BSC

Design Calculation or Analysis Cover Sheet

Complete only applicable items.

1. QA: QA
2. Page 1 of 168

3. System	4. Document Identifier
Subsurface Facility	800-K0C-SSD0-00200-000-00B

5. Title
Prediction of Rockfalls in Nonemplacement Drifts Due to Preclosure Seismic Ground Motions

6. Group
Subsurface/Mining/Geotechnical

7. Document Status Designation
☐ Preliminary ☒ Committed ☐ Confirmed ☐ Cancelled/Superseded

8. Notes/Comments

1) Marek Mrugala has prepared this calculation. Branko Damjanac of Itasca Consulting Group, Inc. provided technical support to the analyses presented in Section 6 and Attachment II.
2) This analysis supersedes the previous version 800-K0C-SSD0-00200-000-00A
3) The document status designation is changed from Preliminary to Committed because the results are used to support regulatory-required safety analyses.

Attachments	Total Number of Pages
I. Determination of Seismic Velocity Spectral Density Functions Using Fast Fourier Transform	5
II. Post-Processing 3DEC Results	9
III. List of Files in 4 DVDs and 1 CD	96

RECORD OF REVISIONS

9. No.	10. Reason For Revision	11. Total # of Pgs.	12. Last Pg. #	13. Originator (Print/Sign/Date)	14. Checker (Print/Sign/Date)	15. EGS (Print/Sign/Date)	16. Approved/Accepted (Print/Sign/Date)
00A	Initial Issue	27	I-5	Yiming Sun Ming Lin	Dwayne Kicker	N/A	Fei Duan 10/20/2004
00B	Calculations revised considering an updated design base ground motions. Extensive revision (see Note 3). All pages are affected.	168	168	Marek Mrugala 6/21/07	Jay Cho 6/21/07	Fei Duan 6/21/07	Robert Saunders 6/21/07

DISCLAIMER

The calculations contained in this document were developed by Bechtel SAIC Company, LLC (BSC) and are intended solely for the use of BSC in its work for the Yucca Mountain Project.

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TABLES

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ACRONYMS AND ABBREVIATIONS

3DEC	3 Dimensional Distinct Element Code
BSC	Bechtel SAIC Company, LLC.
DOE	U.S. Department of Energy
DTN	Data Tracking Number
ECRB	Enhanced Characterization of the Repository Block
ESF	Exploratory Studies Facility
FFT	Fast Fourier Transform
GPa	giga Pascal
K_o	horizontal-to-vertical in situ stress ratio
MPa	mega Pascal
MT	metric ton
PC	Personal Computer
RHH	Repository Host Horizon
SC	Safety Category
SGPR	Subsurface Geotechnical Parameters Report
SNL	Sandia National Laboratories
STN	Software Tracking Number
TEV	Transport and Emplacement Vehicle
TDMS	Technical Data Management System
Tptpln	Lower Nonlithophysal Unit
Tptpmn	Topopah Spring Tuff Crystal-poor Middle Nonlithophysal Unit

1.0 PURPOSE

During transport from the repository surface facilities to the emplacement drifts, waste packages will be placed inside a Transport and Emplacement Vehicle (TEV) steel shielded enclosure to provide radiation protection and to protect the waste packages from the potential impact of rockfalls. The size, quantity, and distribution of the potential rockfalls need to be estimated in order to evaluate the potential impact of rockfalls on integrity of the steel waste package transporter shield.

The purpose of this calculation is to predict the size, quantity, and distribution of the potential rockfalls in the nonemplacement drifts, specifically in the area of access mains and turnouts, due to seismic ground motions, and to assess the overall stability of the excavations. This calculation is intended to provide input to the evaluation of the potential event sequences of the preclosure period and to the evaluation of rockfall impact on the waste package transporter shield (Reference 2.2.14) as specified in *Project Design Criteria Document* 000-3DR-MGR0-00100-000-006 (Reference 2.2.7, p. 78, Section 4.5.2.1), and *Basis of Design for the TAD Canister-Based Repository Design Concept* 000-3DR-MGR0-00300-000-000 (Reference 2.2.8 p.98, Section 8.2.3.1.1, and p.99, Section 8.2.3.1.4).

The scope of this calculation is limited to the prediction of rockfalls in the nonemplacement drifts during the preclosure period. The seismic event that triggers the rockfalls analyzed in this calculation corresponds to an annual probability of exceedance equal to 10^{-5}. The justification for selecting such a magnitude for this mean exceedance probability is addressed in the calculation succeeding Reference 2.2.6 currently under the development by the Preclosure Safety Analysis (PCSA) Group, and the results from this analysis should be used in the context of the PCSA interpretation.

The potential for damage to waste container and/or TEV shielded enclosure is highest for the nonemplacement drifts with largest spans. While the potential for a rockfall is present both in lithophysal and nonlithophysal strata, the potential for forming larger rock blocks is greater in nonlithophysal rock mass units because the rock blocks are relatively strong and the rock mass behavior is governed by the presence of discontinuities. Therefore, the nonlithophysal stratum is considered more representative for analysis since it is capable of producing larger blocks than the lithophysal strata encountered at the repository host horizon.

This analysis is a further refinement of the methodology presented in *Prediction of Rockfalls in Non-emplacement Drifts Due to Preclosure Seismic Ground Motions,* Revision A (Reference 2.2.13). It should be noted that Revision A accounted for seismic ground motions corresponding to a 10^{-4} annual probability of exceedance. Since this initial Revision A, rock mass strength properties have been revised and summarized in the *Subsurface Geotechnical Parameter Report (SGPR), Rev 00* (Reference 2.2.20). Work continued also on the further refinement of Design Basis Ground Motion, which resulted in revision of the ground motion waveforms, and consequently in revision of the ground motion input.

The current analysis includes results considering these new input refinements. Since there are two domains that involve changes, namely, rock mass strength properties and ground motion input, it was considered prudent to provide an assessment of the impact these changes may cause to the previously determined results.

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It should be noted that the use of Data Tracking Numbers (DTNs): MO0301SPASIP27.004. (Reference 2.2.23) and MO0402AVDTM105.001 (Reference 2.2.25) have been approved by their inclusion on the information exchange drawing, *IED Seismic Data,* 800-IED-MGR0-00701-000 REV 00A (Reference 2.2.19). Similarly, DTNs: SNF37100195002.001 (Reference 2.2.28) and SNL02030193001.027 (Reference 2.2.30) are included in *IED Geotechnical and Thermal Parameters II [Sheet 1 of 1],* 800-IED-MGR0-00402-000-00A (Reference 2.2.17), and DTNs: MO0306SDSAVDTH.000. (Reference 2.2.24) and MO0408MWDDDMIO.002 (Reference 2.2.26) are included in *D&E / PA/C IED Emplacement Drift Configuration and Environment [Sheet 1 of 2],* 800-IED-MGR0-00201-000-00B (Reference 2.2.9), and *IED Geotechnical and Thermal Parameters IV [Sheet 1 of 1],* 800-IED-MGR0-00404-000-00A (Reference 2.2.18), respectively. Data from Reference 2.2.20 Subsurface Geotechnical Parameters Report are owned by the BSC Subsurface organization and are not required to be included on an information exchange drawing. These data are qualified data and therefore are appropriate for use in this calculation.

2.3 DESIGN CONSTRAINTS

None

2.4 DESIGN OUTPUTS

This calculation is intended to provide inputs to the categorization of the potential event sequences of the preclosure period and to the evaluation of rockfall impact on the waste package transporter shield. The results will be used in the document succeeding the Reference 2.2.6 currently under the development.

3.0 ASSUMPTIONS

This section contains assumptions used in this calculation and the rationale for use.

3.1 ASSUMPTIONS THAT REQUIRE VERIFICATION

None.

3.2 ASSUMPTIONS NOT REQUIRING VERIFICATION

3.2.1 Average Depth of Openings Considered in Current Calculation

Assumption: A depth of 295 m for the nonemplacement openings is used in the current calculation.

Rationale: This value is based on the information of the depth near the center of emplacement drifts in Panel 1 (Reference 2.2.3, Table 5-2a). Since non-emplacement openings are in the same horizon as the one for emplacement drifts, it is therefore, considered adequate to use this depth for the purpose of this calculation. This assumption does not require verification. This assumption is used in Section 6.3.

3.2.2 In Situ Horizontal-to-Vertical Stress Ratios

Assumption: The horizontal-to-vertical in situ stress ratio (K_o) is assumed to be 0.5.

Rationale: This assumption is according to the in situ stress measurement by hydraulic fracturing in a test hole located in the TSw2 unit (References 2.2.28; 2.2.29, Table 4). The major horizontal principal stress with a direction of N15°E is (2.9 MPa/4.69 MPa)*100 = 62 percent of the vertical stress whereas the minor horizontal principal stress with a direction of N75°W is (1.7 MPa/4.69 MPa)*100 = 36 percent of the vertical stress. An initial horizontal-to-vertical stress ratio of 0.5 is assumed in the calculation. The K_o value selected as being equal to 0.5 is considered an average K_o value and is adequate for the purpose of this calculation. This assumption does not require verification, and is considered appropriate for this calculation. This assumption is used in Section 6.3.

3.2.3 Rock Property Data

Assumption: The data used in the Rev A analysis are adequate for use in the current Rev B calculation.

Rationale: This assumption is justified by comparing the data used in Rev A and the data summarized in the Subsurface Geotechnical Parameters Report Rev. 00 (Reference 2.2.20). These two sets of data presented side-by-side in Table 6-2 show that the parameters magnitudes are indeed very similar. Therefore, a valid assessment of the impact of 10^{-5} ground motions can be obtained without going through an intermediate step of first investigating an impact of ground motion using Rev A ground motion input and a new set of rock property data and then evaluating the impact of the new rock property data and a new set of ground motions. This assumption does not require verification, and is considered appropriate for this calculation. This assumption is used in Section 6.4.1.

3.2.4 Layout of Turnout Intersection

Assumption: The geometry and dimensions of the turnout intersection used in Rev A can be used in the current Rev B analysis.

Rationale: The dimensions of the openings at the turnout intersection are as provided in analyzed in the current calculation are based on the excavation dimensions provided in Reference 2.2.5 (e.g., turnout width 8-m , height 7-m, p. 56, Table 8). A preview of subsurface layout currently under the development indicates that an intersection of 7.62 m main access tunnel and 8.5 m wide turnout bulkhead excavation allowance. These dimensions are in close agreement. The magnitude of rockfall is governed mainly by the orientation, the frequency, and conditions of discontinuities within the rock mass. Small variations in dimensions of the intersecting openings are not expected to alter the overall results of this analysis. This assumption does not require verification, and is considered appropriate for this calculation. This assumption is used in Section 6.3 and in Section 6.5.3.

4.0 METHODOLOGY

4.1 QUALITY ASSURANCE

The calculation is prepared in accordance with EG-PRO-3DP-G04B-00037, *Calculations and Analyses*, and its requirements (Reference 2.1.2).

The Q-List designates some of the nonemplacement openings, such as north portal, north ramp, all access mains and turnouts as 'important to safety' category items and 'not important to waste isolation', and assigns the Safety Category (SC) as 'SC' (Reference 2.2.15, Table A-1, p. A-11). The rockfall results from this calculation are used for assessing the structural adequacy of the TEV that is important to safety. Therefore, this document is subject to the requirements of the *Quality Management Directive* (Reference 2.1.1) and the approved version is designated as QA: QA

4.2 USE OF SOFTWARE

All software documented in this section is appropriate for applications used in this calculation. The software is managed under IT-PRO-0011, *Software Management* (Reference 2.1.3), and was obtained from Software Configuration Management in accordance with IT-PRO-0011.

4.2.1 Level 1 Software Usage

The Level 1 software used in this calculation is identified in Table 4-1.

Table 4-1 List of Level 1 Software Used in This Calculation

Software Title / Version	Software Tracking Number (STN)	Description of Software Use
3DEC (3 Dimensional Distinct Element Code) Version 2.01	STN: 10025-2.01-00	3DEC was used in calculation considering rock mass as discontinuum and seismic analyses.

4.2.1.1 3DEC Computer Software

The commercially available computer program, 3DEC (3 Dimensional Distinct Element Code, Reference 2.2.1, STN: 10025-2.01-00), was used in this calculation. 3 DEC Version 2.01 is a three-dimensional program based on the distinct element method for discontinuum modeling. It is used to simulate the response of discontinuous media (such as a jointed rock mass) subjected to either static or dynamic loading. A detailed discussion on the general features and fields of the 3DEC software applications is presented in the User's Manual (Reference 2.2.22).

3DEC was used to analyze the seismic effects on block movement in the nonemplacement drifts excavated in the nonlithophysal rock unit. The 3DEC analyses were performed on stand-alone personal computers (PC) with a Pentium microprocessor and Microsoft Windows 2000/NT operating system. While the majority of calculations were performed on PCs located in home office, some calculations were performed on PCs located in the office of the Itasca Consulting Group, Inc., Minneapolis, Minnesota. The software was used only within the range of its validation as specified in the software qualification documentation (Reference 2.2.2, Table 2-2) in accordance with the IT-PRO-0011 procedure. The validation test cases of Test 1 and Test 2 documented in the *Software Implementation Report for 3DEC Version 2.01* (Reference 2.2.2, Table 2-2) support the application of mechanical and quasi-static analyses conducted for this calculation.

Input and output files for the software used in this calculation are archived on DVD discs and submitted to the Records Center. A comparison between the results obtained in Rev A and current results is made utilizing data stored in the TDMS DTN: MO0410MWDPRNDP.000 (Reference 2.2.27). The Rev A data are referenced in the text where appropriate. A listing and relevant information pertaining to the input and output files can be found in the Attachment III. The results are presented graphically and described in Section 6.

4.2.2 Level 2 Software Usage

In addition to the 3DEC software, the standard functions of commercial-off-the-shelf software, including Excel® 2000 SP-3 (STN: 610236-2000-00), Mathcad Version 11.2a (STN: 611161-11SP2A-00), and WinZip Version 9.0 (STN: 610649-9.0-00), were also used. The Excel was used to support calculation activities and visual presentation of results as presented in Section 6. The results are verified by hand calculation and visual inspection. Mathcad and its standard 'cfft' function were used in Attachment I to support calculation of seismic wave power spectral densities. WinZip was used to group and compress the input and output files and the results were verified by visually comparing the content of DVDs with the content of subdirectories used to store the original uncompressed files. All software in this category was performed on personal computers with a Pentium microprocessor and Microsoft Windows 2000 operating system. The Excel files are included in the Disk CD_1 submitted with this calculation.

Use of Microsoft® Excel, Mathcad Version 11.2a, and WinZip Version 9.0 are considered Level 2 controlled software that are commercially available and are not required to be qualified per IT-PRO-0011, *Software Management* (Reference 2.1.3, Attachment 12).

Note that few simple hand calculations were performed and documented in the body of this calculation.

4.3 CALCULATION APPROACH

Analyses of data presented in this calculation were performed using results from two series of computer simulations and quasi-static loading approach, of which validation is presented in Section 6.2.2 and summarized in Table 6-1. Analysis performed on the Series 1 results were based on the rock property data used in the *SGPR* Rev 00A (Reference 2.2.4) and 15 distinct combinations of ground motion velocity data. The ground motion data were paired with one of the fracture patterns generated using FracMan software for the purpose of analyzing emplacement drift stability (Reference 2.2.10, Tables 6-7 and 6-8 and Reference 2.2.23). A comparison of rock property data summarized in Table 6-2, show that the recently updated properties of rock (*SGPR* Rev 00, Reference 2.2.20) are similar to those used in Rev 00A (Reference 2.2.13) (also see Assumption 3.2.3).

The calculation results presented in this analysis were obtained in two series of computer simulations. Both Series 1 and Series 2 in the current calculation were performed using the same rock property data as those used in Revision A.

With the rock property data unchanged, the results obtained in Series 1 for several rock jointing patterns identical to those used in 10^{-4} ground motion study could be used for a direct assessment of the impact of the new seismic input on the magnitude of rockfalls between 10^{-4} and 10^{-5} ground motion cases.

After completing analysis of Series 1 results, the second series of calculations was performed using the same rock property data and the same ground motion set of 15 cases, each paired to an additional unique jointing pattern. In effect, 15 sets of ground motion data were paired to 30 distinct rock fracture patterns, which allowed for the development of larger population of rockfall cases, thus providing basis for a more extensive statistical representation of the rock strata and better quantification of the resulting rockfalls. A correlation between the initially developed ground motion/fracture pattern number combinations and cases analyzed in the current calculation are provided in Table 6-3. Each pair of ground motion and fracture pattern data is assigned an individual realization number. Since in the current analysis each of the two series of computer calculations contains 15 realization data sets, in both sets the number of ground motions remains the same but fracture patterns are not repeated. As a result, the rockfall data calculated from both series is evaluated using a 30 unique fracture and associated rock jointing patterns.

As explained in more detail in Section 6, the problem geometry was based on the layout of intersection between the access main and the turnout near the launch chamber. Considering the facts that the ratio of the wavelength to the maximum span of the opening under evaluation is large and that the 10^{-5} ground motions have a relatively long duration (low frequency), the quasi-static approach was adopted to implement the equivalent seismic loads. Here, the loading pattern for each case analyzed was derived using the most severe combination of stresses calculated for a particular case of seismic ground motion. The resulting rockfalls are presented on a series of plots illustrating the rockfall block elevation versus rockfall volume distribution.

5.0 LIST OF ATTACHMENTS

Table 5-1 lists attachments of this calculation.

Table 5-1 List of Attachments

Attachment	Description	No. of Pages
I	Determination of Seismic Velocity Spectral Density Functions Using Fast Fourier Transform (FFT)	5
II	Post-Processing Results from 3DEC Simulations	9
III	List of files contained in 4 DVDs (DVD_1 to DVD_4) and 1 CD (CD_1)	96

6.0 BODY OF CALCULATION

This section describes the approach and results of the prediction of potential rockfalls in the nonemplacement drifts due to the preclosure seismic ground motions. The initial analyses (Rev A, Reference 2.2.13) were carried out for 10^{-4} annual frequency of occurrence ground motion, hereafter referred to as 10^{-4} ground motion. In the current calculation, a rockfall potential under 10^{-5} ground motion is examined.

6.1 INTRODUCTION

General - During transport from the surface facilities to the emplacement drifts, the waste packages will be stored inside the TEV shielded enclosure (Reference 2.2.14). The purpose of the TEV shielded enclosure is to protect workers from waste package radiation as well as to protect the waste package from the impacts of rockfall should they occur during transport. The potential for rockfall in the emplacement drifts has been investigated extensively in the *Drift Degradation Analysis* for both pre- and post-closure conditions (Reference 2.2.10). The analysis was carried out considering rock mass both as continuum and discontinuum. The objective of the analysis presented in this calculation is to provide an assessment of the potential rockfall magnitude in the nonemplacement drifts. Here, the most severe case is represented by the access main/turnout intersection, which has a largest roof span.

Differences Between Rev A and Current Rev B Analyses - The Rev A analysis was performed where the potential rockfalls were evaluated for a single form of 10^{-4} ground motion data (Reference 2.2.13). In the current (Rev B) analysis ground motion input was revised substantially. It is based on 15 distinct vibratory ground motion patterns with the annual probability of exceedance equal to 10^{-5}. In combination with the stochastically derived rock mass fracture pattern data, the two data sets, set 1 referred to as 3DEC cases including 30, and set 2 including 105 combinations of ground motion/fracture pattern cases (generally referred to as realizations) were determined (Reference 2.2.23) (also see Disk CD_1, worksheet *Input All – Comparison of Current vs Previous Study.xls*, Tabs: Table I-1 – 3DEC Cases, Table I-2 - 105 cases, and Report_Table_6_3). Among those, two series of cases, each based on 15 ground motions (for information graphically presented in Disk CD_1, *Ground Motion Input Data – Waveforms.xls*) and associated unique rock fracture pattern were evaluated. In addition, since the current report is based on examining effects of ground motions of much higher energy, an attempt was made to provide a link between the current and the previously analyzed ground motion/rock fracture combination cases. Table 6-6 provides a cross-reference between the cases analyzed using 10^{-4} ground motion data and cases analyzed in Series 1 for 10^{-5} ground motion data.

Intersection Geometry - As described in more detail in Section 6.3, the intersection between access main and the turnout has the largest active roof span (Reference 2.2.12, Section 6.5.1) and provides natural focal case for the rockfall analysis. Analysis at this location was selected because it is anticipated that there is the largest potential for the rockfall en route from the surface facilities to the waste package final destination in the emplacement drift. Therefore, stability analysis of the intersection between the access main and the turnout, considering rock mass as discontinuum, is performed to estimate the size of blocks that could impact the transporter shield. The analysis was evaluated for in situ stress conditions and pre-closure seismic ground motions.

Lithophysal versus Nonlithophysal Rock Strata – The lithophysal rock strata are characterized by a relatively small joint lengths and joint spacing. In effect, the expected size of blocks during the rockfall in lithophysal rock mass and blocks that can become unstable is relatively small. By comparison, long, persistent joints and relatively larger joint spacing in a nonlithophysal rock mass provide conditions for generating large rock blocks. Therefore, the rockfall in a nonlithophysal rock mass capable of producing large rockfall blocks, potentially of concern in the TEV design, was considered in this calculation.

Limits of Numerical Modeling - The size of the rock mass block used in calculations and joint pattern can lead rapidly to the model size that becomes difficult for performing calculations due to excessively long (order of several months) computer runs. During the development of the blocky rock mass, therefore, the size of rock mass sample is limited to dimensions that contain the fractured rock mass blocks in the vicinity of the opening only, while the remaining portion of the rock mass sample contains a smaller number of deformable blocks. These deformable blocks allow for performing calculations within a tolerable (2 to 5 weeks single run duration) timeframe without undue impact on the rockfall analysis.

In effect, an explicit jointing, using the synthetic jointing model of the nonlithophysal rock mass (Reference 2.2.10), is included only in a portion of the model, and the rest of the model does not contain joints explicitly. The region that contains joints explicitly is located around and at some distance away from the openings. The purpose of using a portion of the model with explicit jointing involving smaller rock volume is to reduce the size of the model. This reduction in the model size is such that modeling results are not affected by excluding joints in regions at some distance from the openings. This simplification is justified because the joints that are at some distance from the excavations generally delineate the blocks that do not either participate in the rockfall nor affect the rockfall volume and consequently, are not necessary to be included in the model. The dimensions of the region containing explicit jointing are: length 30-m, width 20-m, and height 15-m. These dimensions are much larger than dimensions of the fractured block size used in the model of the emplacement drift for *Drift Degradation Analysis* (Reference 2.2.10, Section 6.3.1.1).

Fully Dynamic versus Quasi-Static Approach - To acquire a sufficient amount of data needed for a meaningful statistical analysis, a number of calculations involving different combinations of fracture patterns paired with ground motion cases are necessary. The use of a fully dynamic analysis, similar to those used in prediction of rockfall in the emplacement drifts (Reference 2.2.10), is possible for predicting rockfall in intersections. Generally, the overall methodology is very computation-intensive, and typically such calculations are of long duration. Large wavelength in comparison to the opening dimensions, low frequency of ground motions and resulting uniform stresses were considered to justify the decision of analyzing the stability of intersection and the rockfall magnitude in the nonlithophysal rock mass using a more efficient quasi-static approach. This method, involving performing a sequence of quasi-static simulations, is described and validated in Section 6.2. The results of simulations are presented in Section 6.4.

6.2 QUASI-STATIC ANALYSIS OF DYNAMIC LOADING

6.2.1 Description of Approach

The interaction of a seismic ground motion with an underground opening of interest depends on the ratio of the wavelength to the maximum dimension of the opening. If this ratio is large, the transient ground motion caused by seismic waves produces basically quasi-static loading. Therefore, assessment of the effect of dynamic load on stability of the underground opening using the quasi-static analysis is justified.

Preclosure seismic ground motion is based on an event of the annual exceedance probability of 1×10^{-5} (100,000 years). The time histories of the three corresponding ground motion velocity components are shown in Figure 6-1. Using a fast Fourier transform (FFT) scheme (see Attachment I), the velocity power spectral densities for these three velocity components can be obtained. As an example, shown in Figure I-1 are the spectral densities calculated for the 10^{-4} ground motion. These power density spectra indicate that major portion of the energy of this ground motion is transmitted by the relatively low-frequency (less than 1 Hz) oscillations.

Simple calculation demonstrates that the S-wave length (λ), using a frequency (f) of 1 Hz, a shear modulus (G) of 13.6 GPa, and a density (ρ) of 2410 kg/m^3, is approximately equal to 2400 m [$\lambda = C_s/f = 2376/1 \approx 2400$ m, where $C_s = \text{sqrt}(G/\rho) = \text{sqrt}(13.6\times10^9/2410) = 2376$ m/s]. This wavelength is much larger than the dimension of the intersection in cross-section or the characteristic size of any block that may potentially become unstable. The favorable consequence of a large wavelength is that the underground opening and a significant portion of the rock mass surrounding it are subjected to almost homogeneous stress change caused by the ground motion. In other words, the large wavelength causes that the opening does not experience significant seismically induced stress or strain gradients.

The analysis of drift stability for seismic loading was carried out by the quasi-static simulation of a series of the loads calculated from the velocity histories. Stress changes corresponding to the free-field velocity histories are estimated based on plane wave propagation (Reference 2.2.22, 3DEC Optional Features, Equation 2.8):

$$\begin{aligned}
\Delta\sigma_{zz} &= C_p \rho v_z \\
\Delta\sigma_{xx} &= \Delta\sigma_{yy} = \frac{\nu}{1-\nu}\Delta\sigma_{zz} \\
\Delta\sigma_{xz} &= C_s \rho v_x \\
\Delta\sigma_{yz} &= C_s \rho v_y
\end{aligned} \qquad \text{(Eq. 6-1)}$$

where $\Delta\sigma_{ij}$ $(i, j = x, y, z)$ are the stress tensor components, C_p and C_s are P- and S-wave velocities, ρ is the density, ν is the Poisson ratio, and v_i are the components of the incoming velocity vector. The vertical coordinate axis is z; and x and y are the horizontal coordinates axes. (Consequently, $v_x = v_{\text{H1}}$, $v_y = v_{\text{H2}}$ and $v_z = v_{\text{V}}$.).

