2. **LA CORPORACION** se compromete, en el caso que le sea otorgada por el **MEM** autorización para la exploración, explotación, comercialización y venta del mineral de cobre existente en el área Las Cristinas 4,5,6, y 7, a celebrar con **CRYSTALLEX** el addendum correspondiente y complementario al presente contrato, a fin de fijar las condiciones en que dichas actividades serán ejecutadas por **CRYSTALLEX**.

3. El presente contrato podrá ser modificado de mutuo acuerdo entre las partes, mediante addendum celebrado al efecto, sin cambiar el espíritu, propósito y razón que los animó a celebrarlo.

CLÁUSULA VIGÉSIMA TERCERA

LEY APLICABLE

Las partes contratantes declaran expresamente que el presente contrato y sus anexos será gobernado por las leyes de la República Bolivariana de Venezuela.

CLÁUSULA VIGÉSIMA CUARTA

RESCISIÓN DEL CONTRATO

Este contrato podrá ser rescindido unilateralmente por **LA CORPORACIÓN** sin indemnización alguna para **CRYSTALLEX**, en caso de darse un retardo en el inicio, paralización de cualquiera de las actividades o incumplimiento contractual por un periodo de un (01) año sin motivo debidamente justificado.

CLAUSULA VIGÉSIMA QUINTA

DOMICILIO

Sin perjuicio de la competencia que corresponde a la Sala Político-Administrativa del Tribunal Supremo de Justicia, para el conocimiento de las controversias relativas a los contratos administrativos, se elige como domicilio especial a la ciudad de Ciudad Guayana, Municipio Caroní del Estado Bolívar a cuyos tribunales deberán someterse.

Se hacen tres (03) ejemplares de un mismo tenor y a un solo efecto, en Ciudad Guayana a los diecisiete (17) días de mes de septiembre del 2.002.

POR LA CORPORACIÓN

POR CRYSTALLEX

REPUBLICA BOLIVARIANA DE VENEZUELA. DR. PEDRO E. ALFARO. NOTARIO PUBLICO DE LA NOTARIA PUBLICA CUARTA DE PUERTO ORDAZ. MUNICIPIO AUTONOMO CARONI DEL ESTADO BOLIVAR. Puerto Ordaz, Diecisiete (17) De Septiembre de Dos Mil Dos. 192° y 143°. El anterior documento redactado por el Abogado: **FIRELY C. NAVARRO** inscrito en el Inpreabogado bajo el N° **11121**, fue presentado para su autenticación y devolución según planilla N° **38890** de fecha: **17-09-2002**. Presente(s) su(s) Otorgante(s) dijo(eron) llamarse: **FRANCISCO JOSE RANGEL GOMEZ Y MARC J. OPPENHEIMER,** Mayor(es) de edad, domiciliado(s) en: **PUERTO ORDAZ, ESTADO BOLÍVAR**, de nacionalidad(es): **VENEZOLANO, ESTADOUNIDENSE**, de estado(s) civil(es): Casados, titular(es) de la(s) Cédula(s) de Identidad N°(s): **2.520.281 Y PASAPORTE N° 152092004.** Leídole(s) y confrontado el original con sus fotocopias y firmadas éstas y el original en presencia del Notario, el (los) otorgante(s) expuso(ieron): **"SU CONTENIDO ES CIERTO Y MIA(NUESTRAS) LA(S) FIRMA(S) QUE APARECE(N) AL PIE DEL INSTRUMENTO".** El Notario en tal virtud lo declara Autenticado en presencia de los testigos: **YANNINA GUILLÉN y GABRIELA RODRIGUEZ**, con Cédula de Identidad N° **11.995.595** y **11.636.896** Dejándolo inserto bajo el N° **16** Tomo **86** de los Libros de Autenticaciones llevados en ésta Notaría. El Notario Público que suscribe, hace constar que en el presente acto se dio cumplimiento a lo establecido en el Artículo 78 Ordinal 2 del Decreto con Fuerza de Ley de Registro Público y del Notariado. Así mismo hace constar que tuvo a su vista: **1)** Decreto N° 430, de la **CORPORACIÓN VENEZOLANA DE GUAYANA**, del 29-12-1.960, publicado en la Gaceta Oficial de la Republica de Venezuela N° 26.445 de fecha 30-12-1.960, siendo su ultima reforma mediante Decreto de Ley N° 1.531 del 07-11-2001, Publicado en la Gaceta Oficial de la Republica Bolivariana de Venezuela N° 5.553, el 12-11-2001, el cual goza de las prerrogativas y privilegios que el Fisco Nacional confiere en el Título Preliminar de la Ley Orgánica de Hacienda Pública Nacional y está exento del pago de todos los impuestos, tasas y contribuciones conforme lo determinan los artículos 24 y 25 del citado Decreto representada por su Presidente Francisco Rangel Gómez, según designación que hiciere el Ciudadano Presidente de la Republica mediante Decreto Presidencial N° 1.034, Publicado en la Gaceta Oficial De la Republica Bolivariana de Venezuela N° 37.054, el 10-10-2000, suficientemente autorizado para este acto conforme a lo establecido en el artículo 36 y 37 del referido Decreto Ley. 2) Resolución N° 8.700 y Resolución DIR-N° 8.705 de fechas: 02-09-2002 y 16-09-2002 respectivamente. 3) Resolución de Junta Directiva de CRYSTALLEX INTERNATIONAL CORPORATION, de fecha: 16-09-2002. 4) La Notaría se trasladó y constituyó en la sede de la C.V.G, Alta Vista Puerto Ordaz, hoy a las 11:00 AM horas a petición de parte interesada.

EL NOTARIO PUBLICO

LOS OTORGANTES

El Notario Publico quien suscribe hace constar que tuvo a su vista Estatuto Nº 1, Estatutos referidos en general a la realización de los negocios y asuntos de **CRYSTALLEX INTERNATIONAL CORPORATION,** de fecha: 23-01-de 1998.

EL NOTARIO PUBLICO

República Bolivariana de Venezuela Ministerio del Interior y Justicia Notaría Pública Cuarta Municipio Autónomo Caroní - Edo. Bolívar

DR. PEDRO E. [illegible]
NOTARIO PUBLICO CUARTO
DE PUERTO ORDAZ

I, Diana Blachitz, a certified public translator in and for the Republic of Venezuela in the English language, pursuant to authorization published in Official Gazette of the Republic of Venezuela number 35.986, of June 21, 1996, registered before the Principal Public Registry Office of the Federal District on July 1, 1996, under number 2, page 2, tome 3, and registered before the Court of First Instance in Civil, Mercantile and Transit matters of the Metropolitan Area of Caracas, on November 6, 1996, DO HEREBY CERTIFY that the following is a verbatim translation of the attached document submitted to me for its translation into English reads as follows:

LOGO
MINISTRY OF INTERIOR AND JUSTICE
GENERAL DIRECTION OF REGISTRIES AND NOTARIES

FOURTH PUBLIC NOTARY OF PUERTO ORDAZ

SEAL
(Bolivarian republic of Venezuela
Ministry of Interior and Justice
Fourth Notary Public
Autonomous Municipality of Caroní – Puerto Ordaz)

CRYSTAL COMMERCIAL CENTRE – 1ST FLOOR – OFFICES 110 AND 111
TELEPHONE (0286) 962.40.57
Alta Vista - Puerto Ordaz – Estado Bolivar

SIGNATORIES: Francisco Rangel Gómez and Marc J. Oppenheimer. **TOME**: 86.
NUMBER: 16. **APPLICATION NUMBER:** 38890. **DATE:** 9 – 17 - 02

MINING OPERATION AGREEMENT
CRISTINA 4, CRISTINA 5, CRISTINA 6 and CRISTINA 7

Between **Corporación Venezolana de Guayana**, an Autonomous Institute created through Decree # 430 of December 29, 1960, published in the Official Gazette of the Republic of Venezuela # 26.445 of December 30, 1960, reformed through Decree 1.531 of November 7, 2001, published in the Official Gazette of the Bolivarian Republic of Venezuela # 5553 of November 12, 2001, which enjoys the prerogatives and privileges granted by Law to the Republic, and is exempt from the payment of all taxes, tariffs and contributions in accordance to articles 24 and 25 of the above referred decree, represented hereat by its President Francisco José Rangel Gómez, Venezuelan, of legal age, domiciled in Ciudad Bolívar, bearer of identity card # V-2.520.281, of this domicile, whose designation was made through Decree 1.034 of October 10, 2000, published in the Official Gazette of the Bolivarian Republic of Venezuela # 37.054, of October 10, 2000, hereinafter referred to as the "CORPORATION", in execution of Resolution 8.700 and Resolution DIR-N° 8.705, of September 2, 2002 and September 16, 2002, respectively, as one party; and as the other party CRYSTALLEX INTERNATIONAL CORPORATION, a company domiciled in the Province of British Columbia of Canada, continued under the Canada Business Corporations Act as Corporation # 345631-5, through certificate of January 23, 1998, represented hereat by its President, Marc J. Oppenheimer, a citizen of the United States of America, bearer of Passport # 152092004, duly authorized for this act in accordance to Resolution of the Board of Directors of September 16, 2002, hereinafter referred to as "CRYSTALLEX", each of the parties to be referred to also as "Party", and jointly referred to as the "Parties", it has been agreed to celebrate this Agreement of Mining Operation of Cristinas 4, 5, 6 and 7, based on the following:

CONSIDERING:

1- That the Corporación Venezolana de Guayana is an Autonomous Institute with juridical personality distinct and independent from the Republic, ascribed to the Ministry of the Secretary of the Presidency, which has as objectives to promote the balanced development of the Guayana Region, and to do the works of exploration, prospecting, and exploitation of the mines and deposits that to such effect the Ministry of Energy and Mines may grant it.

2- That between the Ministry of Energy and Mines and the Corporación Venezolana de Guayana was entered an agreement of May 16, 2002, where the Ministry authorizes the Corporation the execution of the works of exploitation, extraction and sale of the gold mineral that is in the deposits comprised in the areas of the concessions denominated Cristina 4, Cristina 5, Cristina 6 and Cristina 7, located in the Municipality of Sifontes of the State of Bolivar, referred to "PROJECT LAS CRISTINAS 4, 5, 6 and 7", hereinafter the "Project".

3- That the Ministry of Energy and Mines authorized the Corporación Venezolana de Guayana, through the above agreement, for the use of the assets affected to said concessions that reverted to the Republic in accordance to Resolution # 035 of March 6, 2002, published in the Official Gazette of the Bolivarian Republic of Venezuela # 37.400, of March 8, 2002.

4- That to the effects of the adequate fulfillment of the above referred agreement, the Corporación Venezolana de Guayana may celebrate agreement for the DESIGN, CONSTRUCTION AND OPERATION with third parties, through previous notice to the MEM.

5- That previous to the start of activities of the project all environmental regulations must be fulfilled.

FIRST CLAUSE

INTERPRETATION

1.1 **Definitions**. In this Contract, unless expressly established otherwise, the following words and phrases shall have the meaning established hereunder:

"Contract", shall mean the present Contract of **mining operation** with its Annexes and Modifications made in writing by the Parties.

"Effective Date", means the date of subscription of the present Agreement by the Parties before a Notary Public.

"Material Breach", means any act or omission by any of the Parties that causes an essential prejudice in: (i) the business, the result of the operation or the financial conditions of the other Party; (ii) the capacity of the other Party to fulfill with its obligations foreseen in this Contract in a timely and thorough manner, in accordance to the terms herein foreseen; the validity or force of the Contract or the rights of the other Party.

"Law of Mines", means the Decree with Rank and Force of Law of Mines, published in the Official Gazette # 5.382 of September 28, 1999, as well as its Regulations, decrees, resolutions and other applicable laws.

"MEM", means the Ministry of Energy and Mines.

"Parties" means in plural both signatory Parties of the present Contract, that is the Corporación Venezolana de Guayana and CRYSTALLEX, and in singular (Party) each of them.

"Environmental Permits", means the Permit of Affectation of Resources of gold, copper and other minerals granted by the Ministry of Environment and Renewable Resources; as well as any other permit or environmental authorization that said Ministry or another competent authority may require or is required by Law, for the activities in Las Cristinas.

"Annual Production Plan" refers to the document presented annually by CRYSTALLEX for the consideration and approval of the CORPORATION, which

includes in its contents an estimate over the following issues: -investments, -production volume, -processing capacity, -operative costs, - logistics, -number of workers, -gold production, -price of gold, -income from sales, -and any other elements related to the development and execution of the project.

"monthly Price of Gold", means the monthly average of the price of gold, which shall be calculated dividing the sum of all "London Bullion Market Association P.M.BID Gold Fix prices" (which sets the closing price of each mineral for that day per Troy ounce of refined gold), reported for the correspondent month, by the number of days for which the referred prices were established.

"Production", refers to the amount of gold mineral processed per day, expressed in tons per day (tn/day).

"Grade", means the content of gold in the gold material obtained from the deposit, measured at the entry of the mill of the processing plant, expressed in grams per dry tons (gr/tn).

SECOND CLAUSE

OBJECT OF THE CONTRACT

2.1 The CORPORATION, in accordance to the authorization issued by the MEM, through contract of May 16, 2002, authenticated before the Second Notary Public of Puerto Ordaz, Municipality of Caroní, State of Bolivar, recorded in the Book of Authentications under # 8, tome 82, of June 13, 2002, and First Notary Public of the Municipality of Baruta, State of Miranda, recorded in the Book of Authentications under number 28, tome 40, on June 19, 2002, hereinafter referred to as Contract CVG-MEM, which is annexed and forms an indivisible part of the present Contract, authorizes CRYSTALLEX, and the latter so accepts, to make all the investments and works necessary to reactivate and execute in its totality the Mining Project of CRISTINA 4, CRISTINA 5, CRISTINA 6 and CRISTINA 7, design, construct the plant, operate it, process the gold material for its subsequent commercialization and sale, and return the mine and its installations to the CORPORATION upon the termination of the Contract, in accordance to article 102 of the Law of Mines. The project Las Cristinas 4, 5, 6 and 7 is located in the Municipality of Sifontes of the State of Bolivar of the Bolivarian Republic of Venezuela, which location is described in the map that is annexed identified as Annex "A", which signed by CRYSTALLEX and the CORPORATION, forms part of this Contract. In accordance to this map referred to in the previous provision, the CORPORATION authorizes CRYSTALLEX to exploit and extract gold in the area of Cristina 4, 5, 6 and 7, within the following limits defined by the closed polygonal and vertex expressed with coordinates U.T.M. (Universal Transversal Mercator):

The area denominated Cristina 4. Total surface of one thousand hectares (1000 Ha).

POINT	NORTH (m)	EAST (m)
BOT – 1	683,208.00	666,284.00
BOT – 2	685,208.00	666,284.00
BOT – 3	685,208.00	671,284.00
BOT – 4	683,208.00	671,284.00

The area denominated Cristina 5. Total surface of nine hundred thirty nine (939 Ha).

POINT	NORTH (m)	EAST (m)
BOT – 1	685,208.00	671,284.00
BOT – 2	685,208.00	668,340.00
BOT – 3	687,070.00	668,340.00
BOT – 4	687,070.00	673,340.00
BOT – 5	685,208.00	673,340.00

The area denominated Cristina 6. Total surface of nine hundred forty four hectares and two areas (944,2 Ha).

POINT	NORTH (m)	EAST (m)
BOT - 1	685,208.00	668,340.00
BOT - 2	685,208.00	663,340.00
BOT - 3	687,070.00	663,340.00
BOT - 4	587,070.00	668,340.00

The area denominated Cristina 4. Total surface of one thousand two hectares (1002 Ha).

POINT	NORTH (m)	EAST (m)
BOT - 1	687,070.00	663,340.00
BOT - 2	689,070.00	663,340.00
BOT - 3	689,070.00	668,340.00
BOT - 4	687,070.00	668,340.00

The works to be made by CRYSTALLEX for the design, construction and start of operation and exploitation of the mine object of the Project Las Cristinas 4, 5, 6 and 7" comprise the geological-mining planning and the supply of all the materials, work force, machinery, equipment, replacements, and other material resources or necessary elements for the development, exploitation, processing, commercialization and sale of the gold mineral in the deposits of the mine, in accordance to the terms of this Contract.

2.2 FEASIBILITY STUDY

2.2.1- CRYSTALLEX agrees to present the CORPORATION the economical-financial technical Feasibility Study, within a period no longer than one (1) year counted from the date of the signature of this agreement, for its analysis, consideration and

approval before the start-up of works. During this period CRYSTALLEX shall maintain a minimum of field activity that permits to generate employment in the surrounding communities to the area of the Project.

2- The Feasibility Study must respond to the objectives established in this Contract and to the benefit of both Parties. The approval of this Feasibility Study must exist through separate writ which shall form an indivisible part of this Contract as Annex B.

THIRD CLAUSE

INVESTMENT PROGRAM

CRYSTALLEX agrees to make the necessary investment for the reactivation and execution of the mining Project Las Cristinas 4, 5, 6 and 7, estimated in accordance to the Feasibility Study approved by the CORPORATION for which CRYSTALLEX shall present the CORPORATION, at the same opportunity and as part of the Feasibility Study referred to in the previous clause, a program and/or chronogram of disbursement and execution of the investments, as well as the sources of financement and its conditions.

This program and/or chronogram of investment shall be approved and subscribed by CRYSTALLEX and the CORPORATION, through separate document that shall form an integral part of this Contract as Annex C.

FOURTH CLAUSE

EXPLOITATION PLANS

1- CRYSTALLEX shall present the CORPORATION the Plans of Exploitation for the Life of the Project and the Yearly Exploitation Plans in detail. Both the Plans of Exploitation for the Life of the Project as well as the annual plans must be approved in writing by the CORPORATION for their implementation.

Said Programs of Investment and the Plans of Exploitation must contain the necessary technical information, as requested by the CORPORATION, which may require at any moment from CRYSTALLEX additional information or may propose modifications or adjustments that it may consider reasonably necessary.

2- CRYSTALLEX must specify in these Plans the volumes of excavation of the waste and the ore, the disposal of waste, handling of effluents, environmental protection, industrial security and any other aspect that the CORPORATION considers pertinent, which it will communicate to CRYSTALLEX with sufficient anticipation, depending on the technical characteristics of the required information.

FIFTH CLAUSE

PRODUCTION VOLUME

1- CRYSTALLEX agrees to start production of the mining project Las Cristinas 4, 5, 6 and 7" within the period of time defined in Clause Nine of the Contract CVG-MEM, entered May 16, 2002.

2- CRYSTALLEX agrees to extract annually from the mine object of the project Las Cristinas 4, 5, 6 and 7, an average daily volume of gold mineral present, in accordance to the Annual Production Plan approved between the Parties, which will become part of this Contract as Annex D.

3- CRYSTALLEX agrees to process the volume of gold mineral specified in the Annual Production Plan, at the plant that it shall install according to the Project, seeking to incorporate the highest quantity of added value.

4- CRYSTALLEX shall exploit and extract the waste material that it is not able to deposit in the mine and shall place it in a site to be prepared in accordance with environmental regulations.

SIXTH CLAUSE

ECONOMICAL COMPENSATION

1- CRYSTALLEX shall make to the CORPORATION the following obligatory payments for services rendered:

. Initial Payment: The amount of FIFTEEN MILLION DOLLARS OF THE UNITED STATES OF AMERICA (US$ 15,000,000.00), as eight per cent (8%) of the value of the investments made in the Project, such as: reports, digitalized information, camp, perforations, which payment shall be made by CRYSTALLEX within five (5) working banking days following the granting of the present Contract, subject to previous notification of instructions by the CORPORATION.

. Minimum monthly payment for royalty, calculated on the commercial value of the gross monthly production in percentage terms, to be paid upon termination of the construction phase:

Price US$/ Troy Ounce	%
Less than 280 $/ounce	1.00
More or equal to 280$/ounce and less than 350$/ounce	1.50
More or equal to 350$/ounce and less than 400$/ounce	2.00
More than 400$/ounce	3.00

These royalties are apart from the Exploitation Tax established in the Law of Mines, which will be paid by CRYSTALLEX to the Republic and are subject to revision in accordance to the laws that regulate such matter.

SEVENTH CLAUSE

SPECIAL ADVANTAGES

CRYSTALLEX agrees to fulfill the following Employment Plan and Program for the Social Development of the Region:

FOR THE YEAR 2002:

- Contracting of 50 employees and assumption of the costs of maintenance of the installations and the 24 persons currently working there.

- Continuance of the technical assistance to the five (5) Small Miners Associations organized and installed in the area for Small Mining of the Project.

- Assumption of the maintenance, supply and other expenses for the functioning of the Center of Medical Assistance of Las Claritas, which will serve both the personnel of the Project as well as the community, transforming it from Ambulatory Rural Type II to Ambulatory Urban Type I.

FOR THE YEAR 2003:

- Contracting of 50 additional employees throughout the twelve (12) months of the year.

- Construction of at least 30 homes in the local community of Santo Domingo.

- Training of personnel at the community in the handling of machinery and equipment necessary for mining operations.

- Development of Social programs for the benefit of the community:

    1. Installation and integration of drinking water treatment plants:
        . Km 88 – Santa Lucia de Inaguanay – Las Claritas – New Claritas - Santo Domingo.
        . Las Manacas – El Granzón – Araymantepui.

    2. Construction of sewage systems:
        . Las Claritas – Nuevas Claritas – Santo Domingo.

    3. Improvement and pavement of the roads existent between Km 85 to las Cristinas.

FOR THE YEARS SUBSEQUENT DURING THE FORCE OF THE PRESENT CONTRACT, CRYSTALLEX shall continue with: technical assistance of the small miners installed in the area for small mining of the project; cover the costs of maintenance , supply and other expenses for the functioning of the Medical Center of Las Claritas; maintenance of scholarship and internships of students, as well as training of personnel; execution of activities of maintenance of the road referred to in the above paragraph year 2003.

EIGHTH CLAUSE:

OBLIGATIONS OF CRYSTALLEX

1- CRYSTALLEX shall guarantee that the operations of the mine object of the Project "Las Cristinas 4, 5, 6 and 7" shall be carried out by competent personnel with experience in gold mining, to which effect it shall establish training programs for personnel. In accordance to article 27 of the Organic Labor Law of the Bolivarian Republic of Venezuela ninety per cent (90%) at least of both employees and workers during the execution of this Contract must be Venezuelans, save for the exceptions established in article 28 of said Organic Law. Furthermore, CRYSTALLEX shall contract as of the date of signature of this Contract the administrative and work personnel that currently labors at the installations in operation and maintenance of the Camp of the project Las Cristinas 4, 5, 6 and 7, in accordance to the payroll that the CORPORATION shall supply, as Annex E.

