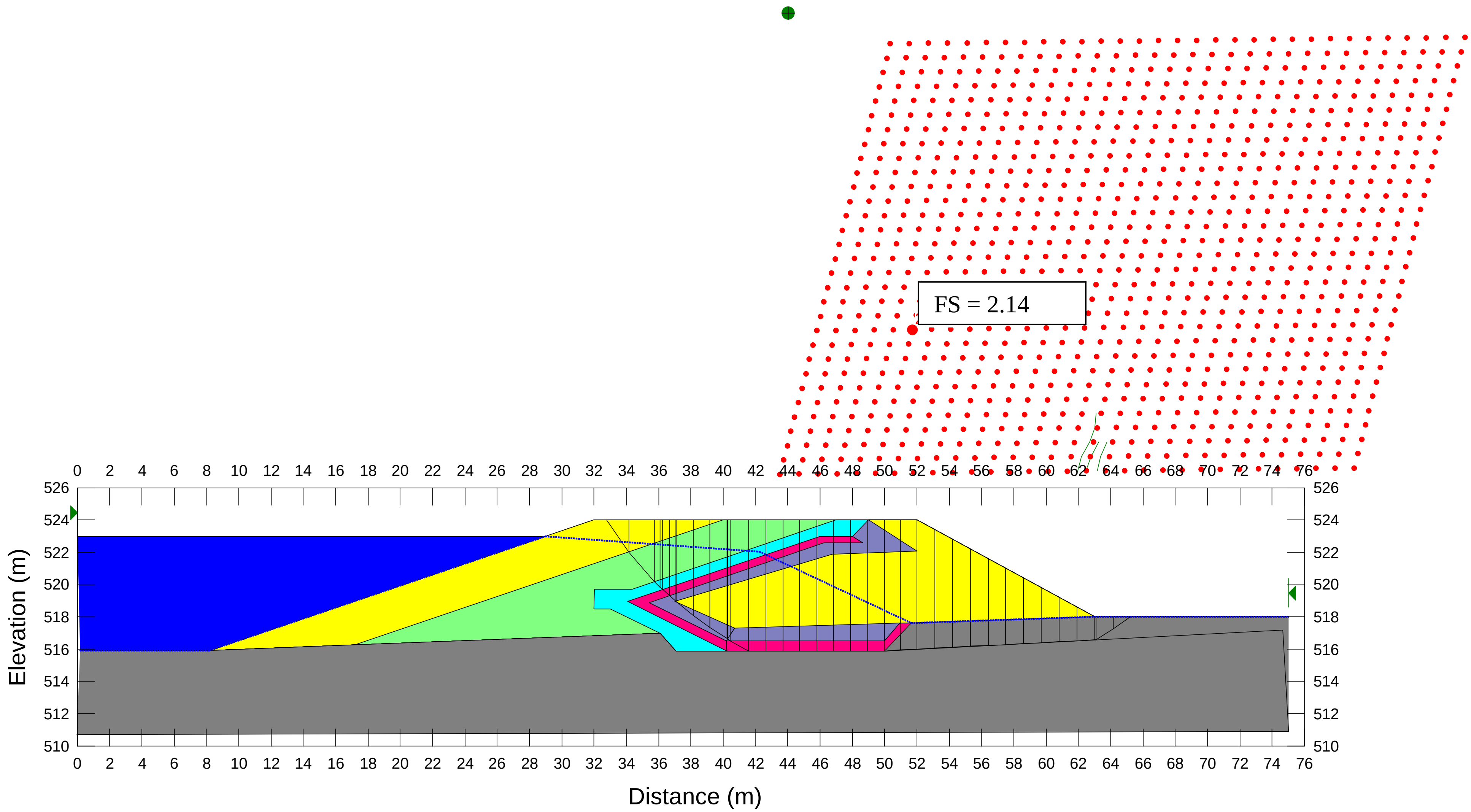

Figure A13

Stability Analysis - Downstream, Static Analysis –Slip Surface along Liner

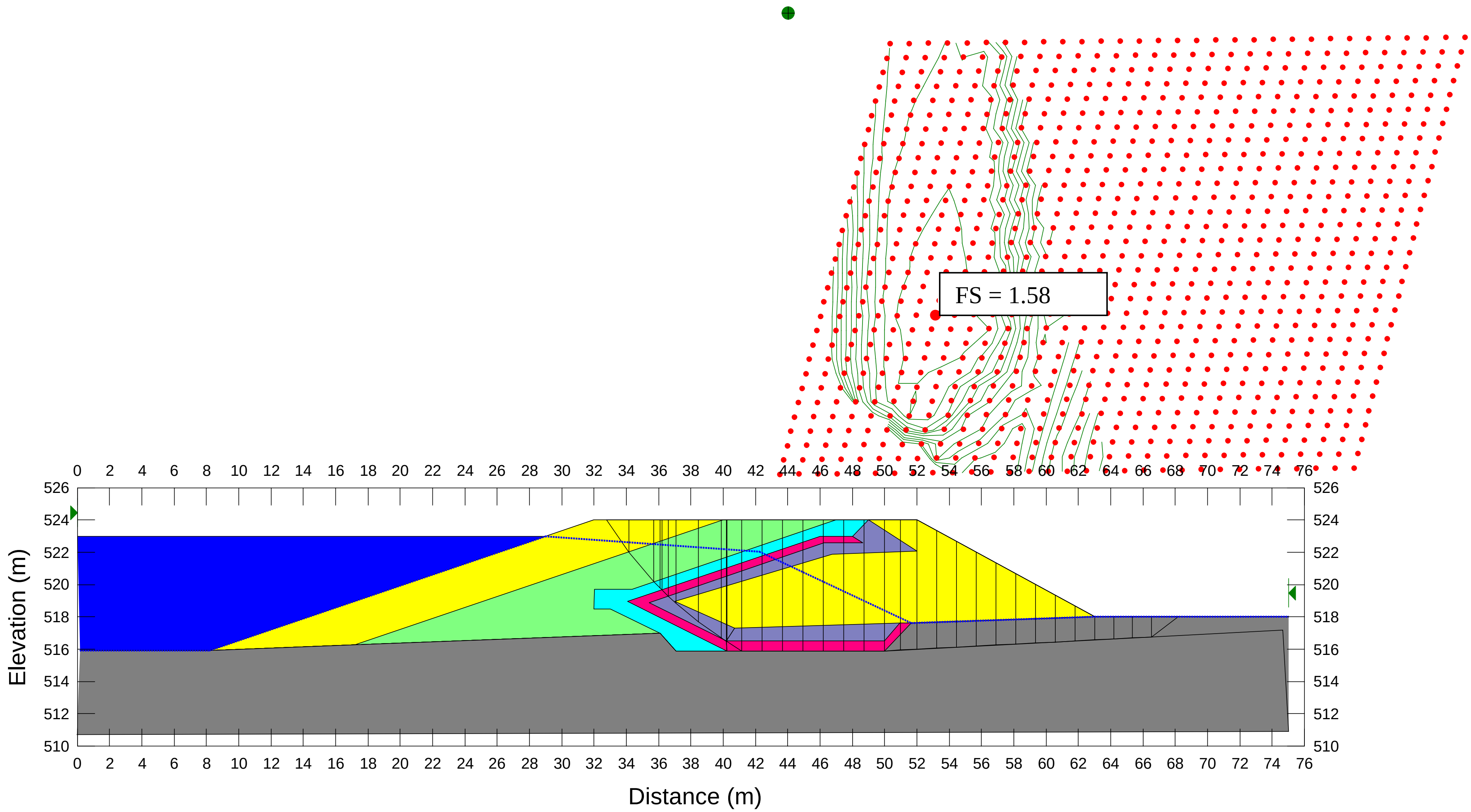

Figure A14

Stability Analysis - Downstream, Seismic Analysis –Slip Surface along Liner

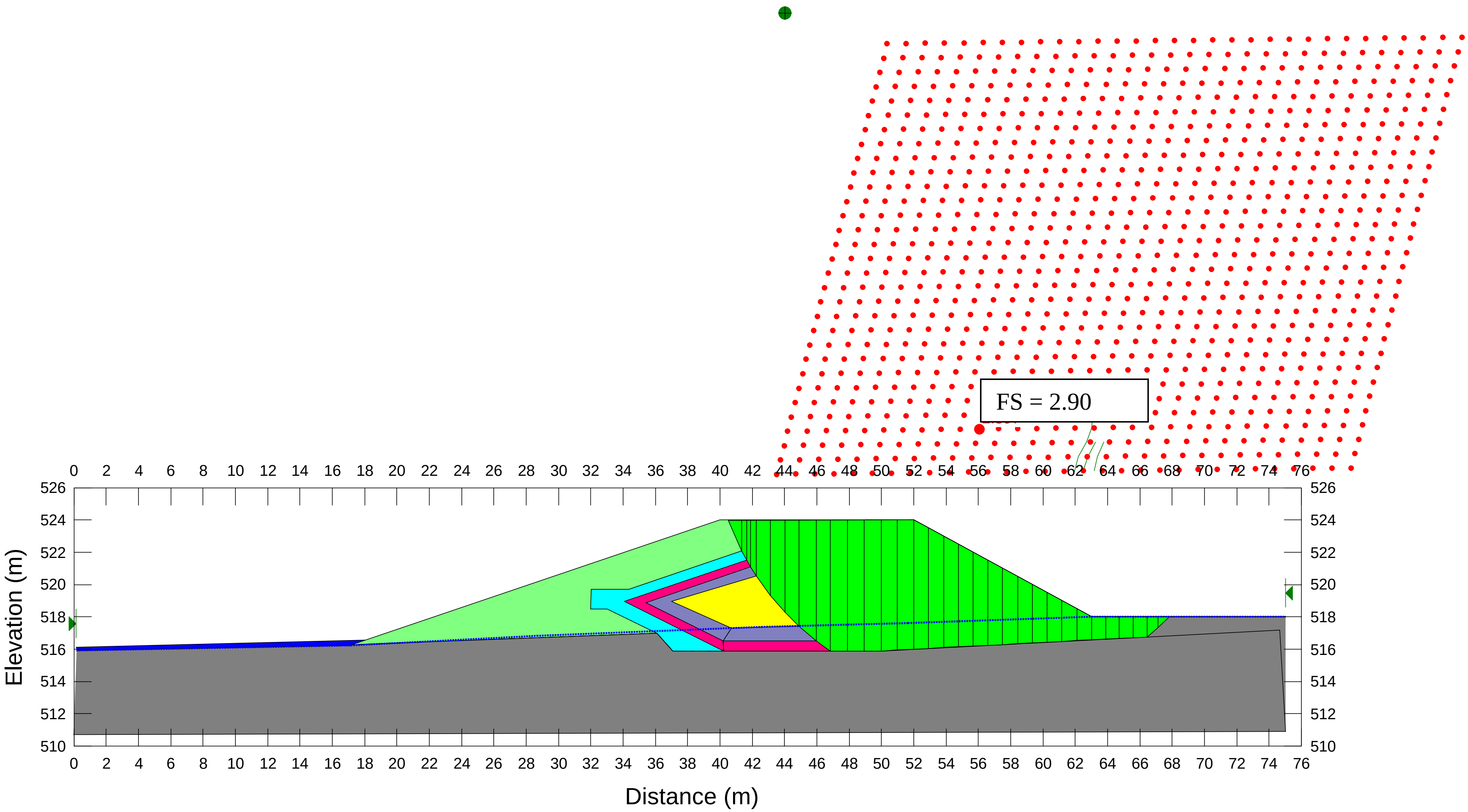

Figure A15

Stability Analysis - Downstream, End of Construction –Slip Surface along Liner

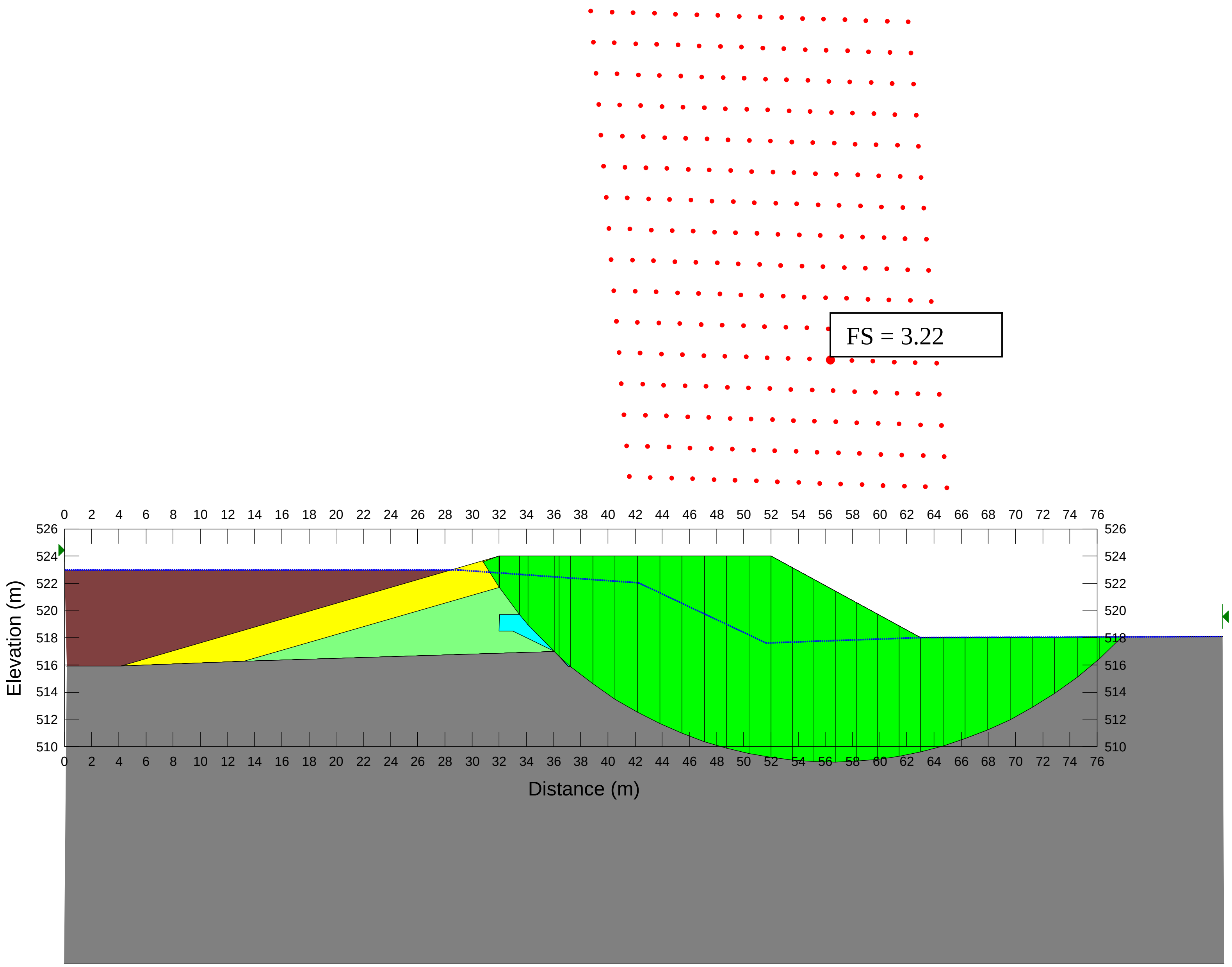

Figure A16

Stability Analysis - Full Tailings – Overalll Stability – Ice Rich Foundation

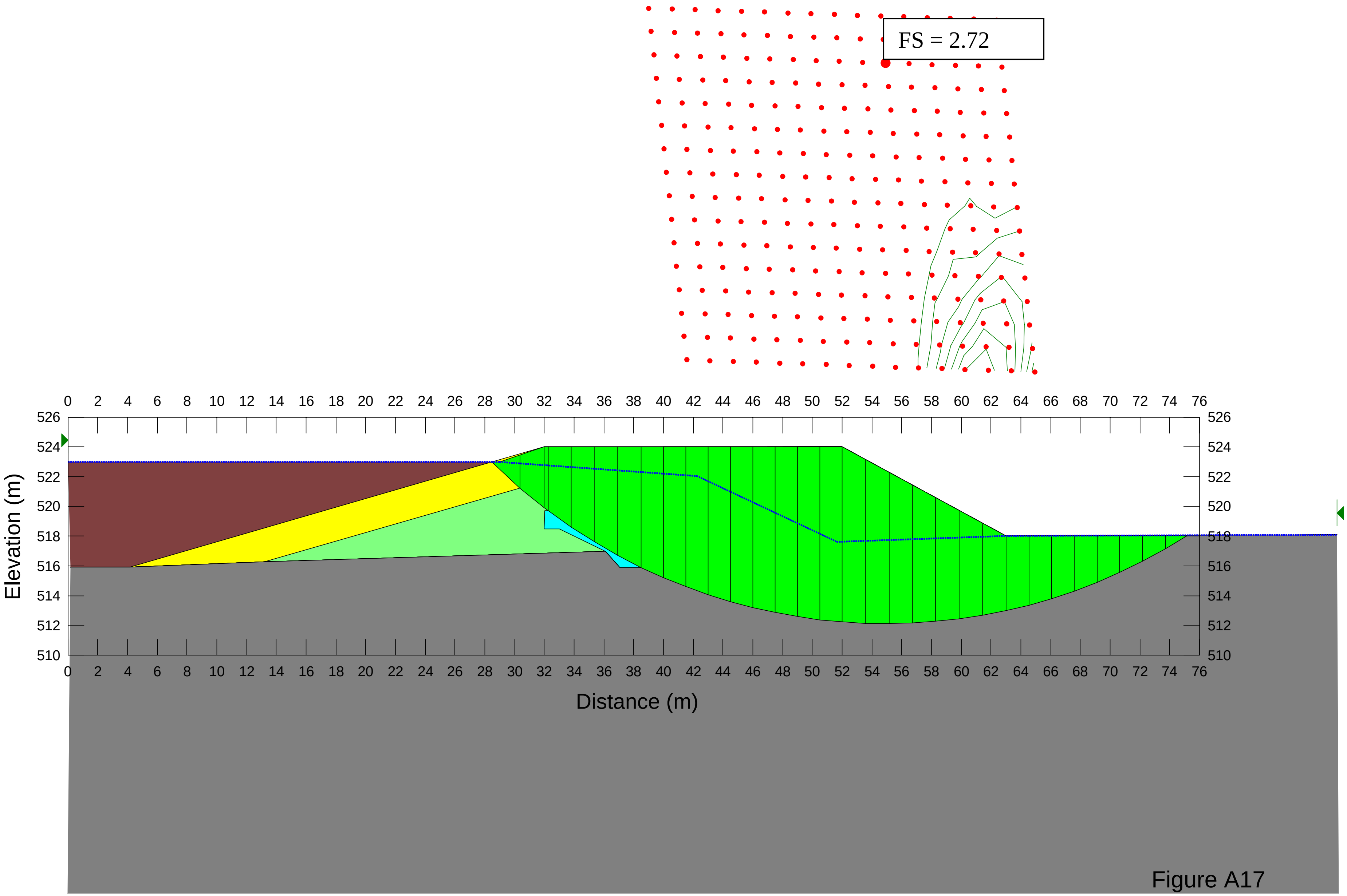

Figure A17

Stability Analysis - Downstream, Full Tailings –Overall Stability – Ice Poor Foundation

APPENDIX

APPENDIX B THERMAL ANALYSIS MEMO

TO:	Bill Horne	DATE:	January 24, 2006
FROM:	Gordon Zhang	FILE:	1100060.004
SUBJECT:	**Thermal Analysis of East and South Dams Jericho Diamond Mine, Nunavut**		

1.0 INTRODUCTION

The Jericho East and South East Dams were designed as zoned dams with a geomembrane liner anchored within a frozen fill key trench (EBA, 2005). The design intent is to maintain the geomembrane liner anchor in the key trench in a frozen condition over the mine life.

Thermal analyses were carried out to predict the short and long-term thermal conditions of the East and South Dams under various assumed conditions. The thermal model was calibrated using the measured ground temperatures at the site and considered the thermal impacts of a nearby lake on the initial ground temperatures within the dam footprint. This memo summarizes the input data and results of the thermal analyses.

2.0 THERMAL ANALYSES METHODOLOGY

Analyses were carried out using EBA's proprietary two-dimensional finite element computer model, GEOTHERM. The model simulates transient, two-dimensional heat conduction with change of phase for a variety of boundary conditions. The heat exchange at the ground surface is modelled with an energy balance equation considering air temperature, wind velocity, snow depth, and solar radiation. The model facilitates the inclusion of temperature phase change relationships for saline soils, such that any freezing depression and unfrozen water content variations can be explicitly modelled.

3.0 CLIMATIC DATA FOR THERMAL EVALUATIONS

3.1 MEAN CLIMATIC CONDITIONS

Climatic data required for the thermal analyses includes monthly air temperature, wind speed, solar radiation, and snow cover. There has been no meteorological station at the Jericho Diamond Mine site. The closest meteorological station is at Lupin/Contwoyto Lake, which is approximately 30 km south of the mine site. The climatic data for air temperature, snow cover, and wind speed were obtained from Environment Canada's meteorological station at Lupin/Contwoyto Lake, which has been operating since 1959. Mean monthly air temperatures for the thermal analyses were based on the 1971–2000 climatic normals at Lupin/Contwoyto Lake (data from Environment Canada's webpage). Monthly wind speed data were based on the 1951-1981 climatic normals at Contwoyto Lake (Environment Canada, 1982a). Month end snow cover data were based on the 1961-1991 climatic normals at Contwoyto Lake (Environment Canada, 1993). The solar radiation data were obtained from the meteorological station at Norman Wells, which is at a similar latitude as that for the Jericho mine site. The solar radiation data were based on the 1951-1980 climatic normals at Norman Wells (Environment Canada, 1982b). Table 1 summarizes the climatic conditions used for the thermal analyses.

TABLE 1: SUMMARY OF CLIMATIC DATA USED IN THERMAL ANALYSIS

Month	Monthly Air Temperature (°C)		Monthly Wind Speed (km/h)	Month-End Snow Cover (m)	Daily Solar Radiation (W/m²)
	Mean (1971-2000)	1 in 100 Warm			
January	-30.4	-25.2	20.2	0.44	5.4
February	-28.5	-23.6	13.3	0.52	31.6
March	-24.9	-20.6	13.8	0.60	97.3
April	-15.9	-13.2	14.3	0.65	179.2
May	-5.7	-4.7	16.5	0.30	233.1
June	6.5	9.2	14.6	0	267.2
July	11.5	16.3	16.8	0	234.5
August	8.8	12.5	18.8	0	166.8
September	1.8	2.5	23.0	0.02	93.9
October	-8.6	-7.1	19.8	0.15	32.5
November	-20.7	-17.1	16.9	0.28	9.6
December	-26.8	-22.2	16.3	0.37	2.0
Mean Annual	-11.1	-7.8			
Freezing Index (°C-days)	4884	4044			
Thawing Index (°C-days)	878	1243			

3.2 1 IN 100 WARM YEAR AIR TEMPERATURES

A probabilistic analysis was carried out to determine the mean monthly temperatures representative of a 1 in 100 warm year. The freezing index and thawing index for each year at Lupin/Contwoyto Lake from 1959 to 2004 were calculated. The freezing index for each winter was ranked in ascending order and plotted on probability paper. A "best-fit" line was drawn through the set of points to estimate the 1 in 100 warm year freezing index. A similar procedure was repeated for the summer temperatures to obtain the 1 in 100 warm year thawing index. Mean winter air temperatures were multiplied by the ratio of the 1 in 100 year freezing index to the mean freezing index to estimate the monthly winter air temperatures of a 1 in 100 warm year. Similarly, mean summer air temperatures were multiplied by the ratio of the 1 in 100 year thawing index to the mean thawing index to estimate the monthly summer air temperatures of a 1 in 100 warm year.

Monthly air temperatures for a 1 in 100 warm year are also listed in Table 1. As shown in Table 1, the 1 in 100 warm year annual air temperature is approximately 3.3°C warmer than the mean annual air temperature for the period of 1971 to 2000.

3.3 AIR TEMPERATURES CONSIDERING GLOBAL WARMING TRENDS