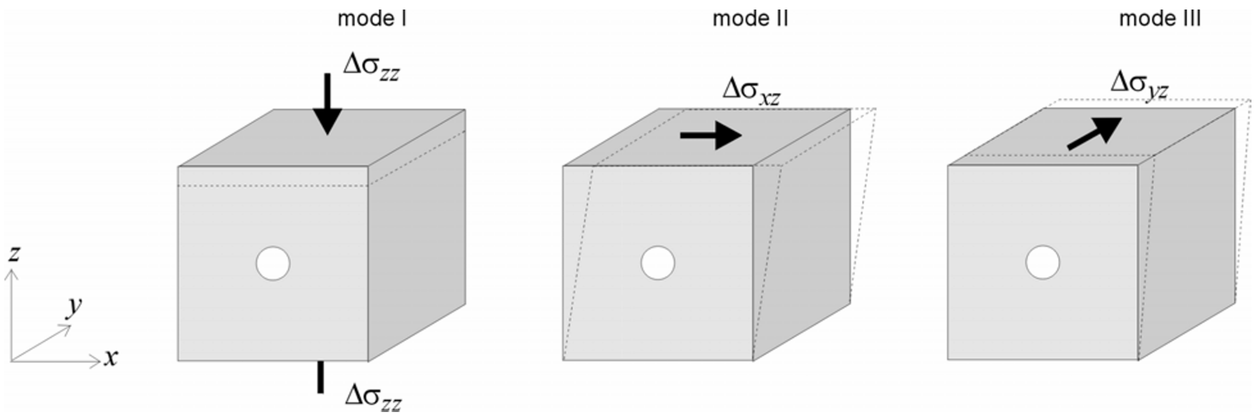


Figure 6-1 Modes of Deformation Induced by Seismic Ground Motion

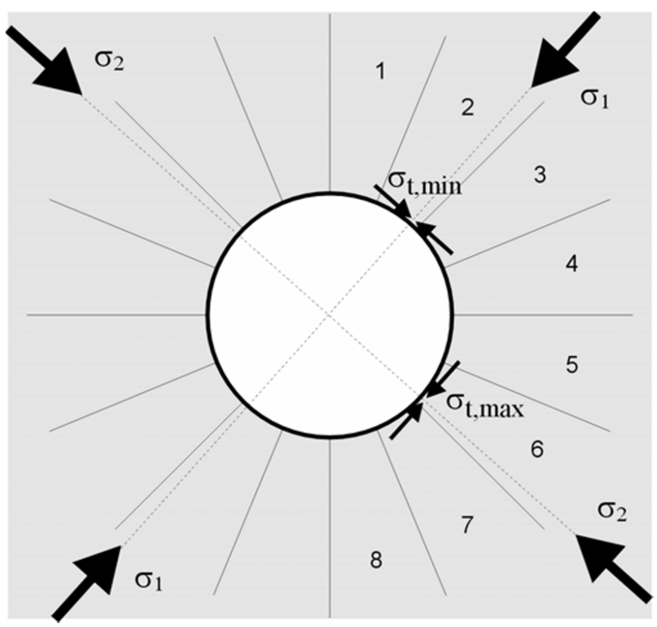


Figure 6-2 Selection of Critical Loads on the Opening

Using the plane wave propagation to estimate seismically induced stress changes is appropriate because for large wavelength (compared to the size of the excavation) the opening does not cause distortion of the incoming wave or the wave does not "see" the opening. In all further analyses, stress changes $\Delta\sigma_{xx}$ and $\Delta\sigma_{yy}$ are neglected, which is conservative because the deviatoric part of the stress change is increased. The modes of deformation caused by seismically induced changes of the three component of the stress tensor are shown in Figure 6-1. Modes I and II affect magnitude and orientation of maximum hoop stresses in the plane normal to the tunnel axis. Stress concentrations around the opening for the free-field stress changes (see Equation 6-1) can be estimated from the following relation (Reference 2.2.21, Equations 34 and 35):

$$\sigma_{t,\max} = 3\sigma_1 - \sigma_2$$
$$\sigma_{t,\min} = 3\sigma_2 - \sigma_1 \quad \text{(Eq. 6-2)}$$

where σ_1 and σ_2 are the principal stresses calculated for the stresses acting in the plane normal to the tunnel axis (i.e., in *xz*-plane in Figure 6-1). Compressive stresses are considered positive in this calculation.

Using Equation 6-1, it is possible to calculate the entire stress history ($v_x(t)$, $v_y(t)$ and $v_z(t)$ are functions of time as shown in Figure 6-5 and Figure 6-6), to which the opening is subjected. Rockfall can occur from different locations in the walls and the tunnel roof. Some stress changes induced by the seismic ground motion could be critical for the stability of the blocks in the roof, while a different stress change might be critical for stability of the blocks in the wall. For this reason, the circumference of the opening is divided into a number of segments, n_{seg}. Eight segments, as indicated in Figure 6-2, are used in the simulations. The closed form applies to the circular opening, where because of symmetry, the segments can be considered on one side of the tunnel only. Using numerical distinct element method this concept can be extended for noncircular openings as the solution for each space segment is obtained as a part of the overall solution, and segments are used to estimate the magnitude of rockfall within the predetermined segments around the opening of arbitrary shape.

For each segment, stress changes caused by ground motion, which cause the extreme, i.e., the maximum and the minimum stresses to be generated on the tunnel circumference, hoop stresses are determined. Although it is expected that a decrease in compressive stresses (i.e., the smallest stress change) is critical from the perspective of block stability, the other extreme (when compressive hoop stresses increase) is analyzed as well. For certain cases, e.g., when joints intersect the tunnel boundary at a small angle, an increase in hoop stresses can be critical to block stability. Two stress changes with extreme values of out-of-plane shear stress, $\Delta\sigma_{yz}$, are also determined. All the critical stress changes (for hoop stresses and out-of-plane shear) are superimposed on in situ stresses, and ordered in the sequence in which they occur during ground motions. The number of critical stress states can be, at most, $2n_{seg} + 2$; however, the number is usually smaller, because the critical states for different segments can be the same. The model is quasi-statically simulated for equilibrium for all the critical stress states in the sequence. For some of the critical stress states rockfall may occur before the equilibrium is achieved.

A force is required to move the already destabilized block into the open tunnel and detach it from the rest of the rock mass. The gravitational body force acts permanently vertically downward and certainly affects rockfall from the tunnel roof. For deep tunnels, the gravitational force is small compared to rock mass stresses, but it causes free fall of the blocks that already are destabilized by the action of stress changes caused by stress redistribution due to excavation. During the seismic ground motion additional body forces that contribute to the rockfall are the inertial forces. Orientation of seismically induced inertial forces varies during ground motion. When the inertial forces become horizontal, they can pull out the loose blocks from the tunnel wall and cause their fall. To account for the effect of inertial forces on rockfall during the quasi-static simulations, particularly for the blocks in the drift walls, an additional body force is applied on the loose blocks.

The procedure utilized during the previous (10^{-4} ground motion) considered the magnitude of the body force corresponding to an acceleration of approximately 1g, and oriented toward the center of the opening. The magnitude and orientation were selected to ensure conservative results. The maximum acceleration during 10^{-4} ground motion is 0.47g (Reference 2.2.24, MatV.ath). In the current (10^{-5} ground motion) analysis 15 ground motion patterns are used. The procedure similar to one described above was applied. First, each ground motion pattern was scanned for the maximum acceleration. The body force corresponding to this acceleration value was applied acting toward the center of the opening during the execution of the program for a particular case. The constant, sustained body force acting toward the center of the opening would result, under most circumstances, in more rockfall than inertial forces varying randomly in magnitude and orientation.

6.2.2 Validation of Approach

Application of the quasi-static approach instead of full dynamic analysis requires validation. This validation is accomplished by comparing rockfall predictions obtained using the quasi-static approach against results for cases based on a fully dynamic approach. The fully dynamic approach was used in the *Drift Degradation Analysis* (Reference 2.2.10) to predict potential rockfalls in the emplacement drifts subject to both the preclosure and postclosure seismic ground motions. The analyses were carried out for different realizations of jointing of the rock mass. For the purpose of validation of the quasi-static approach, two cases associated with the preclosure ground motion are considered. Subsequently, these two cases 23 and 38 were reanalyzed using the quasi-static approach. The summary of the rockfall predictions based on dynamic and quasi-static approaches is presented in Table 6-1.

Table 6-1. Comparison of Rockfall Predictions for Emplacement Drift Using Dynamic and Quasi-static Approaches

Case No.	Jointing No.	Dynamic[a]			Quasi-Static[b]		
		No. of Blocks	Total Volume (m^3)	Max. Volume (m^3)	No. of Blocks	Total Volume (m^3)	Max. Volume (m^3)
23	5	22	3.13	0.84	30	1.58	0.41
38	29	62	7.17	0.69	213	19.15	0.96

Source: [a] Reference 2.2.10, Section 6.3.1.2.6; Reference 2.2.26, file: nonlith rockfall characteristics in emplacement drifts with 1e-4 gm.xls
[b] For Quasi-Static Loading see Cases_23_&_38 – Quasi_Static_Summary.xls (Submitted on Attached CD_1)

Table 6-1 presents a comparison between the results of analysis considering a fully dynamic loading and those obtained using quasi-static approach. The procedure applied to calculate the number of rock blocks and the total rockfall volume involved two stages. During the first stage the entire model rock mass was brought to equilibrium, the access main/turnout intersection was excavated in one step, and the model was cycled to equilibrium again. At the end of this phase a number of rock blocks have fallen and were removed from the model volume. In the second stage the rockfall resulting from ground motion was calculated. The final number of rockfall blocks and the total rockfall volume were calculated as a difference between the final block count and the initial rockfall count due to access main/turnout excavation obtained for the dynamic case.

The quasi-static approach results in predictions that are within 50 percent of the dynamic analysis predictions in terms of different parameters of rockfall listed in Table 6-1 (i.e., a number of blocks, total volume of blocks, and volume of the largest block). For case 38, the quasi-static predictions of rockfall are larger (i.e., conservative) than predictions based on the dynamic analysis. It was concluded that quasi-static analysis yields satisfactory results and that it can be justified for use in predictions of general characteristics of the rockfall from the nonemplacement excavations evaluated in terms of rock volume distribution and the range of block elevations.

6.3 MODEL DESCRIPTION

The predictions of rockfall in the nonemplacement drifts were carried out for the intersection between the access main and the turnout toward the emplacement drift. There are five typical layouts of intersections considered in the analysis of stability of the intersections and ground support. These different layouts were defined as locations A through E shown in Figure 6-1 of Reference 2.2.12. Only location A is considered in this calculation as shown in Figure 6-3, because it has the largest span (Reference 2.2.12, Figure 6-10). The geometry of the intersection for the location A as represented in the 3DEC model is depicted in Figure 6-3 showing the tunnels only, i.e., the surrounding rock mass is hidden. The access main has a circular cross-section with a diameter of 7.62 m. The turnout has a horseshoe shape in the cross-section with dimensions 8-m wide and 7-m high elevation (see Assumption 3.2.4). The floors of the two tunnels are at the same. The dimensions of the entire model are 100 m × 100 m in plan and 50 m in height. The geometry of the 3DEC model is shown in Figure 6-4. The region, in which the jointing of the rock mass is represented explicitly, is 30-m long, 20-m wide and 15-m high surrounding the opening. The cross-section of this region is illustrated in Figure 6-4.

The vertical in-situ stress is gravitational and is the major principal stress. Its value is calculated using the average rock density of 2410 kg/m^3 (see Table 6-2), and the average depth of 295 m for the nonemplacement drifts (see Assumption 3.2.1). The initial stress state in the horizontal plane is set to be isotropic, with a magnitude of 50 percent of the vertical in-situ stress (see Assumption 3.2.2). The vertical model boundaries are fixed in the normal direction but free in the tangential direction (i.e., "roller"). The overburden weight is applied as a stress boundary condition at the top of the model.

The simulations were conducted in several steps. First, the model was equilibrated for in-situ conditions (no excavations). Subsequently, the tunnels included in the model were excavated along their entire length. After excavation, the calculations were run to bring the model to equilibrium using elastic properties of rocks only. After a state of equilibrium was attained, the calculations continued considering the actual joint strength and rock strata properties. The purpose of such an approach is to reduce the inertial effects associated with the sudden material removal (i.e., excavation of entire tunnels) on the results. Finally, the model was subjected to a sequence of critical stress states occurring during the seismic ground motion, that were determined as described in Section 6.2.1.

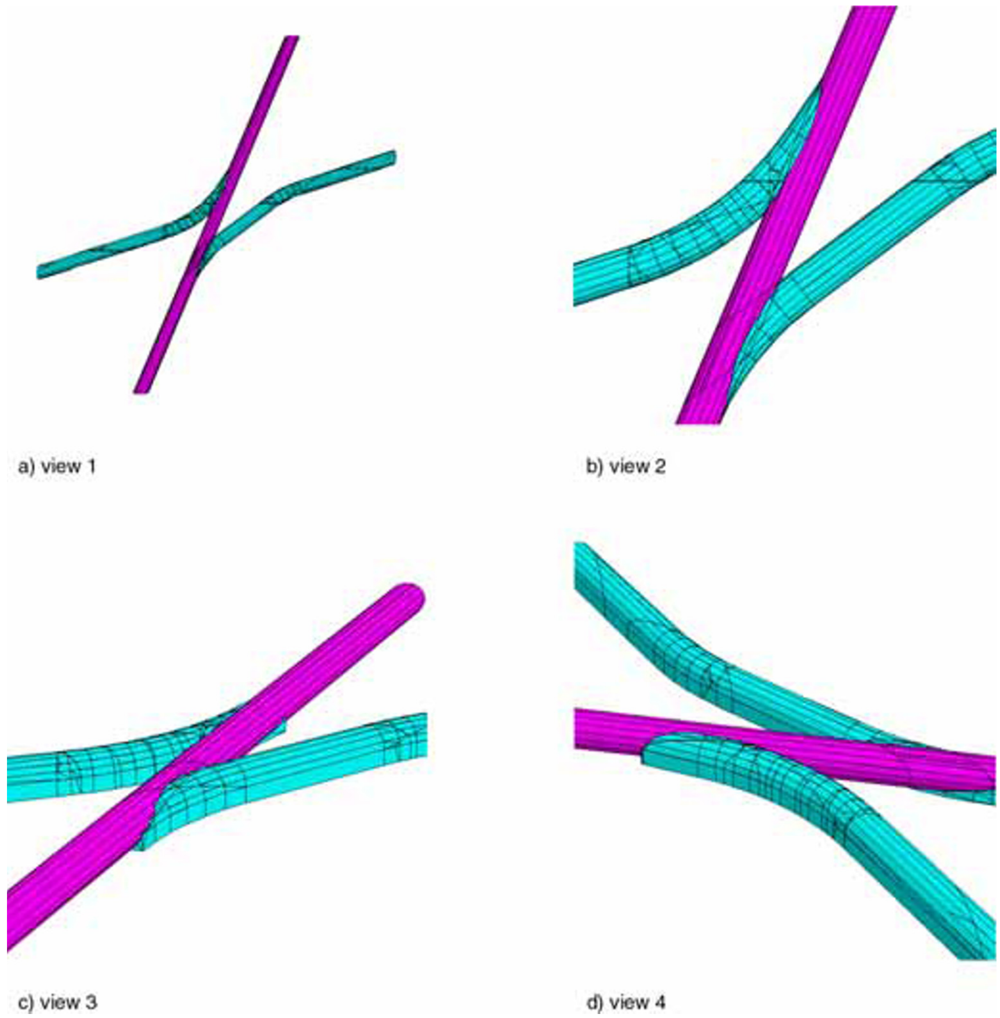


Figure 6-3 Geometry of Intersection

The stress change from one current far-field stress state to the next is superimposed on the current equilibrium stress state for all zones and joints in the model. After superposition of the stress increment, the calculation continues until a new state of equilibrium is attained. The solution is obtained as described above in two phases. During the phase 1 the solution is obtained using elastic material properties only, and then during phase 2, considering the actual joint strength and rock strata properties.

The rock blocks are modeled to behave elastically. Inelastic deformation of joints and joint bridges is controlled by the Coulomb slip criterion. The mechanical properties of blocks and joints used in the model are listed in Table 6-2. 3DEC cannot represent geometry of partially fractured blocks. However, the effect of partial fracturing can be achieved mechanically by increasing the strength (bonding or a “bridge”) of a portion of through-going crack. If the strength is exceeded, the fracture can propagate through the bonded portion of its trace, effectively breaking the “rock bridge.” Details pertaining to the methodology for generation of joints and rock bridges in the nonlithophysal rock mass can be found in the *Drift Degradation Analysis* (Reference 2.2.10, p. 6-117).

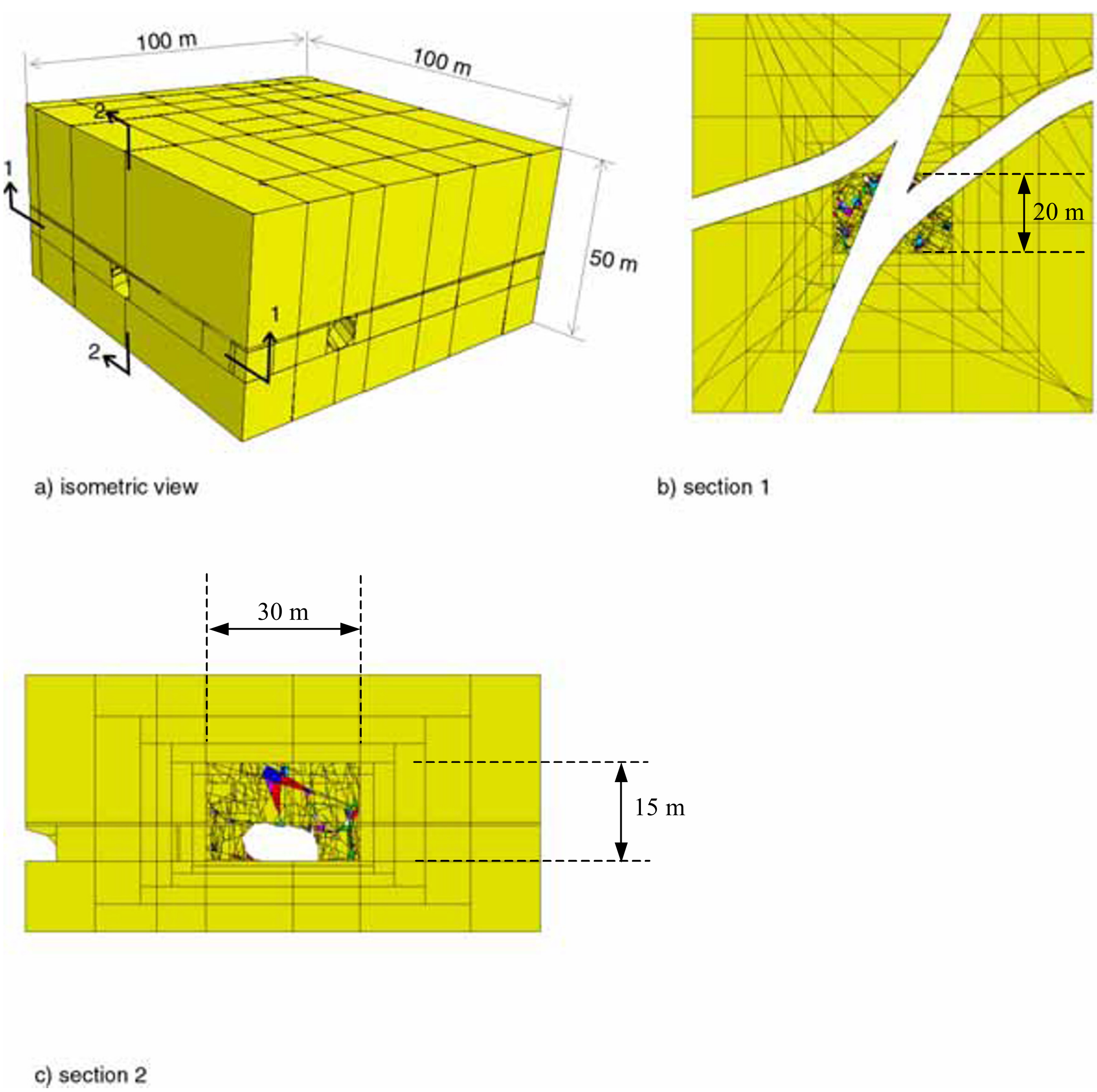


Figure 6-4 Geometry of the 3DEC Model

6.4 INPUT PARAMETERS

6.4.1 Mechanical Properties of Nonlithophysal Rock

Rock mass properties for non-lithophysal (Tptpmn) rock are listed in Table 6-2. This table contains two sets of rock property data. Listed in column 2 are the "old" properties of nonlithophysal rock used in the previous (Rev A) as well as in the current (Rev B) analyses and are referred to as the Base Case Rock Strata Parameters. Column 4 contains the most recent data available in the SGPR, Rev. 00 (Reference 2.2.20). A comparison of the "old" and "new" values indicates that the rock strength data are very similar. Since the joint property source data have not changed since the previous revision of this report, they are not updated in the current (Rev B) analysis (Assumption 3.2.3). The details associated with the methodology on how these values are estimated for use in 3DEC are available in the SGPR Rev 00 (Reference 2.2.20, Section 6.4.4 and Table 6-76).

6.4.2 Synthetic Fracture Patterns in Nonlithophysal Rock

Three-dimensional synthetic fracture patterns in the nonlithophysal rock are used to predict the potential rockfalls in the nonemplacement drifts. These fracture patterns are obtained based on the DTN: MO0301SPASIP27.004 (Reference 2.2.23). The synthetic fracture patterns are parts of a representative volume of jointed rock mass, which was generated using the FracMan fracture generation program based on the observations made in the exploratory tunnels, Exploratory Studies Facility (ESF), and Enhanced Characterization of the Repository Block (ECRB). Detailed description of the geology and the process for generation of the synthetic fracture patterns is provided in the *Drift Degradation Analysis* (Reference 2.2.10, Section 6.1.6).

6.4.3 Seismic Ground Motion Data

Site-specific seismic ground motions with time histories are used as a source in the quasi-static loading simulation in the current calculation. In contrast to the 10^{-4} ground motion data, which include only one set of ground velocity histories, the 10^{-5} input data include 15 sets of seismic ground motions patterns, each supplied with two horizontal components (H1 and H2) and one vertical component (V) of acceleration, velocity, and displacement. Seismic velocity time histories for the annual exceedance probability of 1×10^{-4} (10,000 years) used in the previous analysis, are shown in Figure 6-5 (Reference 2.2.24, MatH1.vth, MatH2.vth, and MatV.vth). Figure 6-6 shows an example of the time histories of velocity components of seismic motion for the repository level at 1×10^{-5} (100,000 years) annual exceedance frequency (Reference 2.2.25, 1e-5h1_12.vel, 1e-5h2_12.vel, and 1e-5up_12.vel). The Excel file *Ground Motion Input Data – Waveforms.xls* (Disk CD _1) presents a set including 15 ground motion velocity waveform combinations of 10^{-5} ground motion velocity histories used as input in the current calculation. Each ground motion is matched to the two different, unique rock jointing patterns.

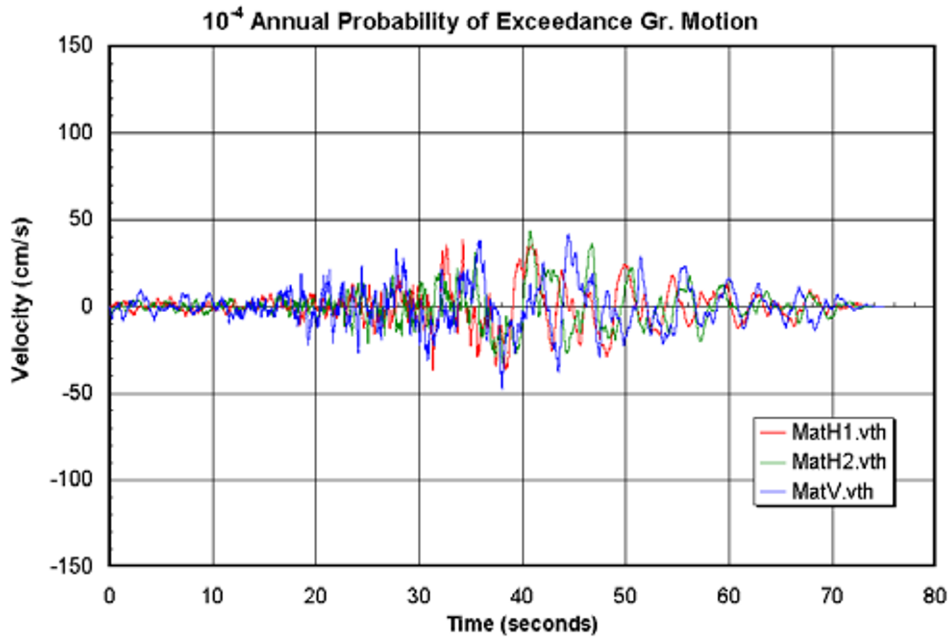
The time histories of the velocity data shown in Figure 6-5 and Figure 6-6 are plotted in the same system of coordinates. Although each ground motion is characterized by a unique waveforms, the Case 12 was selected to provide evidence that the 1×10^{-5} (100,000 years) annual exceedance frequency data indeed display much higher amplitudes and the associated energy than the 1×10^{-4} (10,000 years) seismic events.

In the dynamic model, only the velocity time histories were used. Details on how these seismic velocity time histories are applied in numerical calculations are described in Section 6.1.