2- CRYSTALLEX shall use the most advanced technology with the purpose of reaching international standards and competitive prices. Moreover, it agrees that the extraction of the gold mineral be made according to the best techniques in mining to reach maximum recuperation of the resource, taking care of conserving the deposit and preserving the environment, in the execution of the exploitation works. CRYSTALLEX shall comply with the requirements established in the Annual Production Plans approved by the CORPORATION.

3- CRYSTALLEX is obliged to fulfill the obligations of production and grade of the mineral of gold in accordance to the Annual Production Plan, so it agrees to:

3.1- Adopt the precautions and measures necessary to prevent and avoid work accidents and shall take special interest in the fulfillment of the dispositions of the Ministry of Labor regarding hygiene and industrial security, and compliance with the applicable legal regulations.

3.2- Supply the equipment, consumable materials and related services such as drainage, dikes, electric control and distribution installations, compressed air, ventilation system, pump systems, drinking water processing installations, sewer installations, internal and external systems for communication and transport, dining rooms, and in general all the installations that it shall operate at the mine site.

3.3- CRYSTALLEX is the sole employer of the personnel assigned to the execution of the works object of this Contract, so it shall pay for all obligations derived from the labor contractual relationship and shall strictly comply with the provisions of the applicable laws.

CRYSTALLEX expressly accepts to relieve the CORPORATION of any responsibility as established in the Organic Labor Law. By virtue of this provision, CRYSTALLEX agrees to reimburse all expenses or payments that the CORPORATION may be obliged to make due to labor lawsuits against it based on its shared responsibility from the legal regulations above mentioned.

3.4- CRYSTALLEX shall supply the technical information to the CORPORATION for the processing of the environmental permits necessary for the operation of the mine "Cristina 4, 5, 6 and 7". For its part, CRYSTALLEX shall strictly comply with the applicable environmental regulations in the execution of the works object of this Contract.

3.5- CRYSTALLEX shall participate jointly with the CORPORATION in the obtaining of all the permits for the use of explosives and any other required by Venezuelan Law and regulations in this respect.

3.6- CRYSTALLEX with the backing of the CORPORATION shall obtain the municipal, state and national permits for its legal operation, if these should be required.

3.7- CRYSTALLEX agrees to contract according to its operative requirements Venezuelan service companies, preferably regional and local companies, and to purchase Venezuelan consumables and materials to be used in this project, in accordance to presidential Decree # 1892 of july 25, 2002, published in the Official Gazette of the Bolivarian Republic of Venezuela # 37.494 of July 30, 2002.

3.8 CRYSTALLEX agrees to give the CORPORATION, under inventory, at the end of the period of this Contract, all the installations and equipment existent to this date, and good functioning state, which must coincide with the inventory or list of equipments and installations notified by CRYSTALLEX to the CORPORATION in the opportunity of their acquisition or construction, according to the case, during the force of this Contract. To this purpose CRYSTALLEX agrees to give the CORPORATION the list of the equipments to be imported with their characteristics and specifications, including their commercial value.

3.9 CRYSTALLEX shall present during the first seven (7) days of each month a report of carried out activities (technical studies made including information from the field and production), as well as any other information required from it, in order to follow through the development of the project.

3.10 CRYSTALLEX agrees to desist of any pretension or judicial action it has against the CORPORATION, and the CORPORATION agrees to accept it.

NINTH CLAUSE

OBLIGATIONS OF THE CORPORATION

1- The CORPORATION agrees to give CRYSTALLEX the Studies made over the area of the Contract, so that it may do the Certification of the same and subsequently elaborate the Feasibility Study.

2- The CORPORATION may propose CRYSTALLEX specialized technical personnel that the CORPORATION may consider apt for the development of this project and CRYSTALLEX is in liberty to contract said required personnel, as it deems convenient.

3- The CORPORATION shall give CRYSTALLEX under inventory identified Annex F, at the beginning of the duration of this Contract, the installations currently existing at the mine object of the project "Las Cristinas 4, 5, 6 and 7" for the purposes of this Contract.

4- The CORPORATION shall obtain the environmental and mining permits required for the execution of this Project. In any event the periods contemplated in this Contract shall not start counting until the permits have been obtained.

5- All notices to the MEM object of this Contract shall be made by the CORPORATION.

TENTH CLAUSE

BONDS AND GUARANTIES

1- CRYSTALLEX shall present within sixty (60) days from the signature of the Contract, and each year, a bank bond of performance of the execution of the Contract, correspondent to 5% of the value of the production for the duration of construction, to be liberated with the act of initiation of commercial production by the CORPORATION. Moreover, the CRYSTALLEX shall maintain an insurance policy for equipment and installations in order to cover damages such as: theft, fire and inundations. Also, the Operator shall constitute a labor bond to guarantee the labor obligations of each year.

2- CRYSTALLEX shall present in favor of the Ministry of Environment and Renewable Resources, before both construction and exploitation, the environmental bonds that guaranty the reparation of environmental damages that could be caused

by construction and exploitation of the Project, in order to proceed in accordance to article 59 of the Law of Mines.

ELEVENTH CLAUSE

TECHNICAL SUPERVISION

1- The CORPORATION shall create a Technical Liaison Office formed by a team of professionals, to be in charge of the supervision of the works, under the responsibility of the Liaison Manager, of its free designation and removal. The CORPORATION shall present in writing to CRYSTALLEX, as a result of this supervision, the observations or recommendations it may deem convenient and CRYSTALLEX shall comply with them in the terms indicated, safe when CRYSTALLEX should have a different criteria over the matters at hand, which it will inform with motivation to the CORPORATION for the correspondent discussion and reach a satisfactory agreement for the Parties. Moreover, CRYSTALLEX shall pay the remuneration expenses of the referred personnel of the Technical Office and shall render it logistic assistance: it shall put at its disposal a physical space with the respective office furniture and computer equipment, supply its transport, lodging and food; and shall permit the personnel of the Technical Office free access to the area of the Project.

CLAUSE TWELVTH

SMALL MINERS

CRYSTALLEX agrees to render technical assistance, under the supervision of the CORPORATION, to organized groups of small miners identified as: Nuevas Claritas, Siete Estrellas, Los Rojas y La Bolivariana, installed in limited areas within the Project Cristinas, and any other that may be created and be approved by CRYSTALLEX, in order to guaranty good operative practices and lesser environmental impact.

CLAUSE THIRTEENTH

NOTICES

All notifications that must be made under this Contract shall be made in Spanish and shall be presented in person. The notifications must be sent to the following addresses:

CORPORACIÓN VENEZOLANA DE GUAYANA
Edificio CVG – Alta Vista
Puerto Ordaz, Estado Bolívar
Republica Bolivariana de Venezuela
Atention: Gral (Div.) Francisco Rangel Gómez
Presidente de la Corporación Venezolana de Guayana
Telephone: 0286 9661474 – 966 1475

CRYSTALLEX INTERNATIONAL CORPORATION:

Address: Torre Forum, piso 12, Avenida principal de Las Mercedes con Calle Guaicaipuro, Urbanización El Rosal, Municipio Chacao.
Atention: Ing Luis Felipe Cottin
President of Crystallex de Venezuela, C.A.
Telephone: 0212-952.6061
Fax: 0212-952.5011

Any of the Parties, through written notice, may designate another functionary to receive notices, as well as a new address for the correspondent notices. All notices shall be deemed to have been made upon reception by the addressee.

CLAUSE FOURTEENTH

BREACH OF CONTRACT

1 If during the execution of the works foreseen in this Contract, during a period of one year, CRYSTALLEX did not fulfill the daily production or grade average of the extracted mineral, contemplated in the Annual Production Plan, CRYSTALLEX shall compensate economically in a proportionate manner the CORPORATION for lost profits.

To quantify the effect of this breach of contract, the year will be counted from the first day of work foreseen in the Annual Production Plan, and for the daily average the production to be taken into account shall be that of the year divided into three hundred sixty five (365) days.

Are exempted from being considered as breach the suspensions of operation due to force majeure, in accordance to the provisions in clause Fifteenth of this Contract.

2. Shall be also considered as breach of contract the causes described in article 98 of decree 295 with rank and force of Law.

3. Same treatment shall be applied to any violations of the environmental conditions set by the Ministry of Environment and Renewable Resources (MARNR)

4. The causes defined as material breach in the First Clause of this Contract.

CLAUSE FIFTEENTH

FORCE MAJEURE

None of the Parties shall be responsible for any non-fulfillment of their obligations under this Contract, when said non-fulfillment is the result of force majeure, which

shall consist in any circumstance out of the control of any of the Parties that could not have been reasonably foreseen and overcome, and that may impede or slow excessively the fulfillment of the obligations established in this Contract. Said circumstances include, but are not limited to the acts of nature such as inundations, earthquakes, hurricane winds, and any other of such magnitudes, but also include new laws, decrees, regulations, municipal regulations, or administrative acts by the Government at its different levels or branches of the Public power emanated from any public authority legally competent in the correspondent matter, on condition that upon these acts the affected Party has exercised due care and diligence to reasonably control, avoid or prevent the act and its damaging consequences. Any of the Parties shall notify the other Party in writing, in the case that it may not be able to comply with any of its obligations due to force majeure, as soon as possible, describing the cause of said non-fulfillment and shall reinitiate the fulfillment, if that is the case, within a reasonable period of time after force majeure has disappeared. But in no case and for no reason the duration of the Contract may be extended further than the period hereinafter established.

CLAUSE SIXTEENTH

TERMINATION OF THE CONTRACT

1- The CORPORATION and CRYSTALLEX may mutually agree the termination of this Contract when the circumstances so require. Within a period of time to be agreed by the Parties for the resolution of the Contract, both agree to wholly fulfill the obligations under this Contract.

2- In the case of breach by any of the Parties, under clause Sixteenth of this Contract, the affected Party shall have the right to terminate this Contract immediately after ninety (90) days from the date in which the Party notifies the other in writing, of non-fulfillment of any obligations under this Contract, on condition that within such period of time said breach has not been corrected. If the Party that notifies of the breach considers that it can be corrected before the ninety (90) days mentioned, it must expressly indicate to the other Party in the notification the reasonable period in which the breach of contract must be corrected, with sufficient motivation on which such period is based. If the breach of contract is corrected in a period longer than that reasonably expressed by the aggravated Party, or longer than the period accepted by the latter upon proposal by the aggravating Party, on condition that it not exceed ninety (90) days, the Party that has violated the Contract shall pay the correspondent damages caused by the delay.

The stipulations in this clause shall apply in all cases of breach of contract, except on those cases in which the contract foresees a specific manner and opportunity for the termination of the contract, and the provisions in clause twenty fourth of this contract.

CLAUSE SEVENTEENTH

ENVIRONMENTAL REGULATIONS

1- Shall be the responsibility of CRYSTALLEX the fulfillment of the regulations in force regarding conservation, defense and improvement of the environment, specially those referred to the control of environmental impact of mining activities and the correction, recuperation and improvement of the intervened areas.

2- The mining activities that are developed in the areas shall be carried out in a rational and scientific manner in accordance to the principle of sustained development, the conservation of the environment and the ordering of the territory, in accordance to articles 5 and 15 of the Law of Mines.

3.- CRYSTALLEX shall have the right to use and take advantage of the waters of the public domain on condition that it do so subject to the environmental dispositions in this matter. Moreover, should it be necessary it may use the waters of private domain be it through rights of use or expropriation, on condition that it fulfills the requisites of the applicable legislation.

4.- CRYSTALLEX shall present the program of Environmental Management and the CORPORATION shall review it, validate it, and shall be in charge of the activities before the Ministry of Environment and Renewable Resources.

CLAUSE EIGHTEENTH

DURATION OF THE CONTRACT

1.- This Contract shall have a duration from its date of signature for a period of twenty (20) years, extendable for one (1) or two (2) periods of ten (10) years, previous agreement of the Parties, said extensions shall be notified in anticipation of the force of the Contract.

2. CRYSTALLEX agrees that, one (1) year before the culmination of this Contract, it shall reach an agreement with the CORPORATION in order to define and establish a transfer plan of the assets of the mine "Las Cristinas 4, 5, 6 and 7" and its operations to the CORPORATION.

CLAUSE NINETEENTH

SOLUTION OF CONFLICTS

The doubts and controversies of any nature that could arise from the execution of this Contract and that may not be resolved in an amicable manner by the Parties, shall be decided by the competent tribunals of the Bolivarian Republic of Venezuela, in accordance to its laws, and they may not give origin to reclamations before foreign tribunals.

CLAUSE TWENTIETH

ASSIGNMENT OF THE CONTRACT

Crystallex may not assign, directly or indirectly, partially or totally its rights and/or delegate its obligations by virtue of this Contract to another natural or juridical person. Any Assignment and/or delegation made in violation of this clause shall be null and without legal effects, save for the legal sanctions that may apply.

CLAUSE TWENTY FIRST

DECLARATIONS

1. The Parties, conscious of the impossibility of foreseeing all of the contingencies that may arise during the execution of this Contract, agree that their intention is to agree among themselves according to equity and without prejudice to their correspondent interests. If during the course of the execution of this agreement an inequality prejudice or injustice arises against any of the Parties, both by mutual agreement shall carry out the efforts to take the necessary actions, with the purpose of eliminating or correcting such inequality or prejudice.

2. The Ministry of Energy and mines has granted the CORPORATION through contract entered on May 16, 2002, in accordance to the provisions of decree 1757 of the President of the Republic of April 29, 2002 published in the Official Gazette of the Bolivarian Republic of Venezuela # 37.437 of May 7, 2002, the areas Cristina 4, 5, 6 and 7 located in the Municipality of Sifontes in the State of Bolivar for the exploration, extraction and sale of the mineral of gold that is deposited in these areas. Furthermore, it has been authorized for the use of the assets affected in said areas that were reverted to the Republic in accordance to Resolution 035 of March 6, 2002, published in the Official Gazette of the Bolivarian Republic of Venezuela # 37.400, of March 8, 2002, so no property rights are hereby transferred to CRYSTALLEX for the effects of this Contract and its Annexes.

3 The present Contract complements itself and sustains itself materially and juridically, apart from the provisions in this document with the Annexes mentioned in the text of this Contract, which form an integral and indivisible part of this Contract.

4- Shall be understood for the effects of this Contract that from the technical, geological and legal knowledge that CRYSTALLEX has of the project Las Cristinas, it is disposed “at its own risk and account” to invest its human, technical and financial resources for the exploitation of the deposit, without having the right to claim in the present or the future for the results that it obtains from these activities, since as a professional specialized in mining it has taken the previsions, made the pertinent studies and was able to foresee the existent situations related to geology, production, historical numbers of production, mineralogy conformation, potentials and estimates of the results obtained and to be obtained. In accordance to Article 34 of the Law of Mines, it is presumed, until proof to the contrary, the existence of the mineral and that it is industrial and economically exploitable; with

the granting of this Contract the CORPORATION is not responsible for the truth of such facts. To such effects, the CORPORATION and CRYSTALLEX shall verify the technical information existent that shall be presented by the CORPORATION, within a period of ninety (90) days counted from the date of signature of the present Contract, to be certified in writing.

CLAUSE TWENTY SECOND

COMPLEMENTARY PROVISIONS

1. The Parties shall elaborate and subscribe, within a period of thirty (30) working days, counted from the date of signature of this Contract, a detailed inventory of the installations, assets, and equipment property of the Republic, existing in the area of Cristinas 4,5, 6 and 7 for the date of subscription of said inventory, in accordance to the provisions of numeral 3 of clause nine of this Contract, which will form an integral part of this Contract.

2. The CORPORATION agrees, in the case that the MEM it the authorization for the exploration, exploitation, commercialization and sale of the mineral of copper existent in the area Las Cristinas 4,5,6 and 7, to celebrate with CRYSTALLEX the correspondent addendum and complementary to the present Contract, in order to establish the conditions in which said activities shall be carried out by CRYSTALLEX.

3. The present Contract may be modified by the Parties by mutual agreement, through addendum entered to such effect, without changing the spirit, purpose and reason that moved them to enter it.

CLAUSE TWENTY THIRD

APPLICABLE LAW

The Parties agree expressly that the present Contract and its annexes are subject to the Laws of the Bolivarian Republic of Venezuela.

CLAUSE TWENTY FOURTH

RESCITION OF THE CONTRACT

This Contract may unilaterally rescinded by the CORPORATION without indemnity for CRYSTALLEX, in the case of delay in the beginning, suspension of any of its activities or contractual breach for a period of one (1) year without justified motive.

CLAUSE TWENTY FIFTH

DOMICILE

Without prejudice to the competence of the Administrative-Political Chamber of the Supreme Tribunal of Justice, for the review of the controversies related to administrative contracts, the Parties choose as special domicile the city of Ciudad Guayana, Municipality Caroni, State of Bolivar, to which tribunals they agree to submit.

Three (3) originals of the same content and single effect are made in the city of Ciudad Guayana on the seventeenth (17) day of September of the year 2002.

_(illegible signature)_____
BY THE CORPORATION

___(illegible signature)_____
BY CRYSTALLEX"

BOLIVARIAN REPUBLIC OF VENEZUELA. DR. PEDRO E. ALFARO. NOTARY OF THE FOURTH NOTARY PUBLIC OF PUERTO ORDAZ, AUTONOMOUS MUNICIPALITY OF CARONI, BOLIVAR STATE. Puerto Ordaz, Seventeen (17) of September of two thousand two. 192° and 143°. The afore document drafted by

attorney FIRELY C. NAVARRO, Bar number 11121, was presented for its authentication and devolution according to application number 38890 of September 17, 2002. Its signatories, present before me, said their names were: FRANCISCO JOSÉ RANGEL GÓMEZ and MARC J. OPPENHEIMER, of legal age, domiciled in: PUERTO ORDAZ, BOLIVAR STATE, of nationality: VENEZUELAN AND OF UNITED STATES, of civil status married, bearer of Identity Card number 2.520.281 and PASSPORT N° 152092004. Having read the original and confronted it with its copies, having signed all of them before the Notary, the signatories declared: "ITS CONTENTS ARE TRUE AND THE SIGNATURES AT THE BOTTOM OF THE INSTRUMENTS ARE OURS". The Notary so declared it authenticated in the presence of the following witness: YANNINA GUILLÉN AND GABRIELA RODRÍGUEZ, bearers of identity cards number 11.995595 and 11.636.896. It was inserted under number 16 tome 86 of the Book of Authentications of the Notary. The Public Notary that signs certifies that in the present act article 78 number 2 of the Law of Public Registries and Notaries was fulfilled. It is also certified that: 1) Decree # 430 of the CORPORACIÓN VENEZOLANA DE GUAYANA, of 12-29-1960, published in official Gazette of the Republic of Venezuela # 26445 of 12-30-1960, its last reform through Decree with rank of Law # 1531 of 11-12-2001, Published in the Official Gazette of the Bolivarian Republic of Venezuela # 5553, of 11-12-2001, which enjoys of the prerogatives and privileges that the National Treasury confers in the Preliminary Chapter of the Organic Law of the Public National Treasury and is exempt of the payment of all taxes, tariffs and contributions in accordance to its articles 24 and 25 of the Decree, represented hereat by its President Francisco Rangel Gómez, designated by the President of the Republic through Decree # 1034, published in Official Gazette of the Bolivarian Republic of Venezuela # 37054, of 10-10-2000, sufficiently authorized for this act in accordance to articles 36 and 37 of the above referred Decree. 2) resolution 8700 and Resolution DIR-#8705 of 02-09-2002 and 09-16-2002, respectively. 3) Resolution of the Board of Directors of CRYSTALLEX INTERNATIONAL CORPORATION of 09-16-2002. 4) The Notary moved and constituted itself at the principal office of the CVG, Alta Vista, Puerto Ordaz, today at 11:00am,through request of the interested parties.

THE NOTARY PUBLIC	**THE SIGNATORIES**
(illegible signature)	**(illegible signature)**
Seal (Fourth Notary Public of Puerto Ordaz)	**Francisco Rangel Gómez**
The witnesses	**(illegible signature)**
(illegible signatures)	**Marc J Oppenheimer"**

The foregoing is a true and accurate translation of the attached original, made at the request of the interested party, IN WITNESS WHEREOF I hereunto set my hand and affix my official seal, in Caracas, on this twenty sixth (26) day of September, two thousand two (2002).