Measured air temperatures for the period of 1959 to 2004 indicate that there was generally a warming trend in the air temperatures at Lupin/Contwoyto Lake. Panel on Energy Research and Development (PERD) for Environment Canada (PERD, 1998) reported on estimates of temperature change due to global warming. The "best estimate" scenario and the pessimistic "high sensitivity" scenario were presented in the PERD (1998) report. The predicted temperature changes vary with month and latitude. Table 2 lists the estimated monthly air temperature increases per decade for the "best estimate" case and "high sensitivity" case at a latitude similar to that for the Jericho Diamond Mine site (N65.8°) based on the data from PERD (1998).

TABLE 2: PREDICTED AIR TEMPERATURE CHANGE BY SEASON PER DECADE AT N65.8° LATITUDE

Year	December January February	March April May	June July August	September October November
Best Estimate	0.51	0.38	0.12	0.10
High Sensitivity	0.89	0.63	0.19	0.17

4.0 CALIBRATION THERMAL ANALYSIS

4.1 MODELLED SOIL PROFILE AND PROPERTIES

A thermistor cable was installed in borehole BH-03-10 within the footprint of the East Dam during the 2003 geotechnical program conducted by SRK Consulting. The subsurface soil profile for BH-03-10 consists of a thin (0.1 m) organics layer overlying 23 m thick till and granite bedrock. The till is silty sand and gravel with cobbles and boulders. The index properties for the soils were estimated based on the geotechnical data from the site investigation and past experience. Thermal properties of the soils were determined indirectly from well-established correlations with soil index properties (Farouki 1986; Johnston 1981). Table 3 summarizes the material properties used in the calibration thermal analysis.

TABLE 3: MATERIAL PROPERTIES USED IN CALIBRATION THERMAL ANALYSIS							
Material	Water Content (%)	Bulk Density (Mg/m³)	Thermal Conductivity (W/m-K)		Specific Heat (kJ/kg°C)		Latent Heat (MJ/m³)
			Frozen	Unfrozen	Frozen	Unfrozen	
Moss/Organics	200	1.20	1.38	0.52	1.96	3.36	267
Till	9	2.33	2.65	2.08	0.85	1.02	64
Bedrock	1	2.53	3.00	3.00	0.75	0.77	8

4.2 THERMAL MODEL CALIBRATION AND ANALYSIS RESULTS

One-dimensional calibration thermal analyses were carried out to calibrate the thermal model with the measured ground temperature at BH-03-10. Input such as snow properties, ground surface conditions and evapotranspiration factor were modified to calibration thermal analyses to obtain a good agreement between the modelled and measured ground temperatures. Table 4 compares the calibrated ground temperatures with those measured on September 29, 2003 at BH-03-10.

TABLE 4: MEASURED AND MODELLED GROUND TEMPERATURES ON SEPTEMBER 29, 2003		
Depth below Ground Surface (m)	Measured at BH-03-10 (°C)	Model at BH-03-10 (°C)
2	-2.5	-0.6
5	-3.7	-3.7
9	-6.2	-5.8
15	-6.3	-6.0

Table 4 indicates that there is generally a good agreement between the measured and calibrated ground temperatures for BH-03-10 except for the depth of 2.0 at which the measured ground temperature was approximately 2 °C colder than the calibrated. However, warmer measured ground temperatures at a depth of 2.0 m below the ground surface at other borehole locations at the mine site suggest that the measured ground temperature at the depth of 2 m for BH-03-10 appears too cold for some unknown reasons. The measured ground temperature at a depth of 2 m was 0.5 °C on September 29, 2003, and -0.4°C on October 18, 2005 for BH-03-06. BH-03-06 was on a slightly higher ground surface on the west side of the West Dam. This borehole had a similar soil profile within top 6 m as that for BH-03-10.

In summary, the calibrated ground temperatures were generally consistent with the measured data and on the slightly conservative (warmer) side.

5.0 INITIAL GROUND TEMPERATURES BENEATH DAM FOOTPRINTS

A thermal analysis was carried out to evaluate the thermal influence of the nearby water bodies (lakes) on initial ground temperatures at the East and South East Dams locations. A lake with a diameter of 140 m was simulated in a two-dimensional axisymmetric thermal analysis to represent the presence of Long Lake upstream of the East Dam or the lake downstream of the South East Dam. The lake was simulated as temperature boundary with assumed lake water temperatures similar to those measured at northern lakes. The soil profile and properties used in the analysis were the same as listed in Table 3.

The thermal analyses results estimate that the ground temperatures are warmer closer towards the lake edge; however, the lake has little thermal influence greater than 30 m away from the lake edge. The majority of dam footprint is more than 50 m away from the closest nearby lake. Estimated ground temperatures at a location 50 m away from the lake edge were used as initial ground temperatures prior to the dam construction for the thermal analyses of the two dams. The estimated initial ground temperatures on January 30 were selected to represent the winter construction conditions of the two dams. The estimated initial ground temperature at a depth of 15 m from the ground surface was –5.6°C, which is 0.7°C warmer than the measured ground temperature at the same depth at BH-03-10.

6.0 THERMAL EVALUATION OF EAST DAM

6.1 SOIL INDEX AND THERMAL PROPERTIES

The soil index properties for the construction materials and native soils were estimated based on the geotechnical data from the site investigation and past experience. Thermal properties of the soils were determined indirectly from well-established correlations with soil index properties or based on past experience. Table 5 summarizes the material properties used in the thermal analyses.