Table 6-2 Mechanical Properties of Nonlithophysal Rock

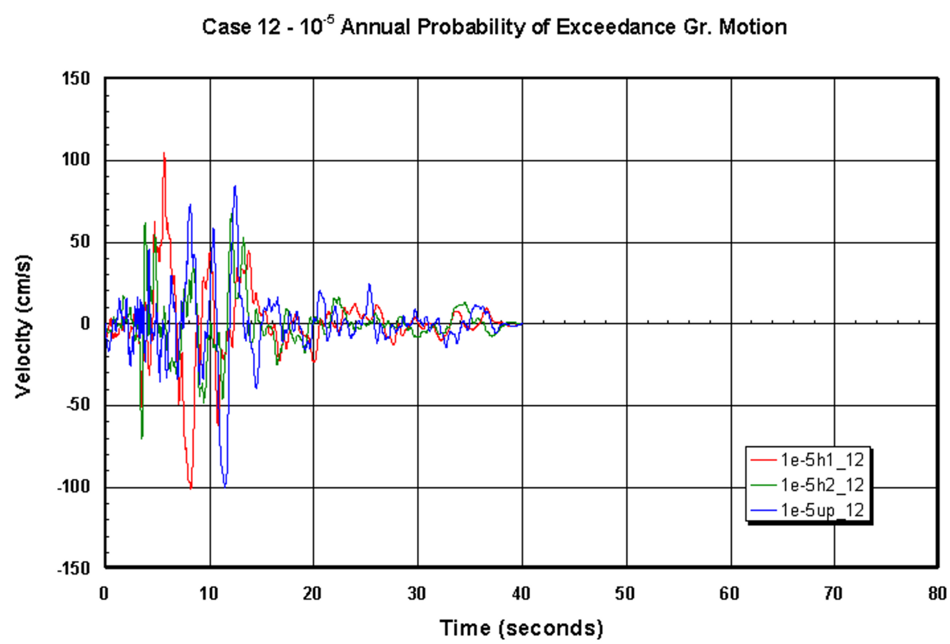
	Original Rev A Data Used in Current (Rev B) Calculation		SGPR Rev 00 Data for Comparison and Information Only	
Property	**Base Case Rock Strata Parameters[(1)]**	**Data Source**	**Parameter Value**	**SGPR Rev 00 Source**
1	2	3	4	5
Density (kg/m^3)	2410	Reference 2.2.11, Section 4.1.7	2410	Reference 2.2.30 (Value for Tptpln RHH Unit Selected as Largest Average Saturated Bulk Density Among Four RHH Units)
Block Young's Modulus, E (GPa)	33.007	Calculated Using K and G Values E = 9GK/(3K+G)	35.48	Reference 2.2.20, Table 6-76 p. 6-276, for 26_TSw2_Tptpmn, Rock Mass Cat. 5
Poisson's Ratio, ν	0.21	Calculated Using K and G Values ν = (3K-2G)/[2*(3K+G)]	0.22	Reference 2.2.20, Table 6-76 p. 6-276, for 26_TSw2_Tptpmn, Rock Mass Cat. 5
Block bulk modulus, K (GPa)	19.2	Reference 2.2.16, Table 1	21.12	(2) Calculated Using E and ν Values K = E/[3*(1-2 ν)]
Block shear modulus, G, (GPa)	13.6	Reference 2.2.16, Table 1	14.54	(2) Calculated Using E and ν Values G = E/[2*(1+ ν)]
Bridge cohesion (MPa)	47.20	Reference 2.2.11, Table 4-4	50.7 (15.8)	Reference 2.2.20, Table 6-13 p. 6-90 for Tptpmn and (Tptpln)
Bridge friction angle (deg)	42	Reference 2.2.11, Table 4-4	34 (63)	Reference 2.2.20, Table 6-13 p. 6-90 for Tptpmn and (Tptpln)
Bridge tensile strength (MPa)	11.56	Reference 2.2.11, Table 4-4	10.88 (7.92)	Reference 2.2.20, Table 6-12 p. 6-89 for Tptpmn and (Tptpln)
Joint normal stiffness (GPa/m)	50	Reference 2.2.11, Table 4-7	94	Reference 2.2.20, Table 6-53 p. 6-163 (Mean Rotary Shear Test for Tptpmn and Tptpln)
Joint shear stiffness (GPa/m)	50	Reference 2.2.11, Table 4-7	97 (11)	Reference 2.2.20, Table 6-54 p. 6-164, Mean Rotary Shear Test, for Tptpmn and Tptpln, (Table 6-55 p. 6-165 Mean Direct Shear Test for Tptpmn)
Joint cohesion (MPa)	0.1	Reference 2.2.11, Table 4-7	0.032	Reference 2.2.20, Table 6-50 p. 6-161 (Mean Direct Shear Test for Tptpmn)
Joint friction angle (deg)	41	Reference 2.2.11, Table 4-7	33.4	Reference 2.2.20, Table 6-50 p. 6-161 (Mean Direct Shear Test for Tptpmn)

NOTE: (1) The parameter values used in current analysis are listed in column 2. Rock joints data shown in the last four rows of Column 2 are the interpreted best estimates of parameter values and values ranges based on data shown in column 4 and may display some deviation from the statistics mean or median presented in *Drift Degradation Analysis* (Reference 2.2.10, Appendix E, Table E-5). Sensitivity analyses on these input parameters investigating the impact of their magnitudes on rockfall prediction were conducted and the results are discussed in *Drift Degradation Analysis* (Reference 2.2.10, Section 6.3.1.6).



Source: Reference 2.2.24, MatH1.vth, MatH2.vth, and MatV.vth

Figure 6-5 Time Histories of Velocity Components of Seismic Motion for Mean Annual Exceedance Frequency 1×10^{-4}



Source: Reference 2.2.25, MatH1.vth, MatH2.vth, and MatV.vth

Figure 6-6 An Example of Case 12 Time Histories of Velocity Components of Seismic Motion for the Repository Level at Annual Exceedance Frequency 1×10^{-5}

6.5 RESULTS OF ROCKFALL PREDICTION

6.5.1 General

This section presents the results of calculations of rockfall in nonemplacement drifts. The analysis is based on simulations of response of the discontinuous rock strata to ground motions considered representative of those with the 10^{-5} frequency of occurrence. The results obtained during the initial Rev A (Reference 2.2.13), 10^{-4} ground motion study are preserved to provide a link and a reference for comparisons with the current results obtained for much higher energy 10^{-5} ground motion input.

For unchanging geometry of intersecting drifts there are two major input entities that contribute to the resulting rockfall, namely: 1) ground motion data, including 15 distinct waveforms, and 2) rock fracturing (105 patterns) representing the rock mass. This calculation maintains the link to the methodology developed to generate the fracturing pattern described in *Drift Degradation Analysis* (Reference 2.2.10, see details in DTN: MO0301SPASIP27.004 (Reference 2.2.23). The 30 3DEC cases 105 rock strata jointing patterns are listed in Table 6-3 (see Disk CD_1, worksheet *Input All – Comparison of Current vs Previous Study.xls*, Tabs: Table I-1 – 3DEC Cases, Table I-2 and Report_Table_6_3). Cross-referenced in this table are cases analyzed in current study.

6.5.2 Cases Analyzed in the Current Analysis With 10^{-5} Ground Motion

Computer simulations forming the basis for the current analysis were performed in two series of 15 cases each. Table 6-3 summarizes cases analyzed in the current analysis with the link to the fracture realization patterns developed according to the methodology described in DTN: MO0301SPASIP27.004 (Reference 2.2.23).

The case numbering system adopted in the current analysis evolved from a simple annotation used in Table 6-3, where an individual case number is used to point the match between the rock jointing system and the ground motion pattern number, to a more complex notation depicting the calculation Series 1 and 2 starting with the prefixes A_ and B_. Cases A_Case_01_14 to A_Case_20_59 are cases analyzed in Series 1. Cases B_Case_21_16 to B_Case_37_74 are those analyzed in Series 2. Each of the patterns selected is unique and the 15 cases in each series correspond to the two sets, each having the same number of 15 distinct sets of 10^{-5} ground motions.

Table 6-3 Rockfall Cases Showing the Synthetic Fracture Pattern and Ground Motion Combinations Analyzed in the Current Calculation

Current Analysis Case Number	Sampling Batch Number	Sampling Realization Number	Ground Motion Time History Number	Synthetic Fracture Pattern Number	Note
Source Table I-1 First Sampling of Input Values for the 3DEC Cases					
		1	4	15	
	1	2	8	29	
	1	3	16	24	
	1	4	12	4	
	1	5	2	16	
	1	6	8	28	
	1	7	14	8	
	1	8	4	20	
	1	9	10	11	
	1	10	6	18	
	1	11	9	1	
	1	12	1	2	
	1	13	1	13	
Case_1	1	14	7	22	
Case_2	1	15	11	21	
Case_3	1	16	11	30	(3)
Case_4	1	17	16	27	
Case_5	1	18	14	26	
Case_6	1	19	13	10	
Case_7	1	20	5	19	
Case_8	1	21	10	9	(4)
Case_9	1	22	5	23	(3)
Case_10	1	23	12	5	
Case_11	1	24	3	6	
Case_12	1	25	3	17	(3)
Case_13	1	26	9	12	(3)
Case_14	1	27	6	14	
Case_24	1	28	7	25	
	1	29	13	3	
	1	30	2	7	
Source Table I-2 Second Sampling of Input Values for Rockfall Calculations					
Case_15	2	3	1	102	
Case_32	2	24	1	83	
	2	50	1	93	
	2	55	1	100	
	2	81	1	44	
	2	84	1	34	
	2	102	1	32	
Case_35	2		2	97	(2)
Case_20	2	29	2	74	
	2	40	2	54	
	2	57	2	73	
	2	67	2	88	
	2	78	2	23	
	2	94	2	14	
	2	95	2	25	
Case_23	1	25	3	17	(4)
Case_26	2	8	3	29	
	2	26	3	98	
	2	36	3	62	
	2	49	3	1	
	2	63	3	30	
	2	72	3	77	
	2	86	3	97	
Case_16	2	13	4	59	
Case_34	2	28	4	8	
	2	62	4	21	
	2	65	4	26	
	2	66	4	10	
	2	79	4	47	
	2	96	4	70	
Case_22	1	22	5	23	(2)
	2	6	5	78	
	2	9	5	37	
	2	19	5	57	
	2	64	5	27	
	2	85	5	17	
	2	91	5	64	
	2	103	5	58	
Case_29	2	10	6	99	
	2	12	6	24	
	2	16	6	50	
	2	38	6	69	
	2	43	6	53	
	2	76	6	89	
	2	90	6	31	
	2	35	7	20	

Table 6-3 Rockfall Cases Showing the Synthetic Fracture Pattern and Ground Motion Combinations Analyzed in the Current Study (Continued).

Current Analysis Case Number	Sampling Batch Number	Sampling Realization Number	Ground Motion Time History Number	Synthetic Fracture Pattern Number	Note
Source Table I-1 First Sampling of Input Values for the 3DEC Cases					
	2	48	7	18	
	2	59	7	72	
	2	75	7	40	
	2	80	7	5	
	2	82	7	55	
	2	88	7	95	
Case_36	2		8	31	(2)
Case_19	2	17	8	103	
	2	41	8	104	
	2	44	8	94	
	2	69	8	86	
Case_37	2	74	8	45	
	2	83	8	6	
	2	98	8	61	
Case_17	2	14	9	65	
Case_30	2	20	9	67	
	2	22	9	82	
	2	37	9	41	
	2	99	9	60	
	2	100	9	87	
	2	104	9	66	
Case_18	2	15	10	39	
Case_31	2	21	10	63	
	2	39	10	11	
	2	47	10	48	
	2	92	10	76	
	2	97	10	51	
	2	105	10	101	
Case_21	2	5	11	33	
	2	30	11	80	
	2	33	11	96	
	2	58	11	43	
	2	60	11	105	
	2	73	11	56	
	2	93	11	12	
Case_28	2	2	12	7	
	2	7	12	15	
	2	23	12	4	
	2	25	12	16	
	2	31	12	81	
	2	32	12	71	
	2	52	12	91	
	2	53	13	90	
	2	54	13	2	
	2	68	13	52	
	2	70	13	85	
	2	71	13	19	
	2	77	13	9	
Case_25	2	101	13	3	
Case_33	2	27	14	28	
	2	34	14	49	
	2	45	14	92	
	2	46	14	68	
	2	51	14	84	
	2	87	14	46	
	2	89	14	38	
Case_27	2	1	16	79	
	2	4	16	75	
	2	11	16	42	
	2	18	16	35	
	2	42	16	36	
	2	56	16	13	
	2	61	16	22	

NOTES:		
	(1)	BSC 10^{-5} case analyzed in Series 1 of fracture pattern/ground motion combinations
	(2)	BSC 10^{-5} case analyzed in Series 2 of fracture pattern/ground motion combinations
	(3)	3DEC 10^{-4} case omitted from the first BSC 10^{-5} series because of redundancy
	(4)	Case not analyzed because of numerical difficulties
		Case not analyzed
		Two cases with ground motions 2 and 8 assigned randomly to joint patterns 97 and 31

Source: Sampling of stochastic input parameters for rockfall calculations and for structural response calculations under vibratory ground motions. Reference 2.2.23 DTN MO0301SPASIP27.004 [DIRS 161869].

6.5.3 Summary of Results Obtained in Rev A Study with 10-4 Ground Motion

For 10^{-4} ground motions, simulations were carried out for 13 different realizations of jointing in the nonlithophysal rock mass. An example of model geometry (for simulation case 14) at the end of simulation, indicating a rockfall from the roof, is presented in Figure 6-7. A summary of the rockfall results for all 13 cases is listed in Table 6-4. The histogram of block sizes of the rock mass shaken down by 10^{-4} ground motion (shown in Figure 6-8) is similar to that predicted for the emplacement drift for the same level of ground motion (Reference 2.2.10, Table 6-20).

A statistical summary of sizes (masses) of unstable blocks in the intersection is provided in Table 6-5. The mean and median of block sizes are slightly larger in the intersection than those predicted for the emplacement drift. According to Reference 2.2.10, Table 6-20, 0.22 MT and 0.10 MT are the mean and median block sizes of the rock mass shaken down by 10^{-4} ground motion in the emplacement drift, respectively. However, the largest unstable block (mass of 36.72 MT) predicted in the intersection is much larger than the largest unstable block (2.72 MT) predicted in the emplacement drift (Reference 2.2.10, Table 6-20). It seems that the character of jointing (i.e., number of joint sets, spacing of joints within a set, orientation) controls the mean and median of block size, while the size of the opening affects the size of the block that can become unstable. Several blocks with mass larger than 10 MT are predicted to be shaken down by 10^{-4} ground motion in the intersection.

A complete listing of rockfall information is provided in DTN: MO0410MWDPRNDP.000 (Reference 2.2.27). For the rockfall simulations, the exposed surface area is determined by subtracting the surface area encompassing the intersection of the access main and turnout from the total model area (i.e., the difference leaves the model area exposed by the intersection). The exposed surface area calculation is documented in DTN: MO0410MWDPRNDP.000 (Reference 2.2.27, file: exposed area calculation.xls), resulting in an exposed surface area of 309.61 m^2. The same tunnel geometry and the resulting surface area are used in all 10^{-5} cases analyzed (also see Assumption 3.2.4).

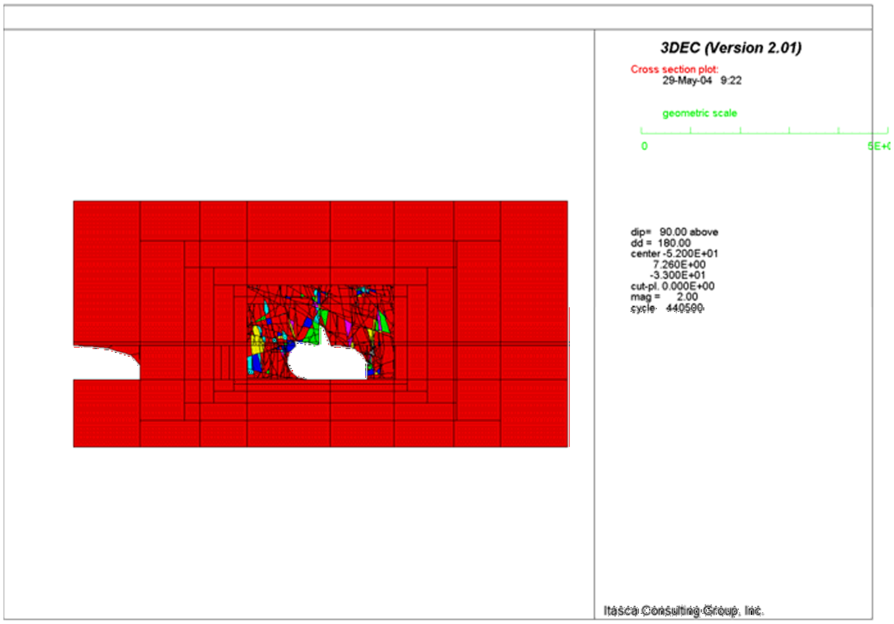
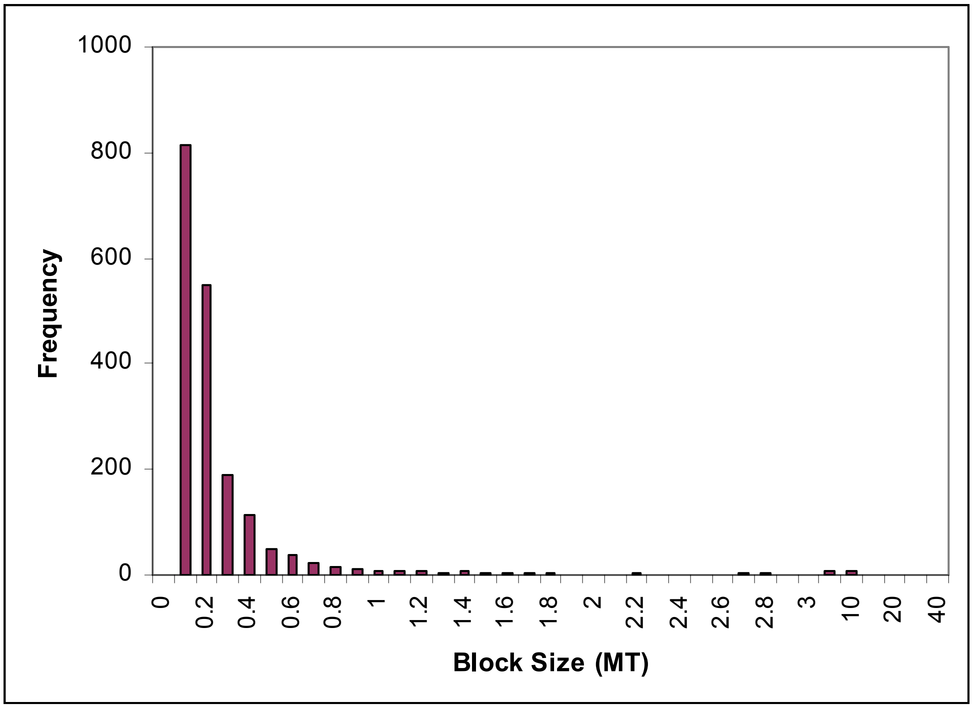


Figure 6-7 Vertical Cross-section through Model of the Intersection (case 14) at the End of Simulation Indicating Rockfall from the Roof

Table 6-4 Summary of the Rockfall Predictions for the Simulated Cases for the Intersection for 10^{-4} Ground Motion

10^{-4} Case No.	Jointing Realization No.	No. of Rockfall Blocks	Total Volume (m^3)	Max. Volume (m^3)
14	22	232	59.99	15.24
15	21	143	15.01	2.07
16	30	84	5.69	1.06
17	27	144	10.82	0.59
18	26	132	8.09	0.48
19	10	285	45.8	3.86
20	19	86	4.93	0.39
22	23	94	7.47	0.88
23	5	99	13.32	3.81
24	6	84	5.12	0.32
25	17	198	19.14	0.58
26	12	125	8.36	0.57
27	14	176	17.14	2.09

Notes: This Table includes only those blocks resulting from the 10^{-4} ground motion and does not include the initial blocks caused by excavation (see Section 6.3). A complete listing of all blocks is provided in the output DTN: MO0410MWDPRNDP.000 (Reference 2.2.27, files: seismic rockfall summary.xls and rockfall characteristics in nonemplacement turnouts with 1e-4 gm.xls). Shaded are the joint realization cases not included in 10^{-5} ground motion analysis.



Output DTN: MO0410MWDPRNDP.000, file: seismic rockfall summary.xls (Reference 2.2.27).

Figure 6-8 Histogram of Rockfall Block Size Shaken Down by 10^{-4} Ground Motion

Table 6-5 Statistical Summary of Rockfall Predictions for the Intersection for 10^{-4} Ground Motion

Parameter	Block Mass (MT)
Mean	0.28
Median	0.12
Standard Deviation	1.19
Skewness	22.26
Range	36.67
Minimum	0.05
Maximum	36.72

Notes: This statistical summary does not include the initial blocks caused by excavation (see Section 6.3). A complete listing of all rockfall blocks is provided in the output DTN: MO0410MWDPRNDP.000, files: seismic rockfall summary.xls and rockfall characteristics in nonemplacement turnouts with 1e-4 gm.xls (Reference 2.2.27).

6.5.4 Limitations of Computer Simulations

Execution of the Program – Computer simulations are performed considering numerical representation of the real, complex physical system, or a process. In simulations these complexities of the real system are often simplified to allow for isolating, examining and better characterizing a limited number of parameters with the largest impact on the model performance. Understanding of software limitations becomes an important factor assisting in obtaining a meaningful solution. Described below are the limits of solutions carried out in this analysis. Some limits are inherent to the hardware used, e.g., roundoff errors, limits to faithfully replicate the problem geometry caused by the discrete element size, and other limits that are revealed as the initially simple program is developed further to accommodate increasing expectations of users.

One of the common aspects of numerical simulations is the effect of model excitation. This excitation may originate at the beginning of the simulation run when the gravity is applied to the model of a given geometry or when the large portions of the model volume are removed (e.g., one-step excavation of the tunnel). This "information" must be propagated through the model volume in the way such that a buildup of excessive loads is avoided. During this transient numerical stage it is common to assume model to be represented by elastic material until the loads within the model volume attain equilibrium. Once the model is stable, the initial elastic model material properties are replaced by the type of material appropriate for the given location within the model volume.

Sometimes a routine 3DEC program execution is interrupted when the input parameters exceed certain limits built-into the code. The cases analyzed in the current calculation involve complex rock mass blocks geometries that often require more memory than is reserved within the program. During the program execution, a file "transf.pol," containing the coordinates of the polyhedrae defining each model block is generated and subsequently used to implement the model geometry. The scientific notation is used in this file to represent the block vertex coordinates. An example of a number representation for vertex coordinates is 8.8233e+001. Sometimes, a number of characters used for commands in "transf.pol" exceed the amount of characters allocated within the 3DEC program for a single input command, causing interruption of the program execution. This 3DEC limitation is overcome by editing the "transf.pol" file to remove the excessive exponent digits, which results in the above number being stored as -8.8233e1. This reduces number of characters and the file size making them to fall within the limits acceptable by the 3DEC program. Simulation is continued by calling the "rerun.dat" file included within every set of input data used in the current study. It causes a restart and continuation of the interrupted program execution without affecting results of calculations.

Distinguishing a Rockfall Block from Moving Block - The quasi-static loading methodology described earlier was applied in the current analysis to optimize the duration of each simulation. The criteria are applied to distinguish the blocks which just moved under the action of stresses generated by the seismic motion from those that indeed fell off were established by setting a block velocity tolerances after certain number of calculation steps. These tolerances would trigger the logic that considers a block as one that fell off. The need for conservative estimate of the amount of rockfall causes that the tolerances are set very tight. As a result, in addition to the number of blocks that are marked as a part of a particular rockfall, a number of such an apparent, mostly small blocks, are also included in the rockfall count. In effect, the number of rockfall blocks also includes these additional blocks, a byproduct of the methodology used. Figure 6-9 and Figure 6-10 present a typical example of analysis results.

Shown in Figure 6-9 are a number of rock blocks generated by the stresses associated with the particular ground motion. The blocks adjacent to the opening are the rockfall blocks. There are also a number of blocks that are located at some distance away from the opening, seemingly floating in an open space. Obviously, these blocks located within the rock mass are not a part of a rockfall.

Somewhat different results are presented in Figure 6-10. Here, assessed from several angles, are the relatively large blocks. These are located above the intersection and delineated by the long parallel fractures. These relatively large blocks are terminated at the top by yet another large sub-horizontal discontinuity, clearly identifiable in the model cross-section at the bottom of the figure. These blocks located at the crown of the excavation and adjacent to the opening are a part of rockfall.

It is important to note that similarly as in the case presented in Figure 6-9, there are a number of blocks "levitating" above the tunnel intersection and located within the rock mass. These distant blocks are also a part of a group of apparent rockfall related to the numerical simulation method applied in the current study. As shown in Figure 6-9, the third group of rockfall is illustrated by the moving blocks located at the tip of the pillar remaining between the main tunnel and the turnout. These blocks located close to excavation had moved as a result of stress readjustment during tunnel excavation and were disturbed further by the stresses due to ground motion. They are located within the pillar and as such are of little threat of falling onto the TEV shielded enclosure. Their low elevation can be used as a parameter helpful in distinguishing them from other rockfall blocks.

Yet another group of rockfall blocks can be distinguished after the excavation of tunnels takes place. Here the model is cycled to equilibrium, and a number of rockfall blocks at the tunnel circumference as well as within the rock mass surrounding the tunnel that fell as a result of tunnel excavation can be identified. These rockfall blocks are further referred to as EQ blocks, and are subtracted from the final block count, such that only rockfall blocks due to the ground motion can be accounted for.

Presentation of Results - A visual examination of the analysis results makes possible to verify if block location satisfies expected occurrence of the fall. One option of presenting the results of rockfall is to present a number of cross-sections through cavities in rock mass resulting from the rockfall. This technique demonstrated in cross-sections shown at the bottom in Figure 6-9 and 6-10. Within 3DEC program the post-processor has its limits, as the intersecting other adjacent blocks can obscure the view of the opening size. As a result, it is more advantageous to show the blocks as they occur in the rock mass, with the portion of rock surrounding them removed for clarity. Such presentation is accomplished in several steps.

During the calculation, each block that satisfies criteria of rockfall is deleted or removed. Initially, therefore, the rockfall blocks are identified by searching the rock mass for blocks that were removed during calculation. This is accomplished by using specifically developed function

"*Deleted1.fis*". This step is implemented on the portion of the output representing the stage of calculation, where one can extract information about the number of rockfall blocks. In effect, a list of marked blocks is obtained. This list is used during the post-processing Stage 2, where the file containing the initial, yet undisturbed geometry and all associated rock mass information is restored. The table containing the list of blocks removed during the rockfall is used to mark blocks in this initial, undisturbed model. In the subsequent step, the rockfall blocks are marked, and other unmarked blocks are hidden. The effect of this post-processing procedure is illustrated in the first three images shown in figures (Figure 6-9 and Figure 6-10), where as a result of this "numerical etching" only the excavated parts of the model are visible.