Appendix B

Estimation Parameters

Material/Zone	Directions Rotations	Search (Meters)	No. Smpls Min;Max;Max/hole	C_0	C_1	R_1	C_2	R_2	C_3	R_3	Restrictions (g Au/t;m)	Comps Used (zone or code)	Blocks Estimated	Weighting	Elev.	File Name
CONDUCTORA																
Gold																
Low-Grade: Pass 1	15°/0°/35°	200;200;50	2;12;2	0.41	0.42	5;15;15	0.16	216;112;112	NA	NA	NA	Zone-21;31;41	1;4;5;7	length	real	Cga
Low-Grade: Pass 2	15°/0°/35°	100;100;40	2;10;2	0.41	0.42	5;15;15	0.16	216;112;112	NA	NA	NA	Zone-21;31;41	1;4;5;7	length	real	Cgb
High-Grade: Pass 1	15°/0°/35°	100;100;50	2;10;2	0.48	0.41	37;16;11	0.11	119;119;56	NA	NA	NA	Zone-22;32;42	2;4;6;7	length	real	Cgc
High-Grade: Pass 2	15°/0°/35°	50;50;20	2;10;2	0.48	0.41	37;16;11	0.11	119;119;56	NA	NA	NA	Zone-22;32;42	2;4;6;7	length	real	Cgd
Outside Zones	15°/0°/35°	100;100;35	2;12;3	0.53	0.19	21;59;5	0.28	51;169;169	NA	NA	1;8	Zone-99	all	length	real	Cg9
Overburden	0°/0°/0°	100;100;50	1;10;1	0.31	0.69	350;350;350	NA	NA	NA	NA	NA	Type-8	3;5;6;7	length	real	Cg8
Silver																
Overburden	0°/0°/0°	100;100;50	1;12;2	0.13	0.87	46;46;46	NA	NA	NA	NA	NA	Type-8	8	length	real	Cs8
All-but-Overburden	15°/0°/35°	200;200;50	2;12;3	0.21	0.30	5;5;16	0.14	7;7;80	NA	NA	3;20	Type: 1-6	All	length	real	Csa
Copper																
Overburden	15°;0°;0°	100;100;50	1;10;1	0.15	0.85	183;183;183	NA	NA	NA	NA	NA	Type 8	Type 8	length	real	Cc8
Oxide Saprolite	15°;0°;0°	100;100;5	1;10;2	0.40	0.25	56;56;20	0.353	294;486;50	NA	NA	NA	Type 6	Type 6	length	relative*	Cc6
Sulfide/Mixed Saprolite	15°;0°;0°	100;100;50	1;10;2	0.33	0.37	89;25;46	0.295	359;150;79	NA	NA	NA	Types 4,5	Type 4,5	length	relative*	Cc4
Bedrock/Saprock	15°/0°/35°	200;200;50	2;12;3	0.20	0.26	34;32;8	0.21	67;81;21	0.30	335;312;141	NA	Type 1-3	Type 1-3	length	real	Cc1
CN-Soluble Cu Ratio																
Overburden: Pass 1	15°;0°;0°	350;350;50	1;10;2	0.30	0.26	97;97;20	0.44	515;515;50	NA	NA	NA	Type 8	Type 8	length	real	Cr8
Overburden: Pass 2	15°;0°;0°	50;50;25	1;8;2	0.30	0.26	97;97;20	0.44	515;515;50	NA	NA	NA	Type 8	Type 8	length	real	Cra
Overburden: Pass 3	15°;0°;0°	20;20;15	1;8;2	0.30	0.26	97;97;20	0.44	515;515;50	NA	NA	NA	Type 8	Type 8	length	real	Cre
Oxide Saprolite	15°/0°/0°	350;350;50	1;10;2	0.56	0.25	98;98;20	0.19	247;174;50	NA	NA	NA	Type 6	Type 6	length	relative*	Cr6
Oxide Saprolite	15°/0°/0°	50;50;25	1;8;2	0.56	0.25	98;98;20	0.19	247;174;50	NA	NA	NA	Type 6	Type 6	length	relative*	Crb
Oxide Saprolite	15°/0°/0°	20;20;15	1;8;2	0.56	0.25	98;98;20	0.19	247;174;50	NA	NA	NA	Type 6	Type 6	length	relative*	Crf
Sulfide/Mixed Saprolite	15°/0°/0°	350;350;50	1;10;2	0.09	0.50	25;25;20	0.41	329;223;40	NA	NA	NA	Type 4, 5	Type 4, 5	length	relative*	Cr4
Sulfide/Mixed Saprolite	15°/0°/0°	50;50;20	1;8;2	0.09	0.50	25;25;20	0.41	329;223;40	NA	NA	NA	Type 4, 5	Type 4, 5	length	relative*	Crc
Sulfide/Mixed Saprolite	15°/0°/0°	20;20;15	1;8;2	0.09	0.50	25;25;20	0.41	329;223;40	NA	NA	NA	Type 4, 5	Type 4, 5	length	relative*	Crg
Bedrock/Saprock	15°/0°/0°	300;300;70	1;12;2	0.25	0.55	63;63;20	0.20	303;256;63	NA	NA	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Crd
Bedrock/Saprock	15°/0°/0°	50;50;20	1;8;2	0.25	0.55	63;63;20	0.20	303;256;63	NA	NA	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Crh
Bedrock/Saprock	15°/0°/0°	20;20;15	1;8;2	0.25	0.55	63;63;20	0.20	303;256;63	NA	NA	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Crh

NOTES

Core Recovery This is estimated at the same time as the gold and with the same parameters so that all gold grades have an estimated recovery from the same samples as used in the estimate and the same weighting

relative* is with respect to the top of the mixed/sulfide and oxide saprolite contact

MESONES/SOFIA

Material/Zone	Directions Rotations	Search (Meters)	No. Smpls Min;Max;Max/hole	C_0	C_1	R_1	C_2	R_2	C_3	R_3	Restrictions (g Au/t;m)	Comps Used (zone or code)	Blocks Estimated	Weighting	Elev.	File Name
Gold																
Low-Grade	315°/0°/65°	100;100;100	2;10;2	0.56	0.26	26;7;17	0.18	67;83;62	NA	NA	NA	Zone 31	1;4;5;7	length	real	Cga
High-Grade	315°/0°/65°	100;100;100	2;10;2	0.43	0.48	25;25;21	0.09	47;119;119	NA	NA	9;80	Zone 32	2;4;6;7	length	real	Cgb
Outside Zones	315°/0°/65°	100;100;35	2;10;2	0.30	0.34	35;35;35	0.36	384;384;384	NA	NA	0.2;30	Zone-99	all	length	real	Mg9
Overburden	315°/0°/0°	100;100;25	1;6;2	0.31	0.02	80;80;40	0.60	490;490;123	NA	NA	2;20	Type-8	3;5;6;7	length	real	Mg8
Silver																
Overburden	315°/0°/0°	100;100;20	1;10;2	0.51	0.49	28;28;28	NA	NA	NA	NA	NA	Type 8	Type 8	length	real	Ms8
All-but-Overburden	315°/0°/65°	100;100;100	2;10;2	0.24	0.31	5;20;20	0.26	33;60;54	0.19	131;134;184	4;20	Types 1-6	All	length	real	Msa
Copper																
Overburden	315°;0°;0°	80;80;20	1;10;2	0.03	0.97	28;28;10	NA	NA	NA	NA	NA	Type 8	Type 8	length	real	Mc8
Oxide Saprolite	315°;0°;0°	80;80;40	1;10;2	0.15	0.25	23;23;11	0.60	114;114;57	NA	NA	NA	Type 6	Type 6	length	relative*	Mc6
Oxide Saprolite	315°;0°;0°	14;14;12	1;10;2	0.15	0.25	23;23;11	0.60	114;114;57	NA	NA	NA	Type 6	Type 6	length	relative*	Mc6
Sulfide/Mixed Saprolite	315°/0°/0°	80;80;40	1;10;2	0.03	0.97	100;100;50	NA	NA	NA	NA	5,000;40	Types 4,5	Type 4,5	length	relative*	Mc4,v
Low-grade	315°/0°/65°	80;80;60	1;10;2	0.33	0.43	8;6;6	0.24	63;96;19	NA	NA	NA	Codes 61	Types 1-3	length	real	Mcm,n,o
High-grade	315°/0°/65°	80;80;60	2;10;2	0.72	0.28	110;110;110	NA	NA	NA	NA	NA	Codes 62	Types 1-3	length	real	Mcp,q,r
Outside zones in bdrk	315°/0°/65°	100;100;60	2;10;2	0.49	0.25	15;15;15	0.26	140;114;114	NA	NA	7,000;50	Code 99	Types 1-3	length	real	Mcs,t,u
CN-Soluble Cu Ratio																
Overburden: Pass 1	315°;0°;0°	100;100;40	1;10;2	0.02	0.98	16;16;8	NA	NA	NA	NA	NA	Type 8	Type 8	length	real	Mr8
Overburden: Pass 2	315°;0°;0°	15;15;10	1;10;2	0.02	0.98	16;16;8	NA	NA	NA	NA	NA	Type 8	Type 8	length	real	Mra
Oxide Saprolite	315°/0°/0°	100;100;50	1;10;2	0.24	0.56	21;21;10	0.20	83;83;41	NA	NA	NA	Type 6	Type 6	length	relative*	Mr6
Oxide Saprolite	315°/0°/0°	25;25;13	1;10;2	0.24	0.56	21;21;10	0.20	83;83;41	NA	NA	NA	Type 6	Type 6	length	relative*	Mrc
Sulfide/Mixed Saprolite	315°/0°/0°	200;200;50	1;10;2	0.24	0.37	48;48;24	0.39	232;232;116	NA	NA	NA	Type 4, 5	Type 4, 5	length	relative*	Mr4
Sulfide/Mixed Saprolite	315°/0°/0°	50;50;12	1;10;2	0.24	0.37	48;48;24	0.39	232;232;116	NA	NA	NA	Type 4, 5	Type 4, 5	length	relative*	Mrc
Bedrock/Saprock	315°/0°/0°	200;200;100	1;12;2	0.17	0.26	16;16;8	0.57	207;207;54	NA	NA	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Mr1
Bedrock/Saprock	315°/0°/0°	50;50;25	1;12;2	0.17	0.26	16;16;8	0.57	207;207;54	NA	NA	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Mrd

NOTES

Core Recovery This is estimated at the same time as the gold and with the same parameters so that all gold grades have an estimated recovery from the same samples as used in the estimate and the same weighting

relative* is with respect to the top of the mixed/sulfide and oxide saprolite contact

MOROCCOY

Material/Zone	Directions Rotations	Search (Meters)	No. Smpls Min;Max;Max/hole	C_0	C_1	R_1	C_2	R_2	C_3	R_3	Restrictions (g Au/t;m)	Comps Used (zone or code)	Blocks Estimated	Weighting	Elev.	File Name
Gold																
Low-Grade	315°/0°/60°	100;100;80	2;10;2	0.20	0.64	9;6;9	0.16	43;47;43	NA	NA	NA	Zone 31	1;4;5;7	length	real	Yga
High-Grade	315°/0°/60°	100;100;80	2;10;2	0.20	0.64	9;6;9	0.16	43;47;43	NA	NA	NA	Zone 32	2;4;6;7	length	real	Ygb
Outside Zones	315°/0°/60°	100;100;35	2;10;3	0.38	0.21	40;48;39	0.41	87;87;64	NA	NA	1;20	Zone-99	all	length	real	Yg9
Overburden	315°/0°/0°	100;100;25	1;12;2	---------- NA - Inverse Distance Cubed ----------							2;20	Type-8	3;5;6;7	length	real	Hg8
Silver																
						Silver not estimated due to unverified and suspicous results										
Copper																
Overburden	315°;0°;0°	100;100;50	1;12;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 8	Type 8	length	real	Hc8
Oxide Saprolite	315°/0°/0°	150;150;50	1;10;2	0.33	0.67	60;60;20	NA	NA	NA	NA	NA	Type 6	Type 6	length	relative*	Yc6
Sulfide/Mixed Saprolite	315°/0°/0°	150;150;50	1;10;2	0.32	0.68	100;100;50	NA	NA	NA	NA	NA	Types 4,5	Type 4,5	length	relative*	Yc4
Bedrock	315°/0°/60°	200;200;50	2;12;3	0.39	0.43	55;42;24	0.18	166;188;115	NA	NA	NA	Code 99	Types 1-3	length	real	Yc1
CN-Soluble Cu Ratio																
Overburden: Pass 1	315°;0°;0°	200;200;50	1;10;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 8	Type 8	length	real	Hr8
Overburden: Pass 1	315°;0°;0°	50;50;25	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 8	Type 8	length	real	Hra
Overburden: Pass 1	315°;0°;0°	20;20;15	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 8	Type 8	length	real	Hre
Oxide Saprolite	315°/0°/0°	300;300;50	1;10;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 6	Type 6	length	relative*	Hr6
Oxide Saprolite	315°/0°/0°	50;50;25	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 6	Type 6	length	relative*	Hrb
Oxide Saprolite	315°/0°/0°	20;20;13	1;10;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 6	Type 6	length	relative*	Hrf
Sulfide/Mixed Saprolite	315°/0°/0°	300;300;50	1;10;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 4, 5	Type 4, 5	length	relative*	Hr4
Sulfide/Mixed Saprolite	315°/0°/0°	50;50;20	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 4, 5	Type 4, 5	length	relative*	Hrc
Sulfide/Mixed Saprolite	315°/0°/0°	20;20;13	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 4, 5	Type 4, 5	length	relative*	Hrg
Bedrock/Saprock	315°/0°/0°	300;300;70	1;12;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Hr1
Bedrock/Saprock	315°/0°/0°	50;50;20	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Hrd
Bedrock/Saprock	315°/0°/0°	20;20;15	1;8;2	---------- NA - Inverse Distance Cubed ----------							NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Hrh

NOTES

Core Recovery This is estimated at the same time as the gold and with the same parameters so that all gold grades have an estimated recovery from the same samples as used in the estimate and the same weighting

relative* is with respect to the top of the mixed/sulfide and oxide saprolite contact

CORDOVA

Material/Zone	Directions Rotations	Search (Meters)	No. Smpls Min;Max;Max/hole	C_0	C_1	R_1	C_2	R_2	C_3	R_3	Restrictions (g Au/t;m)	Comps Used (zone or code)	Blocks Estimated	Weighting	Elev.	File Name
Gold																
Low-Grade	315°/0°/65°	150;150;50	2;12;4	----------		NA - Inverse Distance Cubed				----------	NA	Zone 31	1;4;5;7	length	real	Hga
Low-Grade	315°/0°/65°	15;15;12	2;12;4	----------		NA - Inverse Distance Cubed				----------	NA	Zone 31	1;4;5;7	length	real	Hgc
High-Grade	315°/0°/65°	100;100;50	1;12;2	----------		NA - Inverse Distance Cubed				----------	NA	Zone 32	2;4;6;7	length	real	Hgb
High-Grade	315°/0°/65°	15;15;12	1;12;2	----------		NA - Inverse Distance Cubed				----------	NA	Zone 32	2;4;6;7	length	real	Hgd
Outside Zones	315°/0°/65°	100;100;50	2;10;2	----------		NA - Inverse Distance Cubed				----------	1;20	Zone-99	all	length	real	Hg9
Overburden	315°/0°/0°	100;100;25	1;12;2	----------		NA - Inverse Distance Cubed				----------	2;20	Type-8	3;5;6;7	length	real	Hg8
Silver																
						Silver not estimated due to unverified and suspicous results										
Copper																
Overburden	315°;0°;0°	100;100;50	1;12;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 8	Type 8	length	real	Hc8
Oxide Saprolite	315°;0°;0°	150;150;50	1;10;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 6	Type 6	length	relative*	Hc6
Sulfide/Mixed Saprolite	315°/0°/0°	150;150;50	1;10;2	----------		NA - Inverse Distance Cubed				----------	NA	Types 4,5	Type 4,5	length	relative*	Hc4
Bedrock	315°/0°/65°	200;200;50	1;12;2	----------		NA - Inverse Distance Cubed				----------	3800;150	Types 1,2,3	Types 1-3	length	real	Hc1
CN-Soluble Cu Ratio																
Overburden: Pass 1	315°;0°;0°	200;200;50	1;10;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 8	Type 8	length	real	Hr8
Overburden: Pass 1	315°;0°;0°	50;50;25	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 8	Type 8	length	real	Hra
Overburden: Pass 1	315°;0°;0°	20;20;15	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 8	Type 8	length	real	Hre
Oxide Saprolite	315°/0°/0°	300;300;50	1;10;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 6	Type 6	length	relative*	Hr6
Oxide Saprolite	315°/0°/0°	50;50;25	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 6	Type 6	length	relative*	Hrb
Oxide Saprolite	315°/0°/0°	20;20;13	1;10;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 6	Type 6	length	relative*	Hrf
Sulfide/Mixed Saprolite	315°/0°/0°	300;300;50	1;10;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 4, 5	Type 4, 5	length	relative*	Hr4
Sulfide/Mixed Saprolite	315°/0°/0°	50;50;20	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 4, 5	Type 4, 5	length	relative*	Hrc
Sulfide/Mixed Saprolite	315°/0°/0°	20;20;13	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 4, 5	Type 4, 5	length	relative*	Hrg
Bedrock/Saprock	315°/0°/0°	300;300;70	1;12;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Hr1
Bedrock/Saprock	315°/0°/0°	50;50;20	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Hrd
Bedrock/Saprock	315°/0°/0°	20;20;15	1;8;2	----------		NA - Inverse Distance Cubed				----------	NA	Type 1, 2, 3	Type 1, 2, 3	length	real	Hrh

NOTES

Core Recovery This is estimated at the same time as the gold and with the same parameters so that all gold grades have an estimated recovery from the same samples as used in the estimate and the same weighting

relative* is with respect to the top of the mixed/sulfide and oxide saprolite contact

Appendix C

Preliminary Open Pit Slope Stability Analysis – Updated

SNC·LAVALIN
Engineers & Constructors

MEMORANDUM

LAS CRISTINAS PROJECT

TO:	Dave Evans	Date:	October 5, 2007
C.C.:	Bing Wang, Karlis Jansons, Henri Sangam		
FROM:	Ljiljana Josic	Ref.:	**334408-40-4GCA-0023**
Subject:	Preliminary Open Pit Slope Stability Analysis – Updated		

1.0 General

Las Cristinas property is located in the southeast corner of Venezuela in the Municipality of Sifontes, State of Bolivar, approximately 970 km southeast of Caracas. Las Cristinas project consists of a planned large open pit known as Conductora Pit and a smaller pit Mesones Pit located further to north. This memo presents a summary of a preliminary slope stability analysis for the proposed 2007 pit slope design for Conductora Pit, based on the recent updated ore resource estimates.

2.0 Conductora Open Pit Geometry

The ground surface in this area is disturbed with elevations varying in the range from 125 masl to 142 masl with numerous man-made pits and higher ground. The open pit is to be developed from the current elevation of about 135 masl and 132 masl at West Wall and East Wall, respectively to elevation of 360 mbsl. The pit geometry shown on Figure 1 was designed by Mine Development Associates (MDA), Mine Engineering Service.

3.0 Geological Assessment in Pit Area and Pit Slope Design

The structural geological assessment in the pit area was conducted based on the structural map proposed by Klipfel, 1994 and the 8 structural domains developed by Bruce Geotechnical Consultants Inc. (BGC), 1996. The structural geology of domains designated as North Wall, East Wall, South Wall, and West Wall and related design issues are discussed in details in "Field Investigation Report, Open Pit Slope and Waste Dump Stability Study" prepared by SNC-Lavalin, 2004. Based on the geological assessment, the West Wall and East Wall are considered most critical and thus, the sections of West Wall and East Wall were updated as per current design analyzed and discussed in this memo.

Summary of Conductora Pit slope design as proposed by MDA is given in Table 1. Definitions of face and overall angles are given in Sketch 1.

Table 1: Summary of Conductora Pit Slope Design

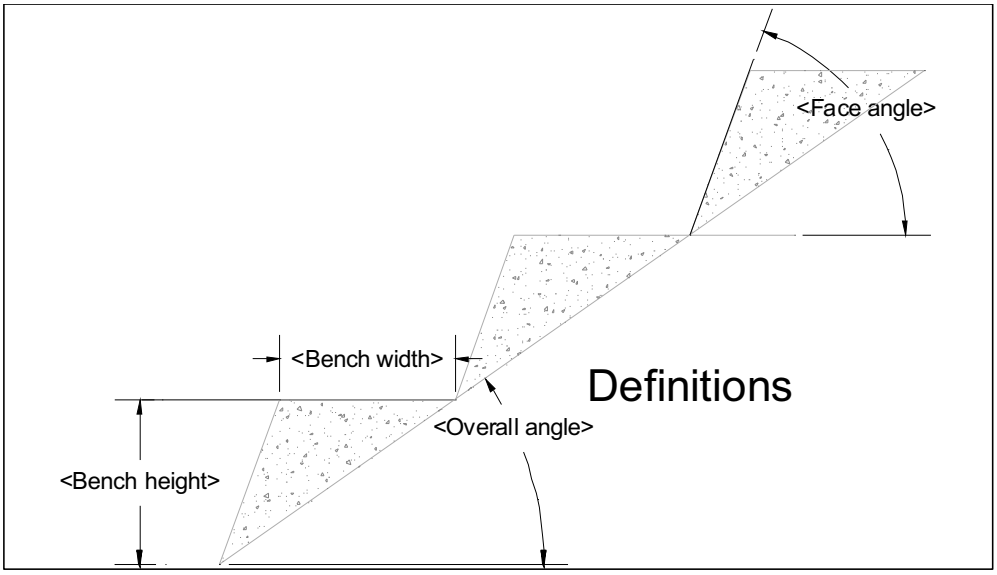
	Unit	Feasibility Study Level Pit Slope Design				2004 Pit Slope Design				2007 Pit Slope Design [d]			
		SAPO	SAPR	CLB	CSB	SAPO	SAPR	CLB	CSB	SAPO	SAPR	CLB	CSB
West Wall													
Face angle	degrees	70	[b]	70	70	70	70 [c]	70	70	45	[b]	70	70
Bench width [a]	metres	13	[b]	8	4	15	15 [c]	8	4	8	[b]	8	4-31
Overall angle	degrees	35	[b]	45	55	31	31 [c]	45	55	30	[b]	44	55
Bench height	metres	12	12	12	12	12	12	12	12	12	[b]	12	12
East Wall													
Face angle	degrees	70	70	70	70	45	45	70	70	44	[b]	43	63-70
Bench width [a]	metres	13	13	8-13	5-10	8	8	8-13	5-10	8	[b]	9	4-18-46
Overall angle	degrees	35	35	35-45	40-50	31	31	35-45	40-50	30	[b]	29	33-41
Bench height	metres	12	12	12	12	12	12	12	12	12	[b]	12	12

Note:

SAPO - Saprolite
SAPR - Saprock

(a) Bench width can be adjusted to fit the face and the overall angles
(b) Saprock is either absent or relatively thin (less than the height of one bench) on the section analyzed
(c) Assumed same as saprolite
(d) Design prepared by Mine Development Associates (MDA), Mine Engineering Services

Sketch 1: Definitions of Slope Geometry



4.0 Analysis Basis and Model Setup

The pit slope sections selected for the analyses are presented on Figures 2 and 3. The various analysed cases are summarized in Table 2.

Table 2: Summary of Pit Slope Analysis Cases

Section	Case No.	Description
A	1	West Wall, overall slope analysis, static condition
		West Wall, overall slope analysis, pseudo-static condition
	2	West Wall, saprolite layer overall stability analysis static condition
		West Wall, saprolite layer overall stability analysis pseudo-static condition
B	1	East Wall, overall slope analysis, static condition
		East Wall, overall slope analysis, pseudo-static condition
	2	West Wall, saprolite layer overall stability analysis static condition
		West Wall, saprolite layer overall stability analysis pseudo-static condition

The phreatic surface has been assumed based on a conservative approach. The CLB and CSB layers are assumed saturated, while the saprolite layer is drained (minimum 40 mbgs – 50 mbgs at West Wall and 20 mbgs at East Wall).

Slope stability analyses were performed using a two dimensional limit equilibrium computer program, “SLIDE”, Version 5, developed by RocScience Inc. of Toronto, Ontario, Canada, using the Bishop simplified method.

The factor of safety for the slopes was calculated for both static and pseudo-static loading conditions. Pseudo-static analysis was employed to check the factor of safety of the slopes for seismic loads imposed on a steady state static loading model. The pseudo-static analyses were carried out using a horizontal ground acceleration (a/g) of 0.1 for an earthquake with a return period of 1 in 475 years. The peak horizontal acceleration is instantaneous, and thus an effective value of 70% of the peak acceleration, i.e., 0.07 g, was applied for the seismic analysis.