TABLE 5: MATERIAL PROPERTIES USED IN THERMAL ANALYSES

Material	Water Content (%)	Bulk Density (Mg/m^3)	Thermal Conductivity (W/m-K)		Specific Heat (kJ/kg°C)		Latent Heat (MJ/m^3)
			Frozen	Unfrozen	Frozen	Unfrozen	
Run-of-Mine	3	2.16	1.65	1.82	0.77	0.83	21
Till Fill (unsaturated)	7	2.14	1.69	1.66	0.82	0.96	47
200 mm Minus (unsaturated)	4	2.18	1.84	1.93	0.79	0.87	28
Bedding Sand (unsaturated)	5	2.15	1.83	1.87	0.80	0.90	34
Coarse Tailings (unsaturated)	6	2.01	1.44	1.51	0.81	0.93	38
Overburden Till	9	2.33	2.65	2.08	0.85	1.02	64
Bedrock	1	2.53	3.00	3.00	0.75	0.77	8
Till Fill (saturated)	13	2.26	2.77	1.94	0.89	1.13	87
Coarse Tailings (saturated)	15	2.18	2.76	1.88	0.91	1.18	95
Fine Tailings	162	1.31	2.32	0.77	1.58	2.87	269

6.2 CASES SIMULATED AND ASSOCIATED ASSUMPTIONS

The typical design cross-section for the East Dam is identical to that for the South East Dam. The lowest original ground surface elevation at the centreline of the East Dam is 517 m, and at the South East Dam is 518 m. A vertical cross-section perpendicular to the axis of the East Dam through its lowest original ground surface was simulated in the thermal analyses.

Three cases were simulated in the thermal analyses as listed in Table 6, to evaluate various climate scenarios. Individual thermal analysis runs were conducted to simulate gradual rises of the upstream water and fine tailings surface elevations with time. The fine tailings elevation rise with time was based on the data presented in SRK (2004) for fine tailings without entrained ice. All analyses assumed that the water level in the PKCA was maintained at highest possible level. This is a conservative assumption, as it results in warmer ground temperatures. The operation water levels are expected to be lower than that assumed.

Case 1 assumed mean climatic conditions. Case 2 was analyzed to evaluate the global warming impacts on the long-term thermal conditions of the dams. Air temperatures associated with the "high sensitivity" case of the global warming were used in the analyses. Case 3 was analyzed to estimate the maximum thaw depth after two consecutive 1 in 100 warm years.

TABLE 6: CASES SIMULATED AND ASSOCIATED ASSUMPTIONS					
Case	Run No.	Simulated Time Period	Upstream Water Elevation (m)	Upstream Fine Tailings Elevation (m)	Air Temperature Assumed
1	1	Jan. 30, 2006 to Jun. 1, 2006	< 517.0	< 517.0	Mean
	2	Jun. 1, 2006 to Jun.1, 2007	518.0	<517.0	
	3	Jun. 1, 2007 to Jun.1, 2008	521.0	517.0	
	4	Jun. 1, 2008 to Jun.1, 2009	523.0	518.0	
	5	Jun. 1, 2009 to Jun.1, 2010	523.0	520.0	
	6	Jun. 1, 2010 to Jun.1, 2012	523.0	521.0	
	7	Jun. 1, 2012 to Jun.1, 2022	523.0	523.0	
2	6a	Jun. 1, 2010 to Jun.1, 2012	523.0	521.0	"High Sensitivity" Global Warming
	7a	Jun. 1, 2012 to Jun.1, 2022	523.0	523.0	
3	6b	Jun. 1, 2010 to Jun.1, 2012	523.0	521.0	1 in 100 Warm

A water/ice temperature boundary was applied on the upstream side of the dam and fine tailings that are below the water level. The assumed water temperature was based on measured lake water temperatures in northern lakes and past experience in design some frozen core dams at EKATI Diamond Mine (EBA, 2003). Table 7 lists assumed water temperatures for shallow lakes (≤ 1.5 m deep) and deep lakes (> 1.5 m deep).

TABLE 7: ASSUMED WATER TEMPERATURES IN THERMAL ANALYSES												
Lake Depth	Mid-Month Lake Water Temperature (°C)											
	J	F	M	A	M	J	J	A	S	O	N	D
≤ 1.5 m	0	-1	-1	-1	1	3	15	14	5	2	1	0.5
> 1.5 m	2	2	2	2	2	4	10	14	7	3	2	2

Climatic conditions were applied at the surfaces exposed to air. The snow cover on the dam was assumed to be affected by wind. The assumed snow cover on the dam crest was 50% of the mean monthly snow cover and on the slopes increased linearly to four times the mean monthly snow depth at the downstream toe. It was assumed that there would be no ponding water on the original ground surface downstream of the dams. Climatic conditions with mean monthly snow depths were applied to the original ground surface 15 m from the downstream toe.

The initial temperatures of the dam construction materials on January 30, 2006 were assumed to be 2°C for the coarse tailings and -4°C for the other materials. Prior to impoundment, the upstream till is frozen; however, water will infiltrate the upstream dam shell as water rises against the dam. It was assumed that impounded water will seep through the coarse tailings and into the originally unsaturated till fill, thereby raising the temperature of the coarse tailings and till fill. The temperatures of the upstream till fill and coarse tailings upon initial submergence were assumed to be 0.5 ^{o}C on June 1. The initial temperature of the submerged fine tailings on June 1 was assumed to be 3 ^{o}C.

6.3 RESULTS AND DISCUSSION

The thermal analyses indicate that the ground temperatures adjacent to the key trench were the warmest in early December. Figures 1 to 4 present predicted temperature distributions under mean climatic conditions in early December 2006, 2008, 2010, and 2014, respectively. The analyses indicate that the ground beneath the dam generally warms with time; nevertheless, the ground temperatures within the key trench remain colder than -2^{o}C at the end of the mine life (2014).

The predicted temperature distribution in early December of 2014 under the "high sensitivity" global warming conditions is shown in Figure 5. The ground temperatures in global warming case are slightly warmer at depth for the mean climate case (Figure 4). The ground temperatures within the key trench area remain colder than -2^{o}C for the global warming case.

The water and fine tailings elevation assumptions in Table 6 are generally conservative. The actual upstream water elevation is expected to be lower than the assumed values; and the actual fine tailings elevation may be higher than the assumed values in Table 6 if ice is entrained in the fine tailings. As a result, the actual ground temperatures for the upstream portion of the dam would be colder than predicted, since the water body (as a heat source) in front of the dams would be pushed further away from the dams and key trenches.

The ground temperatures for the downstream portion of the dam could be warmer if water is ponded against the downstream slope of the dams. Should this happen, engineering measures, such as placing fill on the toe of the downstream slope or diverting the water away from the downstream toe, should be implemented to alleviate the negative thermal impacts of the ponding water.

Thermal analysis results indicate that the thaw depth below the dam crest will be deepest in early October. Table 8 summarizes the maximum thaw depths below the dam surface under the air temperatures of mean, "high sensitivity" global warming, and 1:100 warm year conditions. The predicted ground temperatures in early October of 2011 after two consecutive 1:100 warm years are shown in Figure 6. The dam design included a minimum cover of 5 m of fill over the liner to ensure 1.5 m of frozen fill above the liner.

TABLE 8: PREDICTED MAXIMUM THAW DEPTHS IN EARLY OCTOBER			
Air Temperature	Year	Thaw Depth below Dam Centerline	Thaw Depth below Crest of Downstream Slope
Mean	2014	2.8	3.7
"High Sensitivity" Global Warming	2014	3.1	4.0
Two Consecutive 1:100 Warm Years after June 1, 2010	2011	3.4	4.3

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FIGURES

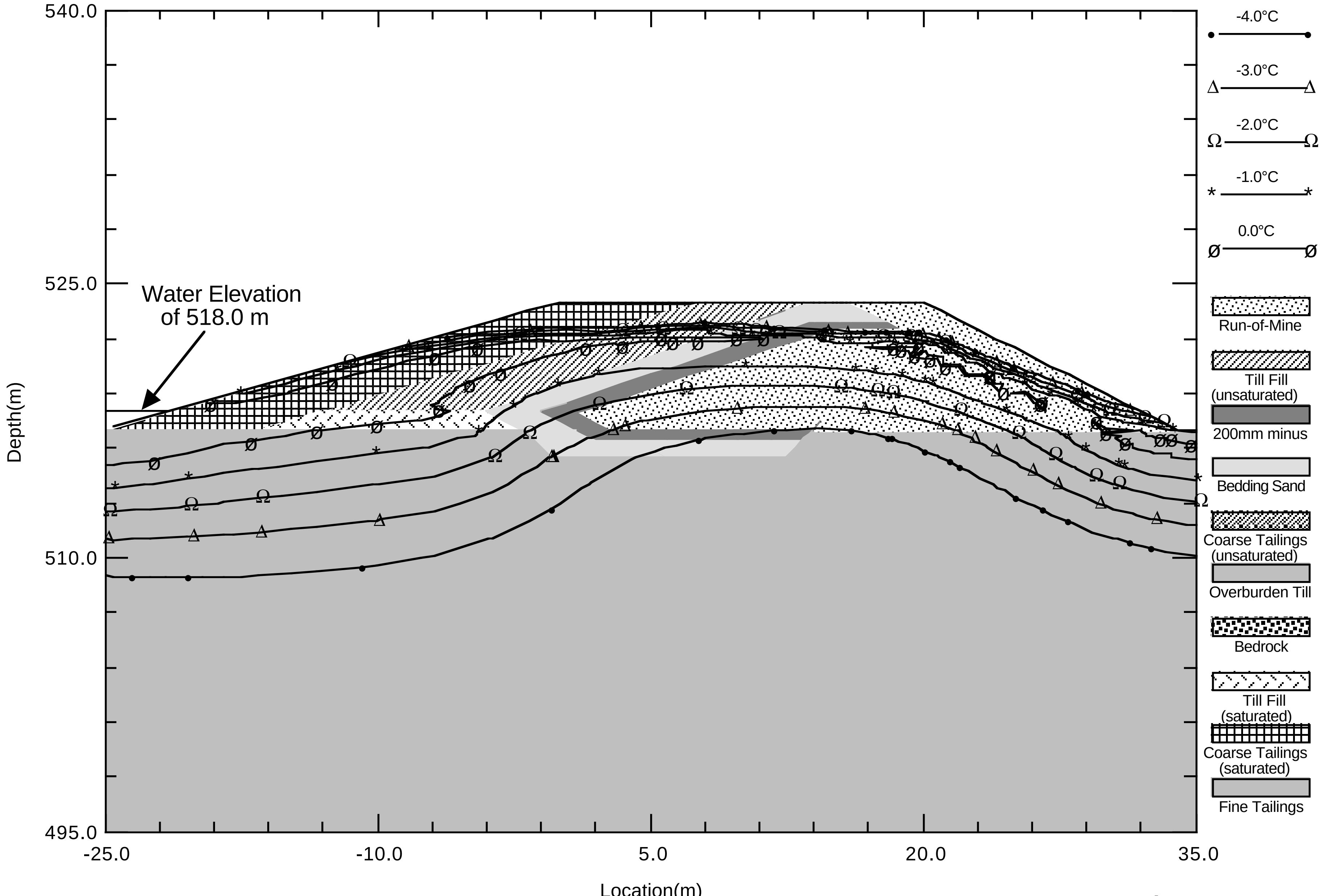


Figure 1

Predicted Isotherms in Early December of 2006
East Dam under Mean Climatic Conditions

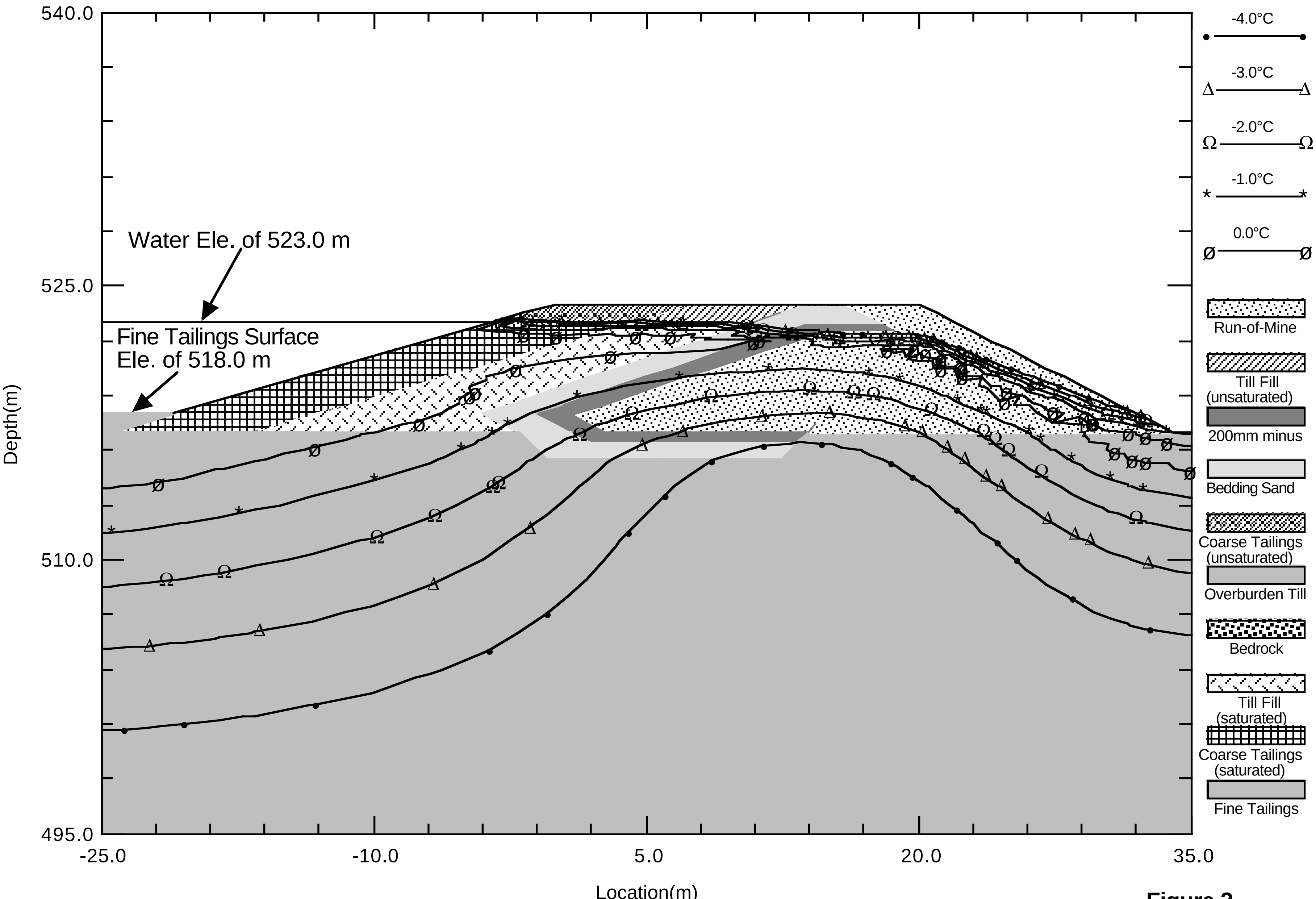


Figure 2

Predicted Isotherms in Early December of 2008
East Dam under Mean Climatic Conditions