The rockfall criterion is applied consistently in all simulations and to all discrete blocks of the rock mass. As a result, in addition to the real rockfall, an "apparent rockfall" also occurs. This apparent rockfall includes rock blocks that moved sufficiently to be counted as rockfall, however, because of the surrounding rock mass, cannot fall out.

In the current analysis two stages of rockfall are analyzed. The first stage includes the EQ rockfall blocks occurring as a result of tunnel excavation. Here the "EQ" associated with the file name is used to identify the files generated at the state of equilibrium attained after tunnels are excavated but before the ground motion is introduced into the simulation. The second stage includes identifying both EQ blocks as well as those that fell as a result of applied ground motions. The final number of rockfall blocks due to ground motion only is obtained by subtracting the EQ blocks from the final block count.

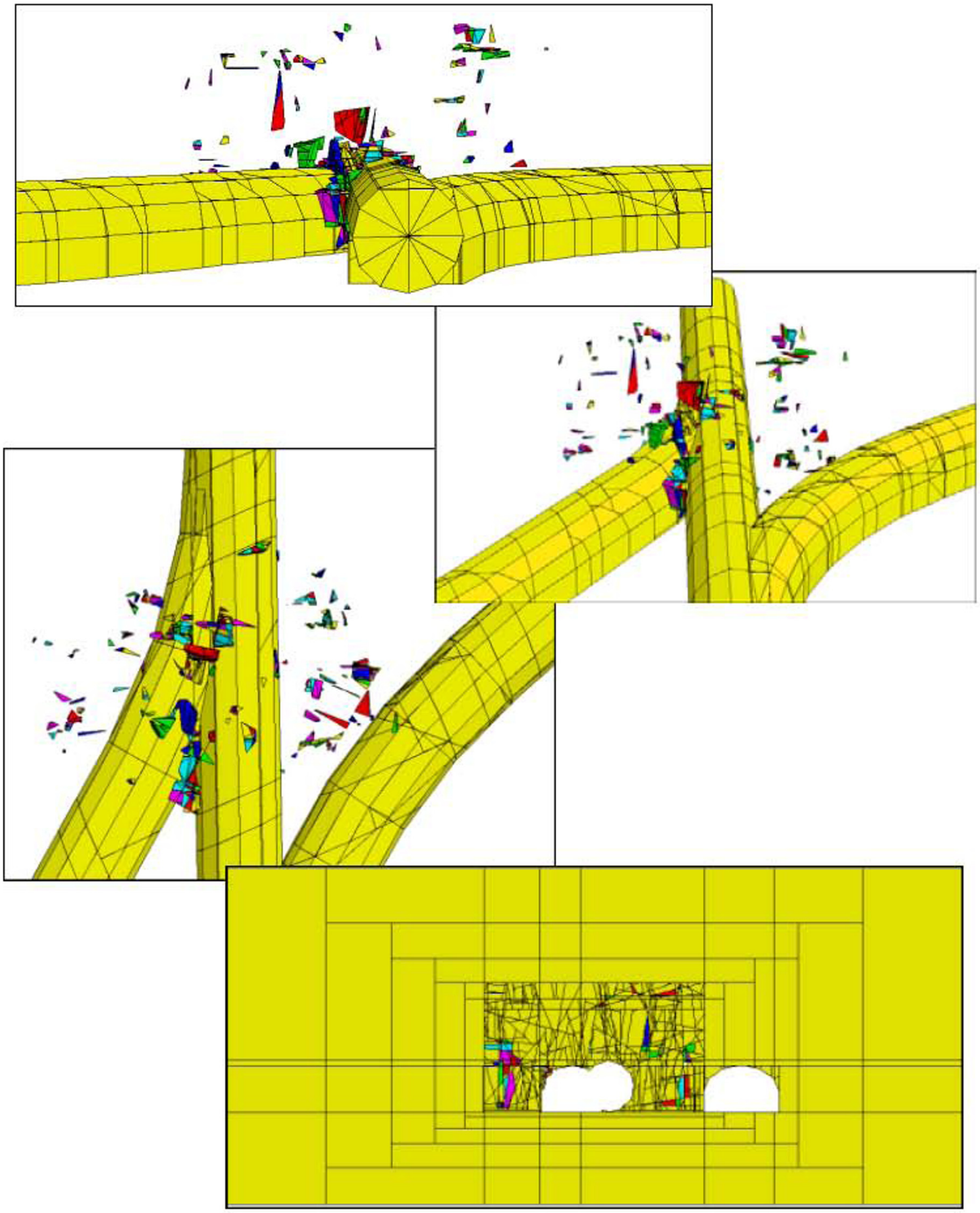
In general, the blocks belonging to the initial (EQ) rockfall are subtracted from the overall number of the rockfall blocks. To facilitate further processing of results, an additional Stage 3 of analysis is introduced. This stage is initiated by invoking the "*Deleted2.fis*" function (see Attachment II), which allows for identifying all rockfall blocks. In addition this function allows for determining the volume of each individual rockfall block and the elevation of lowermost apex of its geometry. In effect, a pair of rock block volume along with the elevation of its lowermost apex is used to uniquely identify each block. To separate EQ blocks from the entire rockfall population, the process of identifying the EQ and all blocks is repeated twice. This procedure must be repeated for each case simulated. Attachment II presents examples of the two functions and the process used to verify and validate their implementation in post-processing of rockfall data. The final step includes separation of the EQ blocks from the entire rockblock population. This task is accomplished within a worksheet that summarizes the rockfall block data for each particular case simulated.

The block separation is performed by arranging the final rockfall data and the initial EQ data side by side and running a simple macro called "*SelBlkDiff*". The macro selects the subsequent pairs of block volume and the block elevation data from the EQ set and compares it to each pair of the final set of rockfall blocks. If the identical pair is found, the EQ data is written in one set of two columns, otherwise the ground motion rockfall data is written in another two-column set. As a result, a separate, "ground motion only" rockfall data set is obtained. This data extracted from all cases are combined and presented further in this report. The *SelBlkDiff* macro can be found in dataset for each case analyzed in the Excel file of the form e.g., *C_04_17_Blk_Vol_&_Elev Data.xls*. The initial data sets and results of the rockfall block separation are readily visually verifiable in each worksheet.

Figure 6-11 shows the results obtained from the Case 34_58 simulations. Shown in this figure from the top are (a) final results including both EQ and blocks due to ground motions together, (b) EQ blocks due to the tunnel excavation only, and (c) the final product, where EQ blocks were subtracted resulting in rockfall blocks due to ground motion only.

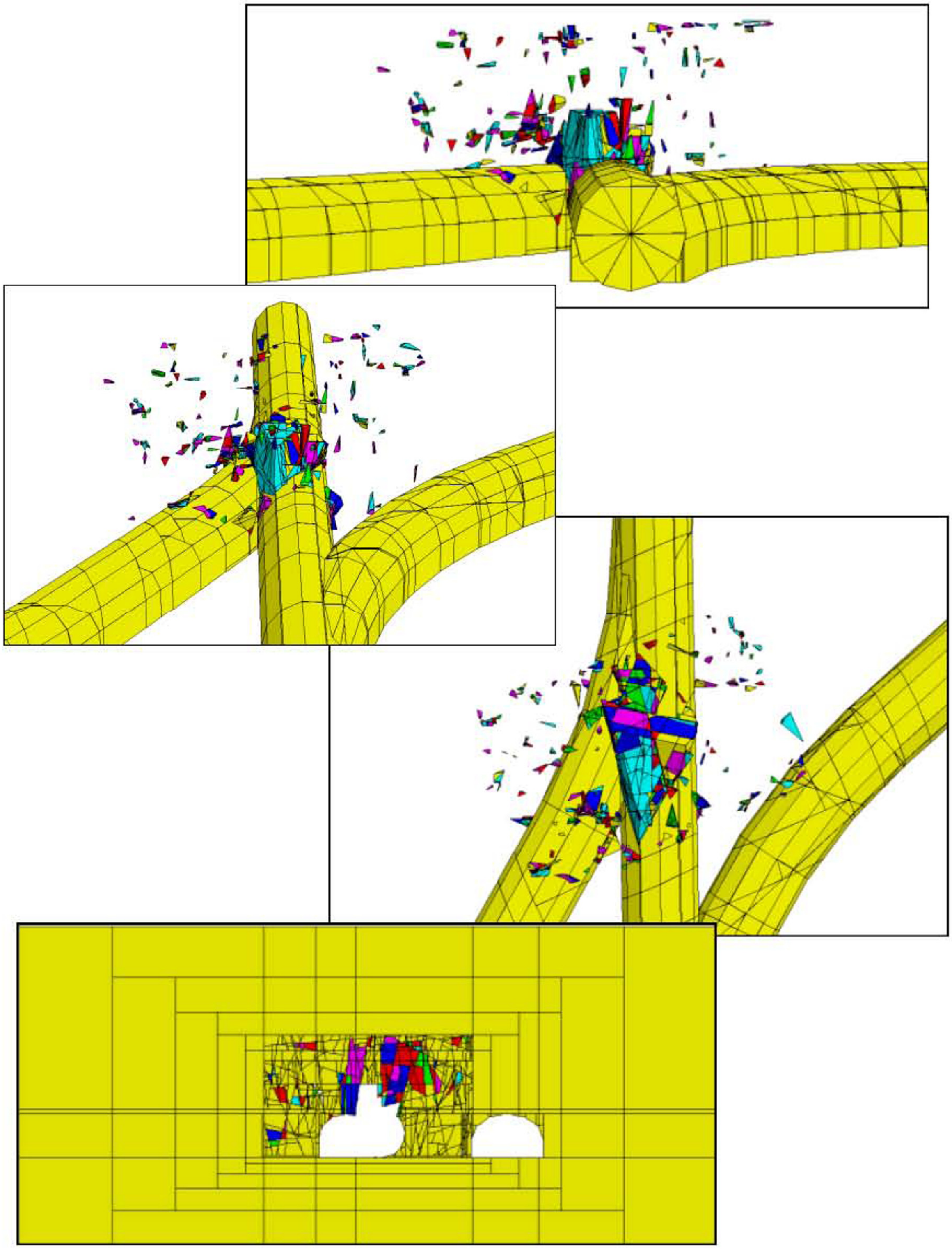
Mechanical Aspect of the Simulated Rockfall - A large number of discontinuities can collectively contribute to a large rockfall. During program execution, the subsequent removal of blocks, which exceeded the prescribed displacement, results in an empty space. This space would otherwise still contain a rock volume and provide a partial restraint against the movement of this newly exposed block. Along with the conservative estimate of loads, this procedure causes that the solution tends to be more conservative, i.e., causing more rockfall.

The model geometry determined by the fracture pattern interacting with the ground motion results in rockfall magnitude that cannot be predicted intuitively. In effect, a number of cases each representing a combination of various standardized ground motions and fracturing patterns must be analyzed on the case population large enough that the approximated the in situ conditions are represented realistically.



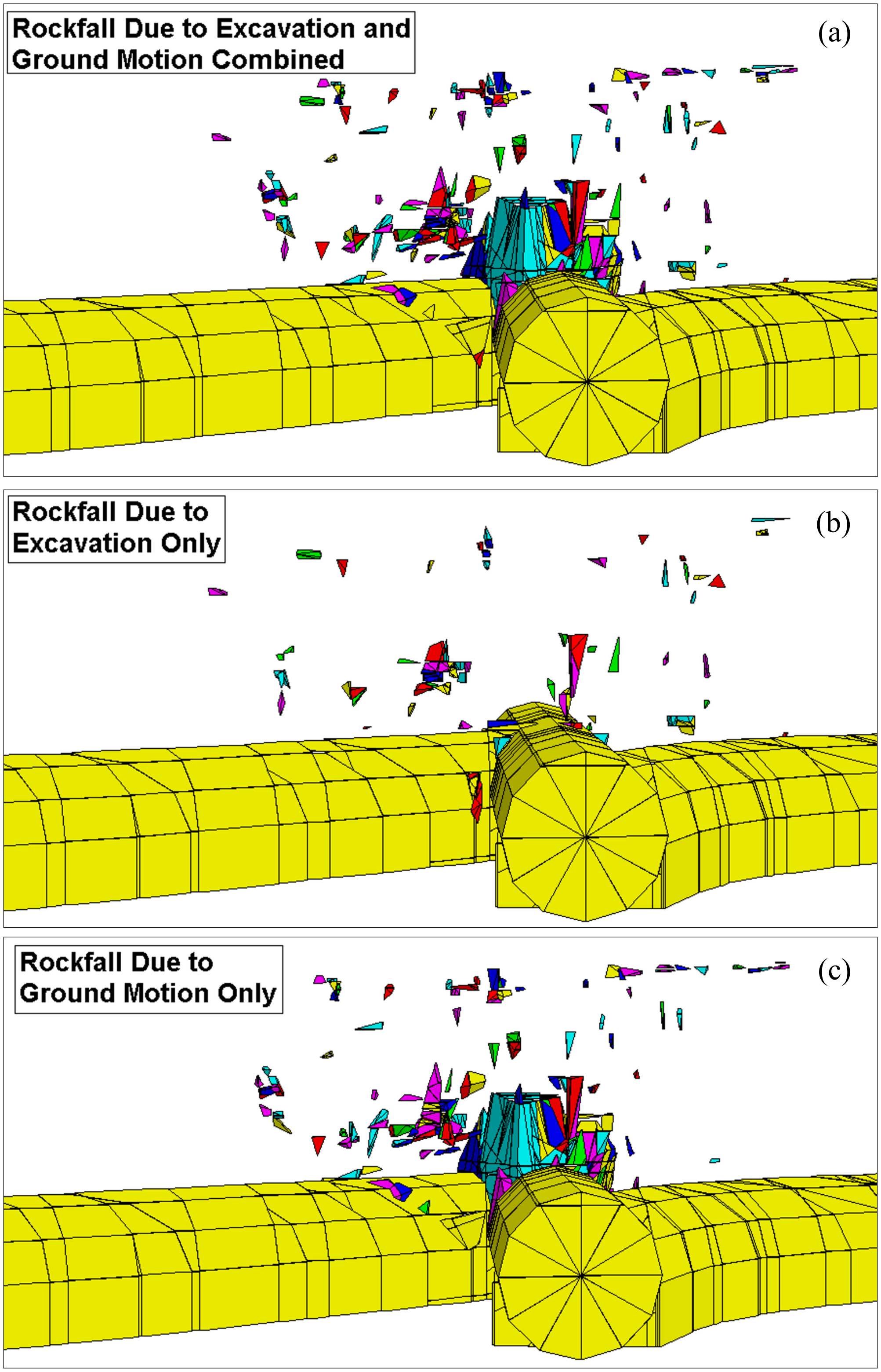
Source: DVD Disk_2, A_Case_20_59, Pfil_1.pcx, Pfil_2.pcx, Pfil_3.pcx, Pfil_4.pcx.

Figure 6-9 An Example of Case 20_59 showing the Rockfall Blocks Adjacent to the Excavation and a Number of Blocks at Some Distance Away from the Openings, a Byproduct of the Numerical Method Applied.



Source: DVD Disk_3, B_Case_34_58, Pfil_1.pcx, Pfil_2.pcx, Pfil_3.pcx, Pfil_4.pcx.

Figure 6-10 An Example of Case 34_58 showing the Rockfall Blocks Adjacent to the Excavation and a Number of Blocks at Some Distance Away from the Openings, a Byproduct of the Numerical Method Applied.



Source: DVD Disk_3, B_Case_34_58, Pfil_1.pcx, Pfil_1_EQ.pcx, Pfil_1_GMotion.pcx

Figure 6-11 An Example of Case 34_58 showing the Rockfall Blocks (a) Due the Tunnel Excavation and Ground Motion Combined, (b) Due to Excavation Only, and (c) Blocks Due to Ground Motion Only. A Number of Blocks at Some Distance Away from the Openings, Represents a Byproduct of the Numerical Method Applied.

6.5.5 Summary of 10^{-5} Ground Motion Results

This section presents results of the current analysis performed under loading conditions resulting from 10^{-5} ground motion. Here an attempt was made to provide a link to the results obtained in the Rev A analysis under 10^{-4} ground motion.

In general, predicting the rockfall size by estimating the combined effect of ground motion and rock mass based on intuition alone is not possible. Each combination presents a unique outcome impacted by the energy of ground motion and a system of fractures, which oriented in a favorable direction (i.e., producing a small rockfall) in one case, can be oriented significantly less favorably in another case. In effect, a number of cases must be analyzed to provide statistically meaningful characterization of the jointed rock strata response to seismic shaking. In the current analysis 30 cases in two series of computer simulations were completed, each containing 15 patterns of the standardized ground motions. In both series each ground motion has been randomly paired to a unique rock jointing pattern. In effect, each ground motion pattern has been used with the two unique rock jointing patterns, together representing a sample population of 30 unique cases.

Table 6-6 provides a summary of rockfall predictions for the simulated cases at the access main/turnout intersection for 10^{-4} ground motion and a correlation to the cases analyzed for 10^{-5} ground motion. During the 10^{-4} ground motion analysis (Rev A) only one pattern of ground motion has been used in combination with 13 different jointing patterns. In the current (Rev B) analysis, 15 ground motion patterns have been used in each series. Table 6-7 summarizes a Series 1, 10^{-5} ground motion cases and provides a link to the 10^{-4} ground motion results listed earlier. As evident in Table 6-7, in Rev B some rock jointing cases analyzed during the 10^{-4} analysis were omitted because of redundancy, while other cases were added, to establish a total of 15 pairs of the ground motion and rock fracturing data in each of two series.

For each case the results of rockfall simulations are analyzed in terms of the three basic parameters; 1) number of rockfall blocks, 2) individual block volume, 3) lowermost elevation of each individual block. The overall results for Series 1 and 2 are based on a combined set of data including the results obtained for all 15 individual cases in each series. The combined results from both series can be found in Disk CD_1 Excel file *Rockfall Results - All Cases Extract Summary.xls* submitted with this report.

In all cases, the zero elevation at the tunnel springline is used. Springlines are the two lines on the opposite side of the tunnel and determined by the plane parallel to the invert, passing through the circular tunnel center and intersecting the tunnel circumference. The blocks with negative elevations are those blocks that moved towards the opening floor or invert and are located below the zero elevation at the springline level.

Examples provided in Figure 6-7 and Figure 6-8 show that considering the safety of the TEV, a number of rock blocks marked as rockfall can be further sorted according to their elevation. It is evident that the potential impact by blocks with their lowermost point elevation located below the springline pose little danger to the TEV shielded enclosure and the threat increases with an increase in block elevation. Therefore, movements of the rock strata below the tunnel springline, from the perspective of the TEV safety, are of much lesser concern than blocks in the tunnel roof, which are located at higher elevation. A rock block mass in combination with its height can be used to calculate its potential energy and to assess the potential threat each block poses to the TEV passing under such a block. A typical irregularity of the rock block geometry and differences in the block volume caused that the location of the lowest point for each rockfall block was required. As described earlier, a set of two functions and a macro, developed to locate, mark, calculate the block volume, and to obtain its lowermost point elevation were used to extract information from the results of each completed case.

Table 6-6 Summary of Rockfall Predictions for the Simulated Cases at the Access Main/Turnout Intersection for 10^{-4} Ground Motion and Correlation to Cases Analyzed for 10^{-5} Ground Motion

3DEC Case No.	Jointing Realization No.	Number of Rockfall Blocks	Total Volume (m^3)	Max. Volume (m^3)	Case Analyzed in Current Study Series 1	Case Number in Current Study Series 1
		10^{-4} Ground Motion			10^{-5} Ground Motion	
14	22	232	59.99	15.24	X	1
15	21	143	15.01	2.07	X	2
16	30	84	5.69	1.06		3
17	27	144	10.82	0.59	X	4
18	26	132	8.09	0.48	X	5
19	10	285	45.8	3.86	X	6
20	19	86	4.93	0.39	X	7
21	9					8
22	23	94	7.47	0.88		9
23	5	99	13.32	3.81	X	10
24	6	84	5.12	0.32	X	11
25	17	198	19.14	0.58		12
26	12	125	8.36	0.57		13
27	14	176	17.14	2.09	X	14
33	102				X	15
43	59				X	16
44	65				X	17
45	39				X	18
47	103				X	19
59	74				X	20
	Total:	1882	220.88	31.94		

Note: Shaded cells indicate cases not considered either in Rev A or in the current Rev B Series 1 Calculations

Due to limitation of the numerical simulation, the rockfall data include rock mass blocks that can occur not only in the tunnel roof or crown, but also at other locations in the vicinity of the opening. This additional rockfall simply indicates that a movement of the block was large enough to satisfy the criterion that triggered decision for the given block to be marked and counted in the rockfall blocks number.

To facilitate calculations related to an assessment of the potential consequences of rockfall the results from current analysis were evaluated considering block elevations as a discriminating parameter. The results from a combined Series 1 and 2 are presented in Figure 6-12 to 6-17. Each figure shows the rock block elevation versus block volume within the following intervals: 1) all rock blocks data combined for the series of 30 runs, which includes blocks with both positive and negative elevations, i.e., located below the zero springline level (Figures 6-12 and 6-13), 2) all blocks located below the springline level (Figure 6-14), 3) blocks located at and above the springline and below the tunnel crown (Figure 6-15), blocks located at and above the tunnel crown, i.e., above 3.81 m elevation (Figure 6-16), and 4) blocks located within elevation interval at and above springline, i.e., 3.81 m to 15 m (Figure 6-17), for which statistical are summarized in Tables 6-13 and 6-14.

The results for all cases analyzed including Series 1 and 2 are shown in Figure 6-12 Source: CD_1 *Rockfall Results – All Cases Extract Summary.xls*, while Figure 6-13 shows the same data with the rockfall block volume limited to 80 m^3. Also shown in these two figures are the reference locations of the tunnel springline, elevation 0.0 m, and the tunnel crown at elevation 3.81 m. A closer views at the magnitude of rockfall blocks volumes versus their distribution within a range of elevations are presented in Figures 6-14 to 6-17. It is evident that as expected, the largest number and volume of rockfalls occur within elevation of the tunnel crown. The largest rockfall block is located at the elevation above the springline but below the tunnel crown. The second largest rockfall block is located below the springline.

Table 6-8 summarizes the 10^{-4} rockfall prediction results for 9 simulations out of 13 that were performed with fracture patterns identical to those extracted from Series 1 for 10^{-5} ground motion results presented in Table 6-9. A direct comparison between these two sets of data must be treated with caution since the Series 1 were obtained using identical rock jointing patterns but each subject to a different case of 10^{-5} ground motion. However, by comparing these two tables it is evident that energy input for 10^{-5} ground motion is substantially higher than its 10^{-4} ground motion counterpart. While the rockfall among the similar cases may vary, on the average, 10^{-5} ground motion produces the total rockfall volume that is approximately 5 times higher than one produced by the 10^{-4} ground motion (1060.27 m^3 versus 188.22 m^3).

Similar comparison is made between the results from two series of cases, where the 10^{-5} set of fifteen ground motion patterns remains the same in each series but each ground motion pattern is paired with one case of randomly generated fracture patterns as shown for Series 1 and 2 in Table 6-10. The side-by-side comparison of results obtained in Series 1 and 2 as well as the combined results for both series are presented in Table 6-11. Here, the 10^{-5} ground motion results indicate similar number of individual rockfall blocks for Series 1 and 2 (5608 versus 5946). However, the rockfall volume (1589.21 m^3 and 3335.09 m^3) and the maximum volume of individual blocks predicted in Series 1 and 2 (79.18 m^3 versus 338.4 m^3), indicates the rockfall magnitude for Series 2 to be approximately four times higher than the corresponding Series 1 results. It also indicates that Series 1 results alone are not sufficient to characterize the rockfall results associated with 10^{-5} ground motion and additional data are required. This comparison provides further evidence that results from both Series 1 and 2 must be used to characterize rock strata.

Table 6-12 summarizes the total number and volume of rockfall blocks obtained from 30 simulations. It appears that 0.21 percent of the total number of blocks of the volume greater than 20 m^3 comprises approximately 41percent of the total rockfall volume. This number indicates that the 10^{-5} ground motion at the intersection, which at its larger span equals to approximately

15 m, can produce rockfall with the largest rockfall block volume approximately an order of magnitude larger than one produced by 10^{-4} ground motion (338.4 m^3 versus 36.72 m^3).

The rockfalls below the tunnel springline are of no practical consequence to the TEV safety, hence further analyses were performed for rockfalls above the springline elevation (H > 0.0 m). Tables 6-13 and 6-14 summarize detailed statistics for all simulation cases performed in the current analysis. Table 6-13 summarizes results pertaining to the rockfall volume. Similar statistics related to the rockfall block elevation are summarized in Table 6-14. In total, the results are based on the volume and elevation of 9836 rockfall blocks, due to ground motion alone, obtained from 30 simulations.

Presented in Figure 6-18 and Figure 6-19 are the histograms of results obtained from all simulation cases carried out in the current study. The results in Figure 6-18 show an overall summary of data and Figure 6-19 shows a closeup of the distribution of the block volume within 0.0 m^3 to 20 m^3 interval. The data summarized in Figure 6-20, where the frequency scale is limited to 10, shows clearly that the volume of the vast majority of rockfalls is less than 20 m^3.

Analysis performed to determine a minimum number of simulations necessary to represent the rockfall characteristics have shown that for 10^{-5} annual probability of exceedance ground motion the number of simulations indicate that the maximum value of the block size, impact velocity and impact energy occur between the 20th and 25th simulation (Reference 2.2.10, Appendix K, p. 4). Current results suggest that analysis utilizing the results presented in this report should be based on both Series 1 and Series 2 data combined.