The required minimum factor of safety (FS) with respect to the stability requirements of the pit slope are summarized in Table 3.

Table 3: Required Minimum Factor of Safety

Loading Conditions	Required Minimum Factor of Safety	Selected Effective Seismic Acceleration
Static	1.2 - 1.3	None
Pseudo-Static (Seismic)	1.0	0.07g

5.0 Material Parameters

The pit wall stratigraphy consists mainly of 4 layers, i.e. saprolite (SAPO), saprock (SAPR), carbonate leachate bedrock (CLB) and carbonate stable bedrock (CSB) layers.

- **Saprolite (SAPO)**

  The most important relic structure in the saprolitic rocks in terms of stability would be the foliation having a trend NNE and dipping W at 40 to 45^{o} which will have a direct implication on East Wall. Its impact may be more on the single bench since the overall slope excavation angle of this wall is more gentle than the dip of the foliation. The parameters of the saprolite foundation material were obtained based on laboratory triaxial strength tests on undisturbed samples from the open pit area from both the SNC-Lavalin 2004 investigation and previous investigation and discussed in details in SNC-Lavalin 2004 report.

- **Saprock (SAPR)**

  The saprock is a gradational contact between the saprolite and the carbonate leached bedrock. It may include coarser material than saprolite which increases the friction angle but reduces the cohesion. However, as no shear strength parameters are

available for the saprock material, the same shear strength parameters of saprolite were used for saprock in the pit slope evaluation.

- **Carbonate Leachate Bedrock (CLB) and Carbonate Stable Bedrock (CSB)**

  The impact of joint systems and foliation in the bedrock have not been evaluated at this stage. In addition no shear strength parameters were measured on CLB and CSB rocks. As conservative approach at this stage, CLB was considered as poor rock quality and the CSB between poor and average rock quality, and the corresponding shear strength parameters were derived from the tables for typical poor and average rock mass quality given in E. Hoek (Practical Rock Engineering, 2000. Chapter 11).

Table 4 summarizes the material parameters used in the slope stability analyses. For the stability analyses lower shear strength values were assumed for saprolite layer.

Table 4: Material Parameters

Material	Unit Weight (kN/m^3)	Cohesion c' (kPa)	Friction Angle ϕ' (degrees)
Saprolite, Saprock [(a)]	18	17 (lower bound)	28.4 (lower bound)
		26	33
CLB	24	550	24
CSB	28	2000	29

Note: (a) Saprock is either absent or relatively thin (less than the height of one bench) in the section analyzed

6.0 Analyses Results and Discussion

The results of analyses are summarized in Table 5 and presented on Figure 4 to Figure 11.

6.1. Aspects Affecting Saprolite (SAPO) Layer

Based on the results obtained from the slope stability analysis, aspects affecting the saprolite layer stability are summarized as follows:

- Rapid excavation of the pit could leave a high phreatic surface in saprolite as a result of an insufficient time for the soil to drain. Localized undrained saprolite close to the pit wall could result in sloughing and wedge slip. Tension cracks may develop due to stress release and slope movement as the pit advances. In addition, desiccation cracks at the saprolite ground surface could also occur due to evapo-transpiration and drainage of saprolite layer. Therefore, routine inspections will be necessary to observe the formation of cracks and if necessary, carry out remedial measures to ensure slope stability. In this regard, measures such as an installation of horizontal drain pipes may be required to lower phreatic surface, and in case of formation of cracks, flattening of the slope may be necessary.

- FS calculated are satisfactory even with lower bound shear strength values of saprolite as per 2007 open pit slope design at West Wall and East Wall (Table 1). It is recommended to keep the height of the bench i.e. saprolite and sprock to

maximum of 12 m. Steepening of the face and overall angles and increase in the bench height may be possible pending the results of monitoring of slope performance as the pit is developed. In that case additional stability analysis is recommended.

Table 5: Summary of Analysis Results

Section	Case No.	Seismic Condition	Factor of Safety	Figure
A	1	Static	1.42	4
		Pseudo-Static 0.07 g	1.28	5
	2	Static	1.19	6
		Pseudo-Static 0.07 g	1.02	7
B	1	Static	1.77	8
		Pseudo-Static 0.07 g	1.55	9
	2	Static	1.65	10
		Pseudo-Static 0.07 g	1.39	11

Note:

(a) The lower bound shear strength values of saprolite were used for the FS calculation

6.2. Aspects Affecting Carbonate Leached Bedrock (CLB) and Carbonate Stable Bedrock (CSB)

Based on the results obtained from the slope stability analyses, aspects affecting the CLB and CSB layer stability are summarized as follows:

- CLB and CSB rock mass will not pose a problem regarding the final overall slope stability. However, the existing joint sets and discontinuities may have an impact on local wedge stability during mining and the impact will be increased if blasting is not controlled.

- Localized overstressed zones may occur, especially in interberms, as a result of the pit geometry selected. Unfavorable combinations of joint sets and slope faces may result in wedge failure, although the overall stability will not be affected.

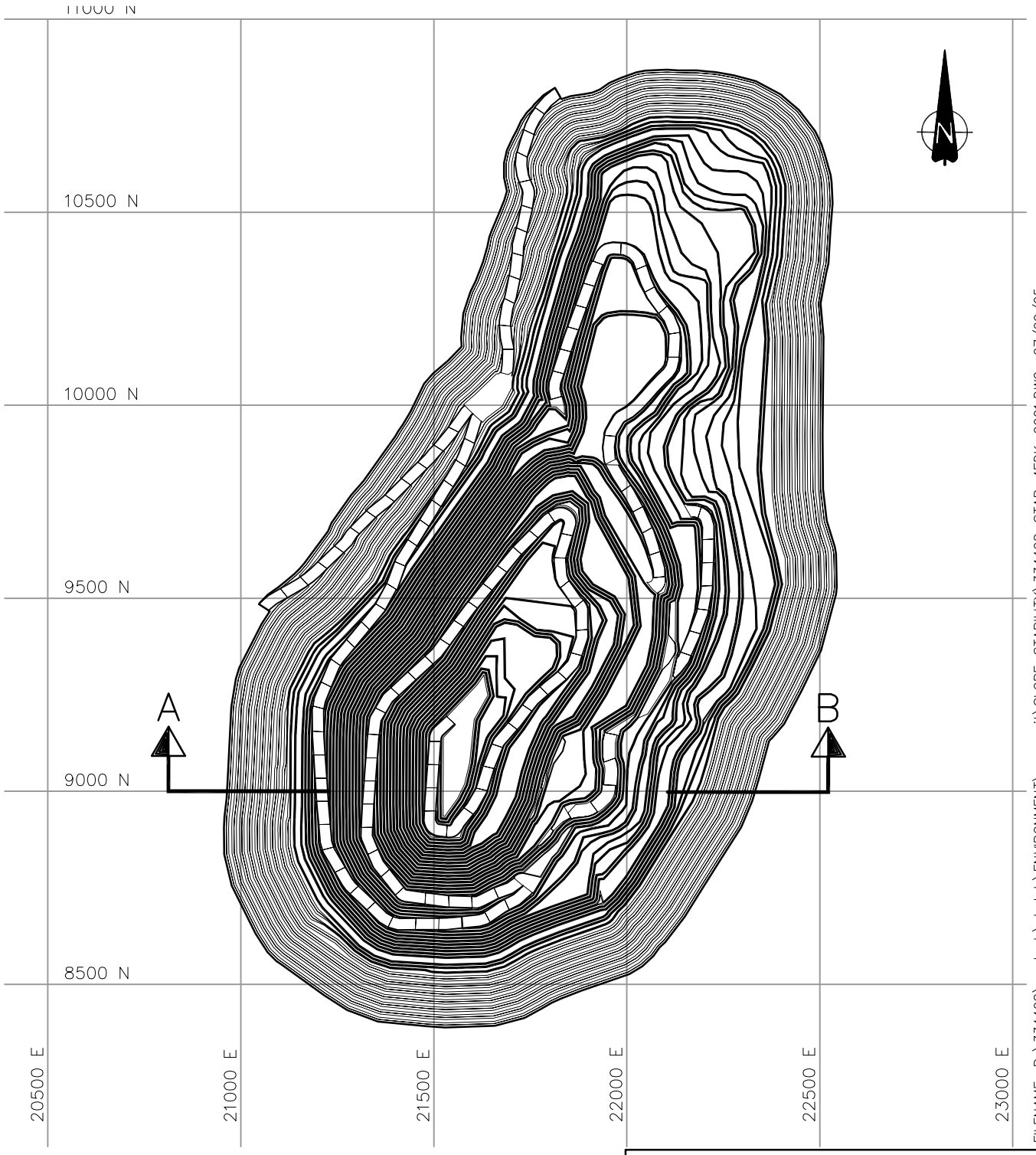
7.0 Tentative Conclusion

The stability analyses carried out herein indicates the 2007 open pit slope geometry as proposed by MDA is stable for both static and pseudo-static conditions. The geotechnical parameters used in the analyses need to be verified and slope behavior monitored as discussed in this memo report.

8.0 Reference

SNC Lavalin, 2004. Field Investigation Report, Open Pit Slope and Waste Dump Stability Study

Hoek, Evert, 2000. Practical Rock Engineering



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Crystallex International Corporation

CLIENT

CLIENT DWG. NO.

SNC·LAVALIN Engineers & Constructors

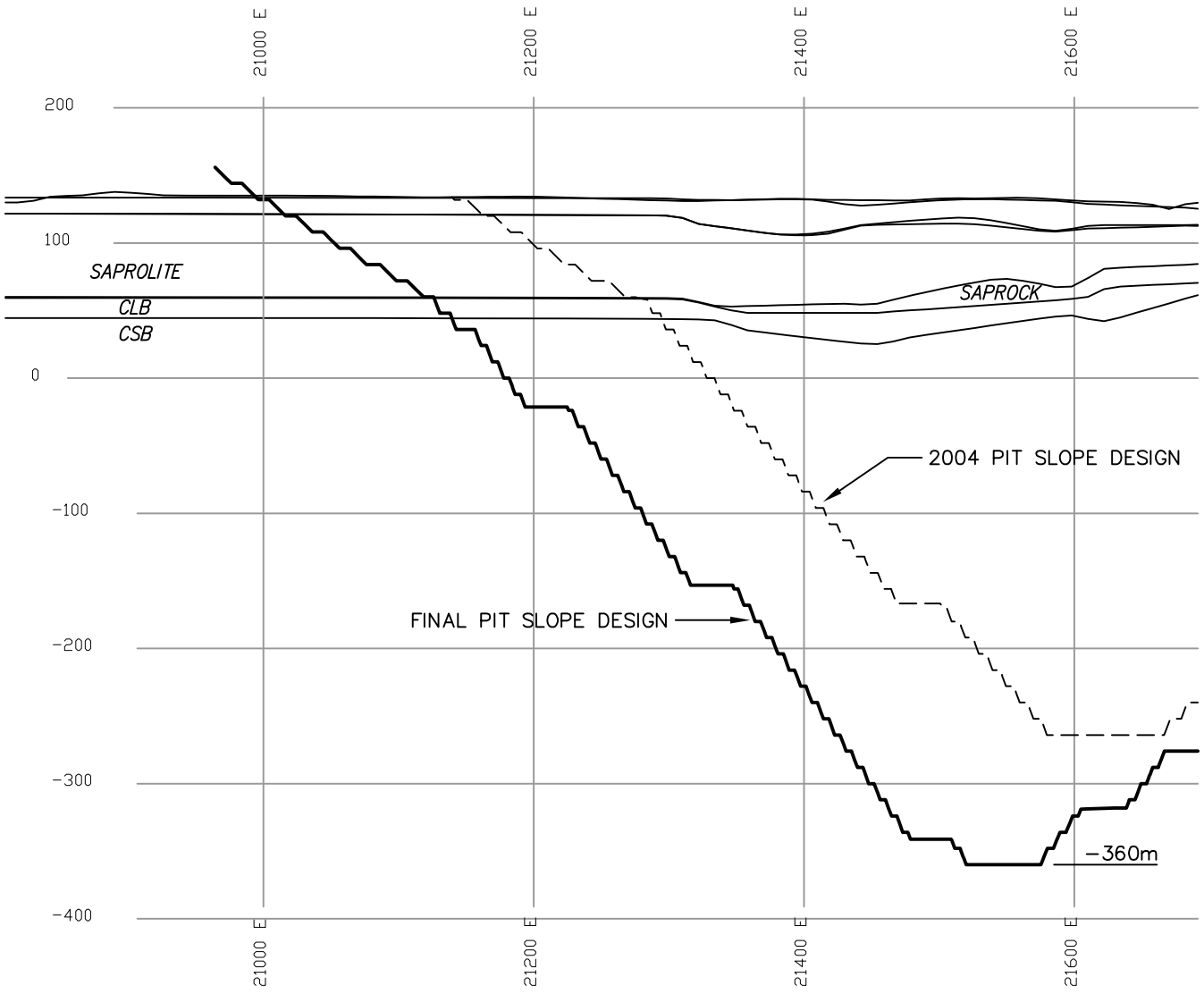
PROFESSIONAL ENGINEER | NAME | NO.

TITLE

LAS CRISTINAS PROJECT
CONDUCTORA OPEN PIT STABILITY STUDY

CONDUCTORA PIT LAYOUT

FIGURE 1



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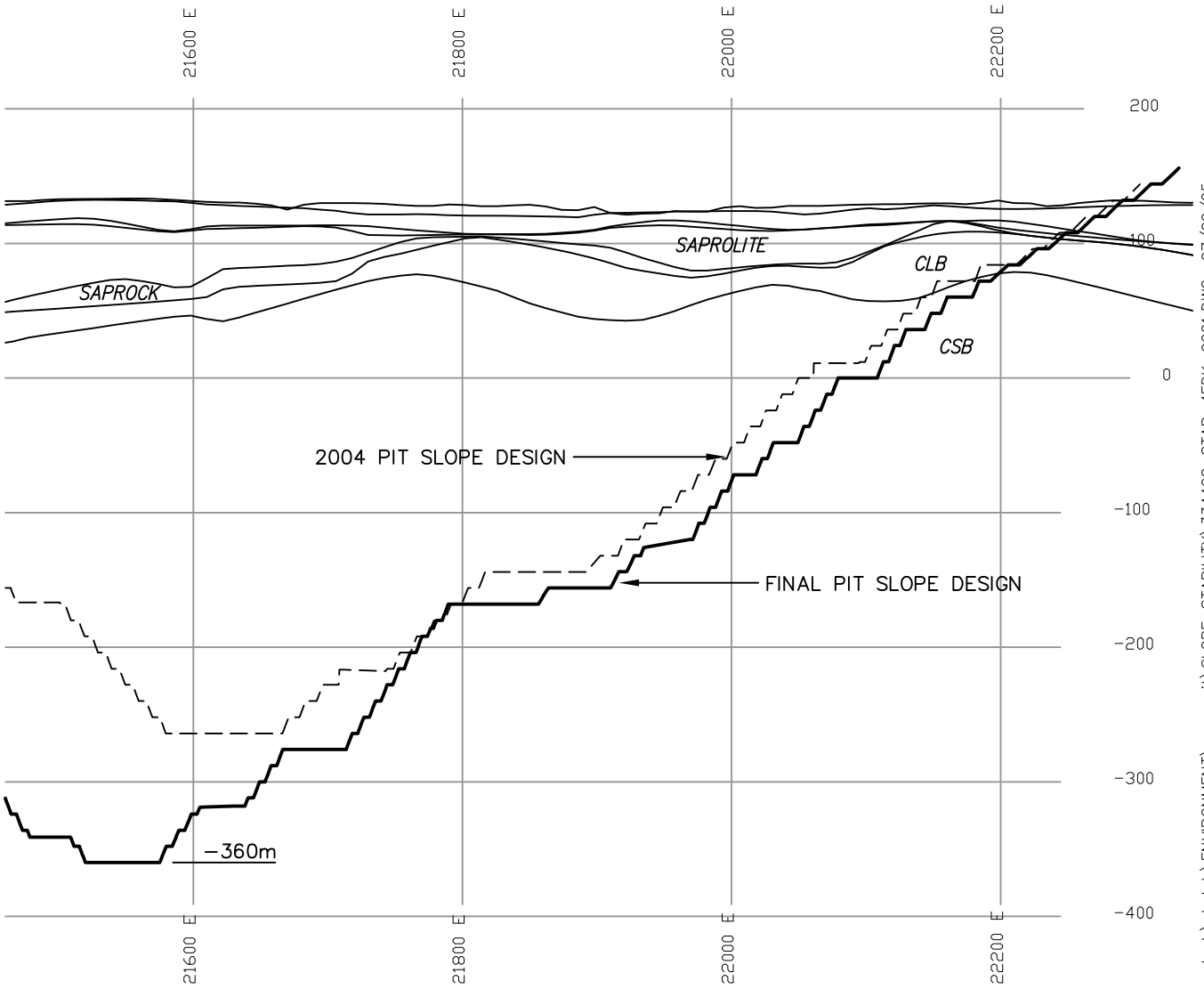
TITLE