2d_ED_Jun01_2008 (Time Step 207)

Figure2_1100060d004

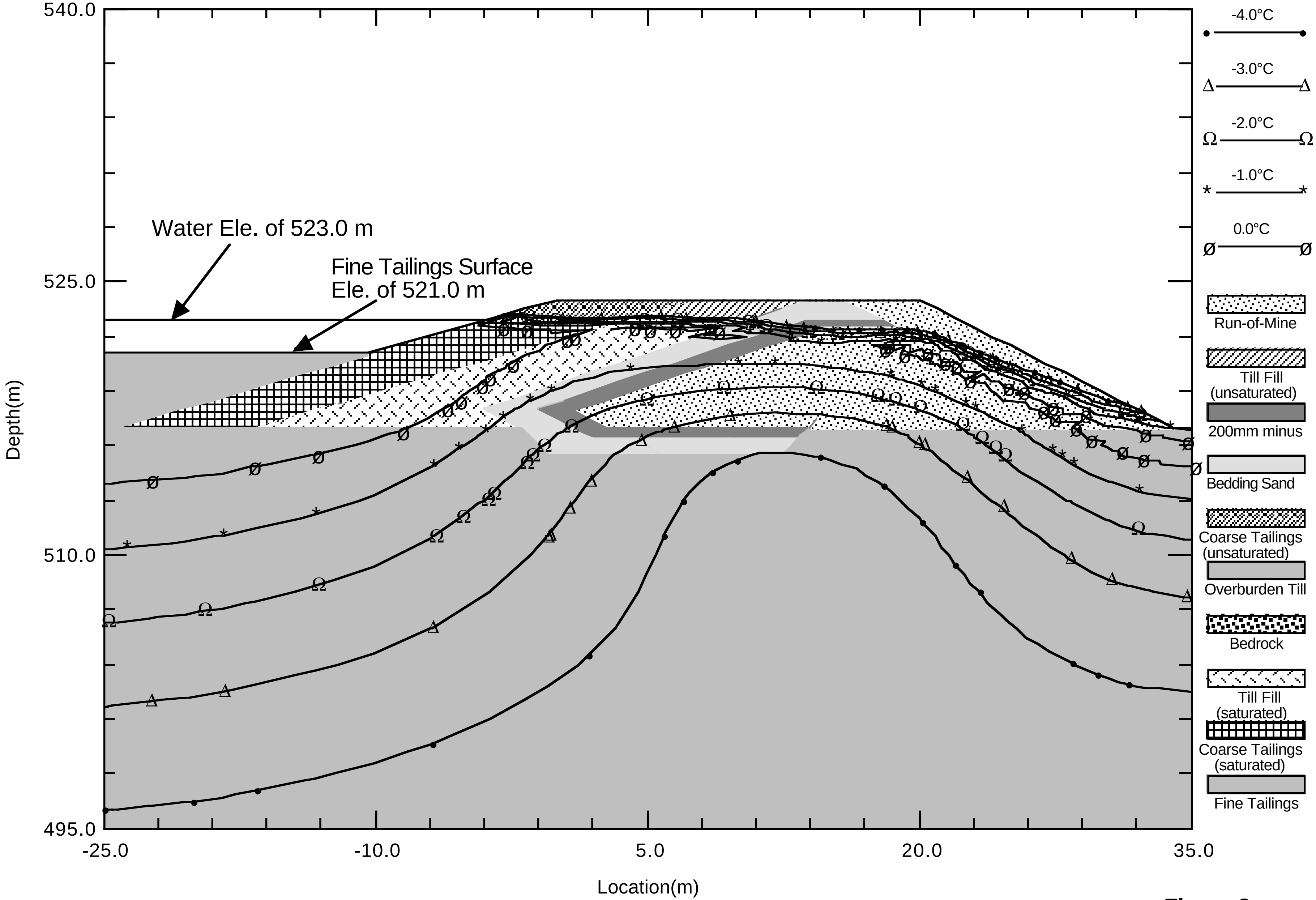


Figure 3

Predicted Isotherms in Early December of 2010
East Dam under Mean Climatic Conditions

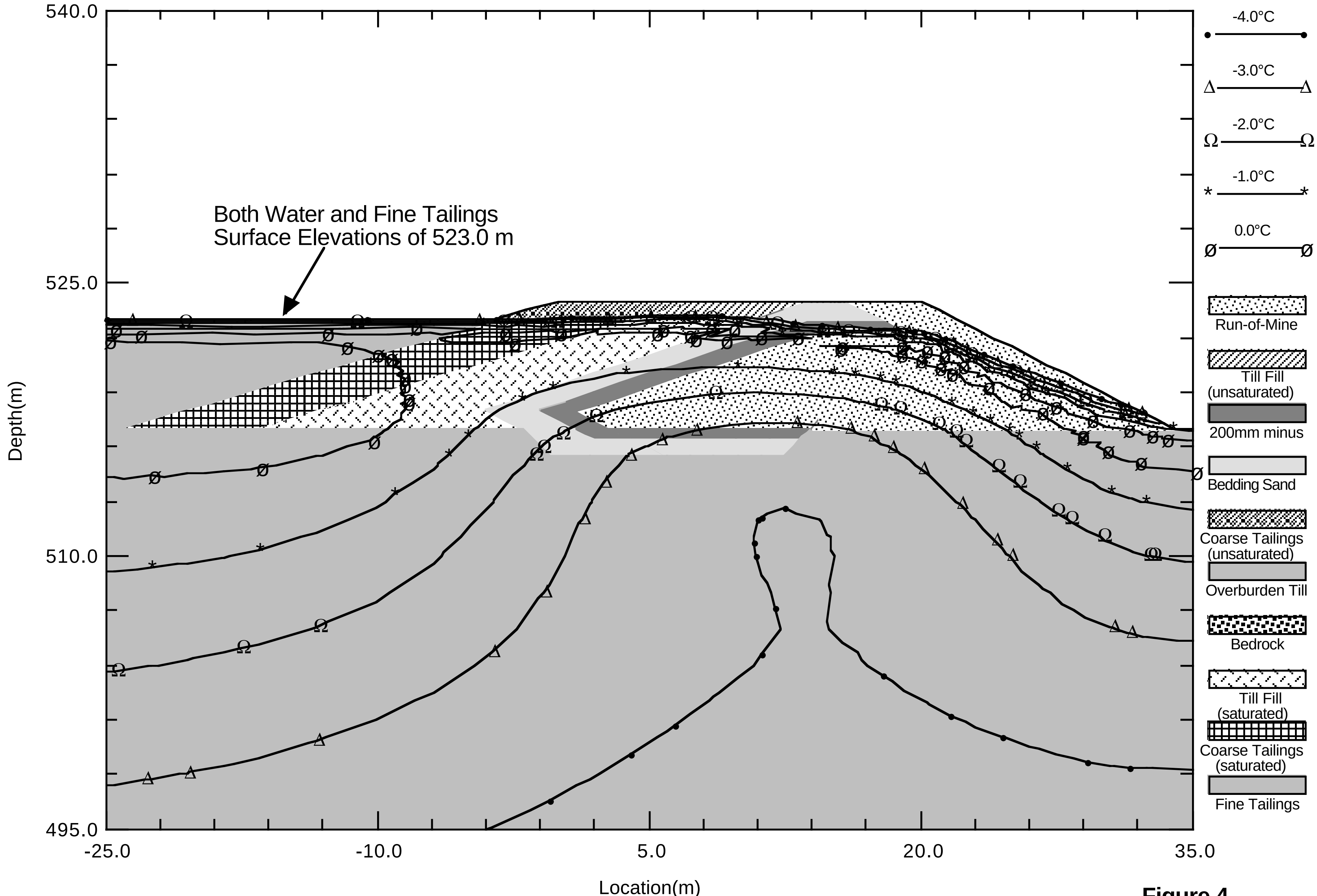


Figure 4

Predicted Isotherms in Early December of 2014
East Dam under Mean Climatic Conditions

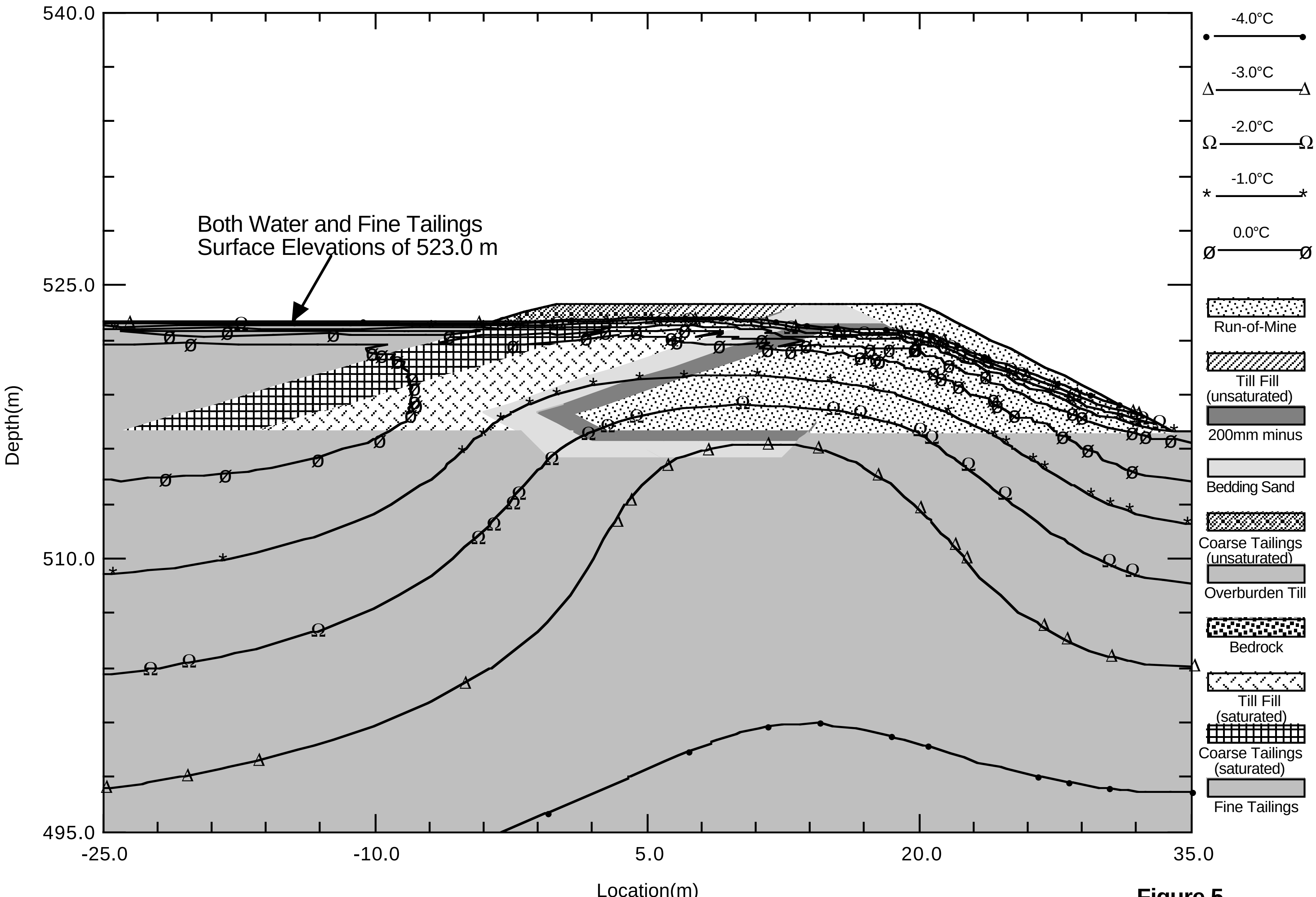


Figure 5

Predicted Isotherms in Early December of 2014
East Dam under "High Sensitivity" Global Warming Conditions

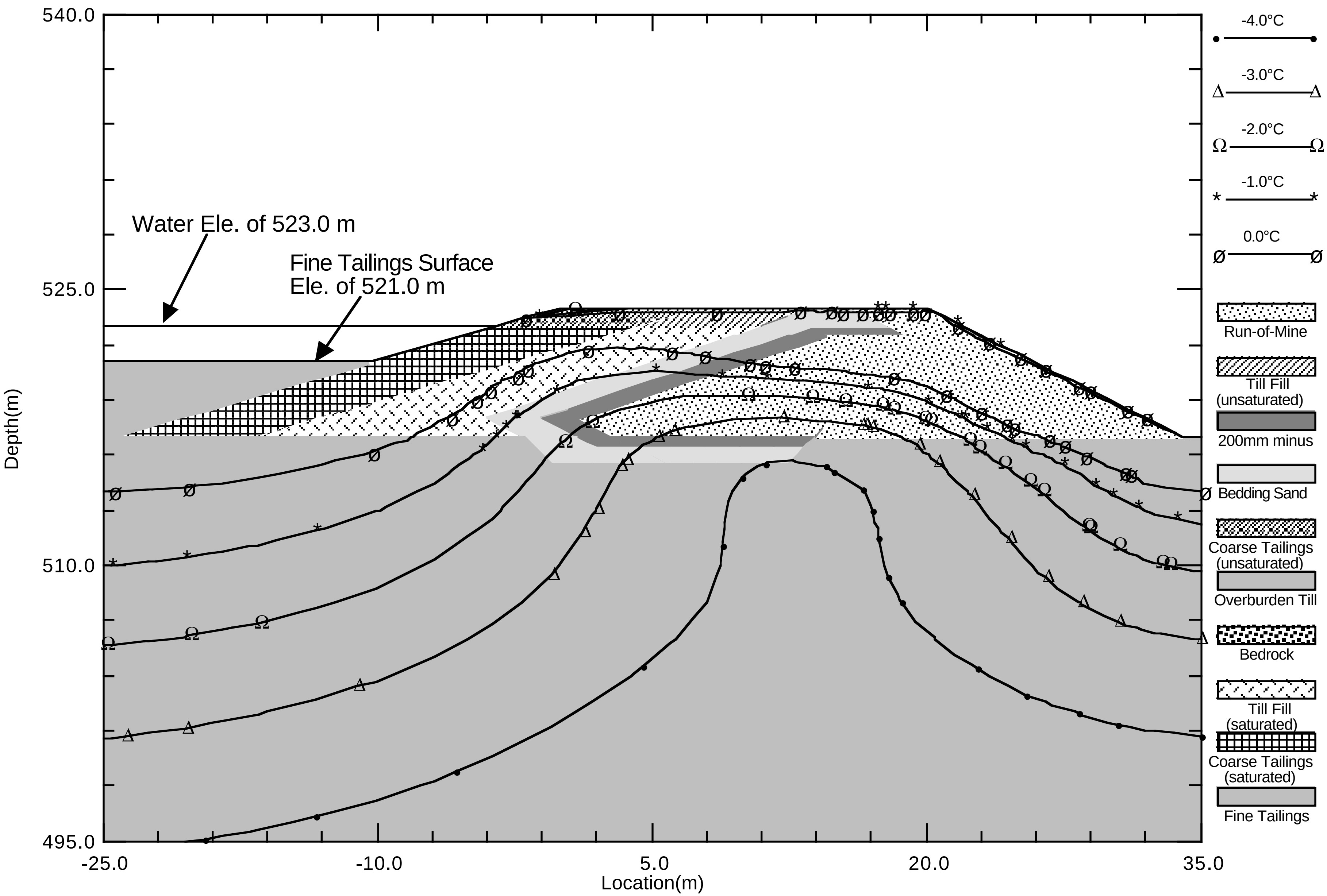


Figure 6

Predicted Isotherms and Maximum Thaw Depth in Early October of 2011
East Dam under Two Consecutive 1:100 Warm Years after June 1, 2010