Table 6-7 Summary of Rockfall Predictions for the Simulated Series 1 Cases at the Access Main/Turnout Intersection for 10^{-5} Ground Motion

BSC Aggregate Sequential Case Number	Sequential Case Number in Current Study	3DEC Case Number	Joint Realization Number	Ground Motion Case Number	Number of Blocks	Total Rockfall Volume, m^3:	Maximum Block Volume, m^3:	Remarks
1	2	3	4	5	6	7	8	9
C_01_14	1	14	22	7	858	513.61	70.60	
C_02_15	2	15	21	11	389	98.71	19.14	
C_03_16	3	16	30					Case redundant
C_04_17	4	17	27	16	189	14.82	3.85	
C_05_18	5	5	18	26	219	14.87	0.69	
C_06_19	6	19	10	13	1061	21.42	60.69	
C_07_20	7	20	19	5	180	12.93	0.44	
C_08_21	8	21	9	10				Numerical difficulties
C_09_22	9	22						Case redundant
C_10_23	10	23	5	12	192	19.37	3.80	
C_11_24	11	24	6	3	313	56.01	20.27	
C_12_25	12	25	17					Case redundant
C_13_26	13	26	12					Case redundant
C_14_27	14	27	14	6	454	52.96	2.88	
C_15_33	15	33	102	1	328	54.57	3.47	
C_16_43	16	43	59	4	285	39.93	1.96	
C_17_44	17	44	65	9	385	191.26	79.18	
C_18_45	18	45	39	10	187	14.29	1.72	
C_19_47	19	47	103	8	348	51.89	129.48	
C_20_59	20	59	74	2	220	45.33	4.56	
				Total:	**7355**	**1870.78**		

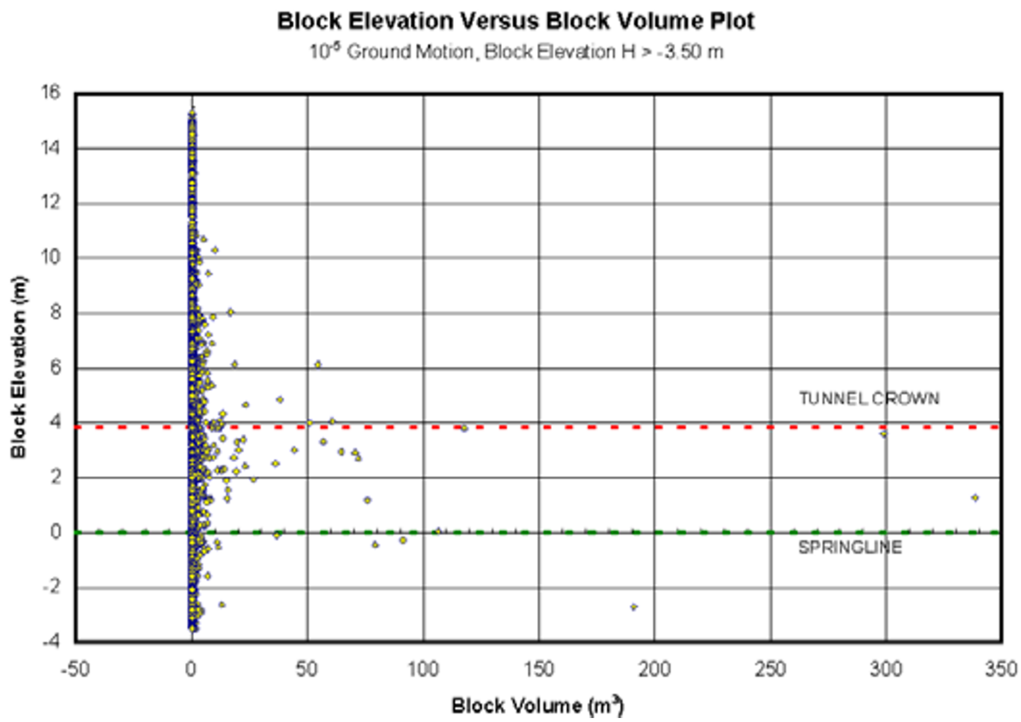
Key to numbering system

: Example: C_07_20_19_05

C = Case Analyzed
07 = Sequential Number in current analysis
20 = 3DEC number as listed in DTN: MO0301SPASIP27.004 [DIRS 161869], Reference 2.2.23.
19 = Joint Realization Number
05 = Ground Motion Pattern Number as provided in DTN: MO0301SPASIP27.004 [DIRS 161869], Reference 2.2.23.

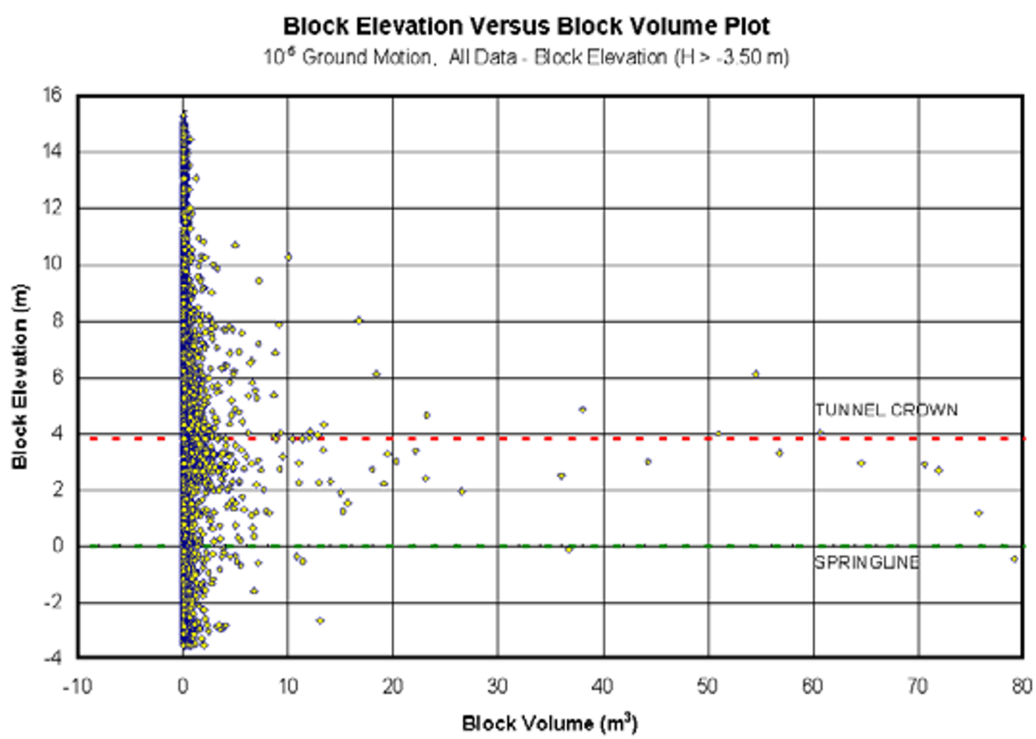
Notes:

1) Case redundant no analyzed and replaced by another case
2) Case with numerical difficulties caused by inadmissible block geometry resulting from jointing pattern applied



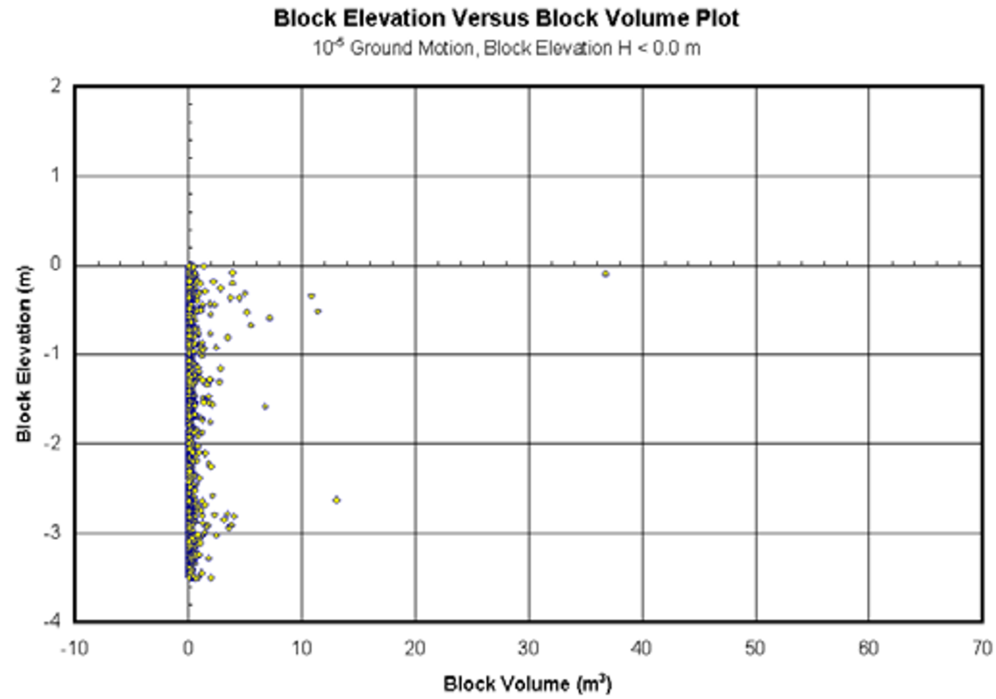
Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-12 Summary of Rockfall Simulations for All Cases Analyzed. All Rockfall Blocks Due to Ground MotionShown.



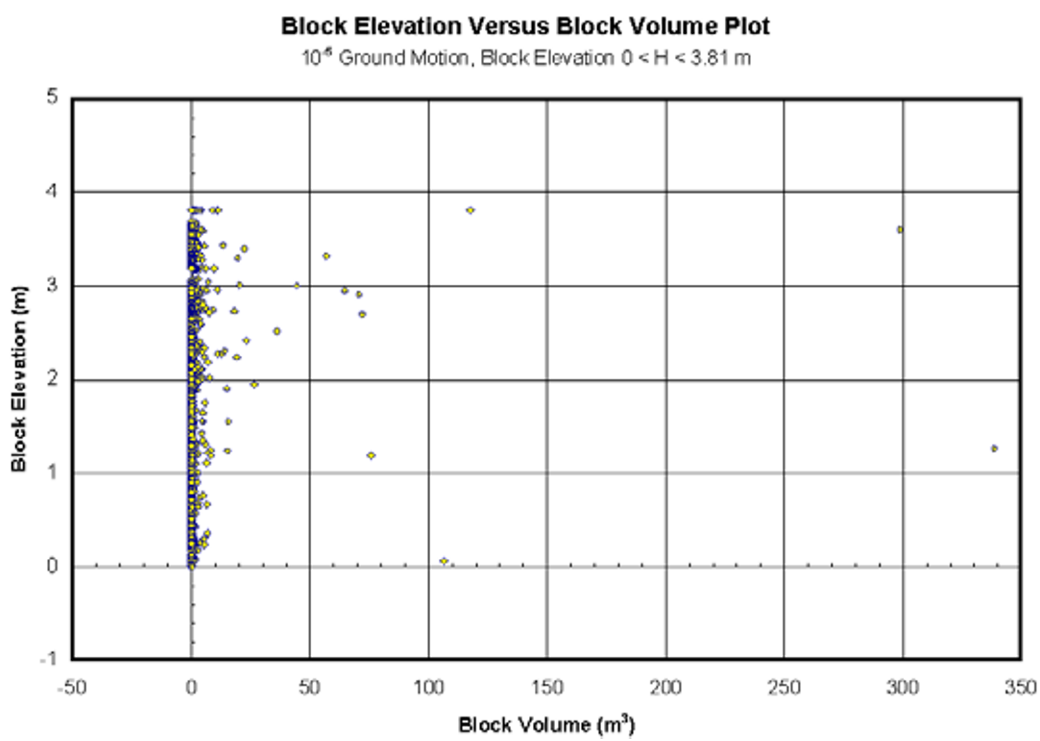
Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-13 Summary of Rockfall Simulations for All Cases Analyzed. Data Shown for the Entire Range of Elevations and for Rockfall Blocks Volume less Than 80.0 m^3.



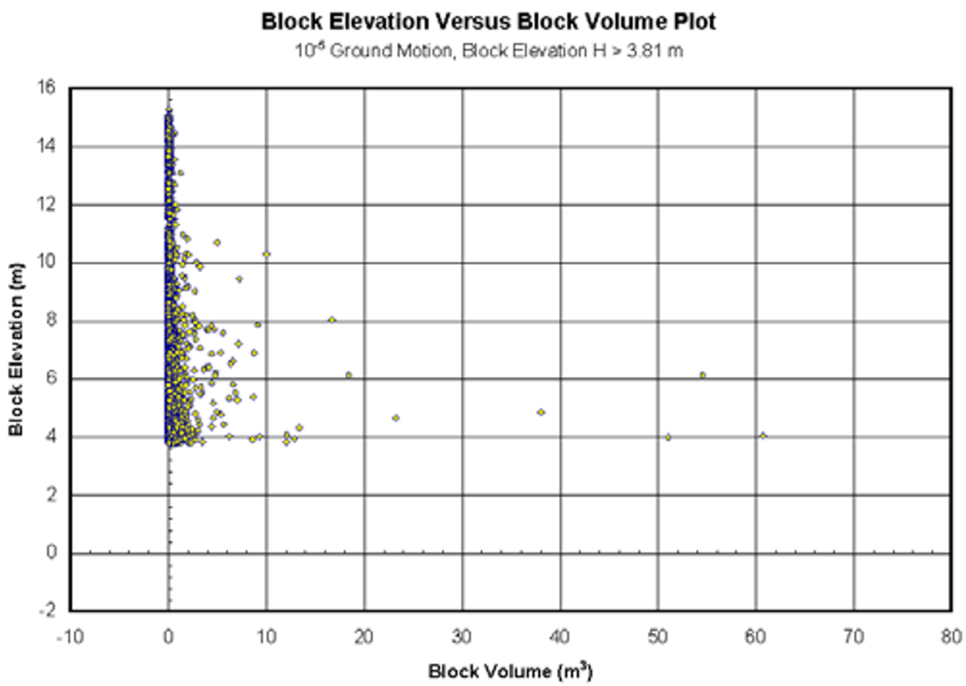
Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-14 Summary of Rockfall Simulations for All Cases Analyzed. Data Shown for Rockfall Blocks at Elevations H < 0.0 m.



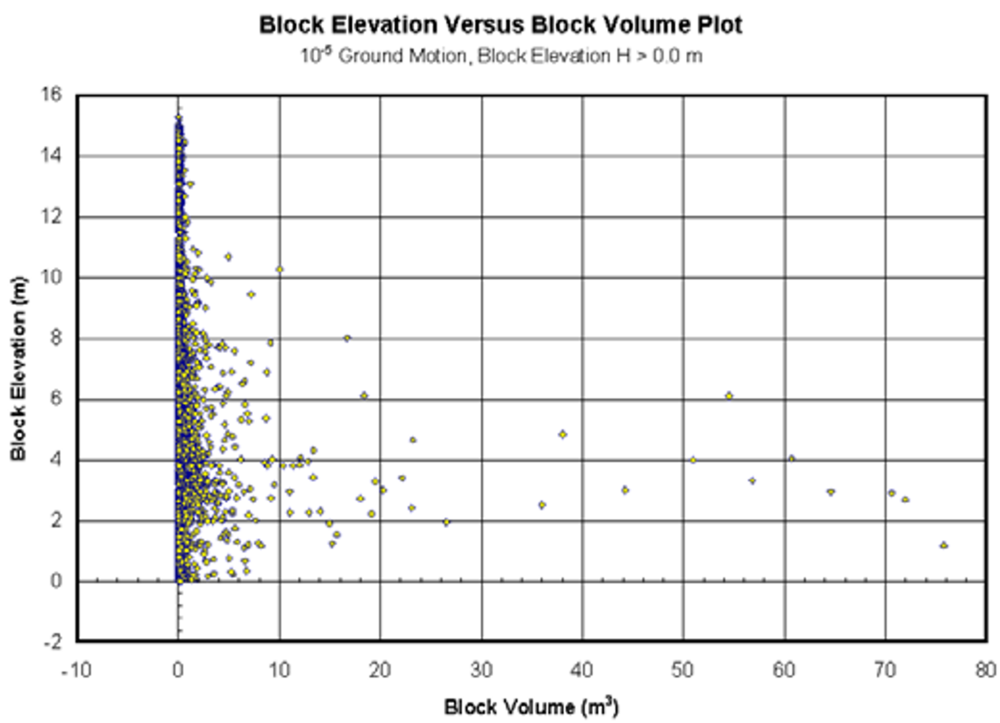
Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-15 Summary of Rockfall Simulations for All Cases Analyzed. Data Shown for Rockfall Blocks at Elevations (H) Within a Range 0.0 m < H < 3.81 m.



Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-16 Summary of Rockfall Simulations for All Cases Analyzed. Data Shown for Rockfall Blocks at Elevations H > 3.81 m.



Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-17 Summary of Rockfall Simulations for All Cases Analyzed. Data Shown for Rockfall Blocks at Elevations H > 0.0 m.

Table 6-8 Summary of the Rockfall Predictions for the Simulated Cases at the Access Main/Turnout Intersection for 10^{-4} Ground Motion Correlating to Cases Analyzed for 10^{-5} Ground Motion

10^{-4} Ground Motion Sequential Case Number	Corresponding Case Number in Current Analysis	3DEC Case No.	Jointing Realization No.	Ground Motion Case Number(1)	Total Number of Rockfall Blocks	Total Rockfall Volume (m^3)	Maximum Block Volume (m^3)
1	1	14	22	NA	232	59.99	15.24
2	2	15	21	NA	143	15.01	2.07
4	4	17	27	NA	144	10.82	0.59
5	5	18	26	NA	132	8.09	0.48
6	6	19	10	NA	285	45.8	3.86
7	7	20	19	NA	86	4.93	0.39
10	10	23	5	NA	99	13.32	3.81
11	11	24	6	NA	84	5.12	0.32
14	14	27	14	NA	176	17.14	2.09
				Total:	1388	188.22	15.24

Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Note: (1) Only one ground motion pattern was used in 10^{-4} ground motion analysis.

Table 6-9 Summary of the Rockfall Predictions for the Simulated Cases at the Access Main/Turnout Intersection for 10^{-5} Ground Motion Correlating to Cases Analyzed for 10^{-4} Ground Motion

Aggregate Case Number	Sequential Case Number in Current Analysis	3DEC Case Number	Joint Realization Number	Ground Motion Case Number	Total Number of Rockfall Blocks	Total Rockfall Volume (m^3)	Maximum Block Volume (m^3)
C_01_14	1	14	22	7	743	451.84	70.60
C_02_15	2	15	21	11	302	68.68	19.14
C_04_17	4	17	27	16	179	14.41	1.35
C_05_18	5	18	26	14	198	13.56	0.46
C_06_19	6	19	10	13	965	387.23	60.69
C_07_20	7	20	19	5	106	7.44	0.44
C_10_23	10	23	5	12	165	14.95	3.80
C_11_24	11	24	6	3	263	51.67	20.27
C_14_27	14	27	14	6	428	50.50	2.88
				Total:	3349	1060.27	70.60

Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Note: All rockfall blocks, except those due to excavation included

Table 6-10 Summary of the Rockfall Predictions for the Simulated Series 1 and Series 2 Cases at the Access Main/Turnout Intersection for 10^{-5} Ground Motion and Sorted According to Rockfall Block Elevation

Series	Elevation (H)-->	H > 3.81 m			0 < H < 3.81 m			H < 0 m			-3.81 m < H < 15 m		
	Case Number	Number of Blocks	Total Rockfall Block Volume Due to Ground Motion	Max Volume (m^3)	Number of Blocks	Total Rockfall Block Volume Due to Ground Motion	Max Volume (m^3)	Number of Blocks	Total Rockfall Block Volume Due to Ground Motion	Max Volume (m^3)	Number of Blocks For Each Case	Total Rockfall Volume Due to Ground Motion for Each Case	Maximum Block Volume for Each Case (m^3)
Series 1	Case 01_14	452	163.37	12.08	291	288.47	70.60	115	61.77	36.74	858	513.61	70.60
	Case 02_15	194	17.52	1.75	108	51.15	19.14	87	30.04	4.95	389	98.71	19.14
	Case 04_17	105	5.65	0.36	74	8.75	1.35	10	0.41	0.06	189	14.82	1.35
	Case 05_18	123	6.87	0.23	75	6.69	0.46	21	1.31	0.15	219	14.87	0.46
	Case 06_19	558	281.36	60.69	407	105.87	7.92	96	21.42	5.49	1061	408.66	60.69
	Case 07_20	70	4.79	14.97	36	2.65	3.81	74	5.49	0.39	180	12.93	14.97
	Case 10_23	81	5.00	0.47	84	9.94	3.80	27	4.42	2.11	192	19.37	3.80
	Case 11_24	200	25.50	8.57	63	26.17	20.27	50	4.34	0.28	313	56.01	20.27
	Case 14_27	276	21.35	0.58	152	29.15	2.88	26	2.46	0.27	454	52.96	2.88
	Case 15_33	152	11.12	0.71	142	39.07	3.47	34	4.38	0.67	328	54.57	3.47
	Case 16_43	98	6.65	0.43	95	14.28	1.33	92	19.00	1.96	285	39.93	1.96
	Case 17_44	94	7.63	0.64	92	28.23	4.82	199	155.41	79.18	385	191.26	79.18
	Case 18_45	86	5.65	0.33	74	6.56	0.45	27	2.08	0.74	187	14.29	0.74
	Case 19_47	194	19.06	2.04	85	21.18	3.68	69	11.65	6.74	348	51.89	6.74
	Case 20_59	69	8.92	4.56	69	17.52	4.39	82	18.88	2.80	220	45.33	4.56
Series 2	Case 21_16	117	10.71	0.66	93	30.66	4.76	24	3.34	0.81	234	44.70	4.76
	Case 22_22	102	7.38	0.68	70	16.91	5.21	61	17.96	3.87	233	42.25	5.21
	Case 24_28	587	295.91	54.53	130	445.01	298.76	146	121.69	91.24	863	862.62	298.76
	Case 25_29	332	35.84	4.34	108	17.86	2.48	67	13.98	2.71	507	67.68	4.34
	Case 26_38	769	298.49	38.04	291	426.96	117.61	85	35.26	13.04	1145	760.71	117.61
	Case 27_31	82	9.41	1.95	54	6.89	0.65	19	2.35	0.52	155	18.66	1.95
	Case 28_32	164	14.17	1.21	44	12.60	2.15	11	2.61	1.98	219	29.39	2.15
	Case 29_40	181	14.05	0.56	227	72.01	9.49	39	3.87	1.11	447	89.93	9.49
	Case 30_50	121	7.09	0.20	60	14.42	2.93	46	5.94	0.97	227	27.45	2.93
	Case 31_51	75	4.45	0.28	38	1.91	0.19	35	5.07	0.92	148	11.44	0.92
	Case 32_54	298	79.26	12.82	194	241.93	56.80	80	220.55	191.02	572	541.74	191.02
	Case 33_57	149	13.20	1.35	153	40.74	4.44	13	0.74	0.16	315	54.68	4.44
	Case 34_58	158	19.13	1.76	83	168.23	75.77	33	8.48	2.42	274	195.85	75.77
	Case 35_68	249	76.59	5.63	181	494.87	338.40	43	4.75	0.82	473	576.21	338.40
	Case 37_74	95	5.91	0.29	32	5.58	1.27	7	0.29	0.07	134	11.78	1.27
	Total Series 1	2752	590.44	60.69	1847	655.69	70.60	1009	343.08	79.18	5608	1589.21	79.18
	Total Series 2	3479	891.60	54.53	1758	1996.59	338.40	709	446.90	191.02	5946	3335.09	338.40
	Grand Total:	**6231**	**1482.04**	**60.69**	**3605**	**2652.28**	**338.40**	**1718**	**789.98**	**191.02**	**11554**	**4924.30**	**338.40**

Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Table 6-11 Summary of the Rockfall Predictions Under 10^{-5} Annual Exceedance Ground Motion for the Simulated Series 1 and 2 Cases at the Access Main/Turnout Intersection for Selected Rock Block Ranges of Elevations.

Series	1	2	All
EL < 0.0 m			
Number of Blocks:	1009	709	1718
Total Volume (m^3):	343.08	446.90	789.98
Max. Block Vol. (m^3):	79.18	191.02	191.02
0 < EL < 3.81 m			
Number of Blocks:	1847	1758	3605
Total Volume (m^3):	655.69	1996.59	2652.28
Max. Block Vol. (m^3):	70.60	338.40	338.40
EL > 3.81 m			
Number of Blocks:	2752	3479	6231
Total Volume (m^3):	590.44	891.60	1482.04
Max. Block Vol. (m^3):	60.69	54.53	60.69
All Cases included			
Number of Blocks:	5608	5946	11554
Total Volume (m^3):	1589.21	3335.09	4924.30
Max. Block Vol. (m^3):	79.18	338.40	338.40

Source: CD_1 *Rockfall Results – All Cases Extract Summary.xls*

Table 6-12 Ratio of the Rockfall Predicted Under 10^{-5} Annual Exceedance Ground Motion Between Rock Blocks of Volume Greater than 20 m^3 to the Entire Rockfall Block Population.