LAS CRISTINAS PROJECT
CONDUCTORA OPEN PIT STABILITY STUDY

CROSS SECTION A
WEST WALL

FIGURE 2



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TITLE

LAS CRISTINAS PROJECT
CONDUCTORA OPEN PIT STABILITY STUDY

CROSS SECTION B
EAST WALL

FIGURE 3

Figure 4: Section A, Case 1, Static Condition

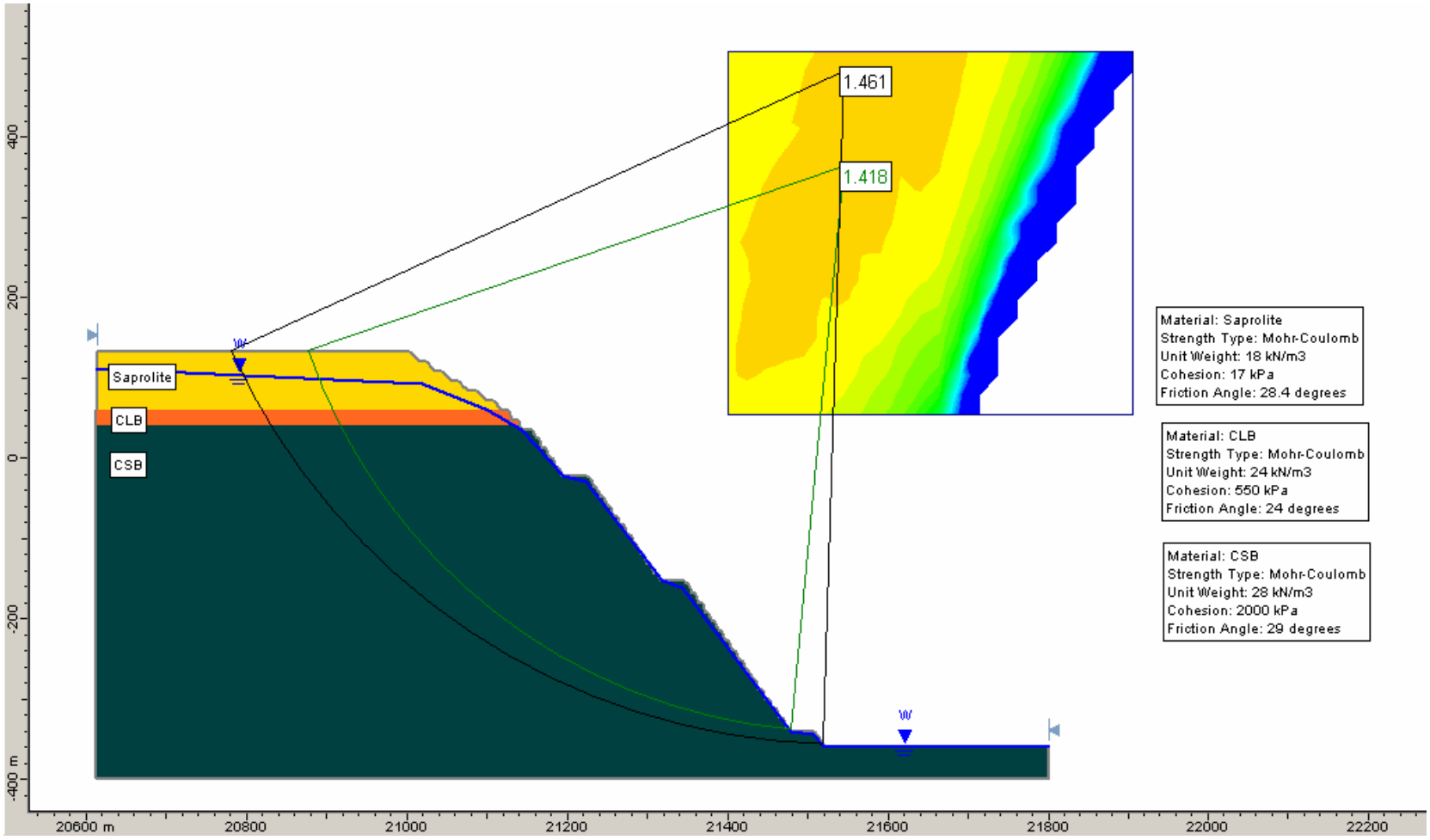


Figure 5: Section A, Case 1, Pseudo-Static Condition

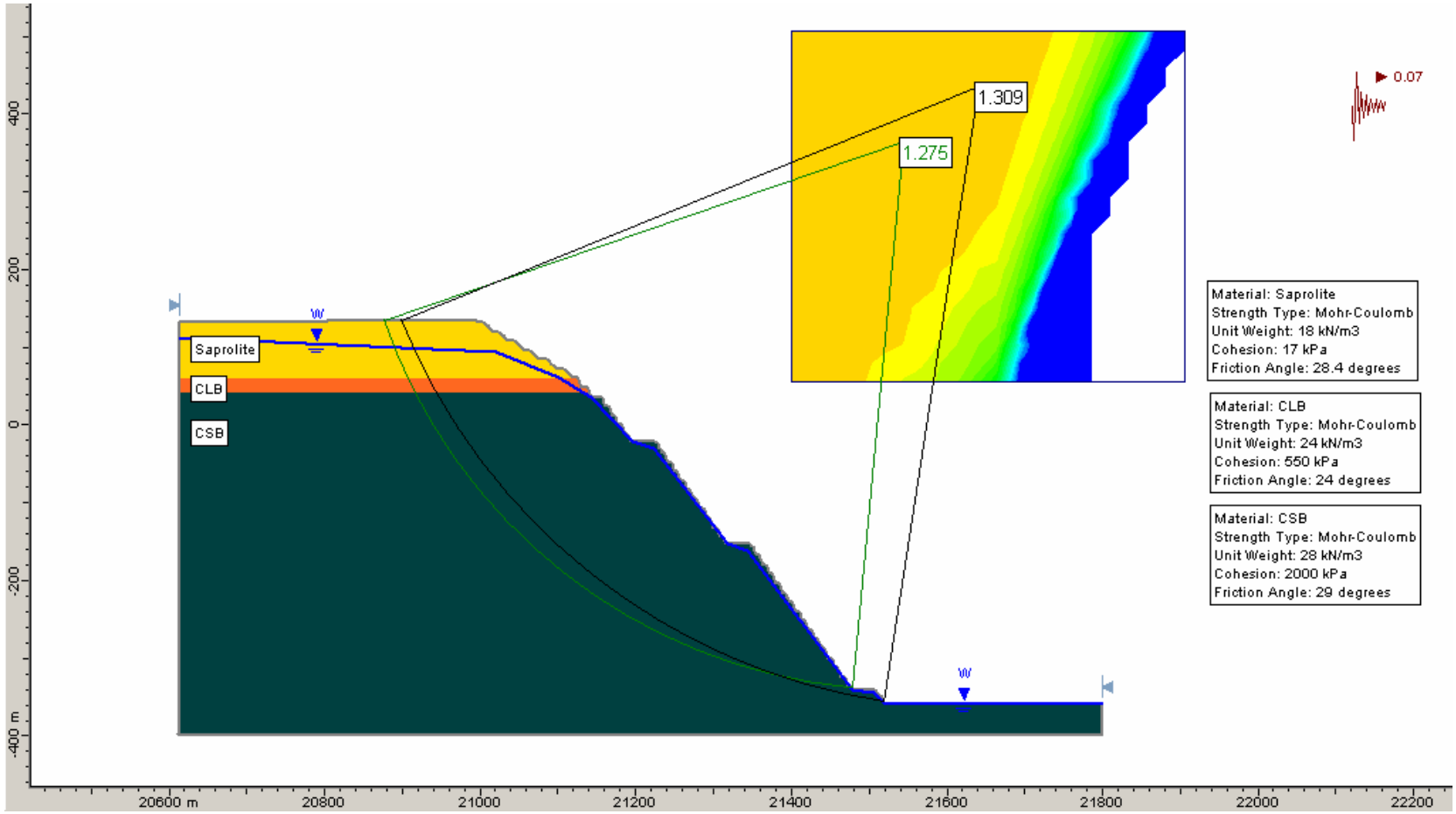


Figure 6: Section A, Case 2, Static Condition

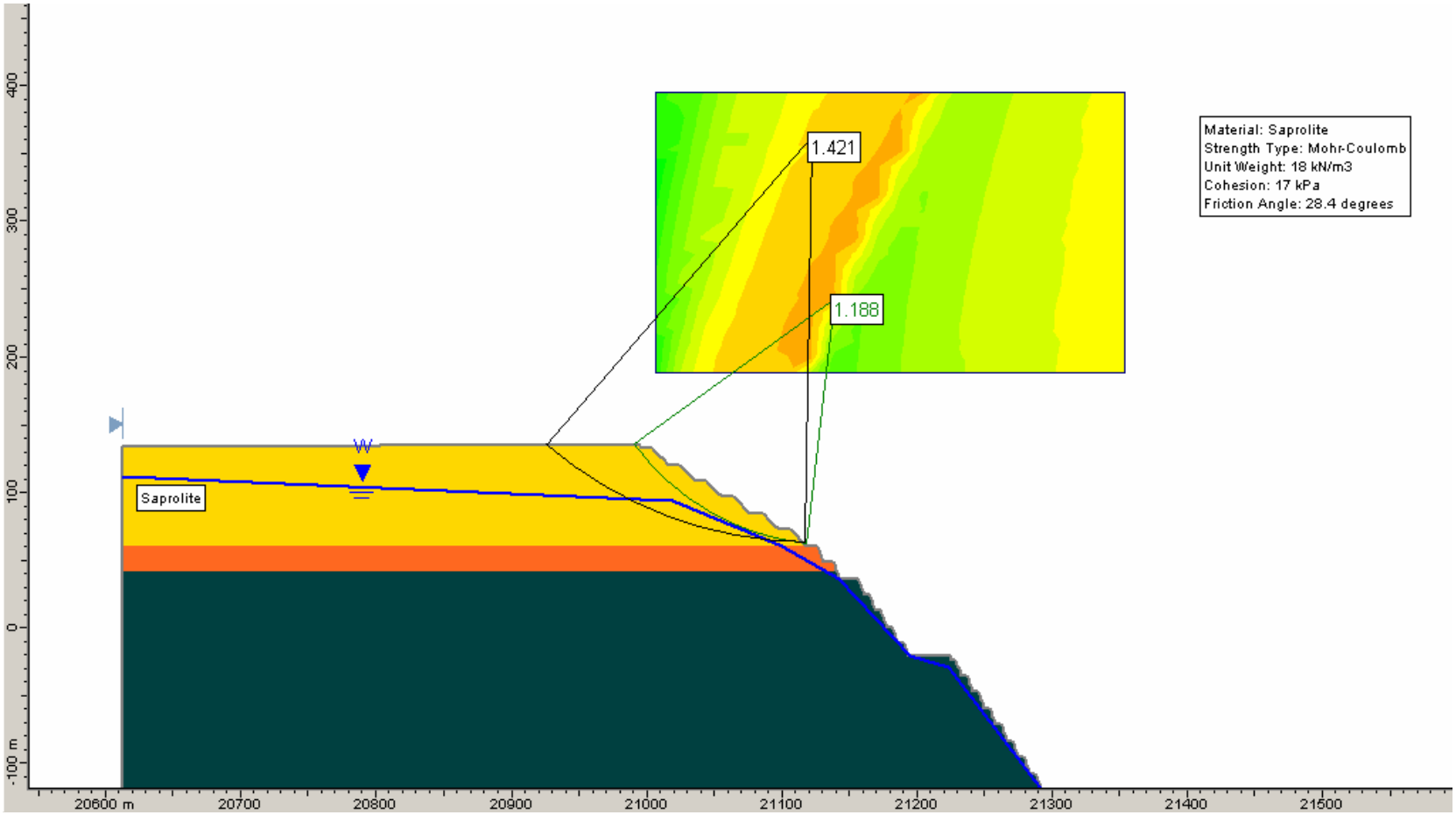


Figure 7: Section A, Case 2, Pseudo-Static Condition

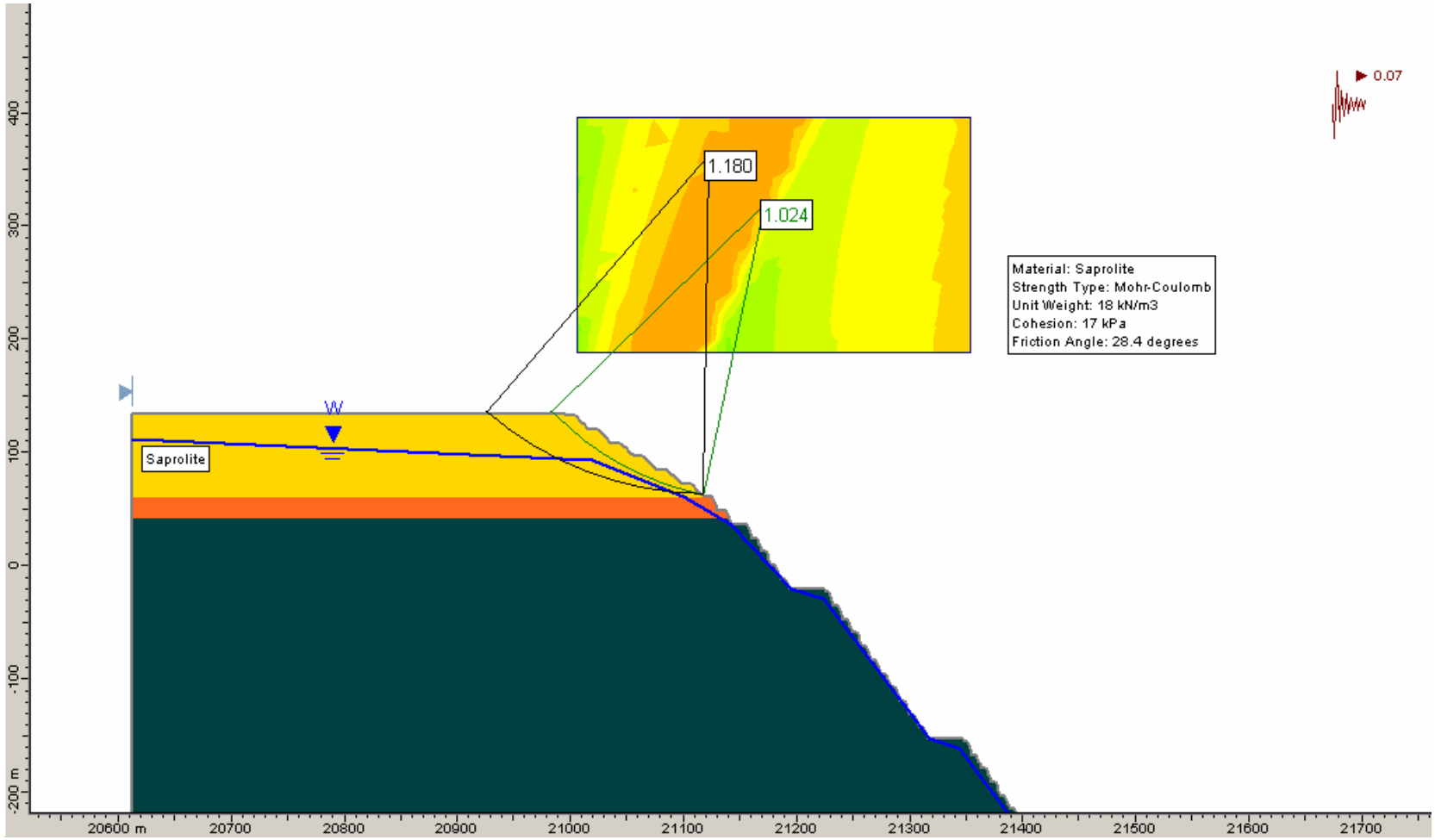


Figure 8: Section B, Case 1, Static Condition

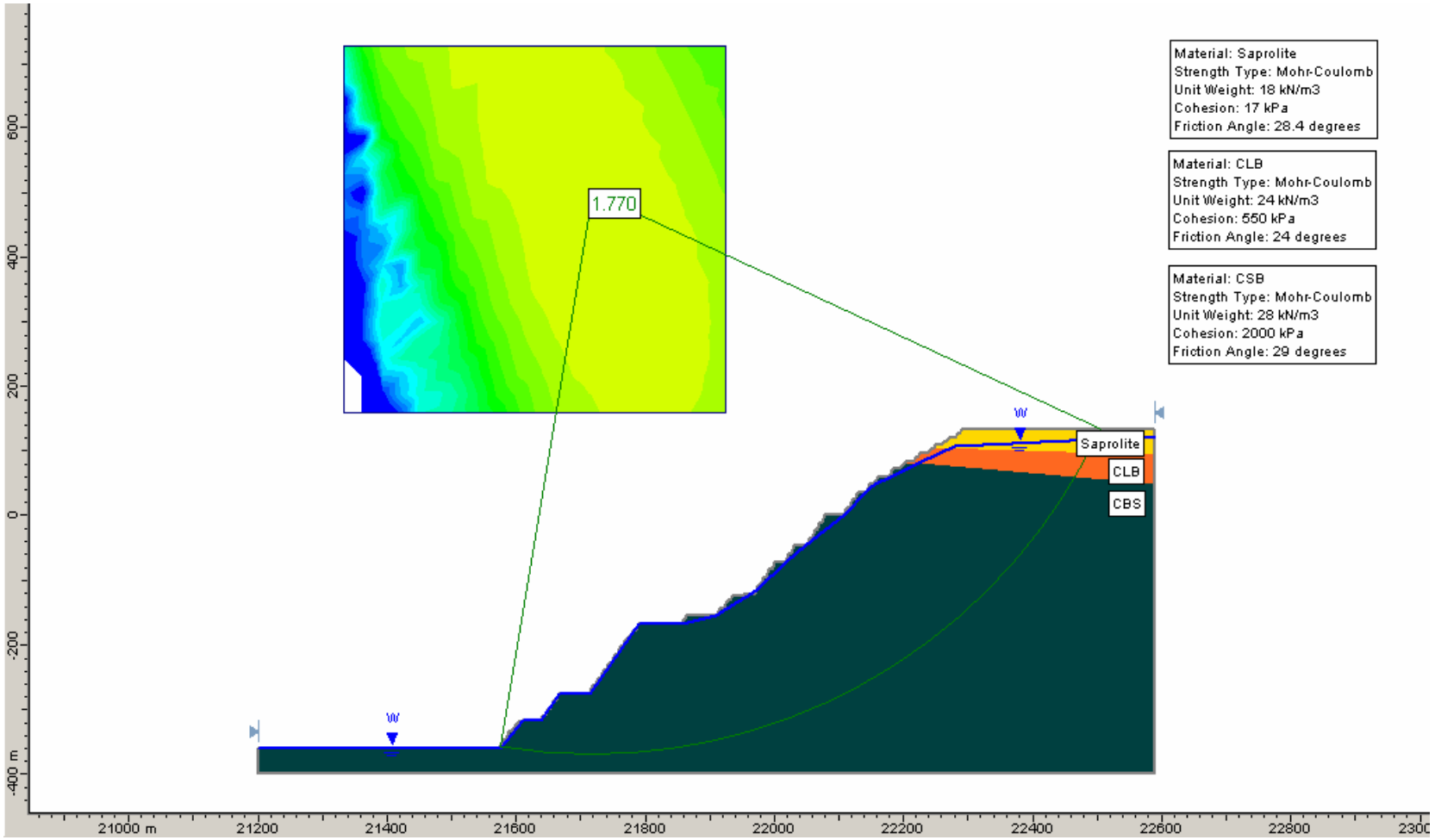


Figure 9: Section B, Case 1, Pseudo-Static Condition

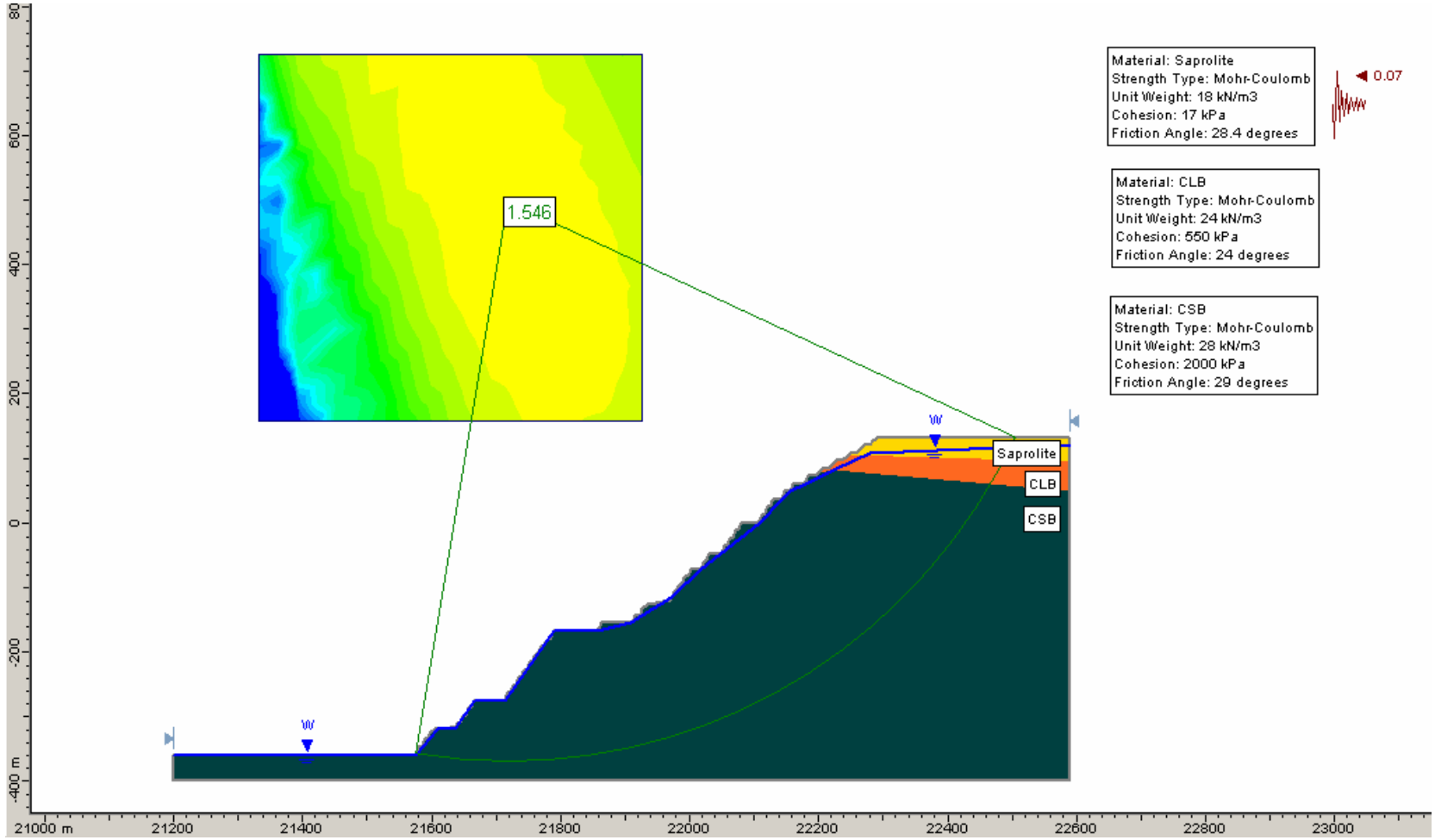


Figure 10: Section B, Case 2, Static Condition

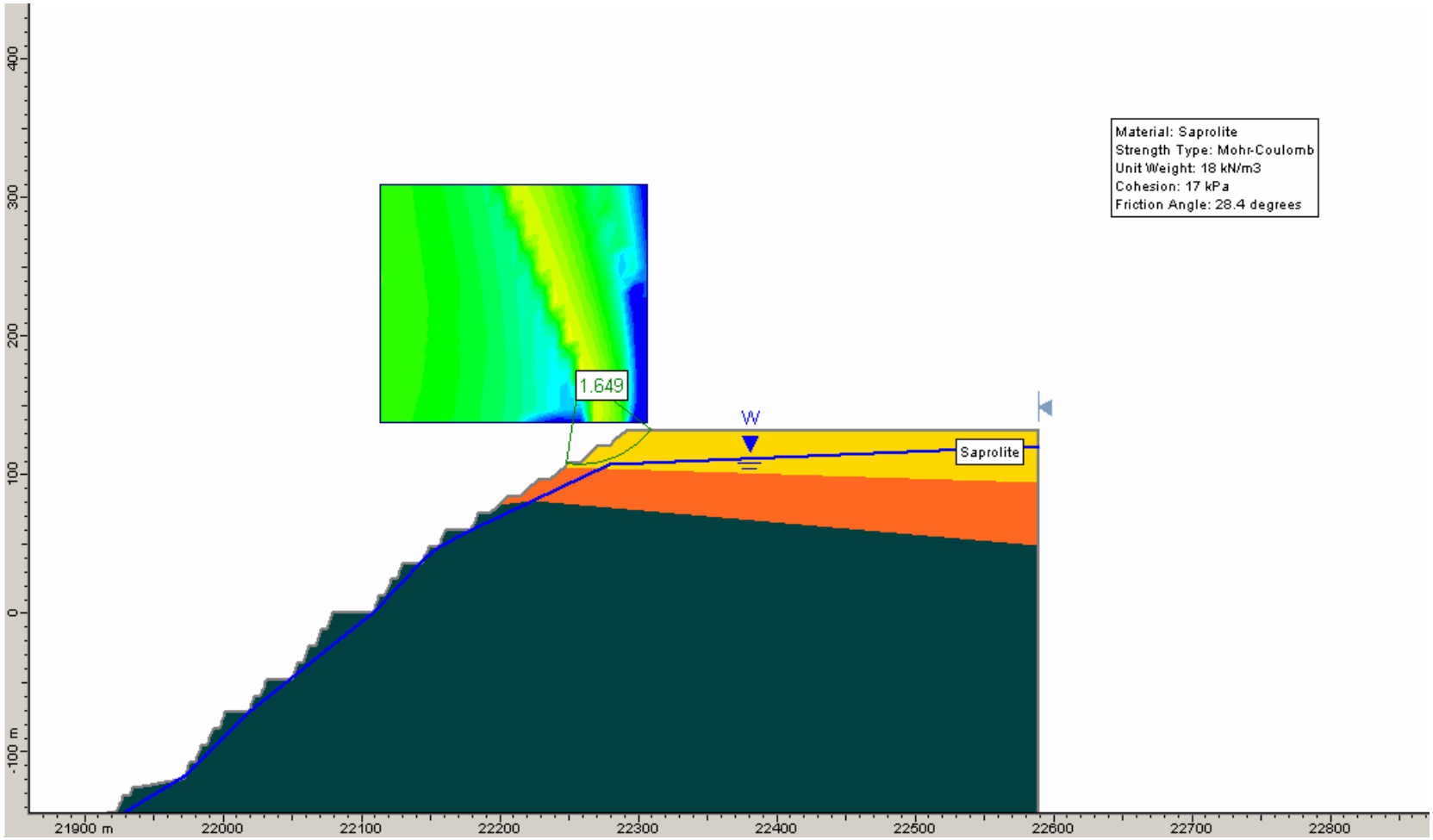
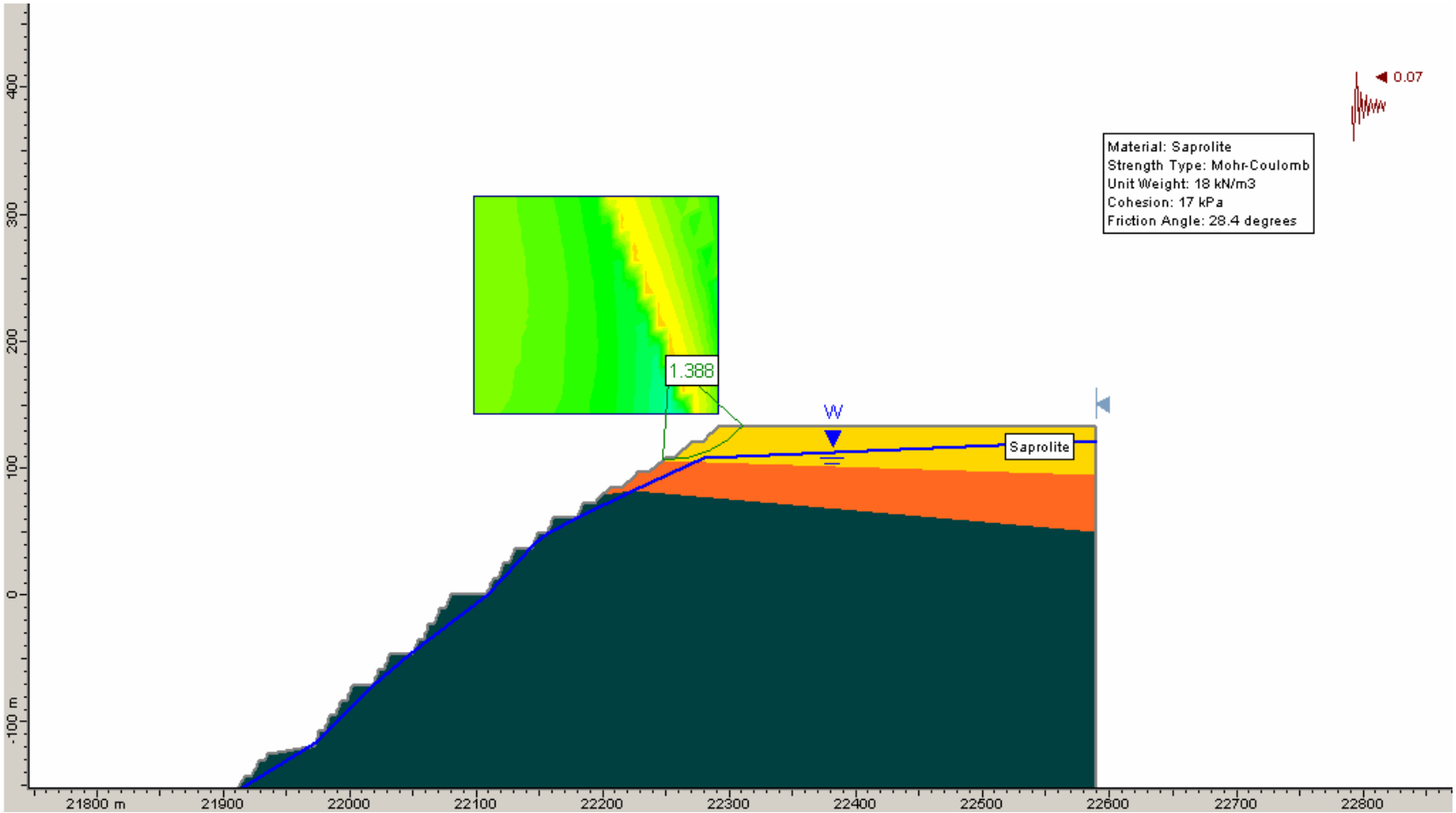