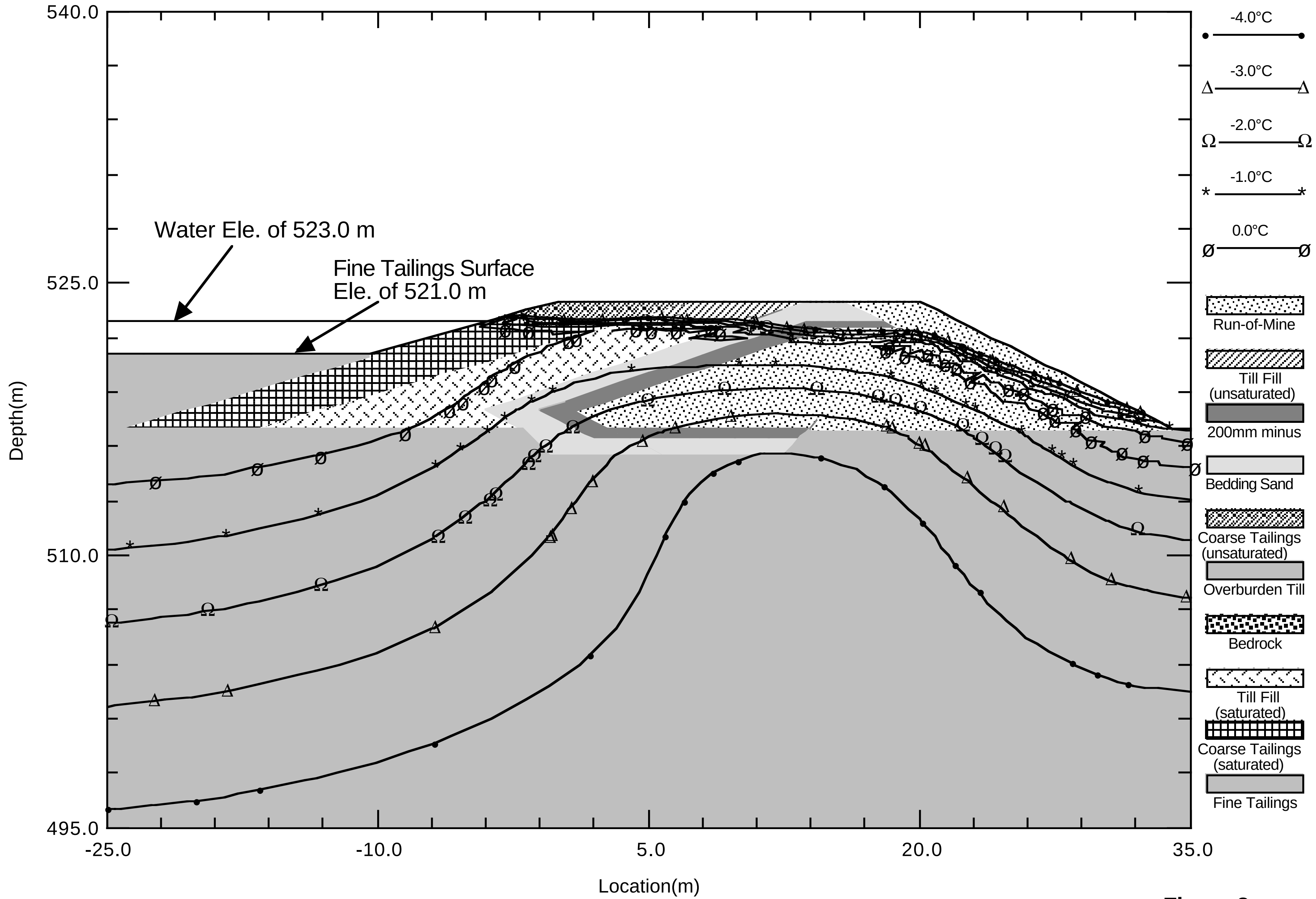


Figure 3

Predicted Isotherms in Early December of 2010
East Dam under Mean Climatic Conditions

APPENDIX

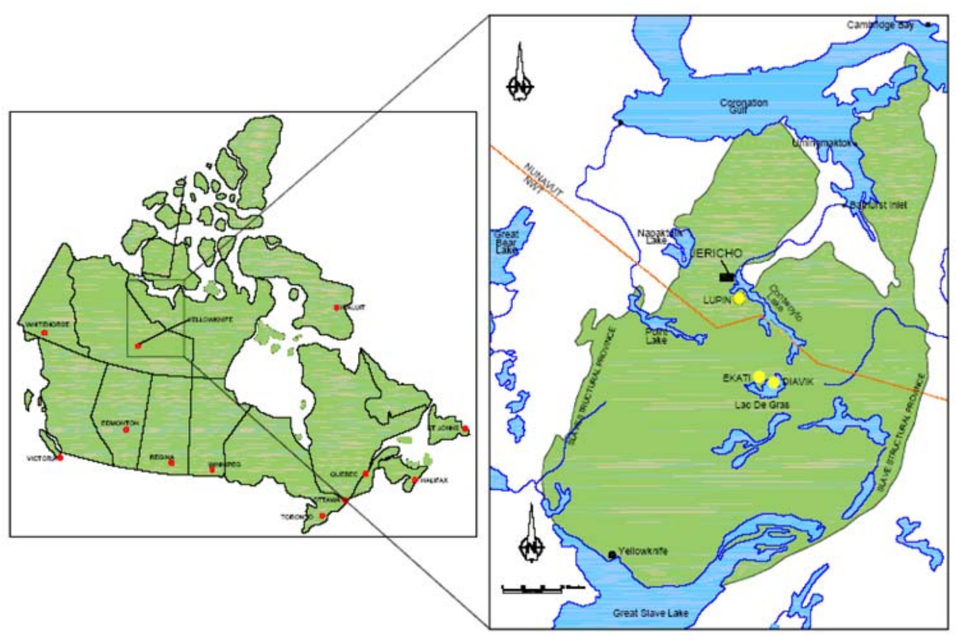
APPENDIX C REVISED CONSTRUCTION DRAWINGS

TAHERA Diamond Corporation

JERICHO PROJECT

EAST AND SOUTHEAST DAM

CONSTRUCTION DRAWINGS



LOCATION PLAN

DRAWING LIST

DRAWING	DRAWING TITLE
ED–2	EAST DAM AND SOUTHEAST DAM SURFICIAL GEOLOGY
ED–3	EAST DAM AND SOUTHEAST DAM LOCATION PLAN
ED–4	EAST DAM AND SOUTHEAST DAM TYPICAL CROSS SECTIONS
ED–5	EAST DAM AND SOUTHEAST DAM KEY TRENCH LAYOUT PLAN
ED–6	EAST DAM AND SOUTHEAST DAM LINER LAYOUT PLAN
ED–7	EAST DAM PROFILE AND CROSS SECTION
ED–8	SOUTHEAST DAM PROFILE AND CROSS SECTION

REVISION #1 JANUARY 2006

EBA ENGINEERING CONSULTANTS LTD.

CONSULTANTS REFERENCE NO.: 1100060.004

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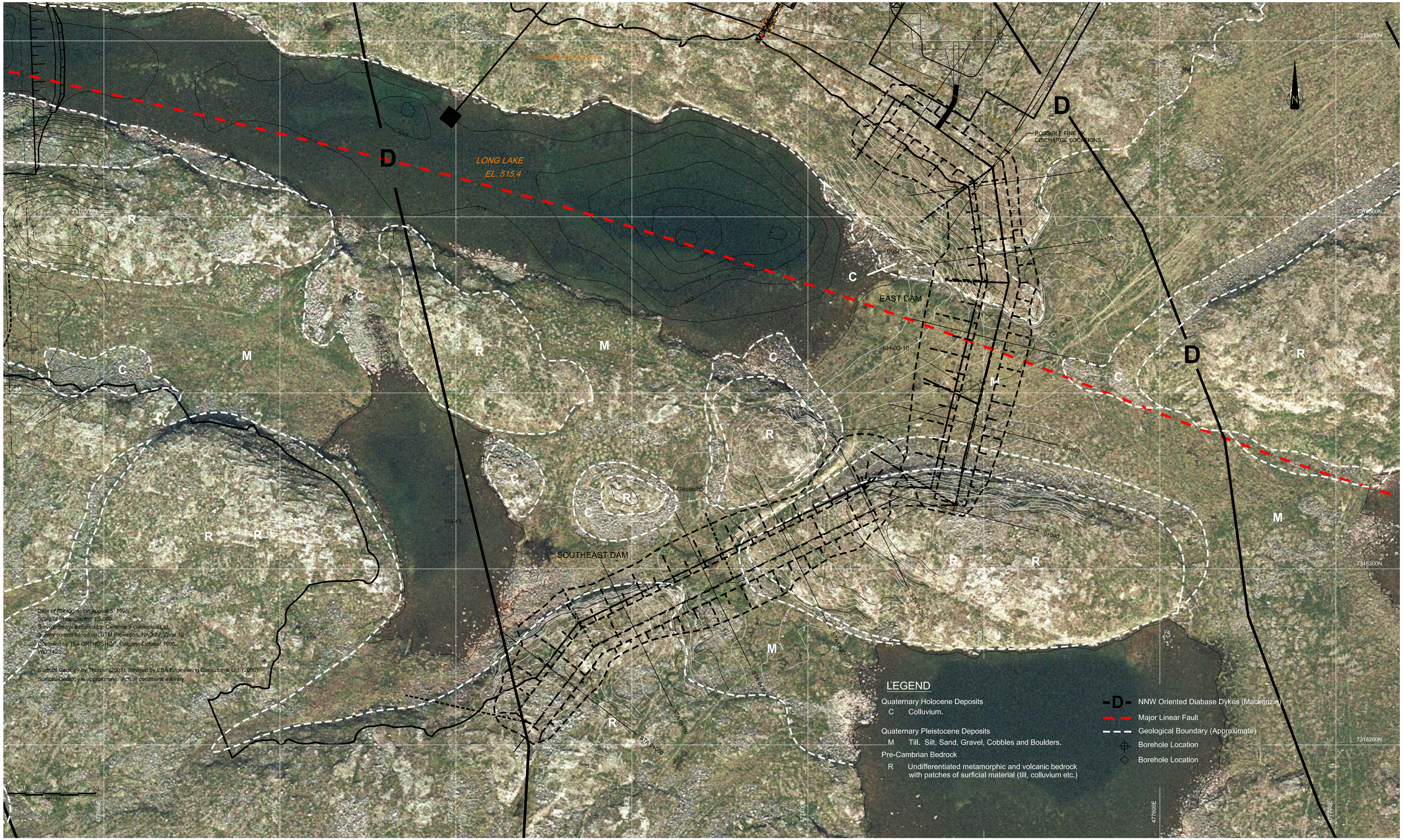

DRAWING No.	DRAWING TITLE	DATE	REV
–	–	DD/MM/YY	

REFERENCE DRAWINGS

No.	DESCRIPTION	DATE	APPROVED
1	REVISED SURFICIAL GEOLOGY	JAN/06	WTH
0	ISSUED FOR CONSTRUCTION	AUG/05	WTH
A	ISSUED FOR REVIEW	AUG/05	WTH

REVISION

EBA ENGINEERING CONSULTANTS LTD.

DESIGNED BY: WTH
DRAWN BY: RGR
DATE: 18/08/05
SCALE: AS SHOWN
PROJECT No.: 1100060.004
ACAD FILENAME: 1100060004R26A.dwg

ORIGINAL
SIGNED AND SEALED

Seal: William T. Horne, P.Eng. Date: August 30, 2005
Permit: Derek C. Cathro, P.Eng. Date: August 30, 2005

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Diamond Corporation

JERICHO PROJECT

EAST AND SOUTHEAST DAM
SURFICIAL GEOLOGY

REVISION ISSUE: 1

DRAWING No.: ED-2

COORDINATE LAYOUT TABLE
EAST DAM

POINT	NORTHING	EASTING	ELEVATION
1	7 318 335.67	477 489.57	527
2	7 318 339.93	477 471.82	527
3	7 318 463.57	477 501.99	524.50
4	7 318 462.62	477 520.56	524.50
5	7 318 531.75	477 510.62	527
6	7 318 521.12	477 493.94	527
7	7 318 554.28	477 446.20	527
8	7 318 569.39	477 456.44	527
9	7 318 521.68	477 512.36	527
10	7 318 518.97	477 494.31	527
11	7 318 478.80	477 518.31	524.50
12	7 318 476.30	477 500.23	524.50
13	7 318 355.66	477 494.38	524.50
14	7 318 359.98	477 476.65	524.50
15	7 318 339.40	477 490.46	527
16	7 318 343.74	477 472.74	527

COORDINATE LAYOUT TABLE
SOUTHEAST DAM

POINT	NORTHING	EASTING	ELEVATION
1	7 318 206.85	477 248.71	527
2	7 318 217.91	477 234.20	527
3	7 318 266.52	477 271.46	526.43
4	7 318 251.99	477 283.32	526.43
5	7 318 328.33	477 439.90	527
6	7 318 344.74	477 431.91	527
7	7 318 323.56	477 430.05	527
8	7 318 339.97	477 422.05	527
9	7 318 313.69	477 409.89	524.50
10	7 318 330.18	477 402.06	524.50
11	7 318 268.20	477 316.62	524.50
12	7 318 284.61	477 308.63	524.50
13	7 318 239.41	477 273.70	527
14	7 318 250.65	477 259.29	527

REFERENCE DRAWINGS

DRAWING No.	DRAWING TITLE	DATE	REV
–	–	DD/MM/YY	

REVISION

No.	DESCRIPTION	DATE	APPROVED
1	REVISED CREST ELEVATION	JAN/06	WTH
0	ISSUED FOR CONSTRUCTION	AUG/05	WTH
A	ISSUED FOR REVIEW	AUG/05	WTH

EBA ENGINEERING CONSULTANTS LTD.