	Number of Blocks	Rockfall Volume (m^3)
All Blocks	11554	4924.30
No. of Blocks with Volume > 20 m^3	24	1998.752
Ratio [(V>20/All) * 100], (%)	0.21	40.59

Source: CD_1 *Rockfall Results – All Cases Extract Summary.xls*

Table 6-13 Rockfall Analysis - Statistics for Each and All Cases for Rockfall Block Volume at and Above Springline

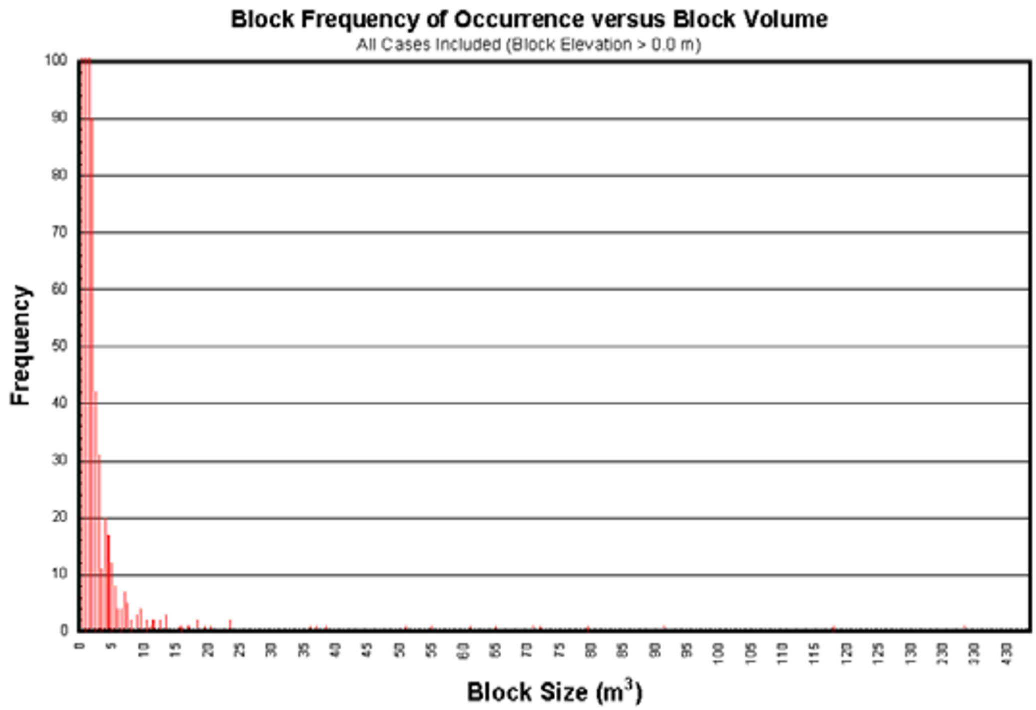
Series	Analyzed Case Number	Rockfall Blocks N	Mean Block Volume (m^3)	Median Block Volume (m^3)	Std Dev Block Volume (m^3)	Range Block Volume (m^3)	Minimum Block Volume (m^3)	Maximum Block Volume (m^3)
Series 1	Series 1	743	0.608	0.075	3.840	70.584	0.020	70.604
	Case 02_15	302	0.227	0.052	1.151	19.121	0.020	19.141
	Case 04_17	179	0.080	0.043	0.124	1.334	0.020	1.354
	Case 05_18	198	0.069	0.046	0.064	0.436	0.020	0.457
	Case 06_19	965	0.401	0.075	2.782	60.668	0.020	60.688
	Case 07_20	106	0.070	0.053	0.067	0.421	0.020	0.441
	Case 10_23	165	0.091	0.048	0.298	3.784	0.020	3.805
	Case 11_24	263	0.196	0.051	1.353	20.247	0.020	20.267
	Case 14_27	428	0.118	0.051	0.267	2.863	0.020	2.883
	Case 15_33	294	0.171	0.058	0.376	3.453	0.020	3.473
	Case 16_43	193	0.108	0.057	0.173	1.306	0.020	1.327
	Case 17_44	186	0.193	0.053	0.493	4.797	0.020	4.817
	Case 18_45	160	0.076	0.051	0.069	0.428	0.020	0.448
	Case 19_47	279	0.144	0.052	0.352	3.656	0.020	3.676
	Case 20_59	138	0.192	0.050	0.637	4.543	0.020	4.563
Series 2	Case 21_16	210	0.197	0.052	0.531	4.742	0.020	4.762
	Case 22_22	172	0.141	0.045	0.479	5.186	0.020	5.207
	Case 24_28	717	1.033	0.122	11.485	298.740	0.020	298.760
	Case 25_29	440	0.122	0.057	0.289	4.319	0.020	4.339
	Case 26_38	1060	0.684	0.103	4.718	117.590	0.020	117.610
	Case 27_31	136	0.120	0.060	0.197	1.927	0.020	1.948
	Case 28_32	208	0.129	0.048	0.258	2.135	0.020	2.155
	Case 29_40	408	0.211	0.061	0.744	9.470	0.020	9.490
	Case 30_50	181	0.119	0.049	0.296	2.908	0.020	2.928
	Case 31_54	113	0.056	0.038	0.044	0.262	0.020	0.282
	Case 32_54	492	0.653	0.088	3.028	56.775	0.020	56.795
	Case 33_57	302	0.179	0.064	0.420	4.420	0.020	4.441
	Case 34_58	241	0.777	0.060	5.274	75.753	0.020	75.773
	Case 35_68	430	1.329	0.079	17.101	338.380	0.020	338.400
	Case 37_74	127	0.090	0.041	0.168	1.249	0.020	1.270
	All Cases	**9836**	**0.420**	**0.064**	**5.296**	**338.380**	**0.020**	**338.400**

Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Table 6-14 Rockfall Analysis - Statistics for Each and All Cases for Rockfall Block Elevation at and Above Springline

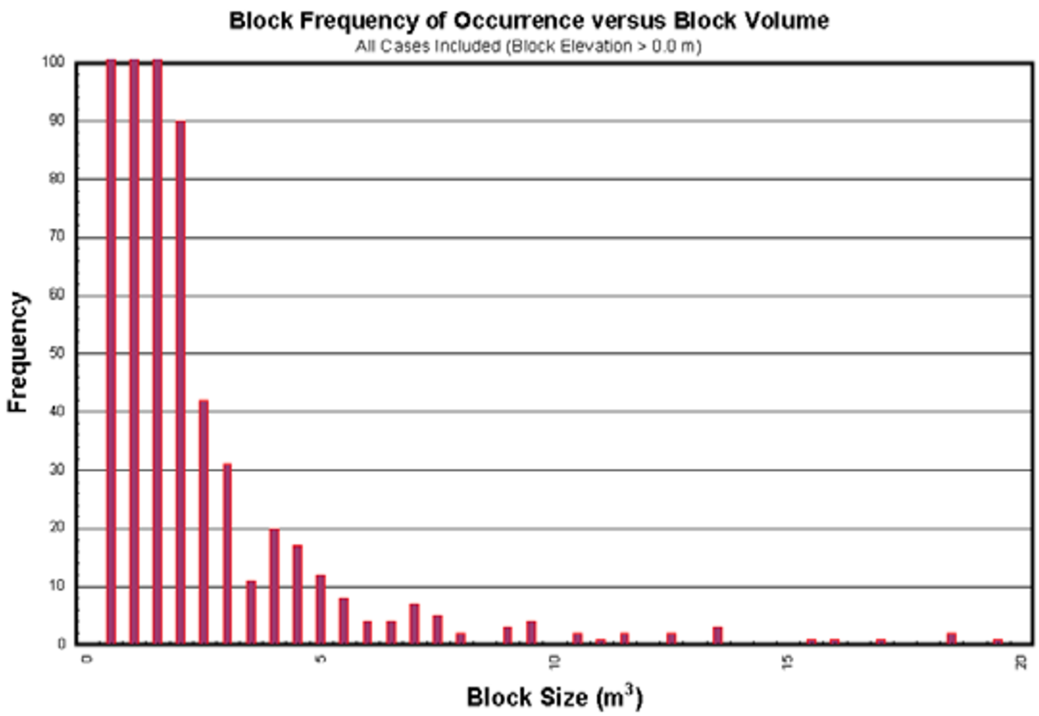
Series	Analyzed Case Number	Rockfall Blocks N	Mean Elevation (m)	Median Elevation (m)	Std Dev Elevation (m)	Range Elevation (m)	Minimum Elevation (m)	Maximum Elevation (m)
Series 1	Case 01_14	743	5.269	4.372	3.351	15.259	0.000	15.259
	Case 02_15	302	6.761	4.981	4.283	14.581	0.224	14.805
	Case 04_17	179	6.393	6.498	4.039	14.847	0.076	14.923
	Case 05_18	198	6.977	7.131	4.294	13.962	0.012	13.974
	Case 06_19	965	5.105	4.188	3.112	14.611	0.000	14.611
	Case 07_20	106	7.631	7.407	4.715	14.851	0.119	14.970
	Case 10_23	165	5.725	3.810	4.114	14.033	0.309	14.342
	Case 11_24	263	7.605	7.496	3.722	15.001	0.020	15.021
	Case 14_27	428	6.123	6.509	3.390	14.950	0.024	14.974
	Case 15_33	294	5.873	3.837	4.175	14.897	0.097	14.994
	Case 16_43	193	5.155	3.890	4.180	15.016	0.022	15.038
	Case 17_44	186	4.530	3.810	3.289	14.253	0.020	14.273
	Case 18_45	160	5.815	4.179	4.075	14.514	0.056	14.570
	Case 19_47	279	6.519	6.568	3.717	14.270	0.026	14.296
	Case 20_59	138	5.593	3.879	4.214	14.271	0.202	14.473
Series 2	Case 21_16	210	6.165	4.691	4.361	14.902	0.025	14.927
	Case 22_22	172	6.529	5.314	4.586	14.635	0.089	14.724
	Case 24_28	717	6.800	6.603	3.235	14.654	0.088	14.742
	Case 25_29	440	6.563	6.626	3.474	14.507	0.006	14.513
	Case 26_38	1060	5.635	5.245	2.790	14.443	0.000	14.443
	Case 27_31	136	6.594	4.982	4.453	14.460	0.079	14.539
	Case 28_32	208	8.439	8.072	4.017	14.368	0.605	14.973
	Case 29_40	408	4.692	3.283	3.707	14.541	0.045	14.586
	Case 30_50	181	5.814	5.482	3.595	15.023	0.011	15.034
	Case 31_54	113	7.439	7.014	4.465	14.636	0.000	14.636
	Case 32_54	492	5.116	4.483	2.671	14.532	0.081	14.613
	Case 33_57	302	5.337	3.810	3.818	14.602	0.226	14.828
	Case 34_58	241	6.067	4.700	3.935	15.300	0.000	15.300
	Case 35_68	430	5.688	4.366	3.603	14.641	0.007	14.648
	Case 37_74	127	7.642	8.001	4.008	14.529	0.000	14.529
All Cases		**9836**	**5.946**	**5.029**	**3.688**	**15.300**	**0.000**	**15.300**

Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*



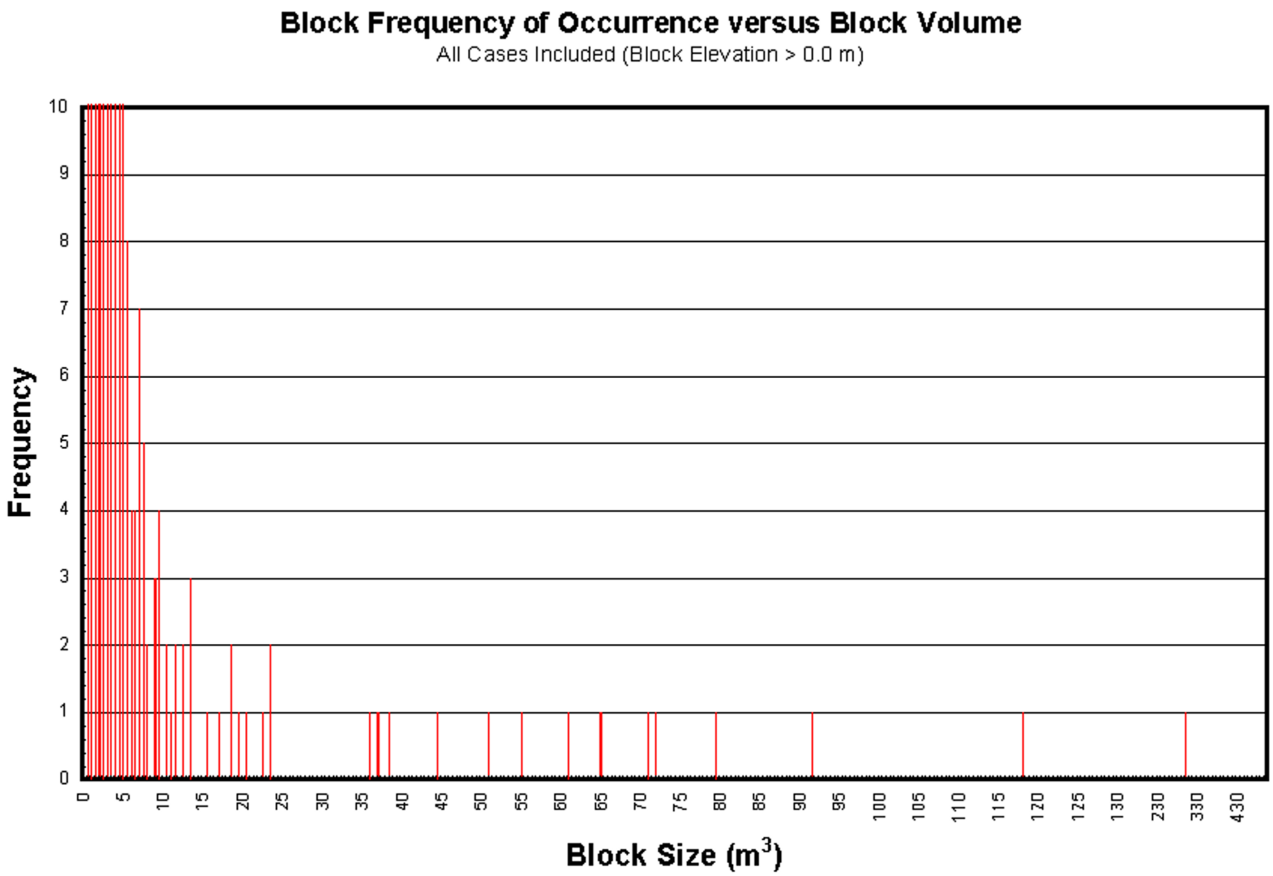
Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-18 Results for Series 1, 10^{-5} Ground Motion Study Showing Rock Block Frequency of Occurrence versus Block Volume. For Clarity the Scale of Frequency is Limited to 100.



Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-19 Results for Series 1, 10^{-5} Ground Motion Study Showing Rock Block Frequency of Occurrence versus Block Volume. Closeup for Block Volume Range up to 20 m^3.



Source: *CD_1 Rockfall Results – All Cases Extract Summary.xls*

Figure 6-20 Results for Series 1 and 2, 10^{-5} Ground Motion Study Showing Rock Block Frequency of Occurrence versus Block Volume. For Clarity the Scale of Frequency is Limited to 10.

7.0 RESULTS AND CONCLUSIONS

The objective of the analysis is to provide input to the PCSA analysis to determine the size and distribution of the rockfall blocks, related to certain probability that can impact the TEV shielded enclosure during the transport of waste packages to the emplacement drifts.

Justification is provided for the number of simulations performed. This number is considered adequate to characterize the rockfall volume and size distribution of caved blocks at the intersection of the access main and turnout as predicted for preclosure ground motions of the annual probability of exceedance equal to 10^{-5}.

Stability of the excavation under seismic loading is assessed by the quasi-static simulation of a sequence of equilibrium states. This approach is justified because of the large wavelength of seismic ground motion compared to the size of excavation, which in effect produces relatively uniform stress and associated strain field. The approach is validated using results of a dynamic stability analysis of the emplacement drifts.

Stability of the intersection between the access main and the turnout is investigated for a total of 30 data sets performed in two series. Each series includes 15 patterns of ground motions paired to the two randomly generated cases of different realizations of rock mass jointing.

The maximum span of the intersection is 15 m, compared to the 5.5-m diameter of the emplacement drift. The statistics of block sizes of the caved rock for 10^{-4} ground motion are very similar for the emplacement drift and the intersection. The main difference in predicted rockfall is that the predicted maximum block size is much larger in the intersection than in the emplacement drift.

A comparison of the similar simulation cases for 10^{-4} and 10^{-5} ground motions indicates that the total number of rockfall blocks for 10^{-5} ground motion is approximately 2.4 times larger and the total rockfall volume is 5.6 times larger. The results also show that for geometrically similar cases, the 10^{-5} annual exceedance ground motion at the intersection produces rockfall with maximum rockfall block volume 4.6 times larger than 10^{-4} ground motion. The overall results also show the maximum rockfall block to be approximately an order of magnitude larger than one produced by 10^{-4} ground motion (338.4 m^3 versus 36.72 m^3). The total number and volume of rockfall blocks obtained for 10^{-5} ground motion from 30 simulations indicates that 0.21 percent of the total number of blocks of the volume greater than 20 m^3 comprises approximately 41 percent of the total rockfall volume.

The results of analysis include statistical parameters for the rockfall volume and the rockfall block elevation. Statistical parameters are calculated for each individual realization case as well as for the entire population of rockfalls generated in 30 rockfall simulations.

The distribution and parameters of discontinuities are major factors affecting the location and the size of rockfall. Small variations of tunnel dimensions and geometry, e.g., the local change of tunnel shape to flat roof or a small increase in the roof span is not expected to affect the overall results obtained from this analysis.

The outputs of this calculation are reasonable compared to the inputs. The results are suitable for the intended use.

ATTACHMENT I

DETERMINATION OF SEICMIC VELOCITY SPECTRAL DENSITY FUNCTIONS USING FAST FOURIER TRANSFORM

This attachment presents the calculation of seismic wave spectrum density functions based on the velocity time histories using the fast Fourier transform (FFT) scheme. The FFT is performed using Mathcad software (see Section 4.2.2). The results of Mathcad calculations are presented in the Output DTN: MO0410MWDPRNDP.000 (file: *spectral density-cfft.mcd*, Reference 2.2.27).

The inputs are the three components of ground motion velocities (H1, H2, and V) (DTN: MO0306SDSAVDTH.000 (Reference 2.2.24, MatH1.vth, MatH2.vth, and MatV.vth), as shown in Figure 6-5. There are a total of 15,000 data points in each velocity component, with a time interval of 0.005 second between two adjacent data points. Define the variables as follows:

$$H1V := H1^{\langle 3 \rangle}$$

$$H2V := H2^{\langle 3 \rangle}$$

$$VV := V^{\langle 3 \rangle}$$

$$n_s := \text{length}\left(H1^{\langle 0 \rangle}\right) \qquad n_s = 1.5 \times 10^4$$

The first 15 data points of these velocity components are given below (DTN: MO0306SDSAVDTH.000 (Reference 2.2.24, MatH1.vth, MatH2.vth, and MatV.vth).

H1V =

	0
0	0
1	$5.586 \cdot 10^{-5}$
2	$7.729 \cdot 10^{-3}$
3	0.025
4	0.047
5	0.075
6	0.125
7	0.201
8	0.259
9	0.288
10	0.324
11	0.354
12	0.362
13	0.391
14	0.424
15	0.402

H2V =

	0
0	0
1	-0.13
2	-0.138
3	-0.124
4	-0.236
5	-0.37
6	-0.447
7	-0.532
8	-0.64
9	-0.69
10	-0.713
11	-0.807
12	-0.892
13	-0.907
14	-0.926
15	-0.959

VV =

	0
0	0
1	-0.219
2	-0.348
3	-0.517
4	-0.616
5	-0.692
6	-0.737
7	-0.791
8	-0.884
9	-0.966
10	-1.076
11	-1.104
12	-1.097
13	-1.185
14	-1.258
15	-1.328

The FFT is achieved using the following built-in function in Mathcad:

$$fh1 := cfft(H1V)$$

$$fh2 := cfft(H2V)$$

$$fv := cfft(VV)$$

$$N := length(fh1) \quad N = 1.5 \times 10^{4}$$

The first 15 data points of the results are shown below.

fh1 =

	0
0	-0.017
1	-0.05-0.86i
2	-0.413-1.855i
3	-8.281-3.9i
4	32.801+52.456i
5	50.599-108.382i
6	-78.506+110.118i
7	93.001-108.318i
8	-212.171+119.54i
9	202.027-66.604i
10	-137.792-13.515i
11	98.773+17.788i
12	-76.449+54.795i
13	152.142-139.152i
14	-112.839+72.018i
15	179.696-57.55i

fh2 =

	0
0	$-3.996 \cdot 10^{-3}$
1	0.033-0.061i
2	1.24+1.115i
3	-0.712-25.323i
4	-52.344+46.944i
5	115.889-8.42i
6	-133.223+7.224i
7	153.453+1.489i
8	-161.466+10.22i
9	162.315-13.232i
10	-173.463-12.398i
11	124.128+53.614i
12	-99.871-98.74i
13	84.776+84.3i
14	-77.366-94.131i
15	34.067+144.94i

fv =

	0
0	0.021
1	-0.403+0.805i
2	-1.508+2.102i
3	-4.836-9.813i
4	-40.333+71.516i
5	97.922+26.496i
6	-46.828-135.083i
7	-36.789+139.093i
8	38.637-228.777i
9	-12.184+193.291i
10	-40.631-128.496i
11	43.818+117.687i
12	-171.595+0.449i
13	162.417-73.416i
14	-202.65+18.382i
15	89.5+162.241i

The magnitudes of these complex numbers are given as

$$mfh1_j := \left|fh1_j\right|$$

$$mfh2_j := \left|fh2_j\right|$$

$$mfv_j := \left|fv_j\right|$$

or

mfh1 =

	0
0	0.017
1	0.862
2	1.901
3	9.154
4	61.867
5	119.611
6	135.238
7	142.765
8	243.529
9	212.723
10	138.453
11	100.362
12	94.058
13	206.18
14	133.863
15	188.687

mfh2 =

	0
0	$3.996 \cdot 10^{-3}$
1	0.069
2	1.668
3	25.333
4	70.311
5	116.194
6	133.418
7	153.46
8	161.789
9	162.853
10	173.905
11	135.212
12	140.441
13	119.556
14	121.844
15	148.889

mfv =

	0
0	0.021
1	0.9
2	2.587
3	10.94
4	82.105
5	101.443
6	142.97
7	143.876
8	232.017
9	193.675
10	134.767
11	125.579
12	171.596
13	178.239
14	203.482
15	185.29

where j is the jth number of data points. The actual frequency, f_j , corresponding to jth data point is determined based on the original data frequency, f_s , of 1/0.005 and the number of data points of 15000, as follows:

$$f_j = \frac{j}{N} f_s = \frac{j}{75}$$

Figure I-1 shows the plot of power spectral densities versus frequency for three velocity components.

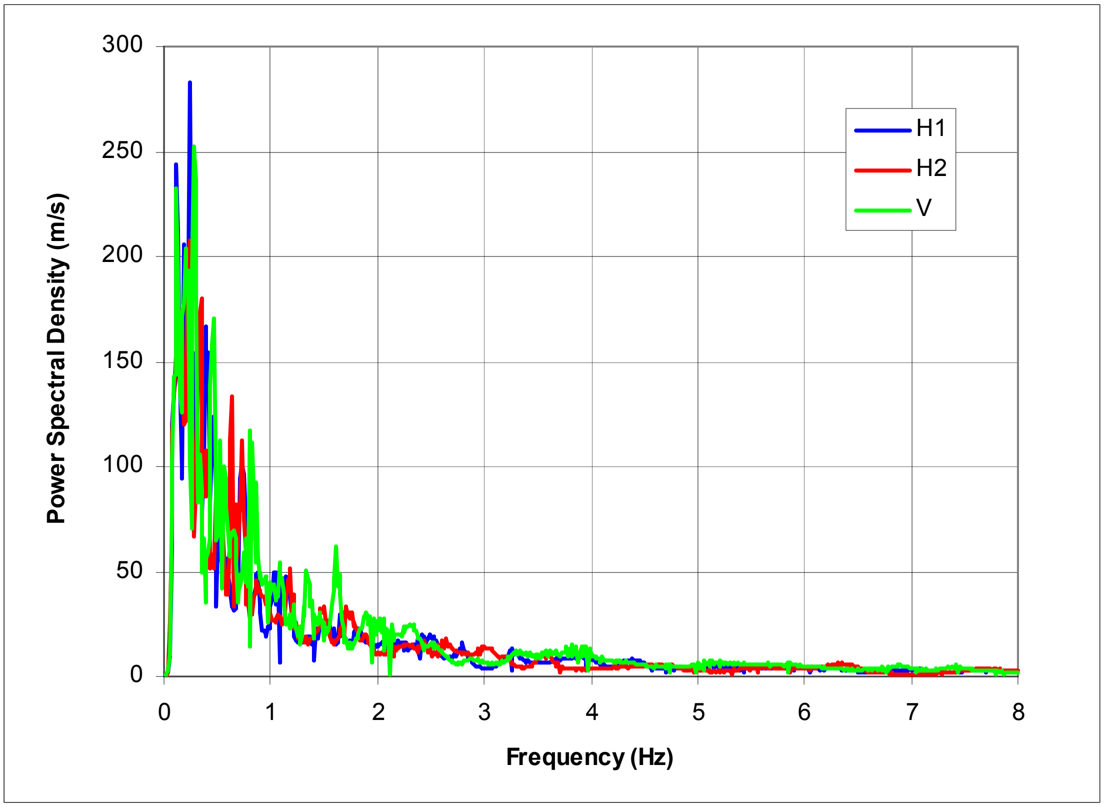


Figure I-1 Power Spectral Density versus Frequency for Three Velocity Components

ATTACHMENT II

POST-PROCESSING RESULTS FROM 3DEC SIMULATIONS

POST-PROCESSING RESULTS FROM 3DEC SIMULATIONS

The results from 3DEC simulations are obtained in a binary file format and the presentation of these results requires post-processing. There are a number of typical commands that can be used to present the results either in a graphical or printed form. The FISH language, an inherent part of the qualified 3DEC software, can be used to extract and present the data in the desired format, and using FISH language for generating scripts, macros or functions written for a specific purpose, can further enhance this standard set of commands.

This attachment presents the description of two functions 1) _printDeletedID (deleted1.fis) and 2) _printDeletedVolumeID (deleted2.fis), that in this analysis are used during the stage of data post-processing. They were written to facilitate visualization and output of volumes and elevations of blocks that have become unstable during simulation of stability of intersections subjected to seismic ground motions.

The functions are listed below with explanation for their use such, that a reviewer can examine the results presented independently. The use of these functions is limited to the particular applications described in this attachment. The functions are used for identification of rockfall block geometry, calculation of volume and determining the elevation of the lowermost apex of the rock block. The results of functions can be verified visually and manually from the geometry, and printed output of associated parameters. These functions are listed below and the results obtained by applying them can be visually checked and verified and do not require further verification.

As explained in Section 6.5.4 the procedure used during simulation of the rockfall results in deleting the blocks that were found to satisfy a criterion used to determine if the block is considered as rockfall. Block that satisfies the rockfall criterion is deleted and calculations continue to attain a new state of equilibrium. An account of all rock mass blocks is maintained by a list of block identifications. These numbers are required to store and orderly retrieve all data pertaining to a particular rock mass fragment.

The function _printDeletedID prints identifications of all blocks that are deleted during simulation. It should be called at the end of simulation to assure that all rockfall blocks are accounted for. The block identifications are written in the form of commands that mark the rockfall/deleted blocks as region 77. One of the function's parameters "volumeThreshold_," allows for printing only the rockfall/deleted blocks with volumes greater than specified by the "volumeThreshold_". Upon calling the function, a log file is generated that contains an image of lines printed to the screen and listing of identifications of the rockfall block. This log file of deleted blocks can be used to verify this function. This task can be accomplished by calling the log file with the stored screen printout from the same save ("… .sav) file, from which the function was called. However, this is a file from which all rockfall blocks were deleted, invoking the function will result in no action. No blocks will be marked as region 77, which confirms that those are indeed the deleted blocks. To mark the deleted blocks, the initial save file, which contains all rock mass blocks prior to applying the seismic loading, where the blocks are still part of the model, must be restored. With initial (… .ini) file restored, by calling the log file, the list of stored commands will mark the blocks that became a part of the rockfall as region 77.