Figure 11: Section B, Case 2, Pseudo-Static Condition



Appendix D

TMF Dam Stability Analysis – 2007 Updated

SNC·LAVALIN
Engineers & Constructors

MEMORANDUM

LAS CRISTINAS PROJECT

TO:	Tom Dyer (MDA)	Date:	November 04, 2007
C.C.:	Bing Wang, Dave Evans		
FROM:	Henri Sangam/Ruijie Chen	Ref.:	**334408-40-4GCB-0009**
Subject:	TMF Dam Stability Analysis – 2007 Updated		

1 General

Las Cristinas property is located in the southeast corner of Venezuela in the Municipality of Sifontes, State of Bolivar, approximately 970 km southeast of Caracas. A Tailings Management Facility (TMF) design report was prepared by SNC-Lavalin in March 2005. It was estimated that to accommodate tailings resulting from the 2005 ore reserves of 333 Mt, an ultimate dam elevation of 202 m would be required for a basin of approximately 3,780,900 m^2. Due to the recent increase in ore reserves to 464 Mt, the TMF needs to be updated to store the resulting increased quantity of tailings. This memo presents an update of TMF dam requirements and a preliminary slope stability analysis for the TMF, based on the recent updated ore reserves estimates.

2 Estimation of the New Dam Crest

A revised dam crest was estimated at El. 230 m for the increased total ore reserve of 464 Mt using the same tailings basin as in the Tailings Management Facility Design Report (2005). The dam crest elevation was estimated based on average tailings density used in the previous design as presented in the Tailings Management Facility Design Report (SNC-Lavalin, 2005). In the next level of design the dam crest elevation should be determined more accurately based on density determined from the various ore types from the mine development plan and a simulation of consolidation process.

An average settled tailings dry density of 1.36 t/m^3 was assumed based on the variable dry densities provided in the Tailings Management Facility Design Report (SNC-Lavalin, 2005). In addition, the same normal operating pond volume, extreme storage and free board were assumed for the dam crest estimate.

Considering the difference between the settled dry density of saprolite dominate tailings and bedrock dominate tailings and the possible further tailings consolidation for longer mine life, substantial change of the dam crest is expected subsequent to developing a new mine plan and mine life.

3 Dam Stability Analysis

3.1 Analysis Basis and Considerations

Preliminary stability analyses were carried out for the highest dam section for the ultimate dam, crest at El. 230 m. The phreatic surfaces were assumed based on previous seepage modelling results presented in Tailings Management Facility Design Report (SNC-Lavalin, 2005). In order to evaluate the dam stability with respect to the presence of soft, disturbed, potentially low shear strength saprolite clay foundation, sensitivity analyses were carried out for both the starter dam and ultimate dam.

Effective stress analyses have been used for the ultimate dam stability since total stress analysis is judged not applicable to the present condition due to the fact the dam raising will be slow, and there is an expected quick consolidation of the saprolite foundation, resulting in no appreciable amount of porewater increase in the dam foundation

The two analyzed cases are summarized below.

Tailings Beach Saturated – Stability analyses were carried out for the ultimate dam when it is filled with tailings using the effective stress approach. The foundation saprolite was assumed to have a friction angle of 34 degrees and an effective cohesion of 50 kPa. The tailings beach was assumed saturated in this case and both static and seismic loading conditions were analyzed. The effective horizontal acceleration of the maximum design earthquake (MDE), 0.17 *g,* was applied in the seismic analysis. As discussed in the Tailings Management Facility Design Report (SNC-Lavalin, 2005), the design earthquake was selected as a 1/10,000 annual probability earthquake which was estimated with a peak ground acceleration (PGA) of 0.2g. A 30% amplification was applied to the PGA to account for the possible amplification generated by the overburden saprolite. In addition, since the peak ground acceleration is instantaneous during earthquake, 2/3 of the PGA, i.e., 0.17g has been selected based on common practice.

Tailings Beach Saturated (Sensitivity Analysis) – Sensitivity analysis was carried out for the ultimate dam with the presence of potentially low shear strength saprolite in the upper 3 m of the foundation. The lower shear strength was reflected by using a friction angle of 25 degrees and 10 kPa of effective cohesion in the upper 3 m of saprolite foundation soil. This condition was selected to simulate the possibility of lower strength saprolite in the low lying areas. The effective horizontal acceleration of the MDE, 0.17 *g,* was applied in the seismic analysis. This analysis represents the worst case scenario.

To examine what factor of safety will be achieved with a flatter slope, the above two cases were examined using a downstream slope of 3:1 and a toe berm, respectively.

3.2 Model Set-up and Material Parameters

The stability analyses were performed using a computer software program, "SLIDE", Version 5, developed by RocScience Inc. of Toronto, Ontario, using the Bishop simplified method.

The material strength parameters were obtained based on laboratory test data from the TMF area and engineering judgement as discussed in "Tailings Management Facility Design Report" (SNC-Lavalin, 2005). The material parameters used in the analyses are summarized in Table 1.

Table 1: Material Properties for Stability Analyses

Material	Description	Unit Weight (kN/m^3)	Angle of Internal Friction (°)	Cohesion (kPa)
Compacted Saprolite Fill		19.0	29.0	28.0
Granular Filter		20.0	35.0	0
Rockfill		21.0	35.0	0
Tailings	Tailings SAPO (fresh)	16.3	15.0	0
	Tailings SAPO (consolidated)	17.0	20.0	0
	Tailings (MIXED)	19.4	25.0	0
Foundation	0-3 m Saprolite	17.8	34.0 (25.0)	50.0 (10)
	3-20 m Saprolite		34.0	50.0
	20-75m CLB	24.0	Hard Bottom	
	75 m below, CSB	28.0		

Note: The values in brackets denote the parameters used in sensitivity analysis.

3.3 Stability Criteria

The design criteria with respect to the stability requirements of the dams are summarized in Table 2. The minimum required factor of safety (FOS) for the dam slopes under static loading conditions is 1.3 during construction, 1.5 for operating conditions with a full tailings pond and also 1.5 for long-term closure conditions. These minimum factors of safety are based on the Canadian Dam Association's "Dam Safety Guidelines" (1999). It is noted that the minimum factors of safety given on Table 2 for the pseudo-static analyses are for screening purposes only and that a factor of safety of less than one can be accepted, but this condition triggers a deformation analyses.

Table 2: Required Minimum Factors of Safety

Loading Conditions			Required Minimum Factor of Safety
Static	End of Construction, Operation and Closure		1.3* (End of Construction) 1.5* (Operation and Closure)
Pseudo-Static (Earthquake)	End of Construction, Operation and Closure	Starter and Intermediate Dams	1.0** (End of Construction, Upstream Slips)
		Ultimate Dam	1.1** (Operation and Closure)

Notes: (*) Canadian Dam Association, Dam Safety Guidelines, 1999.
(**) Based on common engineering practice.

3.4 Analysis Results

The analysis results are summarized in Table 3 for the dam with a downstream slope of 2.5:1. The potential slip surfaces for the dams were analyzed as illustrated on Figures 1 to 4. Note that on the stability analysis figures, besides the minimum FOS given, higher FOS values related to different slip surfaces are also provided for information.

The stability analyses demonstrate that the ultimate dam is stable for the current design with a downstream slope of 2.5:1, with a calculated FOS value of 1.87 for static loading conditions and 1.19 for seismic loading conditions, satisfying the minimum required under both static and seismic loading conditions (Table 2).

The increase of dam crest from El 202 m (2005 design) to 230 m (based on 2007 ore reserves) with a downstream slope of 2.5:1 will result in an increase of the dam base by about 70 m.

Table 3: Factor of Safety - Ultimate Dam Stability Analyses (2.5:1 Slope)

Case	Downstream Slope	
	Static	Seismic Loading (0.17g)
Tailings Beach Saturated, effective stress analysis	1.87 (Fig. 1)	1.19 (Fig. 2)
Tailings Beach Saturated, Sensitivity Analysis, effective stress analysis	1.69 (Fig.3)	1.05 (Fig. 4)

Notes: 1) The figure number showing the critical slip surface is in brackets below the factor of safety.

Due to a marginal factor of safety obtained for the dam with a downstream slope of 2.5:1, scenarios to increase the FOS were examined. The two scenarios examined

include a flatter downstream slope of 3.0:1 and 2.5:1 slope with a toe berm. The results of the analysis for the dam with a downstream slope of 3.0:1 are presented in Table 4. The potential slip surfaces for the dams are shown on Figures 5 to 8.

Table 4: Factor of Safety - Ultimate Dam Stability Analyses (3:1 Slope)

Case No. and Name	Downstream Slope	
	Static	Seismic Loading (0.17g)
Tailings Beach Saturated, effective stress analysis	2.23 (Fig. 5)	1.29 (Fig. 6)
Tailings Beach Saturated, Sensitivity Analysis, effective stress analysis	1.96 (Fig. 7	1.17 (Fig. 8)

Notes: 1) The figure number showing the critical slip surface is in brackets below the factor of safety.

As can be seen, the FOS values are higher than for the dam with a downstream 2.5:1 and compare very well with FOS obtained for dam with a crest elevation at 202 m as presented in Tailings Management Facility Design Report (SNC-Lavalin, 2005). However, the increase of dam crest from El 202 m (2005 design) to 230 m (based on 2007 reserves) with a downstream slope of 3:1 will result in an increase of the dam base by about 85 m in comparison with the 70m increase for the 2.5:1 slope.

The stability analysis results for the scenarios with a toe berm of 35 m wide and 10 m high are summarized in Table 5 and the potential slip surfaces for the dams were analyzed as illustrated on Figures 8 to 12.

Table 5: Factor of Safety - Ultimate Dam Stability Analyses (2.5:1 Slope with Toe Berm)

Case No. and Name	Downstream Slope	
	Static	Seismic Loading 0.17g
Tailings Beach Saturated, effective stress analysis	1.88 (Fig. 9)	1.20 (Fig. 10)
Tailings Beach Saturated, Sensitivity Analysis, effective stress analysis	1.81 (Fig. 11)	1.07 (Fig. 12)

Notes: 1) The figure number showing the critical slip surface is in brackets below the factor of safety.

The analysis results presented in Table 5 demonstrates that the FOS values for the dam with a downstream 2.5:1 can be increased with the presence of a toe.

4 Conclusions and Recommendations

In the 2005 Tailings Management Facility (TMF) design report, it was estimated that to accommodate tailings resulting from the 2005 ore reverses of 333 Mt, an ultimate dam elevation of 202 m would be required for a basin of approximately 3,780,900 m^2. Due to the recent increase in ore reserves to 464 Mt, the TMF needs to be updated to store the resulting tailings.

If the 2005 TMF basin is maintained, it is estimated that an ultimate dam crest elevation of 230 m would be required to accommodate tailings resulting from 2007 ore reserve estimate of 464 Mt. This estimate was based on an average tailings density of 1.36 t/m^3. A more accurate crest elevation should be calculated at the next level of design using densities based on the different ore types identified in the mine development plan and a simulation of consolidation process.

The slope stability analysis showed that ultimate dam with a crest elevation at 230 m and a downstream slope of 2.5H:1V should be stable for both static and seismic loading conditions. However, there is no available case history that a 100 m high dam using saprolite can be constructed and on potentially a collapsible saprolite foundation. Therefore, monitoring of porewater pressure response and performance in the foundation soil during initial and subsequent construction phases will be paramount in order to acquire relevant information that will help to decide and optimize on the approach and precautions to take during the raising of the dam to the new ultimate elevation.

The analysis showed that flattening the downstream slope to 3:1 would significantly enhance the stability of the slope. However, flattening the slope will result in significant increase in material quantities required for the construction of the dam. The analysis results also showed that an addition of a toe berm to the 2.5:1 slope will also enhance the stability but would require less construction material than for a flatter slope of 3:1.

Based on the monitoring results during the construction and mine operation, a toe berm may be added as required to enhance the stability of the downstream slope. It is noted that erosion protection of the dam slope will also be required.

Increasing the dam crest elevation from 202 m (2005 design) to 230 m (based on 2007 reserves) will result in an increase of the dam base by about 70 to 100 m, depending on the final stable slope configurations.

One alternative that needs to be examined is to expand the TMF footprint to increase the storage volume without significantly increasing the ultimate dam crest elevation. The potential size of the expansion estimated based on preliminary sizing iteration as illustrated on Figure 13, will provide storage for tailings resulting from the 2007 ore reserve estimates of 464 Mt without any or significant increase of the ultimate dam crest

elevation. The proposed expansion is to the north and to the west of the 2005 TMF footprint.

Note that, should the option to expand the TMF footprint is carried forward; substantial dam alignment optimization and geotechnical field investigation would be required for the detail design.

The stability analysis presented herein is solely based on data/parameters inferred from previous investigations data carried out for a lower height dam. Due to the height increase to about 100 m, additional field investigation and tests are required to confirm the analysis. The additional soil tests will include, but are not necessarily limited to, consolidation tests, collapse potential, triaxial shear tests, in-situ permeability testing, etc.

It is also recommended to carry out seepage and contaminant transport analysis to evaluate the impact of increased tonnage of tailings on the environment and identify required mitigation measures that should be implemented, if any.

Recommendations presented in 2005 design report regarding site preparation, construction and monitoring should be still followed.

5 References

SNC-Lavalin (2005). Tailings Management Facility Design Report.

Canadian Dam Association (1999). Dam Safety Guidelines.

Figure 1: Ultimate Dam (2.5H:1V)– Base Case (Static Condition)

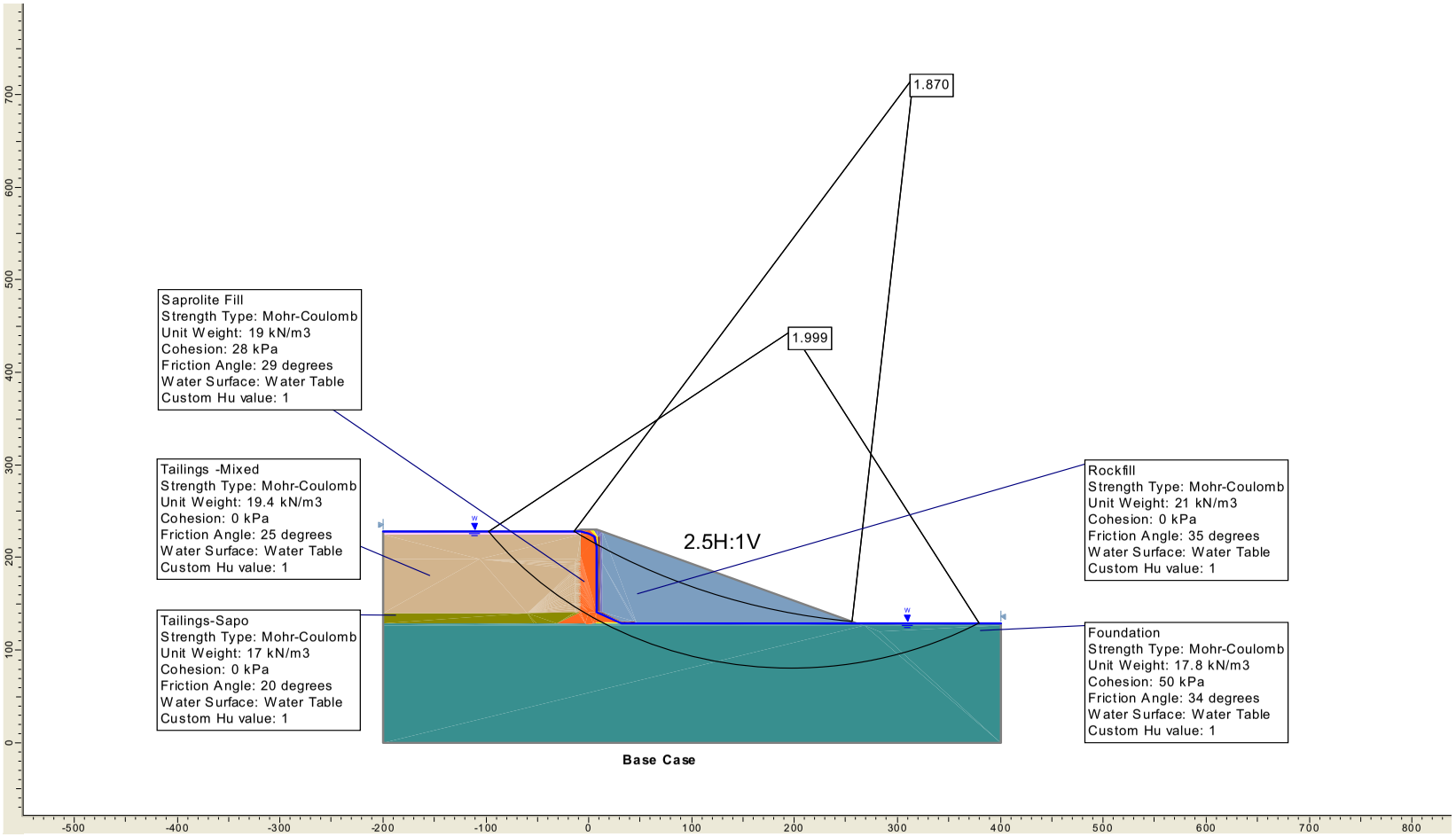


Figure 2: Ultimate Dam (2.5H:1V) – Base Case (Seismic Loading Condition)