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DRAWN BY:	RGR
DATE:	02/08/05
SCALE:	AS SHOWN
PROJECT No.:	1100060.004
ACAD FILENAME:	1100060004R35A.dwg

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Date: August 30, 2005

Permit: Derek C. Cathro, P.Eng.
Date: August 30, 2005

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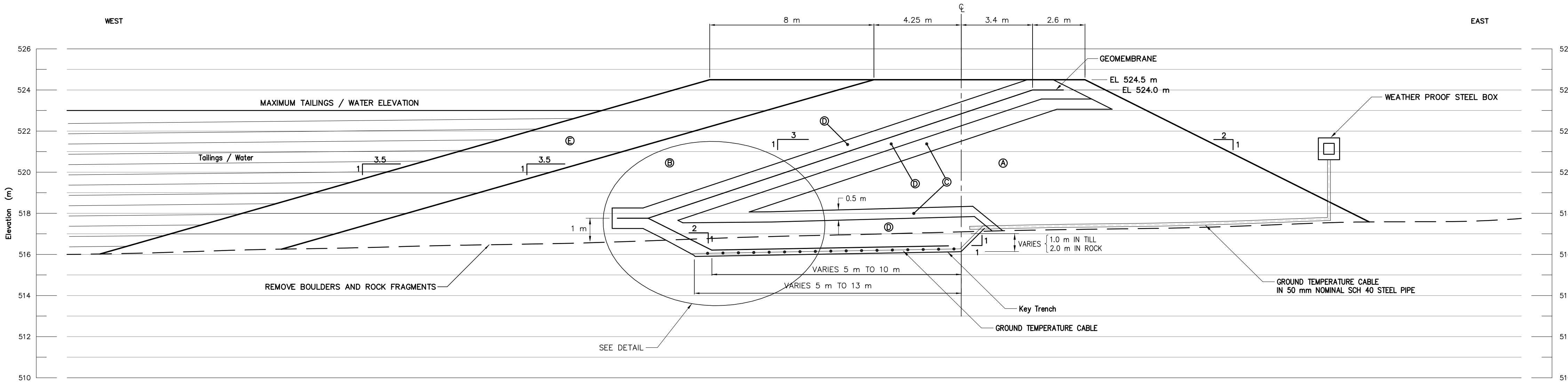
JERICHO PROJECT

EAST DAM AND SOUTHEAST DAM
LOCATION PLAN

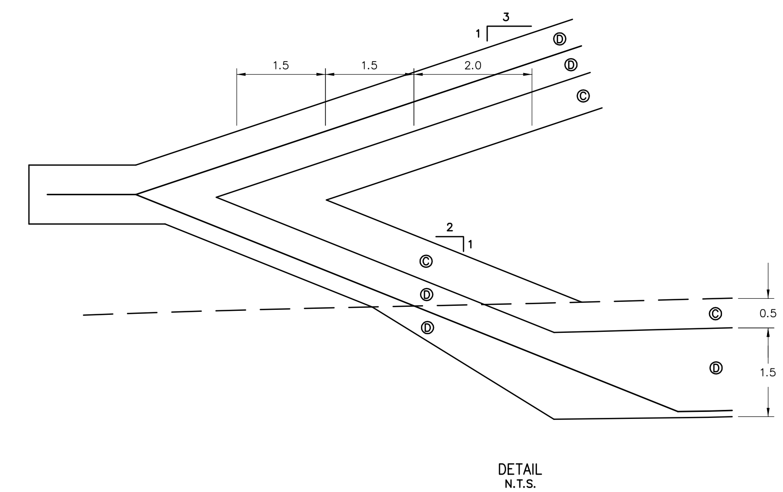
REVISION ISSUE
1

DRAWING No.
ED–3

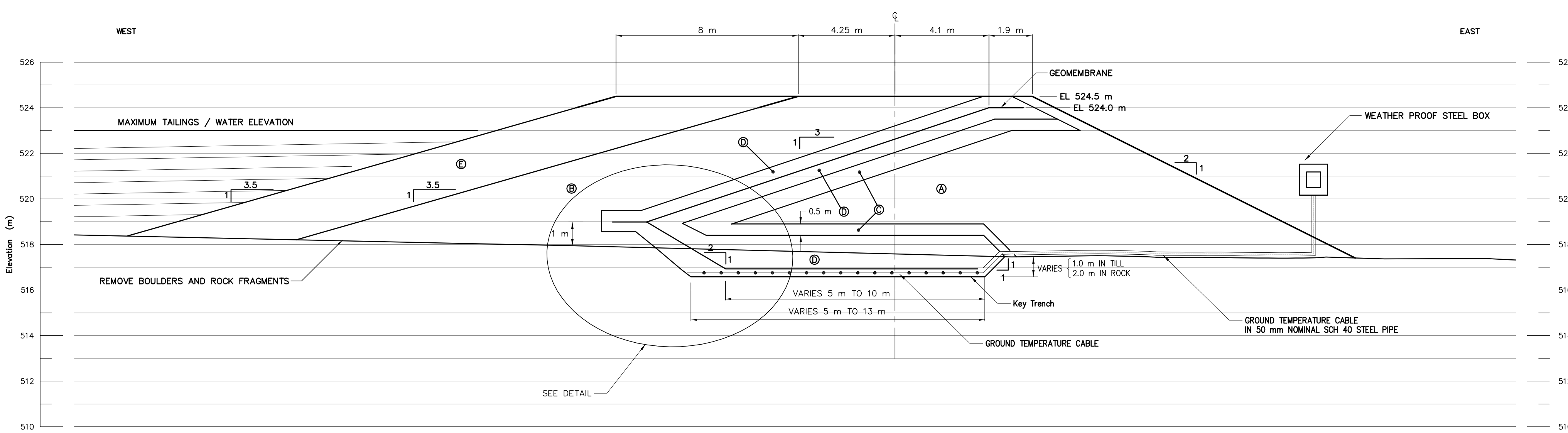


MATERIAL TYPES
- Ⓐ RUN–OF–MINE
- Ⓑ TILL
- Ⓒ 200 mm MINUS
- Ⓓ BEDDING (Screened Esker or 20 mm Minus)
- Ⓔ COARSE TAILINGS

EAST DAM – TYPICAL SECTION



DETAIL
N.T.S.



MATERIAL TYPES
- Ⓐ RUN–OF–MINE
- Ⓑ TILL
- Ⓒ 200 mm MINUS
- Ⓓ BEDDING (Screened Esker or 20 mm Minus)
- Ⓔ COARSE TAILINGS

SOUTHEAST DAM – TYPICAL SECTION

0 5
metres

DRAWING No.	DRAWING TITLE	DATE	REV
–	–	DD/MM/YY	

REFERENCE DRAWINGS

No.	DESCRIPTION	DATE	APPROVED
1	REVISED CREST ELEVATION	JAN/06	WTH
0	ISSUED FOR CONSTRUCTION	AUG/05	WTH
A	ISSUED FOR REVIEW	AUG/05	WTH

REVISION

EBA ENGINEERING CONSULTANTS LTD.

DESIGNED BY: WTH
DRAWN BY: RGR
DATE: 08/08/05
SCALE: AS SHOWN
PROJECT No.: 1100060.004
ACAD FILENAME: 1100060004R28A.dwg

ORIGINAL
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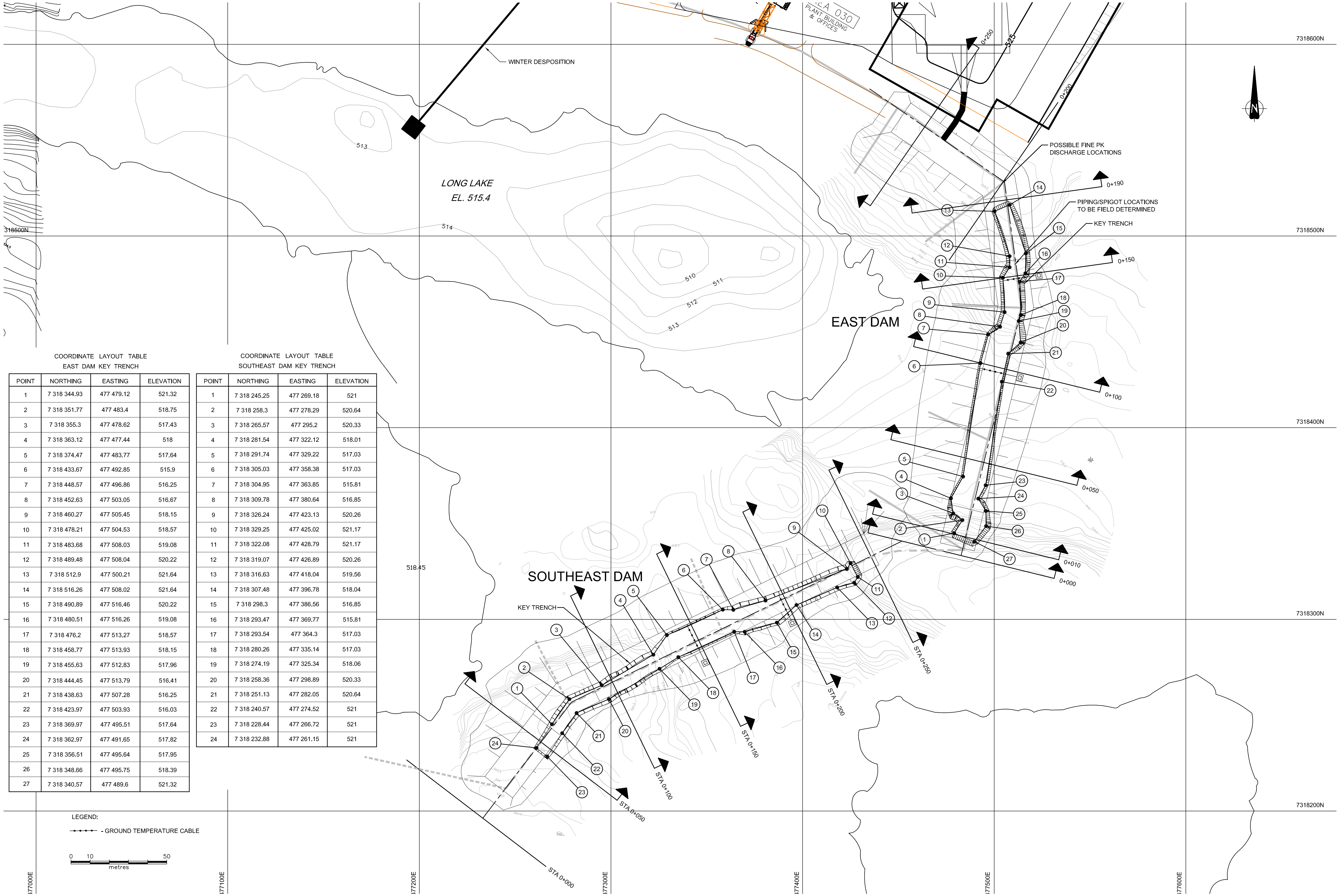
JERICHO PROJECT

EAST DAM AND SOUTHEAST DAM
TYPICAL CROSS–SECTIONS

REVISION ISSUE: 1
DRAWING No.: ED–4



COORDINATE LAYOUT TABLE
EAST DAM KEY TRENCH

POINT	NORTHING	EASTING	ELEVATION
1	7 318 344.93	477 479.12	521.32
2	7 318 351.77	477 483.4	518.75
3	7 318 355.3	477 478.62	517.43
4	7 318 363.12	477 477.44	518
5	7 318 374.47	477 483.77	517.64
6	7 318 433.67	477 492.85	515.9
7	7 318 448.57	477 496.86	516.25
8	7 318 452.63	477 503.05	516.67
9	7 318 460.27	477 505.45	518.15
10	7 318 478.21	477 504.53	518.57
11	7 318 483.68	477 508.03	519.08
12	7 318 489.48	477 508.04	520.22
13	7 318 512.9	477 500.21	521.64
14	7 318 516.26	477 508.02	521.64
15	7 318 490.89	477 516.46	520.22
16	7 318 480.51	477 516.26	519.08
17	7 318 476.2	477 513.27	518.57
18	7 318 458.77	477 513.93	518.15
19	7 318 455.63	477 512.83	517.96
20	7 318 444.45	477 513.79	516.41
21	7 318 438.63	477 507.28	516.25
22	7 318 423.97	477 503.93	516.03
23	7 318 369.97	477 495.51	517.64
24	7 318 362.97	477 491.65	517.82
25	7 318 356.51	477 495.64	517.95
26	7 318 348.66	477 495.75	518.39
27	7 318 340.57	477 489.6	521.32

COORDINATE LAYOUT TABLE
SOUTHEAST DAM KEY TRENCH

POINT	NORTHING	EASTING	ELEVATION
1	7 318 245.25	477 269.18	521
2	7 318 258.3	477 278.29	520.64
3	7 318 265.57	477 295.2	520.33
4	7 318 281.54	477 322.12	518.01
5	7 318 291.74	477 329.22	517.03
6	7 318 305.03	477 358.38	517.03
7	7 318 304.95	477 363.85	515.81
8	7 318 309.78	477 380.64	516.85
9	7 318 326.24	477 423.13	520.26
10	7 318 329.25	477 425.02	521.17
11	7 318 322.08	477 428.79	521.17
12	7 318 319.07	477 426.89	520.26
13	7 318 316.63	477 418.04	519.56
14	7 318 307.48	477 396.78	518.04
15	7 318 298.3	477 386.56	516.85
16	7 318 293.47	477 369.77	515.81
17	7 318 293.54	477 364.3	517.03
18	7 318 280.26	477 335.14	517.03
19	7 318 274.19	477 325.34	518.06
20	7 318 258.36	477 298.89	520.33
21	7 318 251.13	477 282.05	520.64
22	7 318 240.57	477 274.52	521
23	7 318 228.44	477 266.72	521
24	7 318 232.88	477 261.15	521

LEGEND:
- GROUND TEMPERATURE CABLE

0 10 50
metres

DRAWING No.	DRAWING TITLE	DATE	REV	No.	DESCRIPTION	DATE	APPROVED
–	–	DD/MM/YY		1	REVISED LENGTH OF SOUTHEAST DAM KEY TRENCH	JAN/06	WTH
				0	ISSUED FOR CONSTRUCTION	AUG/05	WTH
				A	ISSUED FOR REVIEW	AUG/05	WTH

REFERENCE DRAWINGS

REVISION

EBA ENGINEERING CONSULTANTS LTD.