The "_printDeletedVolumeID" function allows to print volumes, identifications and the minimum elevation of rockfall blocks. This output is obtained on the screen. Here again, the log file can be created to preserve information pertaining to the volume, identification and elevation of the rockfall blocks. By examining the printed log, one can easily verify that no blocks with volume greater than one specified by the "volumeThreshold_" are included.

************** deleted1.fis ***************************************

```
def _printDeletedID
  iPnt_ = listActualBlocks_
  loop while iPnt_ # null
    if mem(iPnt_+KADEL_) = 1 then
      volume_ = mem(iPnt_+KAVOL_)
      if volume_ >= volumeThreshold_
        jPnt_ = mem(iPnt_+KALIST_)
        loop while jPnt_ # null
         iBlock_ = mem(jPnt_+KPADD_)
         can_ = out('mark block '+string(iBlock_)+' region 77' )
         jPnt_ = mem(jPnt_+KPNEXT_)
        end_loop
      endif
    endif
    iPnt_ = mem(iPnt_+KANEXT_)
  end_loop
end
set volumeThreshold_ 0.0
_printDeletedID
```

************** deleted2.fis ************************************

```
def _printDeletedVolumeID
  iPnt_ = listActualBlocks_
  loop while iPnt_ # null
    jPnt_ = mem(iPnt_+KALIST_)
    iBlock_ = mem(jPnt_+KPADD_)
    if b_region(iBlock_) = 77
      volume_ = mem(iPnt_+KAVOL_)
      can_ = out('block volume '+string(volume_))
      yMin_ = 1.e30
      loop while jPnt_ # null
        iBlock_ = mem(jPnt_+KPADD_)
        can_ = out('  block ID '+string(iBlock_))
        iGp_ = b_vertex(iBlock_)
        loop while iGp_ # 0
          yMin_ = min(yMin_,gp_y(iGp_))
          iGp_ = gp_next(iGp_)
        end_loop
        jPnt_ = mem(jPnt_+KPNEXT_)
      end_loop
      can_ = out('  minimum elevation '+string(yMin_))
    endif
    iPnt_ = mem(iPnt_+KANEXT_)
  end_loop
end
_printDeletedVolumeID
```

BLOCK ELEVATION VERIFICATION

The elevation and volume are verified directly by visual inspection and by printing block information from 3DEC.

For example, in Case_01_14, there is a rockfall block with the following information:

Block volume 1.4513e+000
block ID 8260441
block ID 8259571
block ID 8274689
minimum elevation **3.2995e+000**

Plotting those three block components with identifications as listed above and inspecting interactively the coordinates displayed on the screen, one can verify a minimum block elevation.

An overall view of the Case_01_14 rockfall is presented in Figure II- 2 shows the block selected in the current example and its position with the lowermost apex located at the tunnel roof elevation. Shown in Figure II- 3 is an enlarged view of the looked upon at different angle. In the right corner of the Figure II- 4, a position of the cursor (here shown symbolically as an arrow) is shown along with the reading of x, y, and z coordinates indicating its location with respect to the opening springline. The plot indicates the y-coordinate of the lowest block point to be 3.32. The difference between the approximate y-coordinate displayed on the screen and equal to 3.321788, and the printed minimum elevation of the lowermost block vertex 3.2995 is small and both numbers are considered practically the same.

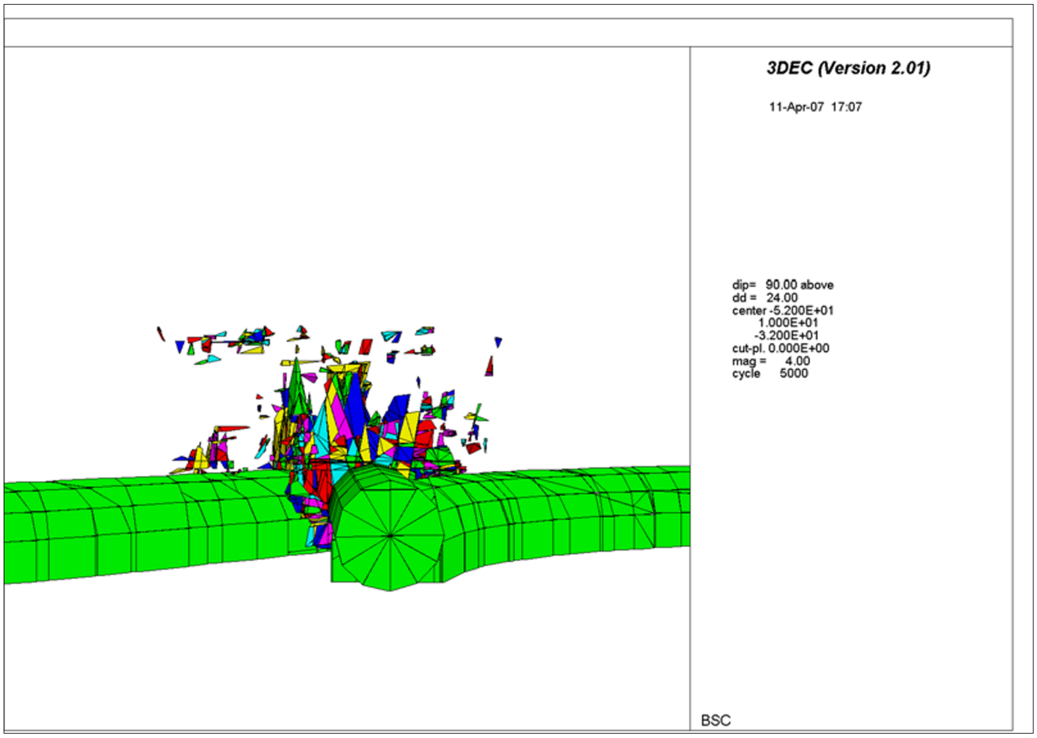


Figure II- 1 Case_01_14 - Overall View of Rockfall Relative to the Tunnel/Turnout Intersection

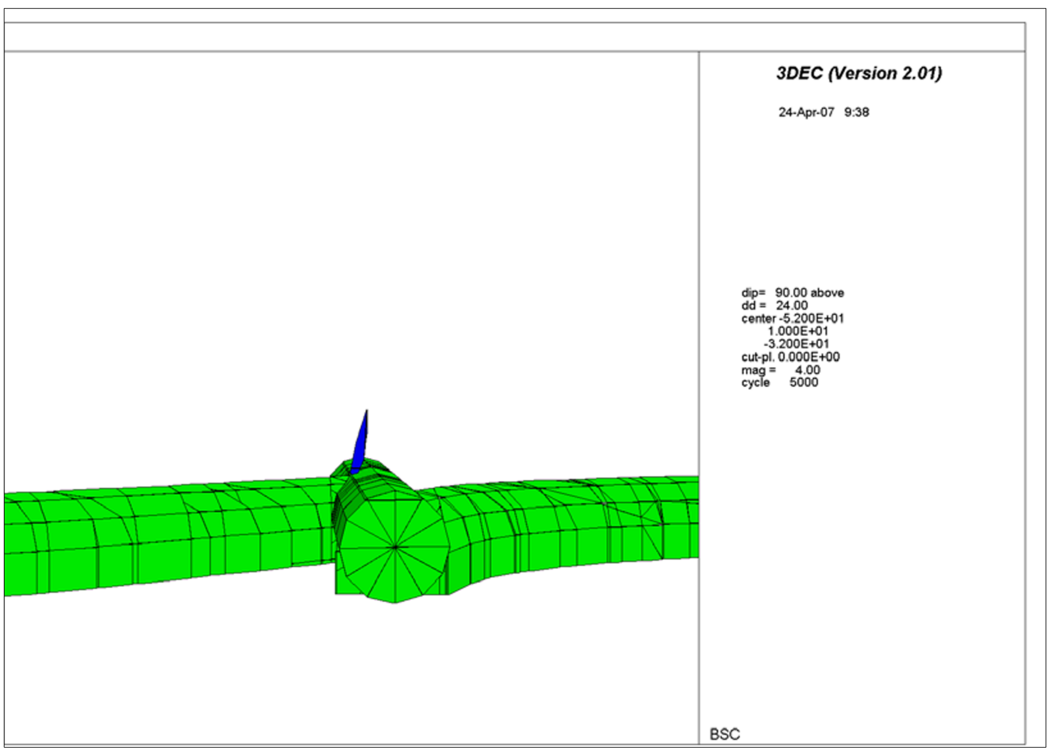


Figure II- 2 Case_01_14 - Location of the Selected Block Relative to the Tunnel Crown

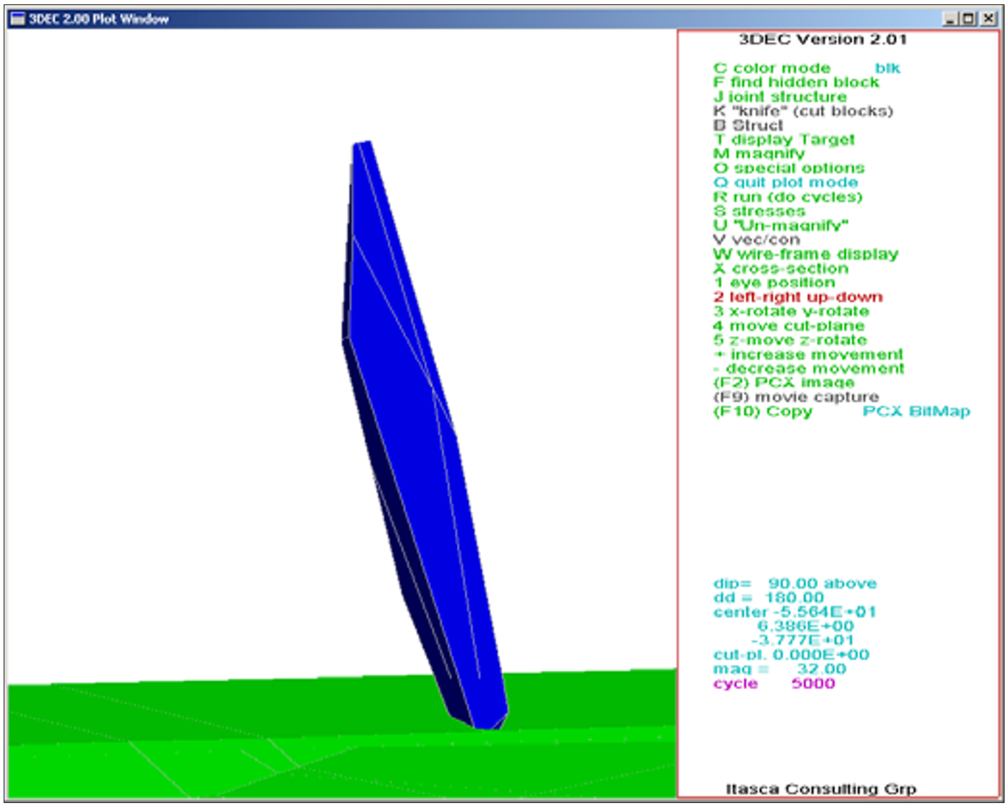


Figure II- 3 Case_01_14 - Location of the Selected Block Relative to the Tunnel Crown

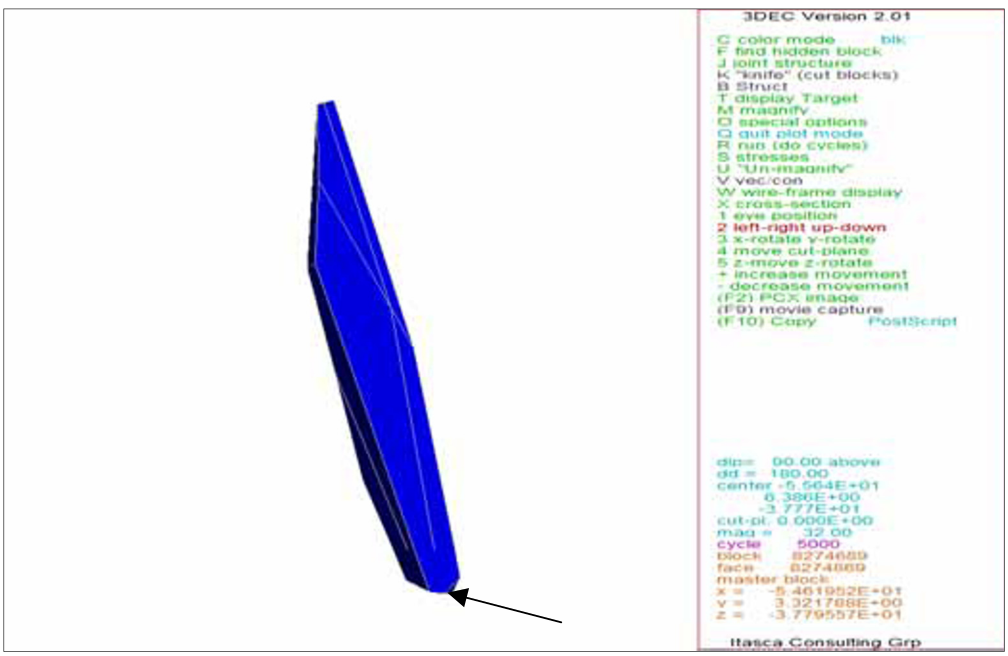


Figure II- 4 Case_01_14 - Location of the Selected Block Apex Used to Estimate Elevation of Each Rockfall Block

BLOCK VOLUME VERIFICATION

The volume is verified by printing the block information, which for three block of interest is as follows:

```
3dec>pr bl 8260441

 block data

    block mat const region  id    volume      centroid coord. (x,y and z)
  8260441   1   1      77 9025   7.314E-01   -5.537E+01  5.754E+00 -3.753E+01
(fdef)
               This block is slaved to block   8274689

 contact block-1 block-2 code-- unit normal --     x          y          z
 4697877 8259571 8260441 m-s 0.310-0.015 0.951 -5.538E+01  5.840E+00 -3.767E+01
 8261218 8260441 8274689 m-s-0.002-1.000-0.001 -5.491E+01  3.810E+00 -3.771E+01

 vertex data

  block  8260441
    vertex      x          y          z          dx         dy         dz
  23134107  4 -5.486E+01  4.282E+00 -3.787E+01  1.549E-05 -1.821E-05  1.858E-05
  18409378  4 -5.493E+01  4.754E+00 -3.783E+01  1.099E-05 -2.053E-05  1.963E-05
  18409312  4 -5.501E+01  5.226E+00 -3.780E+01  1.085E-05 -2.019E-05  2.388E-05
 3dec>pr bl 8259571

 block data

    block mat const region  id    volume      centroid coord. (x,y and z)
  8259571   1   1      77 9024   6.520E-01   -5.564E+01  6.461E+00 -3.777E+01
(fdef)
               This block is slaved to block   8274689

 contact block-1 block-2 code-- unit normal --     x          y          z
 4697877 8259571 8260441 m-s 0.310-0.015 0.951 -5.538E+01  5.840E+00 -3.767E+01
12935542 8259571 8274689 m-s 0.002-1.000 0.004 -5.486E+01  3.810E+00 -3.790E+01

 vertex data

  block  8259571
    vertex      x          y          z          dx         dy         dz
  52928947  4 -5.585E+01  6.506E+00 -3.809E+01  1.880E-05 -2.109E-05  3.089E-05
  45236965  4 -5.605E+01  7.369E+00 -3.806E+01  1.767E-05 -1.306E-05  3.164E-05
  37197513  4 -5.589E+01  8.404E+00 -3.764E+01  1.750E-05  5.005E-06  2.869E-05
 3dec>pr bl 8274689

 block data

    block mat const region  id    volume      centroid coord. (x,y and z)
  8274689   1   1      77 9041   6.852E-02   -5.485E+01  3.593E+00 -3.773E+01
(fdef)

 contact block-1 block-2 code-- unit normal --     x          y          z
12935542 8259571 8274689 m-s 0.002-1.000 0.004 -5.486E+01  3.810E+00 -3.790E+01
 8261218 8260441 8274689 m-s-0.002-1.000-0.001 -5.491E+01  3.810E+00 -3.771E+01
```

```
vertex data

 block  8274689
   vertex      x           y           z           dx          dy          dz
 23964708  4 -5.489E+01  3.810E+00 -3.756E+01  2.003E-05 -1.453E-05  1.946E-05
 23964585  4 -5.506E+01  3.810E+00 -3.781E+01  1.871E-05 -1.321E-05  2.070E-05
 23964519  4 -5.478E+01  3.810E+00 -3.790E+01  2.007E-05 -1.669E-05  2.124E-05
  8275151  7 -5.483E+01  3.329E+00 -3.801E+01  1.580E-05 -1.199E-05  2.196E-05
  8275018  7 -5.498E+01  3.810E+00 -3.802E+01  1.975E-05 -1.503E-05  2.156E-05
```

Adding printed volumes of three blocks gives: **0.7314+0.652+0.06852 = 1.4513**, which is identical to the value printed by the function.

****

ATTACHMENT III

4 DVDS AND 1 CD - LIST OF FILES

Disk DVD_1 – List of Files

6/14/2007 7:34 AM D:\A_Case_01_14.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_01_14\Case_01_14_22_7 - 022307\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_01_14\Case_01_14_22_7 - 022307\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_01_14\Case_01_14_22_7 - 022307\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_01_14\Case_01_14_22_7 - 022307\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_01_14\Case_01_14_22_7 - 022307\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_01_14\Case_01_14_22_7 - 022307\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_01_14\Case_01_14_22_7 - 022307\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_01_14\Case_01_14_22_7 - 022307\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_01_14\Case_01_14_22_7 - 022307\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_01_14\Case_01_14_22_7 - 022307\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_01_14\Case_01_14_22_7 - 022307\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_01_14\Case_01_14_22_7 - 022307\

6/14/2007 7:34 AM **D:\A_Case_01_14.zip** **Page 2**

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_01_14\Case_01_14_22_7 - 022307\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_01_14\Case_01_14_22_7 - 022307\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_01_14\Case_01_14_22_7 - 022307\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_01_14\Case_01_14_22_7 - 022307\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_01_14\Case_01_14_22_7 - 022307\
simulationQS.DAT	DAT File	1/26/2007 12:33 PM	734	62%	282	A_Case_01_14\Case_01_14_22_7 - 022307\
3dec.lnk	Shortcut	2/6/2007 3:42 PM	635	35%	412	A_Case_01_14\Case_01_14_22_7 - 022307\
rerun.dat	DAT File	2/7/2007 5:59 PM	1,462	64%	526	A_Case_01_14\Case_01_14_22_7 - 022307\
Case14jointing22_ini.sav	SAV File	2/28/2007 6:56 PM	349,743,623	58%	148,208,435	A_Case_01_14\
Case14jointing22motion7step14.sav	SAV File	2/28/2007 7:01 PM	387,898,871	60%	154,708,293	A_Case_01_14\
Case14.txt	Text Document	3/2/2007 1:21 PM	57,484	84%	9,112	A_Case_01_14\Figures & Miscs\
C_14_2.pcx	Corel PHOTO-...	3/2/2007 1:33 PM	290,176	76%	70,009	A_Case_01_14\Figures & Miscs\
C_14_3.pcx	Corel PHOTO-...	3/2/2007 1:35 PM	265,493	77%	61,953	A_Case_01_14\Figures & Miscs\
C_14_4.pcx	Corel PHOTO-...	3/2/2007 1:49 PM	221,352	79%	47,544	A_Case_01_14\Figures & Miscs\
C-14_5.pcx	Corel PHOTO-...	3/2/2007 1:54 PM	209,238	82%	37,997	A_Case_01_14\Figures & Miscs\
C_14_6.pcx	Corel PHOTO-...	3/2/2007 2:01 PM	209,751	82%	38,291	A_Case_01_14\Figures & Miscs\
C_14_7.pcx	Corel PHOTO-...	3/2/2007 2:03 PM	234,405	79%	50,213	A_Case_01_14\Figures & Miscs\
C_14_8.pcx	Corel PHOTO-...	3/2/2007 3:25 PM	229,408	80%	45,516	A_Case_01_14\Figures & Miscs\
C_14_9.pcx	Corel PHOTO-...	3/2/2007 3:37 PM	285,480	78%	63,414	A_Case_01_14\Figures & Miscs\
C_14_10.pcx	Corel PHOTO-...	3/2/2007 3:47 PM	233,072	79%	49,413	A_Case_01_14\Figures & Miscs\
C_14_11.pcx	Corel PHOTO-...	3/2/2007 3:49 PM	227,973	79%	47,257	A_Case_01_14\Figures & Miscs\
Case14_Block_ID.txt	Text Document	3/5/2007 7:23 PM	18,295	75%	4,586	A_Case_01_14\Figures & Miscs\
Case14_Block_ID_Mod.txt	Text Document	3/7/2007 4:29 PM	17,980	74%	4,620	A_Case_01_14\Figures & Miscs\
Case14_Block_ID_Mod_2.txt	Text Document	3/7/2007 4:29 PM	17,980	74%	4,620	A_Case_01_14\Figures & Miscs\
Case14_Block_ID.xls	Microsoft Excel ...	3/7/2007 5:49 PM	137,728	76%	33,403	A_Case_01_14\Figures & Miscs\
Case 14 block volume IDs & Mark_Block.txt	Text Document	3/7/2007 6:00 PM	13,672	67%	4,452	A_Case_01_14\Figures & Miscs\
Case 14 block volume IDs & Mark_Block_Final.txt	Text Document	3/7/2007 6:20 PM	17,563	73%	4,788	A_Case_01_14\Figures & Miscs\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_01_14\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_01_14\
C14_77.log	Text Document	3/8/2007 3:40 PM	29,746	84%	4,849	A_Case_01_14\Figures & Miscs\
c14_r77.dat	DAT File	3/8/2007 3:43 PM	29,746	84%	4,849	A_Case_01_14\Figures & Miscs\
C14_V_ID_Mod_2.txt	Text Document	3/8/2007 4:46 PM	63,272	87%	8,239	A_Case_01_14\Figures & Miscs\
C14_V_ID.dat.log	Text Document	3/8/2007 6:04 PM	36,884	79%	7,702	A_Case_01_14\Figures & Miscs\

6/14/2007 7:34 AM **D:\A_Case_01_14.zip** **Page 3**

Name	Type	Modified	Size	Ratio	Packed	Path
Case14_LargeBlocks.dat	DAT File	3/8/2007 6:31 PM	9,143	82%	1,686	A_Case_01_14\Figures & Miscs\
C14_Vol_ID_Elev.xls	Microsoft Excel ...	3/12/2007 12:47 PM	227,840	75%	57,338	A_Case_01_14\Figures & Miscs\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_01_14\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_01_14\
C_01_14_r77.txt	Text Document	4/11/2007 5:06 PM	57,511	84%	9,116	A_Case_01_14\
Pfil_1.pcx	Corel PHOTO-...	4/11/2007 5:07 PM	108,775	79%	23,169	A_Case_01_14\
Pfil_2.pcx	Corel PHOTO-...	4/11/2007 5:08 PM	135,286	72%	38,185	A_Case_01_14\
Pfil_3.pcx	Corel PHOTO-...	4/11/2007 5:09 PM	148,348	72%	41,691	A_Case_01_14\
Pfil_4.pcx	Corel PHOTO-...	4/11/2007 5:10 PM	100,587	90%	10,444	A_Case_01_14\
C_01_14_Blk_Vol_&_Elev_Dt.dat	DAT File	4/11/2007 5:13 PM	52,734	83%	9,192	A_Case_01_14\
Case_01_14 - All Blocks Distr.doc	Microsoft Word ...	4/17/2007 9:30 AM	472,064	13%	409,863	A_Case_01_14\
3dec.lnk	Shortcut	4/17/2007 9:50 AM	575	37%	365	A_Case_01_14\
Region_77m.txt	Text Document	4/24/2007 8:48 AM	249	34%	165	A_Case_01_14\
C_01_14_Blk_Vol_&_Elev_Dt_2.dat	DAT File	4/24/2007 8:54 AM	104,435	81%	19,560	A_Case_01_14\
C_01_14_Blk_Vol_&_Elev_Dt_2.xls	Microsoft Excel ...	4/24/2007 9:02 AM	272,384	74%	71,485	A_Case_01_14\
Region_77ma.txt	Text Document	4/24/2007 9:20 AM	335	41%	196	A_Case_01_14\
Pfil_1ma.pcx	Corel PHOTO-...	4/24/2007 9:38 AM	87,240	87%	11,432	A_Case_01_14\
Pfil_2ma.pcx	Corel PHOTO-...	4/24/2007 9:49 AM	81,968	88%	9,693	A_Case_01_14\
Case14jointing221_eq.sav	SAV File	5/8/2007 9:22 PM	349,745,011	57%	149,242,479	A_Case_01_14\
driver.dat	DAT File	5/15/2007 7:58 AM	6,268	74%	1,658	A_Case_01_14\Case_01_14_22_7 - 022307\
EQ_Volume.dat	DAT File	5/15/2007 1:07 PM	4,968	82%	919	A_Case_01_14\
Region_77.txt	Text Document	5/24/2007 6:03 PM	755	55%	336	A_Case_01_14\
C_01_14_r77_EQ.txt	Text Document	5/24/2007 6:16 PM	6,822	83%	1,138	A_Case_01_14\
Pfil_1_EQ.pcx	Corel PHOTO-...	5/24/2007 6:16 PM	92,472	84%	14,900	A_Case_01_14\
Pfil_2_EQ.pcx	Corel PHOTO-...	5/24/2007 6:16 PM	117,195	76%	28,437	A_Case_01_14\
Pfil_3_EQ.pcx	Corel PHOTO-...	5/24/2007 6:16 PM	134,080	77%	30,188	A_Case_01_14\
Pfil_4_EQ.pcx	Corel PHOTO-...	5/24/2007 6:17 PM	102,524	89%	11,114	A_Case_01_14\
Region_77_EQ.txt	Text Document	5/24/2007 6:17 PM	770	56%	335	A_Case_01_14\
C_01_14_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/24/2007 6:19 PM	8,979	82%	1,645	A_Case_01_14\
C_01_14_Blk_Vol_&_Elev Data_EQ.xls	Microsoft Excel ...	5/24/2007 6:26 PM	663,040	64%	237,281	A_Case_01_14\
C_01_14 - Summary.xls	Microsoft Excel ...	6/2/2007 12:24 PM	520,704	69%	161,660	A_Case_01_14\
C_01_14_Blk_Vol_&_Elev Data.xls	Microsoft Excel ...	6/4/2007 10:05 AM	1,195,008	66%	401,938	A_Case_01_14\
126 file(s)			**1,111,824,895**	**59%**	**457,478,282**	