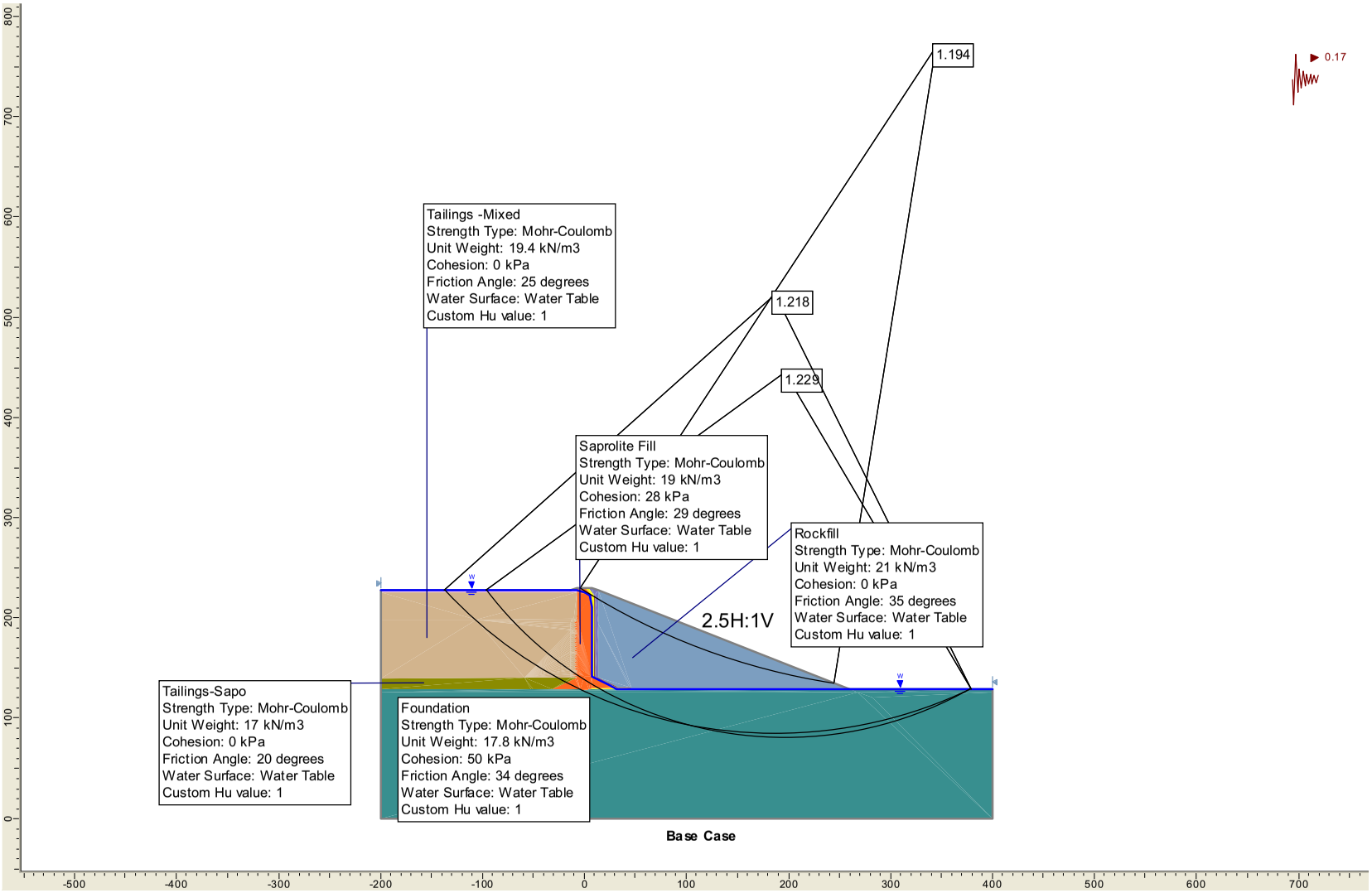


Figure 3: Ultimate Dam (2.5H:1V)– Sensitivity Analysis (Static Condition)

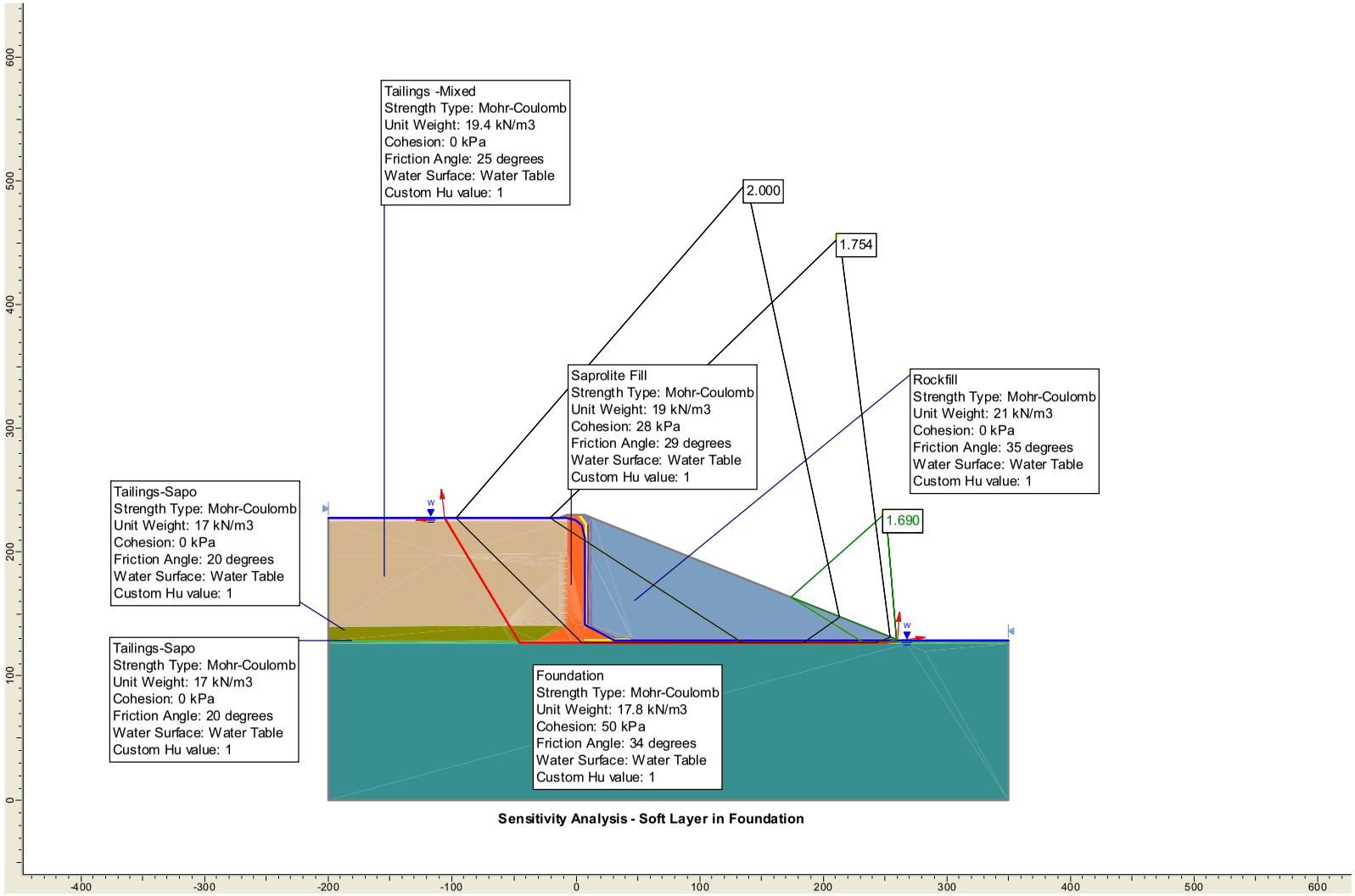


Figure 4: Ultimate Dam (2.5H:1V)– Sensitivity Analysis (Seismic Loading Condition)

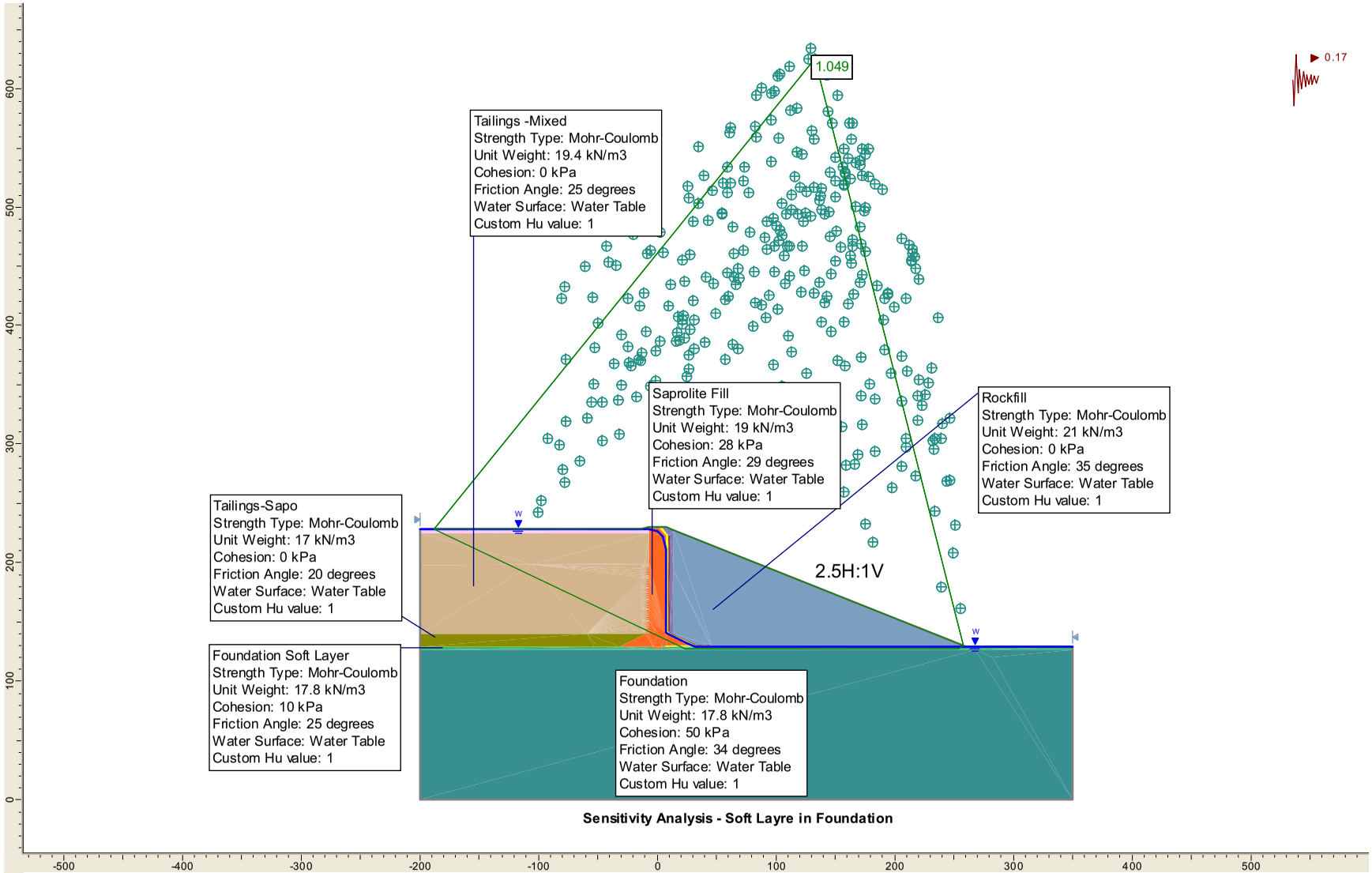


Figure 5: Ultimate Dam (3H:1V)– Base Case (Static Condition)

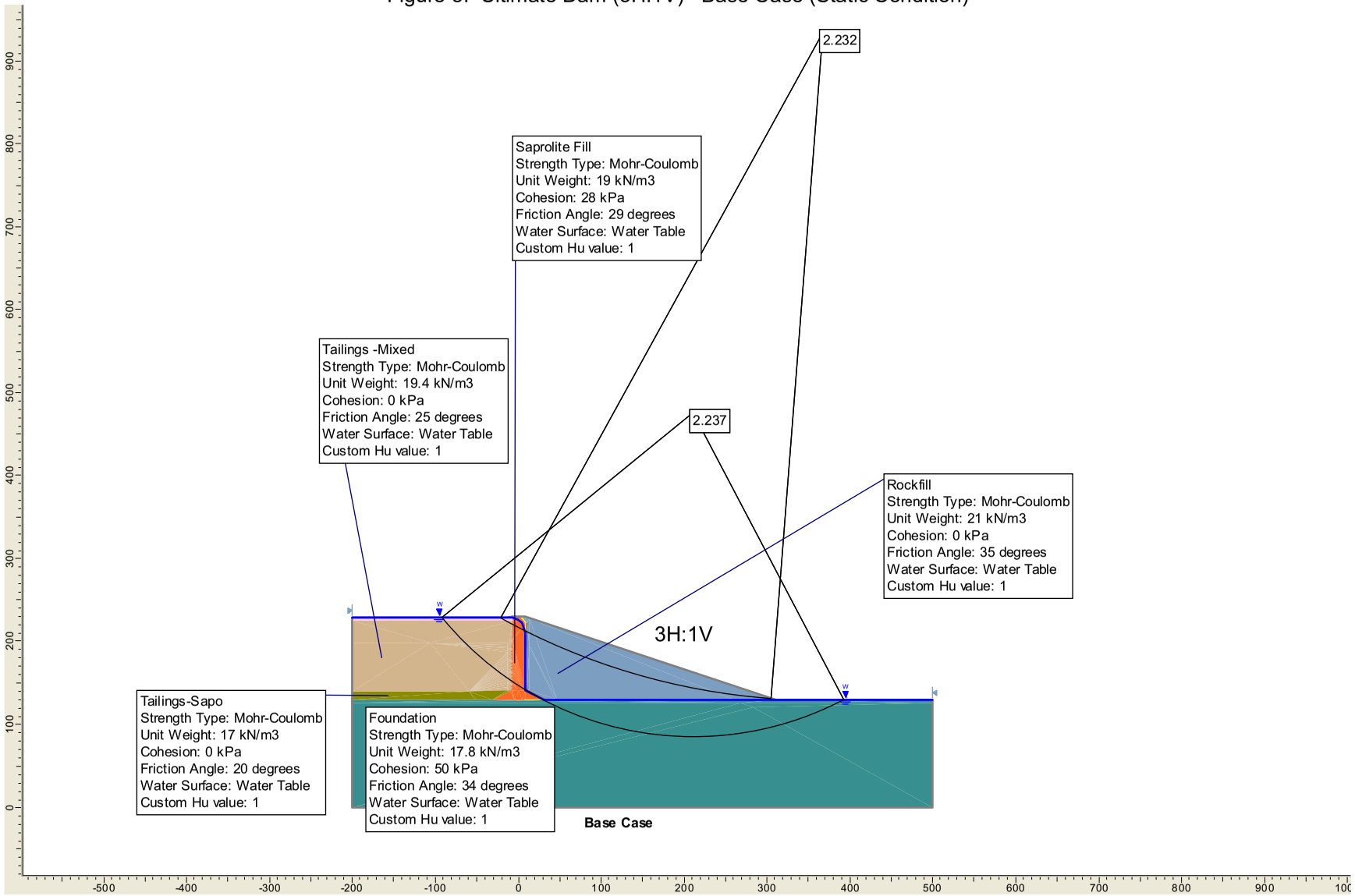


Figure 6: Ultimate Dam (3H:1V)– Base Case (Seismic Loading Condition)

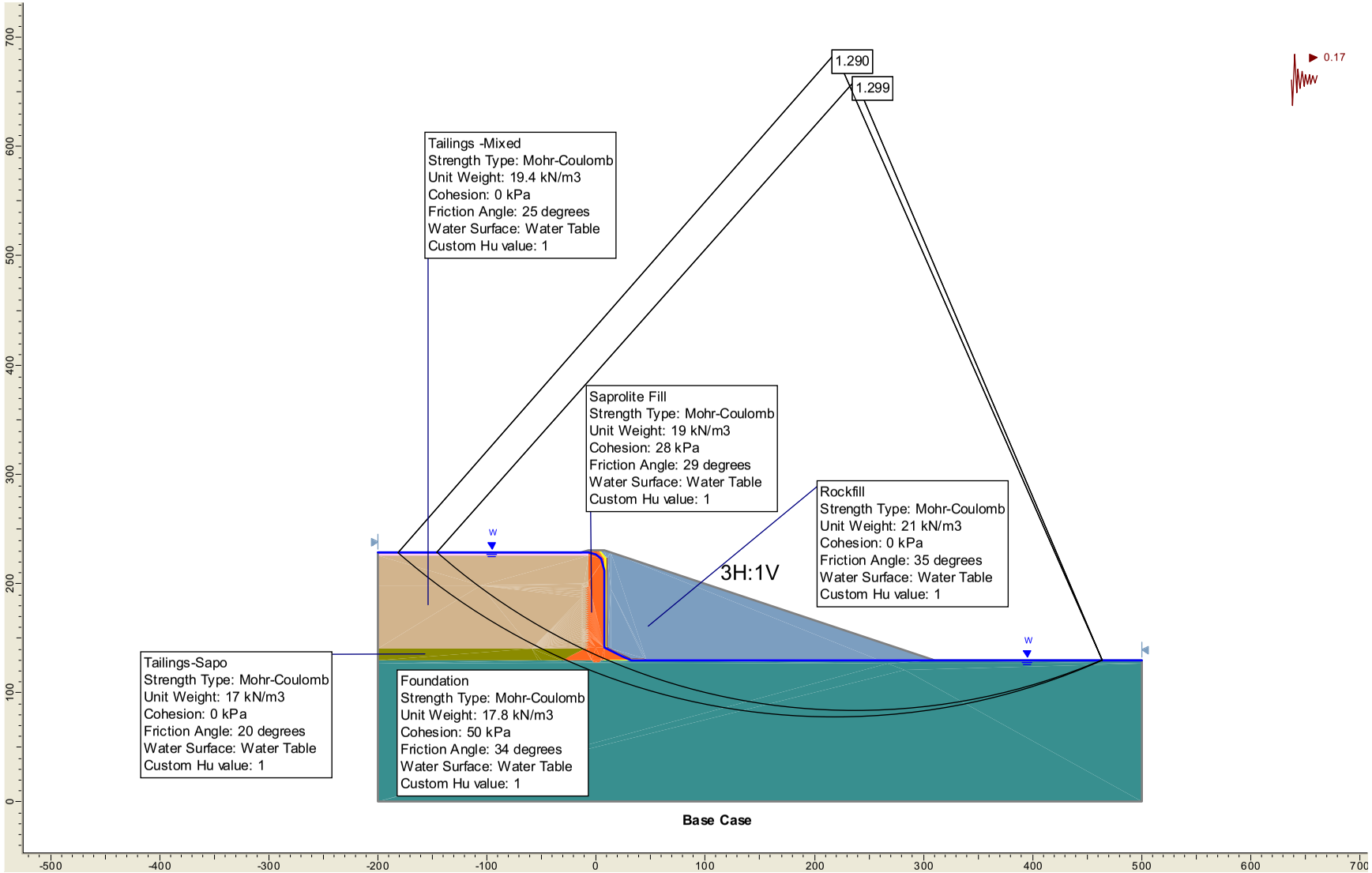


Figure 7: Ultimate Dam (3H:1V)– Sensitivity Analysis (Static Condition)

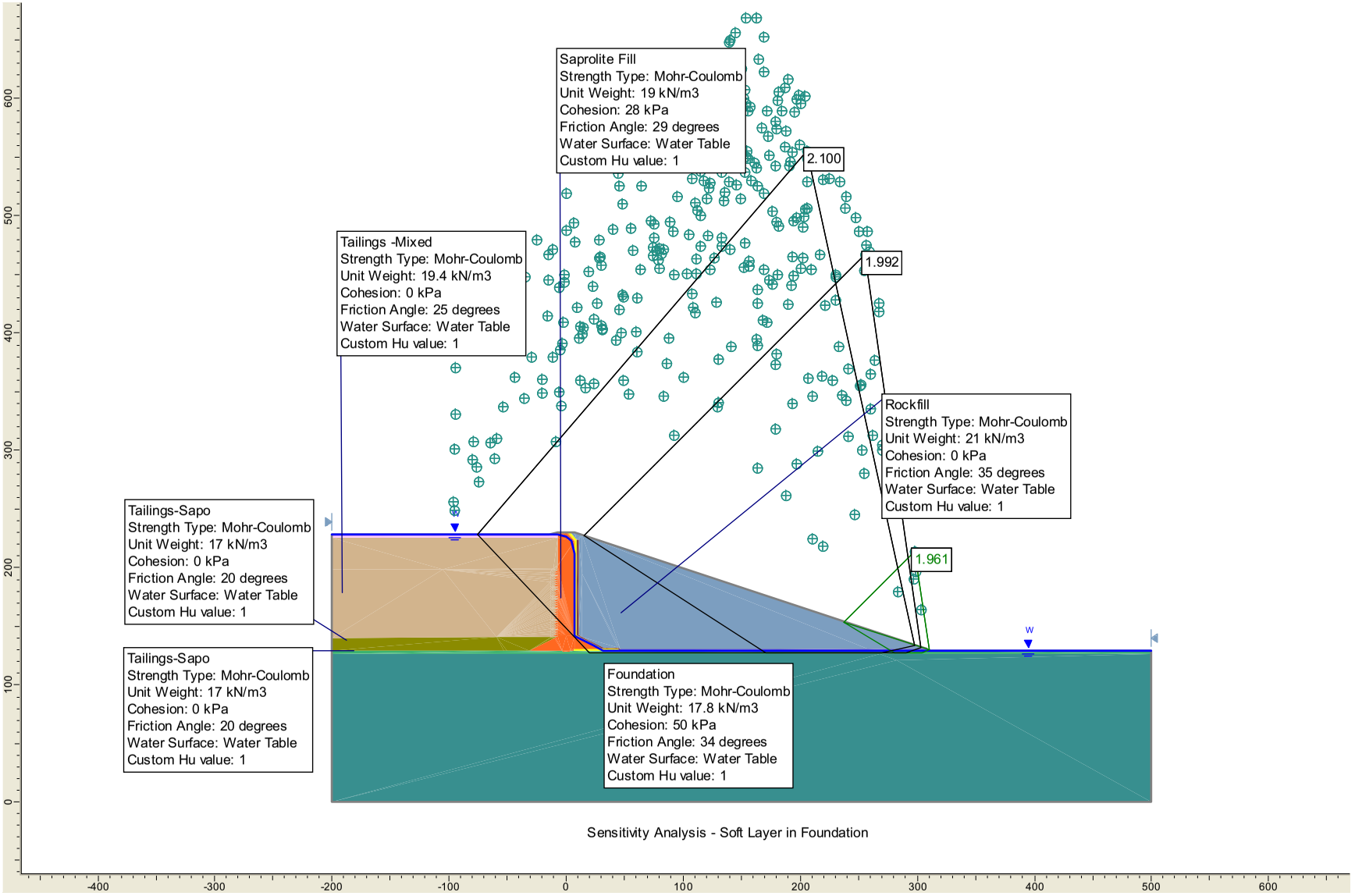


Figure 8: Ultimate Dam (3H:1V)– Sensitivity Analysis (Seismic Loading Condition)