DESIGNED BY: WTH
DRAWN BY: RGR
DATE: 02/08/05
SCALE: AS SHOWN
PROJECT No.: 1100060.004
ACAD FILENAME: 1100060004R25A.dwg

ORIGINAL
SIGNED AND SEALED

Seal: William T. Horne, P.Eng.
Date: August 30, 2005

Permit: Derek C. Cathro, P.Eng.
Date: August 30, 2005

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TAHERA
Diamond Corporation

JERICHO PROJECT

EAST DAM AND SOUTHEAST DAM
KEY TRENCH LAYOUT PLAN

REVISION ISSUE
1

DRAWING No.
ED-5

COORDINATE LAYOUT TABLE
EAST DAM LINER

POINT	NORTHING	EASTING	ELEVATION
1	7 318 343.43	477 477.72	524.0
2	7 318 346.35	477 479.65	524.0
3	7 318 354.41	477 473.84	520.9
4	7 318 361.82	477 475.33	519.95
5	7 318 374.99	477 482.59	519.54
6	7 318 403.41	477 486.4	518.51
7	7 318 431.11	477 491.03	517.8
8	7 318 448.61	477 496.05	518.1
9	7 318 455.21	477 501.03	520
10	7 318 460.51	477 503.37	520.97
11	7 318 477.51	477 502.4	521.29
12	7 318 483.73	477 504.06	522.07
13	7 318 488.34	477 506.15	523
14	7 318 505.54	477 502.81	524.0
15	7 318 513.93	477 501.22	524.0
16	7 318 488.38	477 509.35	524.0
17	7 318 446.79	477 514.05	524.0
18	7 318 369.53	477 495.03	524.0

COORDINATE LAYOUT TABLE
SOUTHEAST DAM LINER

POINT	NORTHING	EASTING	ELEVATION
1	7 318 246.36	477 266.13	524.0
2	7 318 261.21	477 275.52	524.0
3	7 318 269.46	477 293.13	524.0
4	7 318 285.24	477 320.23	521.06
5	7 318 294.96	477 331.84	518.84
6	7 318 311.25	477 366.88	519.08
7	7 318 314.53	477 380.46	520.08
8	7 318 329.44	477 423.20	524.0
9	7 318 304.33	477 386.37	524.0
10	7 318 280.38	477 337.30	524.0
11	7 318 235.29	477 257.77	524.0

DRAWING No.	DRAWING TITLE	DATE	REV	No.	DESCRIPTION	DATE	APPROVED
-	-	DD/MM/YY		A	ISSUED FOR REVIEW	AUG/05	WTH
				0	ISSUED FOR CONSTRUCTION	AUG/05	WTH
				1	REVISED CREST ELEVATION	JAN/06	WTH

REFERENCE DRAWINGS — REVISION

EBA ENGINEERING CONSULTANTS LTD.

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DRAWN BY:	RGR
DATE:	02/08/05
SCALE:	AS SHOWN
PROJECT No.:	1100060.004
ACAD FILENAME:	1100060004R31A.dwg

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Permit: Derek C. Cathro, P.Eng. Date: August 30, 2005

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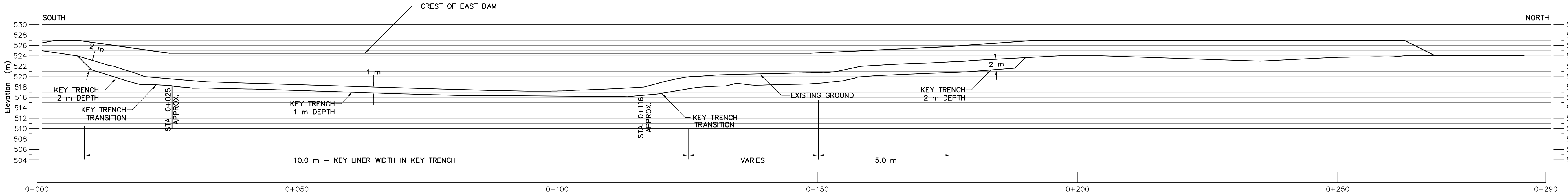
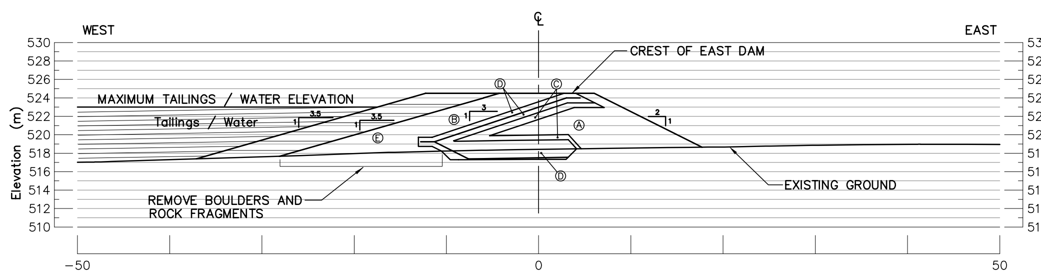
JERICHO PROJECT

EAST DAM AND SOUTHEAST DAM
LINER LAYOUT PLAN

REVISION ISSUE: 1

DRAWING No.: ED-6





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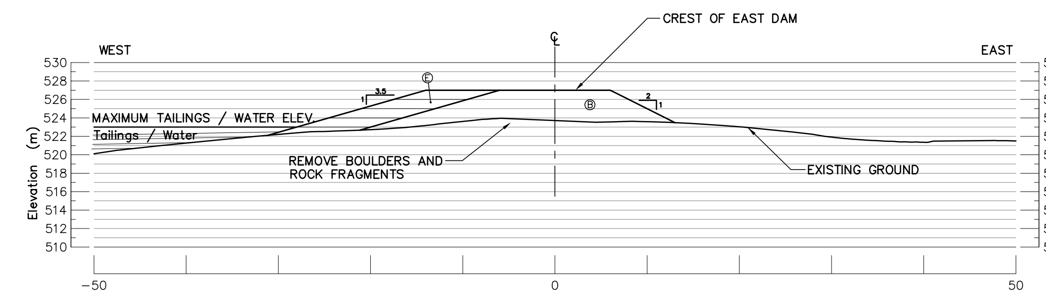

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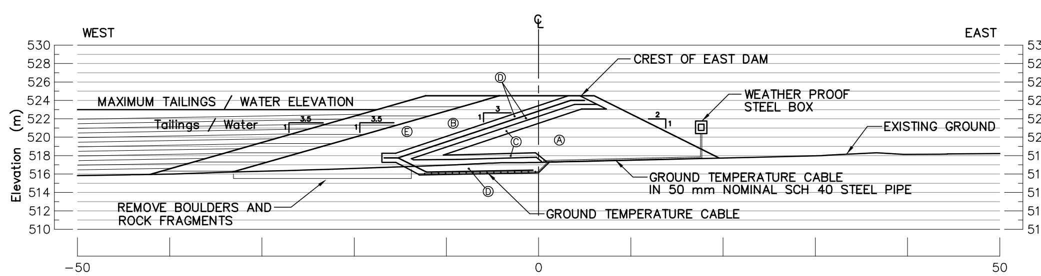

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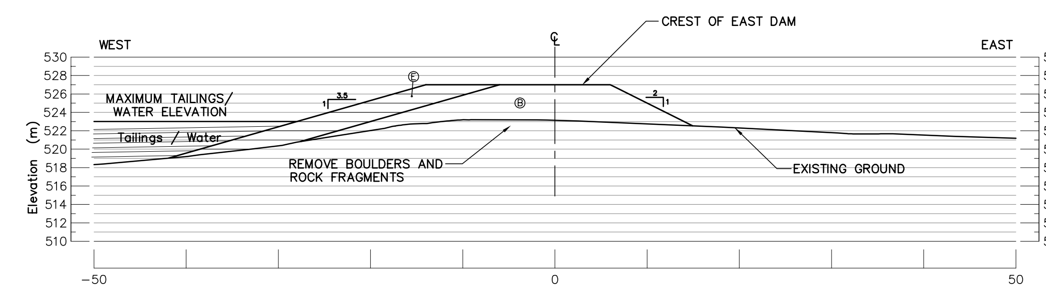

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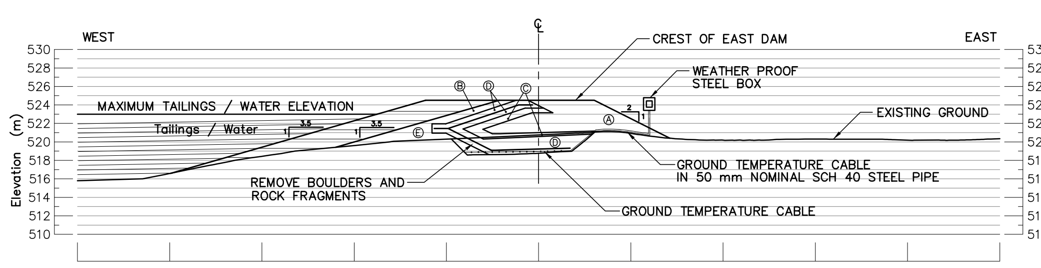

STATION 0+150

MATERIAL TYPES

- Ⓐ RUN–OF–MINE
- Ⓑ TILL
- Ⓒ 200 mm MINUS
- Ⓓ BEDDING (Screened Esker or 20 mm Minus)
- Ⓔ COARSE TAILINGS

NOTE: COARSE TAILINGS PLACED DURING MILL PRODUCTION. COARSE TAILING LEVEL TO REMAIN 2 m HIGHER THAN WATER LEVEL

DRAWING No.	DRAWING TITLE	DATE	REV
–	–	DD/MM/YY	

REFERENCE DRAWINGS

No.	DESCRIPTION	DATE	APPROVED
1	REVISED CREST ELEVATION	JAN/06	WTH
0	ISSUED FOR CONSTRUCTION	AUG/05	WTH
A	ISSUED FOR REVIEW	AUG/05	WTH

REVISION

EBA ENGINEERING CONSULTANTS LTD.

DESIGNED BY: WTH
DRAWN BY: RGR
DATE: 08/08/05
SCALE: AS SHOWN
PROJECT No.: 1100060.004
ACAD FILENAME: 1100060004R33A.dwg

ORIGINAL SIGNED AND SEALED

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Permit: Derek C. Cathro, P.Eng. Date: August 30, 2005

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JERICHO PROJECT

EAST DAM
PROFILE and CROSS–SECTIONS

REVISION ISSUE: 1

DRAWING No.: ED–7

APPENDIX

APPENDIX D NRCAN SEISMICITY MEMO

Comments from NRCan on Seismicity
(Extracted from Jericho Final EIS Review, dated 12 May 2003)

The project is in a region of very low seismicity, but two magnitude 4+ earthquake recently happened in a similar part of the shield (Magnitude 4.5 and 4.2; November 28th 2001; 64.95N 113.5W; about 140 km SW of the site). These demonstrate that all the seismic hazard does not come from distant earthquakes. Indeed events exceeding magnitude 6.5 are thought possible anywhere in the Canadian Shield, albeit rarely.

The seismic hazard calculation from PGC used to conclude that the overall impact is negligible is what the GSC calculates as being equivalent to the 1995 (and 1985) National Building Code of Canada and is based on GSC's 1982 seismic source zones. It indicates less than 2% g and 0.05 m/s for the 1/1000 year event, from Attachment 3.3. However these results are rather inappropriate (see below). A specific point is that the seismic sources used in 1982 totally neglect all earthquakes within about 400 km of the Jericho site, and so the seismic hazard is computed only from distant sources in Boothia-Ungava and the Nahanni and Mackenzie mountains. Furthermore, the Nahanni earthquakes - earthquakes far larger than any considered by the 1982 model that are relevant to the site - were not included since they happened after the calculations were finalized.

Our "4th generation" seismic hazard calculations for the 2005 edition of the National Building Code of Canada (details available on the WWW at www.seismo.nrcan.gc.ca) uses two probabilistic models that include the consequences of the Nahanni earthquakes and updates other seismicity parameters. NRCan ran a computation for the site at the 0.0001 p.a. probability level and found the hazard from these two models to be negligible.

A better representation of seismic hazard at the site considers instead the occurrence of large earthquakes in the Canadian Shield as a whole, and in worldwide shields of similar age. NRCan has concluded that:

- the maximum earthquake credible would have magnitude 6 3/4;
- current knowledge does not permit the screening out of shield areas that could have earthquakes of this size, so they should be considered as low probability events anywhere on the Canadian Shield;
- a reasonable design earthquake for the shield would be magnitude 6.0; and
- the rate of magnitude 6.0 or greater is estimated to be 0.004 p.a. per 1,000,000 square kilometres.

For the probability level of 0.001 p.a., the M6 earthquake could be expected to occur within an area of 250,000 km*km, equivalent to a circle of radius 280 km about the site. For the probability level of 0.0001 p.a., the earthquake could be expected to occur within an area of 25,000 km*km, equivalent to a circle of radius 90 km about the site. Thus by this analysis, the mine should cope with a magnitude 6 earthquake at a distance of 280 km (estimated Peak Ground Acceleration of about 1% g and PGV of 0.004 m/s, on a rock site) or possibly 90 km (Peak Ground Acceleration of about 5% g and PGV of 0.01 m/s, on a rock site). For comparison, NRCan computed the largest Nahanni earthquake (M6.9 at about 600 km distance) might have produced a little less than 0.3% g.

NRCan has incorporated a comparable probabilistic analysis into our NBCC 2005 work as a third model representing the shield earthquakes. The probabilistic hazard values for NBCC will be 6% g for a probability of 0.000404 per annum (2% in 50 years).

NRCan concludes that a safety check against the shaking from these rare large shield earthquakes which may occur close to the site would be prudent.

Seismic Hazard Analysis for Contwoyto Lake, Nunavut

prepared by Alison Bird, Seismologist

What follows is a detailed hazard assessment of the site near Contwoyto Lake, Nunavut (65.997°N, 111.475°W). The approach for this site is somewhat different to that of sites addressed in the past as it does not lie in the vicinity of any large active faults for which a maximum possible earthquake could be determined. This site instead lies within the 'stable craton' of central Canada, with a 'floor' level of potential seismic activity.

It should be noted that neither site conditions nor structural engineering are considered in this analysis.