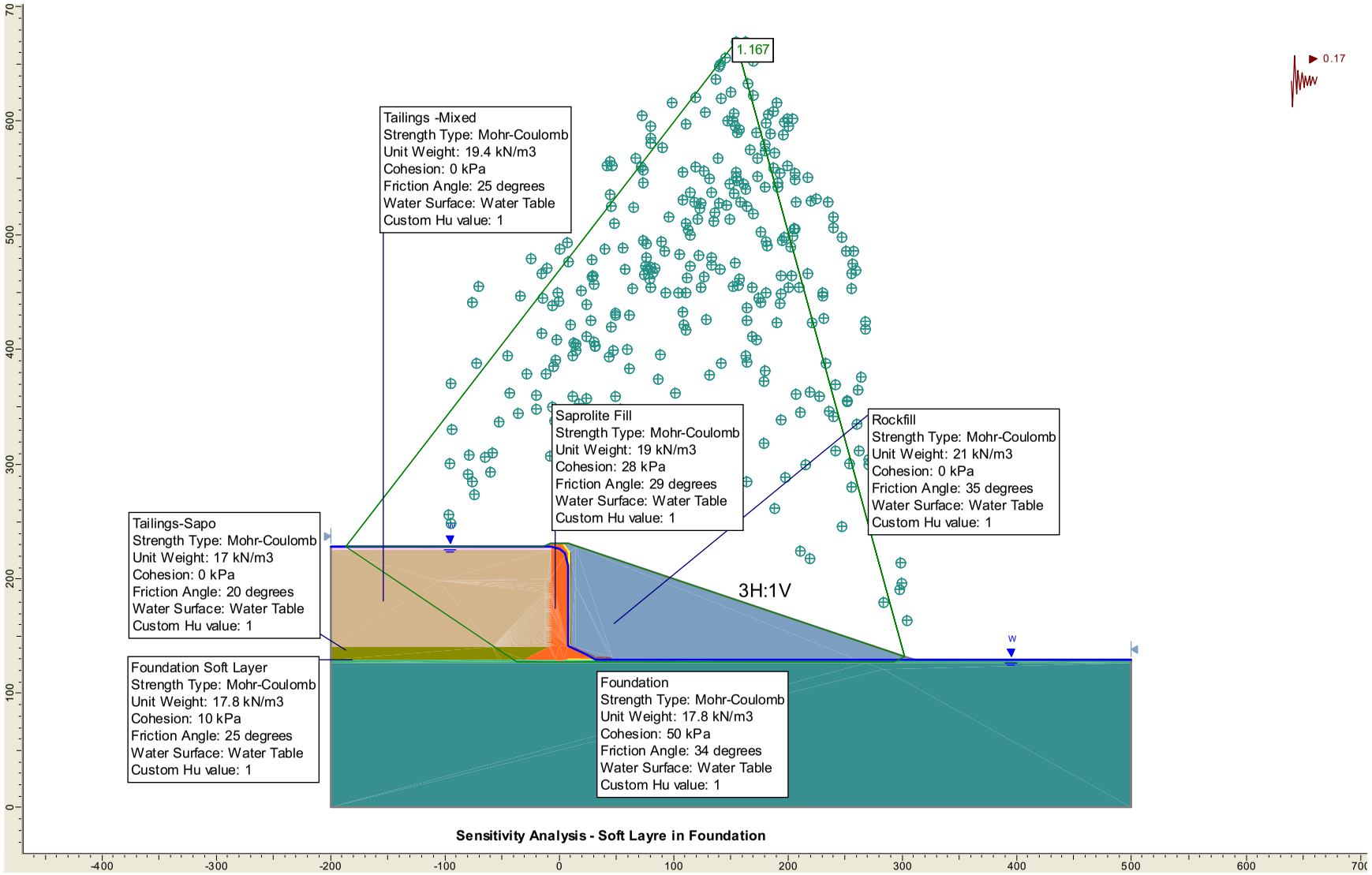


Figure 9: Ultimate Dam (2.5H:1V, 10m high, 35m wide toe berm)– Base Case (Static Condition)

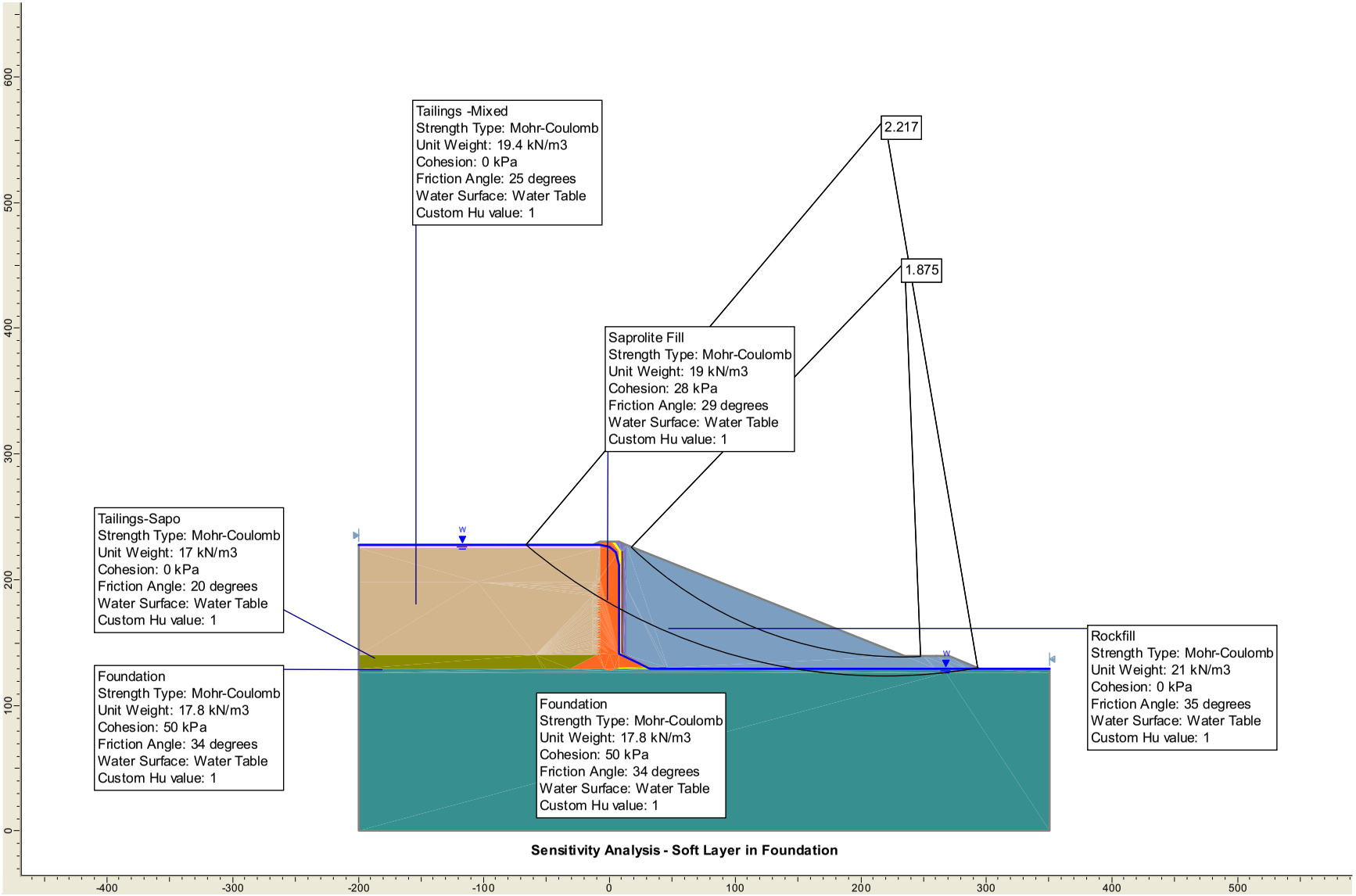


Figure 10: Ultimate Dam (2.5H:1V, 10m high, 35m wide D/S berm)– Base Case (Seismic Loading Condition)

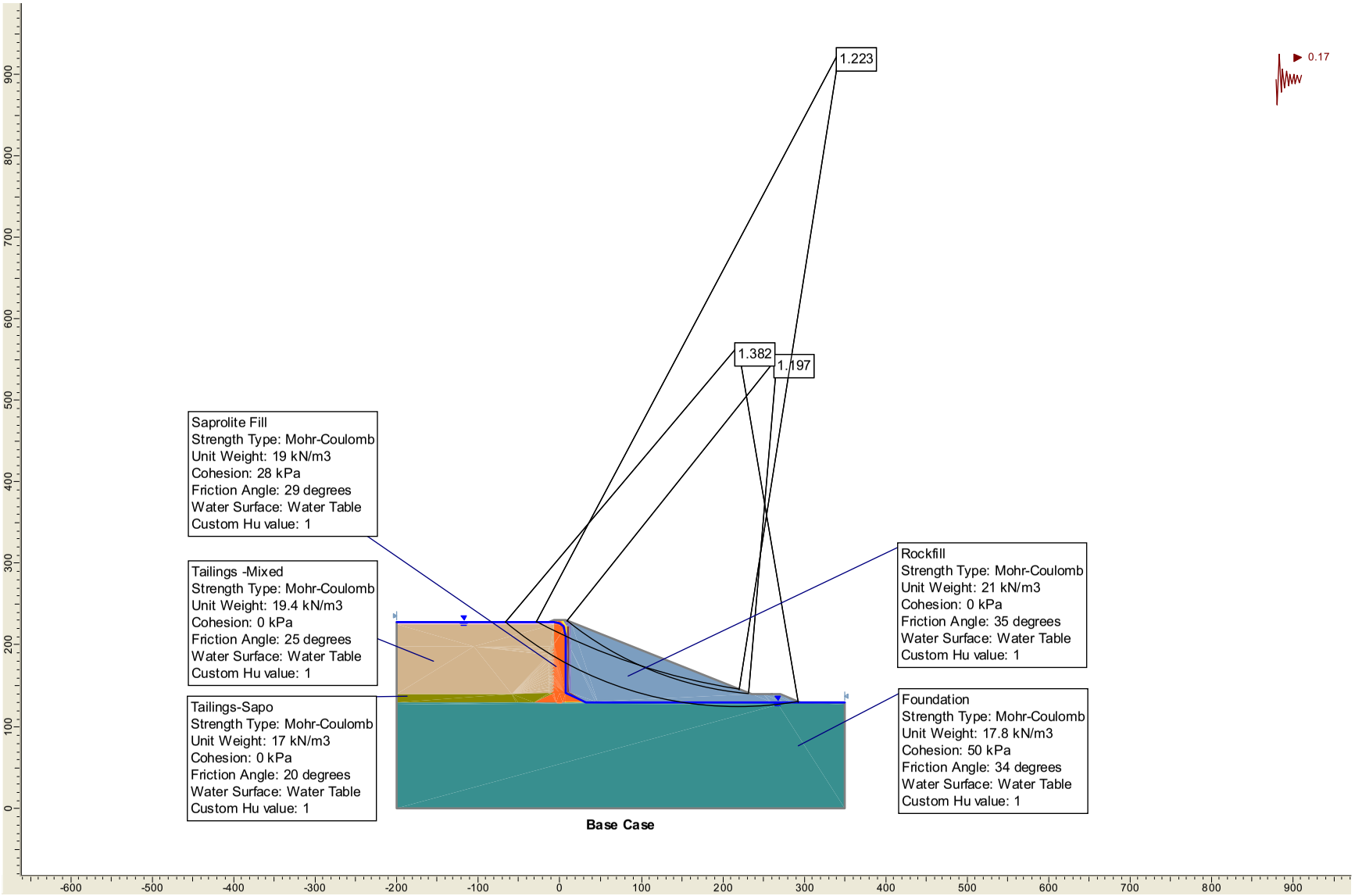


Figure 11: Ultimate Dam (2.5H:1V, 10m high, 35m wide toe berm)– Sensitivity Analysis (Static Condition)

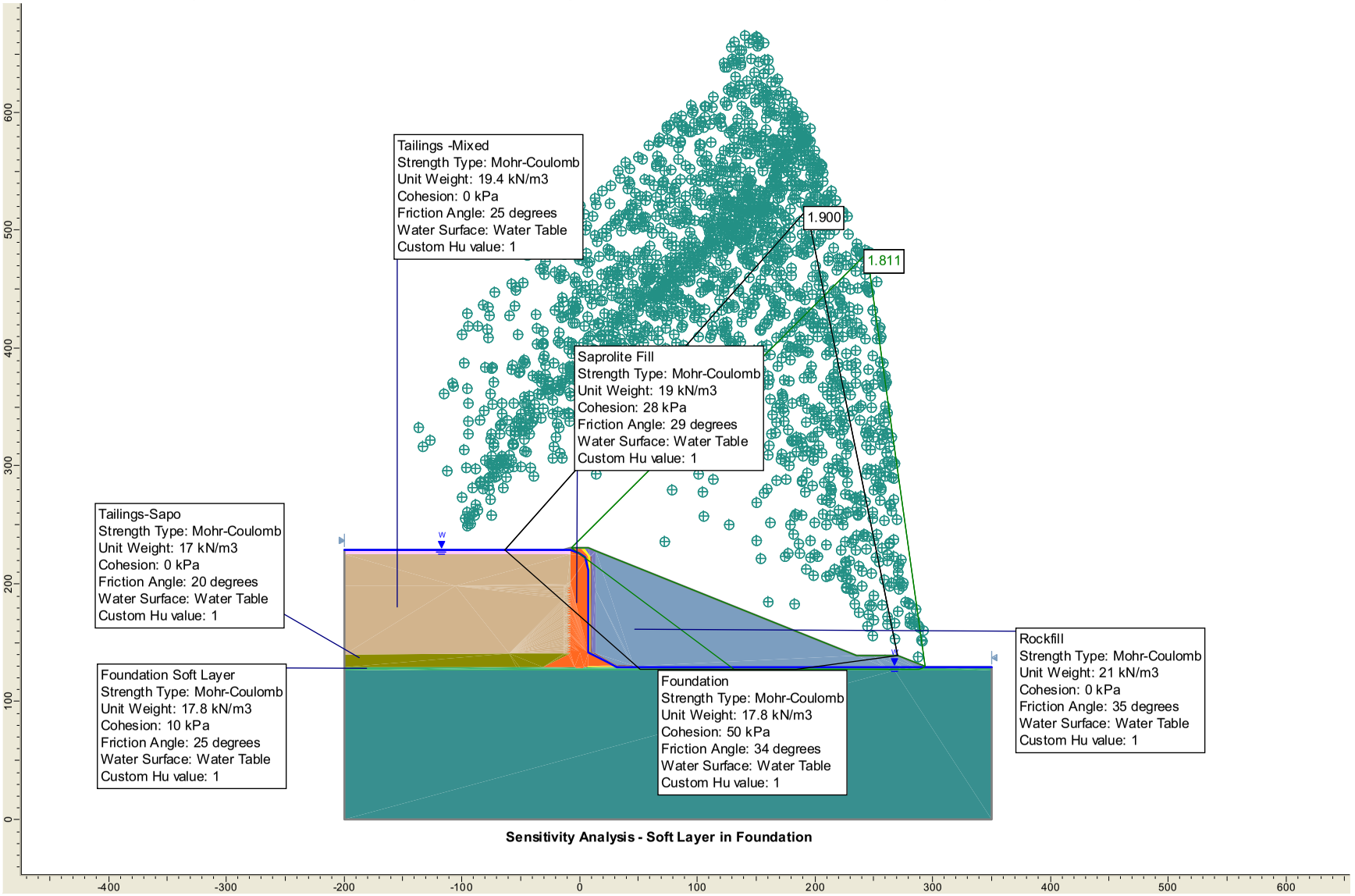
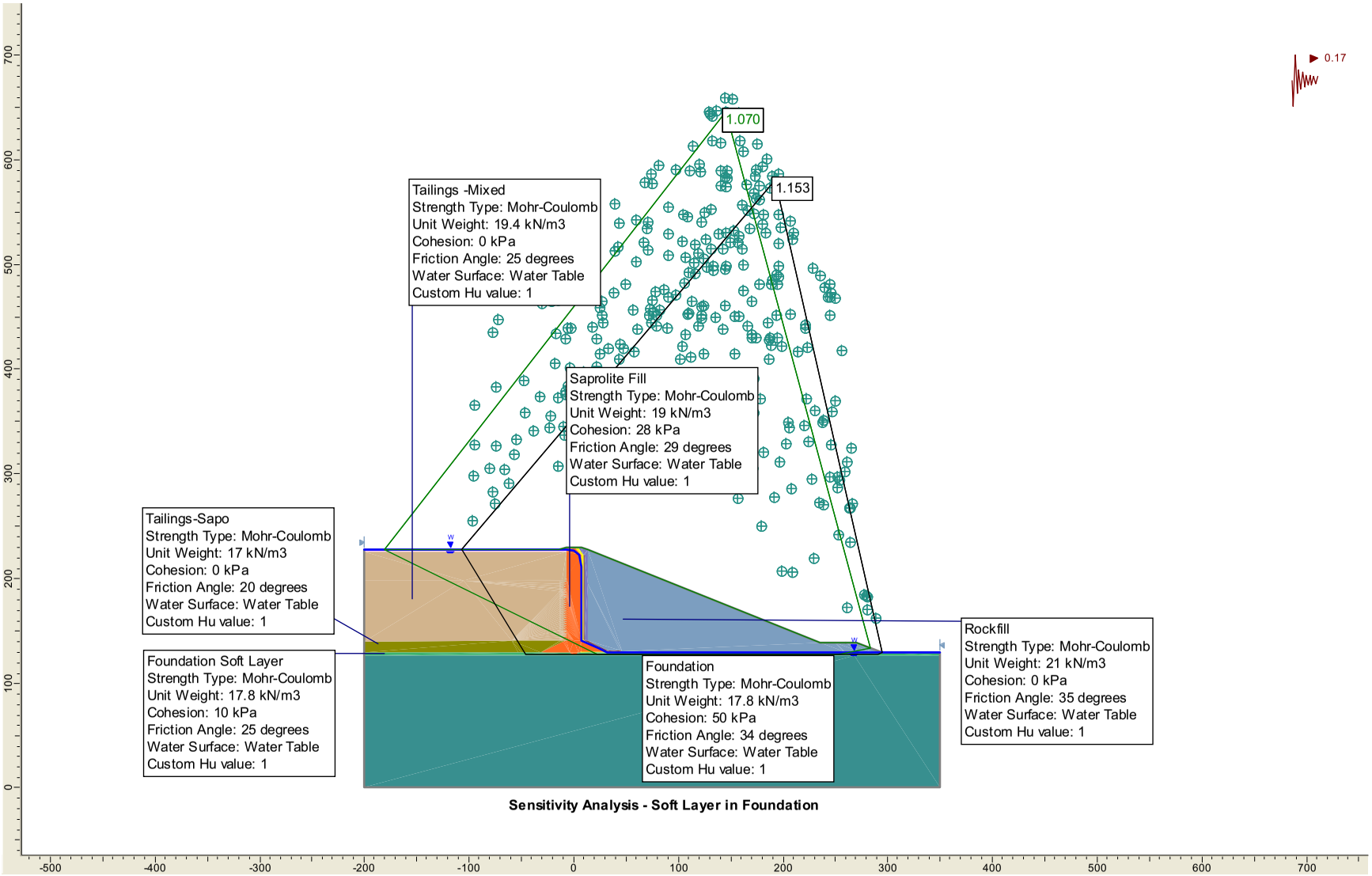
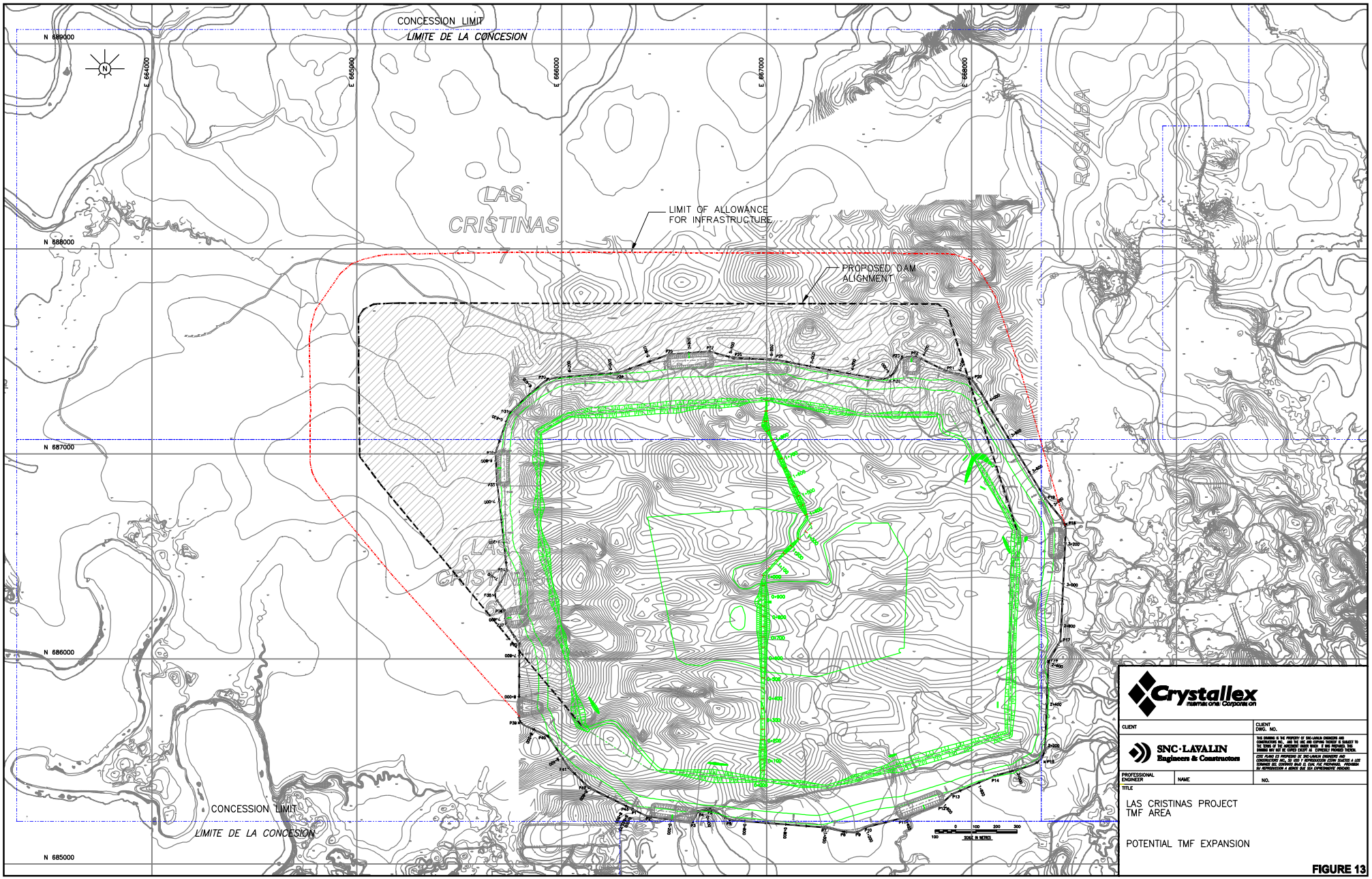


Figure 12: Ultimate Dam (2.5H:1V, 10m high, 35m wide toe berm)– Sensitivity Analysis (Seismic Loading Condition)





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