Recorded Earthquakes

All seismicity which has been located in the region since 1898 (when the first seismographs were installed in western North America) is shown on the map in Figure 1. The Contwoyto Lake site is indicated with a red triangle. Note that although the level of recording in this region has, until recent years, been minimal, any earthquake which could be expected to cause damage would have been recorded during the past century. There have been few events, all less than magnitude 5; seismic activity in this region is generally thought to be caused by post-glacial rebound:

Date yyyy mm dd	Time hhmm ss.s	Lat	Lon	Depth km	Mag
1963 06 05	0131 37.0	66.500	-110.000		3.10
1966 01 10	0428 20.0	66.250	-111.830		4.60
1966 01 19	0710 20.0	67.830	-107.670		3.70
1966 04 19	0520 59.0	66.750	-111.000		2.50
1976 10 21	1750 56.0	68.060	-109.930	18.00F	2.90
1983 03 23	1147 23.0	65.690	-111.560	18.00F	3.30
2001 11 28	0411 14.2	64.914	-113.666	20.00F	3.90
2001 11 28	0418 39.6	64.957	-113.660	20.00F	4.50

Probabilistic Analysis

The current standard probabilistic analysis of the Contwoyto Lake site was sent to Mr. Robertson on September 3^{rd}. The results are also presented below:

Return Period (years)	100	200	475	1,000
Probability of Exceedence per annum	0.010	0.005	0.0021	0.001
Probability of Exceedence in 50 years	40%	22%	10%	5%
Peak Horizontal Ground Acceleration (g)	0.009	0.011	0.013	0.016
Peak Horizontal Ground Velocity (m/s)	0.027	0.032	0.040	0.047

The zoning for this site, using the 1990 NBCC/CNBC, is Acceleration Zone 0, corresponding to 0.00-0.04 g; Velocity Zone 0, corresponding to 0.00-0.04 m/s. These figures are for a probablility level of 10% in 50 years.

Extrapolated Values

If the above data is presented in a log-log plot, it can be extrapolated to determine a peak ground acceleration (PGA) of 0.030 g and peak ground velocity (PGV) of 0.090 m/s, for a return period of 10,000 years (Figure 2). It should be noted that extrapolation to this return period is outside the realm of the NBCC and should be taken only as a rough approximation.

Proposed values for new National Building Code

As mentioned above, the site near Contwoyto Lake lies within the 'stable craton' of central North America, which has too few earthquakes to define reliable source zones. Previous hazard maps (as used in the current probabilistic analysis presented above) considered only ground motions generated from distant sources. Understanding of seismicity in the stable shield or core regions of continents, using global examples, has lead to revised values and the development of a 'floor' level of seismic hazard which has been incorporated into proposed models which will form the basis of the 2005 edition of the National Building Code of Canada (Adams *et al.* 2003). This assumes large earthquakes could occur anywhere in Canada.

What follows are the proposed NBCC 2005 median values for Site Class C (firm ground) 2%/50 year (equivalent to 1/2475 years or 0.000404 per annum probability) values for your region of interest. Peak acceleration (PGA) and 5% damped spectral acceleration values are expressed in terms of g.

Location	Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA
Contwoyto Lake, NU	0.12	0.056	0.023	0.006	0.059

For rock site values, the amplification factor of 1.39 should be divided into values for firm soil (Adams *et al.* 1999).

This code is not yet published; these values are therefore unofficial, but the differences should be noted. Newer peak ground acceleration values for this region are somewhat higher in order to consider not simply earthquakes which have occurred in the site area, but also those which *could* occur, according to activity recorded in other regions of the Canadian Shield.

In developing the floor level, the following conclusions are have been reached:

i) the maximum earthquake credible would have a magnitude of 7.0.
ii) current knowledge does not permit the exclusion of shield areas which could not have earthquakes up to this size, so they should be considered as low probability events anywhere on the Canadian Shield.
iii) a reasonable design earthquake for the shield would be magnitude (Ms, or surface wave magnitude) 6.0, but larger, much more rare earthquakes can occur.
iv) the rate of Ms 6.0 or greater is estimated to be a 0.004 p.a. per 1,000,000 km^2.

The new National Building Code of Canada, due out January 2005, is available on-line at: www.seismo.nrcan.gc.ca/hazards/OF4459/index_e.php.

Deterministic Analysis

Mapped faults within several hundred kilometers of the Contwoyto Lake site have been reviewed. There are only a few minor faults in the GSC catalogue, none of which is associated with recorded earthquakes nor is known by the GSC to be active (Figure 3). It is suggested you confer with a geotechnical consultant to determine the status of these faults.

The nearest major faults are the Tintina, Denali and Fairweather Faults in Yukon and Alaska which are 1200 km, 1440 km and 1545 km from the site, respectively. The distances suggest the site would receive only minor ground motions from their maximum expected magnitudes of 7.3, 7.3 and 8.7 respectively.

The above work has been discussed with both Garry Rogers and John Adams; they both agree that the probabilistic results, particularly those of the 2005 NBCC, are likely to yield the most reliable results for your purpose. A deterministic approach, when there are no known active faults in the region, does not provide a representative measure of PGA.

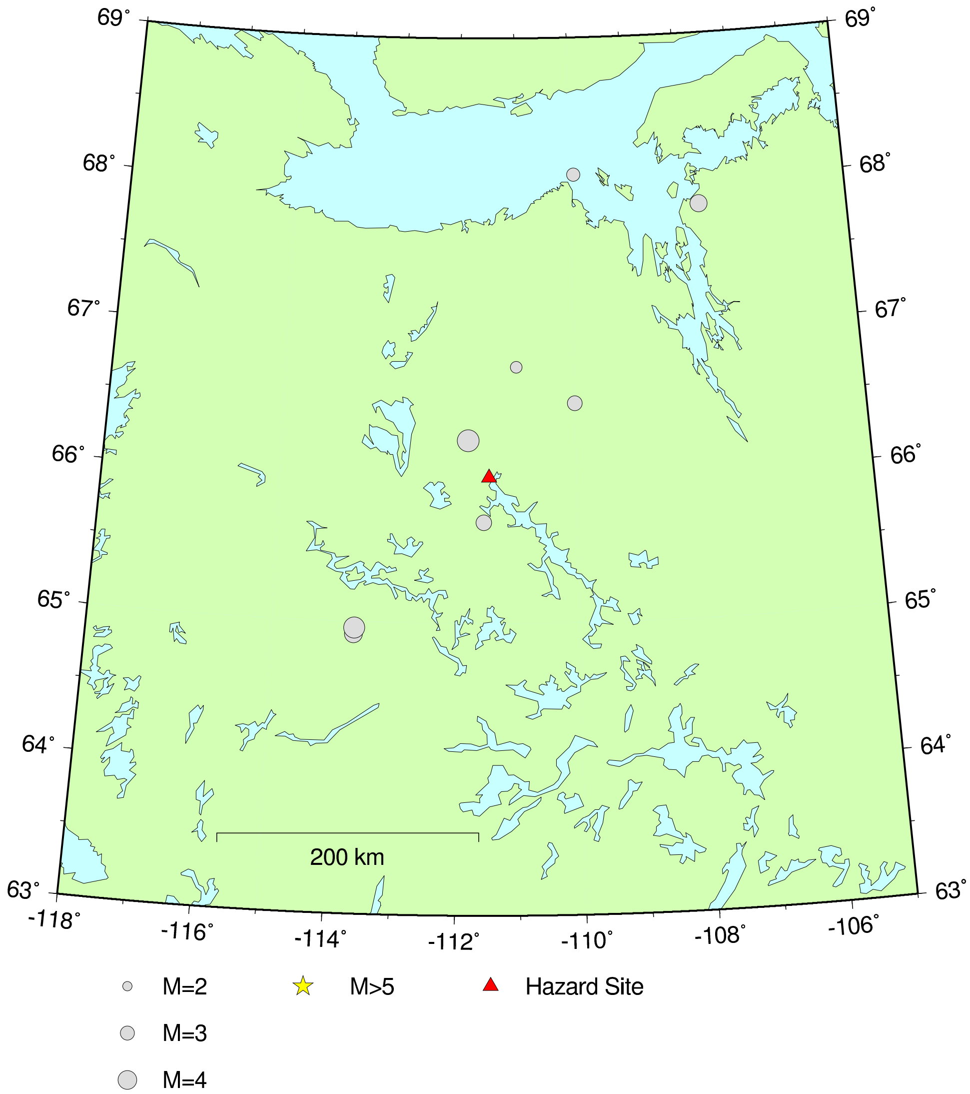

Figure 1: Area of study, showing all seismic activity for the period 1898 to 2003. Contwoyto Lake site is denoted by a red triangle.

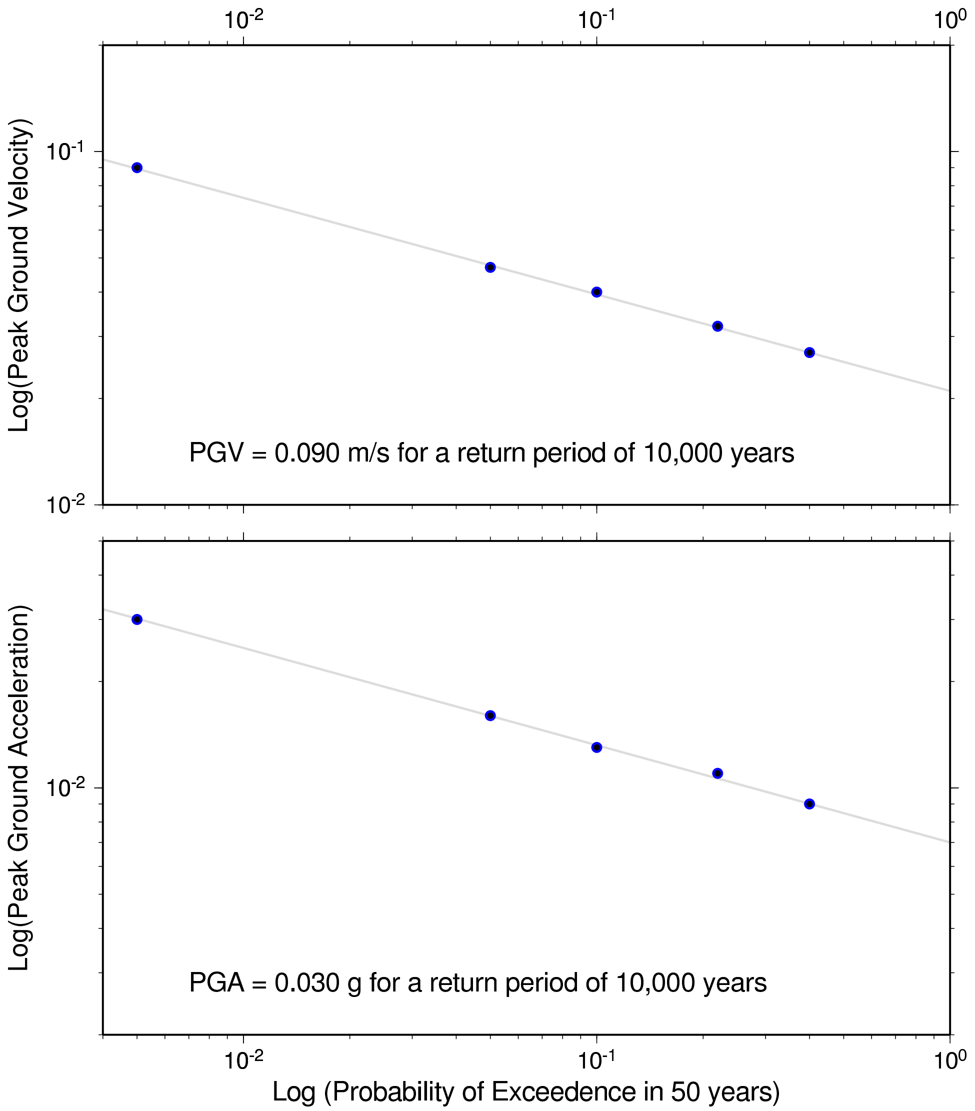

Figure 2: Log-log plots of Peak Ground Velocity and Peak Ground Acceleration versus Probablility of Exceedence.

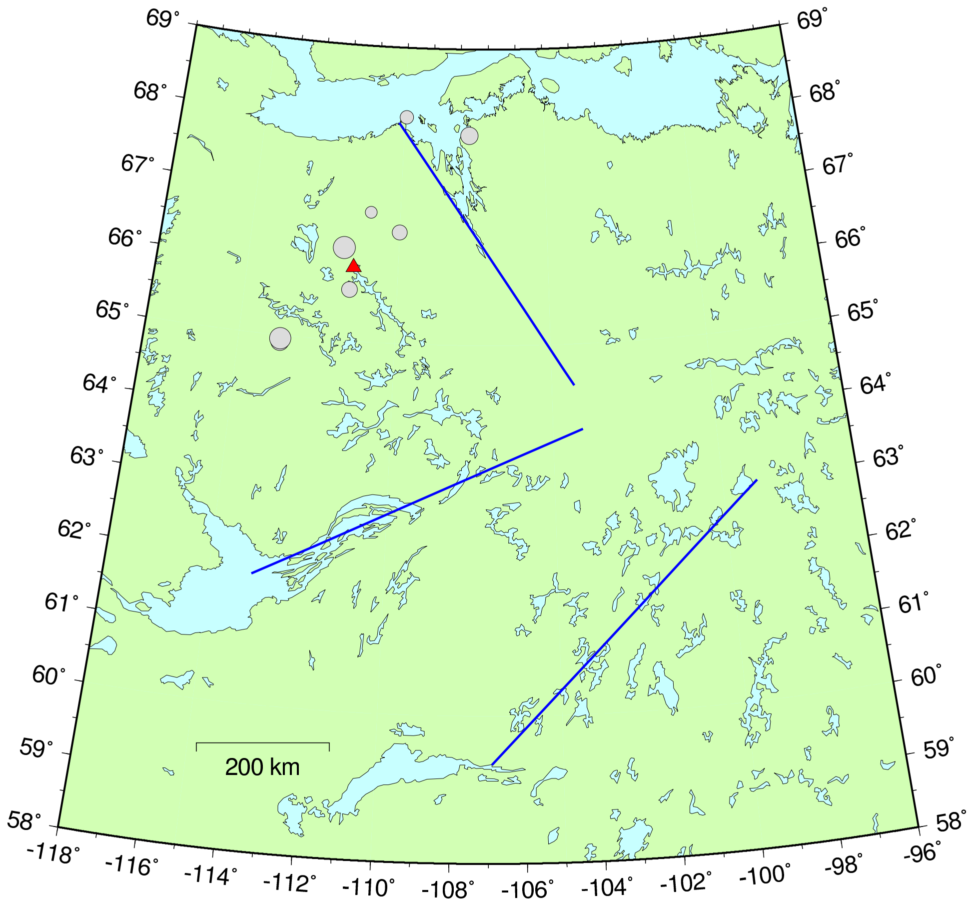

Figure 3: Approximate traces of mapped faults in the Contwoyto Lake area; none are known to be active.

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