6/14/2007 7:35 AM **D:\A_Case_02_15.zip** **Page 1**

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_02_15\Case_02_15_21_11 - 020607\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_02_15\Case_02_15_21_11 - 020607\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_02_15\Case_02_15_21_11 - 020607\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_02_15\Case_02_15_21_11 - 020607\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_02_15\Case_02_15_21_11 - 020607\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_02_15\Case_02_15_21_11 - 020607\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_02_15\Case_02_15_21_11 - 020607\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_02_15\Case_02_15_21_11 - 020607\
functions.fis	FIS File	6/12/2003 8:40 AM	27,288	87%	3,539	A_Case_02_15\Case_02_15_21_11 - 020607\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_02_15\Case_02_15_21_11 - 020607\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_02_15\Case_02_15_21_11 - 020607\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_02_15\Case_02_15_21_11 - 020607\

6/18/2007 4:02 PM **D:\A_Case_02_15.zip** **Page 2**

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_02_15\Case_02_15_21_11 - 020607\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_02_15\Case_02_15_21_11 - 020607\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_02_15\Case_02_15_21_11 - 020607\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_02_15\Case_02_15_21_11 - 020607\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_02_15\Case_02_15_21_11 - 020607\
simulationQS.DAT	DAT File	1/26/2007 12:33 PM	734	62%	282	A_Case_02_15\Case_02_15_21_11 - 020607\
3dec.lnk	Shortcut	2/6/2007 3:42 PM	635	35%	412	A_Case_02_15\Case_02_15_21_11 - 020607\
D144208.tmp	TMP File	2/6/2007 3:42 PM	0	0%	0	A_Case_02_15\Case_02_15_21_11 - 020607\
rerun.dat	DAT File	2/7/2007 5:59 PM	1,462	64%	526	A_Case_02_15\Case_02_15_21_11 - 020607\
Case15jointing21_ini.sav	SAV File	2/9/2007 1:34 PM	354,783,411	57%	150 788,749	A_Case_02_15\
Case15jointing211_eq.sav	SAV File	2/10/2007 3:21 AM	354,784,063	57%	151 591,329	A_Case_02_15\
Case15jointing21motion11step16.sav	SAV File	2/24/2007 3:41 PM	394,295,547	60%	157 251,161	A_Case_02_15\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_02_15\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_02_15\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_02_15\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_02_15\
Case_02_15 - All Blocks Distr.doc	Microsoft Word Do...	3/20/2007 10:40 AM	158,720	13%	138,587	A_Case_02_15\
Case_02_15 Block & Intersection Figures.doc	Microsoft Word Do...	3/20/2007 11:22 AM	83,456	29%	59,495	A_Case_02_15\
C_02_Blk_Vol_&_Min_Elev Data.xls	Microsoft Excel W...	3/20/2007 3:24 PM	178,688	65%	62,826	A_Case_02_15\
Region_77.txt	Text Document	4/23/2007 4:34 PM	760	55%	343	A_Case_02_15\
3dec.lnk	Shortcut	4/25/2007 10:06 AM	575	37%	365	A_Case_02_15\
C_02_15_r77.txt	Text Document	4/25/2007 10:22 AM	23,536	84%	3,840	A_Case_02_15\
Pfil_1.pcx	Corel PHOTO-PAI...	4/25/2007 10:22 AM	101,808	81%	19,685	A_Case_02_15\
Pfil_2.pcx	Corel PHOTO-PAI...	4/25/2007 10:22 AM	128,383	73%	34,510	A_Case_02_15\
Pfil_3.pcx	Corel PHOTO-PAI...	4/25/2007 10:22 AM	142,228	74%	36,349	A_Case_02_15\
Pfil_4.pcx	Corel PHOTO-PAI...	4/25/2007 10:23 AM	102,769	89%	11,063	A_Case_02_15\
C_02_15_Blk_Vol_&_Elev_Dt.dat	DAT File	4/25/2007 10:24 AM	25,145	82%	4,437	A_Case_02_15\
driver.dat	DAT File	5/15/2007 7:57 AM	6,271	74%	1,659	A_Case_02_15\Case_02_15_21_11 - 020607\
Region_77_EQ.txt	Text Document	5/25/2007 6:04 PM	770	56%	336	A_Case_02_15\
C_02_15_r77_EQ.txt	Text Document	5/25/2007 6:07 PM	3,295	83%	568	A_Case_02_15\
Pfil_1_EQ.pcx	Corel PHOTO-PAI...	5/25/2007 6:08 PM	92,646	84%	14,666	A_Case_02_15\
Pfil_2_EQ.pcx	Corel PHOTO-PAI...	5/25/2007 6:08 PM	117,504	77%	27,538	A_Case_02_15\
Pfil_3_EQ.pcx	Corel PHOTO-PAI...	5/25/2007 6:08 PM	132,093	78%	28,436	A_Case_02_15\

6/18/2007 4:02 PM **D:\A_Case_02_15.zip** **Page 3**

Name	Type	Modified	Size	Ratio	Packed	Path
Pfil_4_EQ.pcx	Corel PHOTO-PAI...	5/25/2007 6:08 PM	103,079	89%	11,182	A_Case_02_15\
C_02_15_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/25/2007 6:08 PM	5,306	82%	977	A_Case_02_15\
C_02_15_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel W...	5/30/2007 9:46 AM	29,696	67%	9,669	A_Case_02_15\
C_02_15 - Summary.xls	Microsoft Excel W...	6/2/2007 11:14 AM	281,088	70%	85,340	A_Case_02_15\
C_02_Blk_Vol_&_Elev Data.xls	Microsoft Excel W...	6/4/2007 10:24 AM	482,304	67%	159,536	A_Case_02_15\
99 file(s)			**1,122,940,774**	**59%**	**463,453,765**	

6/14/2007 7:35 AM D:\A_Case_04_17.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_04_17\Case_04_17_27_16 - 020607\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_04_17\Case_04_17_27_16 - 020607\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_04_17\Case_04_17_27_16 - 020607\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_04_17\Case_04_17_27_16 - 020607\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_04_17\Case_04_17_27_16 - 020607\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_04_17\Case_04_17_27_16 - 020607\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_04_17\Case_04_17_27_16 - 020607\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_04_17\Case_04_17_27_16 - 020607\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_04_17\Case_04_17_27_16 - 020607\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_04_17\Case_04_17_27_16 - 020607\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_04_17\Case_04_17_27_16 - 020607\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_04_17\Case_04_17_27_16 - 020607\

6/14/2007 7:35 AM D:\A_Case_04_17.zip Page 2

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_04_17\Case_04_17_27_16 - 020607\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_04_17\Case_04_17_27_16 - 020607\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_04_17\Case_04_17_27_16 - 020607\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_04_17\Case_04_17_27_16 - 020607\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_04_17\Case_04_17_27_16 - 020607\
simulationQS.DAT	DAT File	1/26/2007 12:35 PM	734	62%	282	A_Case_04_17\Case_04_17_27_16 - 020607\
3dec.lnk	Shortcut	2/6/2007 3:43 PM	625	36%	401	A_Case_04_17\Case_04_17_27_16 - 020607\
D144334.tmp	TMP File	2/6/2007 3:43 PM	0	0%	0	A_Case_04_17\Case_04_17_27_16 - 020607\
D162152.tmp	TMP File	2/6/2007 5:21 PM	0	0%	0	A_Case_04_17\Case_04_17_27_16 - 020607\
rerun.dat	DAT File	2/7/2007 6:02 PM	1,462	64%	526	A_Case_04_17\Case_04_17_27_16 - 020607\
Case17jointing27_ini.sav	SAV File	2/9/2007 1:47 PM	333,569,447	58%	140,673,754	A_Case_04_17\
Case17jointing271_eq.sav	SAV File	2/10/2007 1:12 PM	333,570,547	58%	141,508,693	A_Case_04_17\
Case17jointing27motion16step17.sav	SAV File	3/1/2007 12:11 PM	370,096,587	60%	146,260,316	A_Case_04_17\
Case33_st_1_To_17.xls	Microsoft Excel Worksh...	3/3/2007 11:52 AM	204,288	79%	43,227	A_Case_04_17\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_04_17\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_04_17\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_04_17\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_04_17\
C_04_17_r77.txt	Text Document	4/17/2007 9:55 AM	13,744	84%	2,234	A_Case_04_17\
Pfil_1.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:56 AM	97,375	82%	17,798	A_Case_04_17\
Pfil_2.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:56 AM	122,721	74%	31,928	A_Case_04_17\
Pfil_3.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:56 AM	136,579	76%	32,460	A_Case_04_17\
C_04_17_Blk_Vol_&_Elev_Dt.dat	DAT File	4/17/2007 9:56 AM	20,059	81%	3,756	A_Case_04_17\
Pfil_4.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:56 AM	101,082	89%	10,874	A_Case_04_17\
Case 04_17 Rockfall Blocks Location.doc	Microsoft Word Docum...	4/17/2007 10:18 AM	237,568	22%	184,514	A_Case_04_17\
Region_77.txt	Text Document	4/23/2007 4:34 PM	752	55%	335	A_Case_04_17\
3dec.lnk	Shortcut	5/9/2007 4:47 PM	575	37%	365	A_Case_04_17\
D164755.tmp	TMP File	5/9/2007 4:48 PM	0	0%	0	A_Case_04_17\
driver.dat	DAT File	5/15/2007 7:57 AM	6,264	74%	1,658	A_Case_04_17\Case_04_17_27_16 - 020607\
Region_77_EQ.txt	Text Document	5/30/2007 10:01 AM	770	56%	336	A_Case_04_17\
C_04_17_r77_EQ.txt	Text Document	5/30/2007 10:05 AM	6,452	83%	1,074	A_Case_04_17\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:06 AM	92,100	84%	14,833	A_Case_04_17\
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:07 AM	116,727	76%	28,090	A_Case_04_17\

6/14/2007 7:35 AM D:\A_Case_04_17.zip Page 3

Name	Type	Modified	Size	Ratio	Packed	Path
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:07 AM	131,097	78%	29,090	A_Case_04_17\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:09 AM	100,676	89%	10,826	A_Case_04_17\
C_04_17_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 10:09 AM	10,420	79%	2,137	A_Case_04_17\
C_04_17_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksh...	5/30/2007 10:42 AM	41,984	66%	14,074	A_Case_04_17\
C_04_17 - Summary.xls	Microsoft Excel Worksh...	6/2/2007 11:38 AM	229,888	70%	68,521	A_Case_04_17\
C_04_17_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksh...	6/4/2007 10:27 AM	364,032	67%	119,724	A_Case_04_17\
100 file(s)			**1,056,149,357**	**59%**	**432,171,725**	

6/14/2007 7:36 AM D:\A_Case_05_18.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_05_18\Case_05_18_26_14 - 020607\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_05_18\Case_05_18_26_14 - 020607\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_05_18\Case_05_18_26_14 - 020607\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_05_18\Case_05_18_26_14 - 020607\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_05_18\Case_05_18_26_14 - 020607\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_05_18\Case_05_18_26_14 - 020607\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_05_18\Case_05_18_26_14 - 020607\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_05_18\Case_05_18_26_14 - 020607\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_05_18\Case_05_18_26_14 - 020607\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_05_18\Case_05_18_26_14 - 020607\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_05_18\Case_05_18_26_14 - 020607\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_05_18\Case_05_18_26_14 - 020607\

6/14/2007 7:36 AM D:\A_Case_05_18.zip Page 2

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_05_18\Case_05_18_26_14 - 020607\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_05_18\Case_05_18_26_14 - 020607\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_05_18\Case_05_18_26_14 - 020607\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_05_18\Case_05_18_26_14 - 020607\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_05_18\Case_05_18_26_14 - 020607\
simulationQS.DAT	DAT File	1/26/2007 12:37 PM	733	62%	281	A_Case_05_18\Case_05_18_26_14 - 020607\
3dec.lnk	Shortcut	2/6/2007 3:45 PM	635	36%	408	A_Case_05_18\Case_05_18_26_14 - 020607\
D144513.tmp	TMP File	2/6/2007 3:45 PM	0	0%	0	A_Case_05_18\Case_05_18_26_14 - 020607\
D162306.tmp	TMP File	2/6/2007 5:23 PM	0	0%	0	A_Case_05_18\Case_05_18_26_14 - 020607\
D110041.tmp	TMP File	2/7/2007 12:00 PM	0	0%	0	A_Case_05_18\Case_05_18_26_14 - 020607\
rerun.dat	DAT File	2/7/2007 6:06 PM	1,462	64%	526	A_Case_05_18\Case_05_18_26_14 - 020607\
Case18jointing26_ini.sav	SAV File	2/9/2007 1:32 PM	339,396,135	58%	143,809,405	A_Case_05_18\
Case18jointing261_eq.sav	SAV File	2/10/2007 4:18 PM	339,397,755	57%	144,671,779	A_Case_05_18\
Case18jointing26motion14step17.sav	SAV File	2/24/2007 11:19 PM	376,901,683	60%	149,639,228	A_Case_05_18\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_05_18\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_05_18\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_05_18\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_05_18\
Case 05_18 Rockfall Blocks Location.doc	Microsoft Word Docum...	3/15/2007 4:05 PM	19,456	89%	2,051	A_Case_05_18\
3dec.lnk	Shortcut	5/9/2007 8:51 AM	575	37%	365	A_Case_05_18\
driver.dat	DAT File	5/15/2007 7:56 AM	6,266	74%	1,660	A_Case_05_18\Case_05_18_26_14 - 020607\
C_05_18_Blk_Vol_&_Elev_Dt_1.dat	DAT File	5/15/2007 11:32 AM	19,331	82%	3,396	A_Case_05_18\
Region_77_1.txt	Text Document	5/15/2007 11:37 AM	447	46%	242	A_Case_05_18\
Region_77.txt	Text Document	5/15/2007 12:33 PM	759	56%	335	A_Case_05_18\
C_05_18_r77.txt	Text Document	5/15/2007 12:36 PM	13,162	84%	2,129	A_Case_05_18\
Pfil_1.pcx	Corel PHOTO-PAINT 8...	5/15/2007 12:37 PM	98,385	82%	17,952	A_Case_05_18\
Pfil_2.pcx	Corel PHOTO-PAINT 8...	5/15/2007 12:37 PM	123,981	74%	31,913	A_Case_05_18\
Pfil_3.pcx	Corel PHOTO-PAINT 8...	5/15/2007 12:37 PM	137,641	76%	33,087	A_Case_05_18\
Pfil_4.pcx	Corel PHOTO-PAINT 8...	5/15/2007 12:37 PM	101,917	89%	10,990	A_Case_05_18\
C_05_18_Blk_Vol_&_Elev_Dt.dat	DAT File	5/15/2007 12:37 PM	20,722	81%	3,900	A_Case_05_18\
Region_77_EQ.txt	Text Document	5/30/2007 10:55 AM	770	56%	337	A_Case_05_18\
C_05_18_r77_EQ.txt	Text Document	5/30/2007 10:57 AM	5,365	83%	890	A_Case_05_18\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:58 AM	92,625	84%	14,781	A_Case_05_18\

6/14/2007 7:36 AM **D:\A_Case_05_18.zip** **Page 3**

Name	Type	Modified	Size	Ratio	Packed	Path
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:58 AM	117,448	76%	28,080	A_Case_05_18\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:58 AM	133,088	78%	29,791	A_Case_05_18\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 10:58 AM	102,029	89%	11,022	A_Case_05_18\
C_05_18_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 10:58 AM	8,162	81%	1,528	A_Case_05_18\
C_05_18_Blk_Vol_&_Elev_Dt_EQ.txt	Text Document	5/30/2007 5:01 PM	8,784	72%	2,473	A_Case_05_18\
C_05_18_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksh...	5/30/2007 5:01 PM	38,912	73%	10,479	A_Case_05_18\
C_05_18_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksh...	6/4/2007 10:32 AM	454,144	67%	150,995	A_Case_05_18\
C_05_18 - Summary.xls	Microsoft Excel Worksh...	6/4/2007 10:42 AM	234,496	70%	69,190	A_Case_05_18\
102 file(s)			**1,074,311,670**	**59%**	**441,659,112**	

6/14/2007 7:36 AM D:\A_Case_06_19.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_06_19\Case_06_19_10_13 - 020607\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_06_19\Case_06_19_10_13 - 020607\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_06_19\Case_06_19_10_13 - 020607\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_06_19\Case_06_19_10_13 - 020607\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_06_19\Case_06_19_10_13 - 020607\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_06_19\Case_06_19_10_13 - 020607\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_06_19\Case_06_19_10_13 - 020607\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_06_19\Case_06_19_10_13 - 020607\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_06_19\Case_06_19_10_13 - 020607\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_06_19\Case_06_19_10_13 - 020607\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_06_19\Case_06_19_10_13 - 020607\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_06_19\Case_06_19_10_13 - 020607\

6/14/2007 7:36 AM **D:\A_Case_06_19.zip** **Page 2**

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_06_19\Case_06_19_10_13 - 020607\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_06_19\Case_06_19_10_13 - 020607\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_06_19\Case_06_19_10_13 - 020607\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_06_19\Case_06_19_10_13 - 020607\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_06_19\Case_06_19_10_13 - 020607\
simulationQS.DAT	DAT File	1/26/2007 12:38 PM	734	62%	280	A_Case_06_19\Case_06_19_10_13 - 020607\
D144643.tmp	TMP File	2/6/2007 3:46 PM	0	0%	0	A_Case_06_19\Case_06_19_10_13 - 020607\
rerun.dat	DAT File	2/7/2007 6:08 PM	1,462	64%	526	A_Case_06_19\Case_06_19_10_13 - 020607\
3dec.lnk	Shortcut	2/12/2007 9:12 AM	635	36%	408	A_Case_06_19\Case_06_19_10_13 - 020607\
Case19jointing10_ini.sav	SAV File	2/13/2007 1:09 PM	412,310,559	57%	176,310,351	A_Case_06_19\
Case19jointing101_eq.sav	SAV File	2/14/2007 11:50 AM	412,311,427	57%	177,227,890	A_Case_06_19\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_06_19\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_06_19\
Case19jointing10motion13step14.sav	SAV File	3/11/2007 12:23 AM	458,097,091	60%	184,163,776	A_Case_06_19\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_06_19\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_06_19\
3dec.lnk	Shortcut	4/17/2007 9:43 AM	575	37%	365	A_Case_06_19\
C_06_19_r77.txt	Text Document	4/17/2007 9:45 AM	63,249	84%	10,032	A_Case_06_19\
Pfil_1.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:47 AM	114,619	78%	25,100	A_Case_06_19\
Pfil_2.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:47 AM	139,527	71%	40,348	A_Case_06_19\
Pfil_3.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:47 AM	153,817	71%	44,074	A_Case_06_19\
Pfil_4.pcx	Corel PHOTO-PAINT 8...	4/17/2007 9:48 AM	102,289	89%	11,043	A_Case_06_19\
C_06_19_Blk_Vol_&_Elev_Dt.dat	DAT File	4/17/2007 9:48 AM	65,180	83%	11,170	A_Case_06_19\
Case 06_19 Rockfall Blocks Location.doc	Microsoft Word Docum...	4/17/2007 10:50 AM	273,408	20%	219,287	A_Case_06_19\
Region_77.txt	Text Document	4/23/2007 4:36 PM	752	55%	335	A_Case_06_19\
driver.dat	DAT File	5/15/2007 7:55 AM	6,260	73%	1,659	A_Case_06_19\Case_06_19_10_13 - 020607\
Region_77_EQ.txt	Text Document	5/30/2007 11:00 AM	770	56%	336	A_Case_06_19\
C_06_19_r77_EQ.txt	Text Document	5/30/2007 11:02 AM	7,421	83%	1,231	A_Case_06_19\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 11:04 AM	94,354	83%	15,618	A_Case_06_19\
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 11:04 AM	119,296	75%	29,286	A_Case_06_19\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 11:04 AM	133,491	78%	29,932	A_Case_06_19\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 11:05 AM	102,825	89%	11,237	A_Case_06_19\
C_06_19_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 11:05 AM	11,069	82%	1,968	A_Case_06_19\

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Name	Type	Modified	Size	Ratio	Packed	Path
C_06_19_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksh...	5/30/2007 5:38 PM	48,640	67%	16,149	A_Case_06_19\
C_06_19_Blk_Vol_&_Min_Elev Data.xls	Microsoft Excel Worksh...	6/4/2007 9:15 AM	1,212,416	67%	403,465	A_Case_06_19\
C_06_19 - Summary.xls	Microsoft Excel Worksh...	6/4/2007 10:55 AM	744,448	70%	223,766	A_Case_06_19\
97 file(s)			**1,302,991,116**	**58%**	**541,909,531**	

6/14/2007 7:36 AM D:\A_Case_07_20.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_07_20\Case_07_20_19_5 - 020607\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_07_20\Case_07_20_19_5 - 020607\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_07_20\Case_07_20_19_5 - 020607\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_07_20\Case_07_20_19_5 - 020607\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_07_20\Case_07_20_19_5 - 020607\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_07_20\Case_07_20_19_5 - 020607\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_07_20\Case_07_20_19_5 - 020607\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_07_20\Case_07_20_19_5 - 020607\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_07_20\Case_07_20_19_5 - 020607\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_07_20\Case_07_20_19_5 - 020607\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_07_20\Case_07_20_19_5 - 020607\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_07_20\Case_07_20_19_5 - 020607\

6/14/2007 7:36 AM D:\A_Case_07_20.zip Page 2

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_07_20\Case_07_20_19_5 - 020607\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_07_20\Case_07_20_19_5 - 020607\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_07_20\Case_07_20_19_5 - 020607\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_07_20\Case_07_20_19_5 - 020607\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_07_20\Case_07_20_19_5 - 020607\
simulationQS.DAT	DAT File	1/26/2007 12:39 PM	734	62%	282	A_Case_07_20\Case_07_20_19_5 - 020607\
3dec.lnk	Shortcut	2/6/2007 3:48 PM	635	35%	411	A_Case_07_20\Case_07_20_19_5 - 020607\
D144808.tmp	TMP File	2/6/2007 3:48 PM	0	0%	0	A_Case_07_20\Case_07_20_19_5 - 020607\
rerun.dat	DAT File	2/7/2007 6:09 PM	1,462	64%	525	A_Case_07_20\Case_07_20_19_5 - 020607\
Case20jointing19_ini.sav	SAV File	2/7/2007 10:03 PM	312,606,395	58%	131,239,013	A_Case_07_20\
Case20jointing191_eq.sav	SAV File	2/9/2007 12:01 AM	312,607,623	58%	132,115,245	A_Case_07_20\
Case20jointing19motion5step16.sav	SAV File	2/19/2007 2:50 PM	346,458,495	61%	136,470,552	A_Case_07_20\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_07_20\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_07_20\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_07_20\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_07_20\
Case 07_20 Rockfall Blocks Location.doc	Microsoft Word Document	3/14/2007 5:53 PM	31,232	53%	14,720	A_Case_07_20\
3dec.lnk	Shortcut	4/25/2007 10:26 AM	575	37%	364	A_Case_07_20\
C_07_20_r77.txt	Text Document	4/25/2007 10:34 AM	9,230	84%	1,506	A_Case_07_20\
Pfil_1.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:34 AM	94,476	83%	16,322	A_Case_07_20\
Pfil_2.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:34 AM	121,576	74%	31,395	A_Case_07_20\
Pfil_3.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:34 AM	136,883	76%	32,442	A_Case_07_20\
Pfil_4.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:34 AM	101,608	90%	10,635	A_Case_07_20\
C_07_20_Blk_Vol_&_Elev_Dt.dat	DAT File	4/25/2007 10:35 AM	13,263	82%	2,393	A_Case_07_20\
Region_77.txt	Text Document	4/25/2007 10:36 AM	755	55%	336	A_Case_07_20\
driver.dat	DAT File	5/15/2007 7:55 AM	6,265	74%	1,657	A_Case_07_20\Case_07_20_19_5 - 020607\
Region_77_EQ.txt	Text Document	5/30/2007 11:07 AM	770	56%	336	A_Case_07_20\
C_07_20_r77_EQ.txt	Text Document	5/30/2007 11:08 AM	2,590	82%	459	A_Case_07_20\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:09 AM	89,542	86%	12,906	A_Case_07_20\
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:09 AM	113,992	77%	26,044	A_Case_07_20\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:10 AM	130,503	79%	27,748	A_Case_07_20\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:10 AM	101,692	90%	10,630	A_Case_07_20\
C_07_20_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 11:10 AM	4,082	81%	777	A_Case_07_20\

6/14/2007 7:36 AM D:\A_Case_07_20.zip Page 3

Name	Type	Modified	Size	Ratio	Packed	Path
C_07_20_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksheet	5/30/2007 5:47 PM	26,112	68%	8,280	A_Case_07_20\
C_07_20 - Summary.xls	Microsoft Excel Worksheet	6/2/2007 12:35 PM	161,792	71%	46,633	A_Case_07_20\
C_07_20_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksheet	6/4/2007 11:04 AM	268,800	68%	85,834	A_Case_07_20\
97 file(s)			**989,965,884**	**59%**	**403,267,344**	

6/14/2007 7:36 AM **D:\A_Case_10_23.zip** **Page 1**

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_10_23\Case_10_23_5_12 - 021607\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_10_23\Case_10_23_5_12 - 021607\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_10_23\Case_10_23_5_12 - 021607\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_10_23\Case_10_23_5_12 - 021607\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_10_23\Case_10_23_5_12 - 021607\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_10_23\Case_10_23_5_12 - 021607\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_10_23\Case_10_23_5_12 - 021607\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_10_23\Case_10_23_5_12 - 021607\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_10_23\Case_10_23_5_12 - 021607\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_10_23\Case_10_23_5_12 - 021607\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_10_23\Case_10_23_5_12 - 021607\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_10_23\Case_10_23_5_12 - 021607\

6/14/2007 7:36 AM D:\A_Case_10_23.zip Page 2

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_10_23\Case_10_23_5_12 - 021607\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_10_23\Case_10_23_5_12 - 021607\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_10_23\Case_10_23_5_12 - 021607\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_10_23\Case_10_23_5_12 - 021607\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_10_23\Case_10_23_5_12 - 021607\
simulationQS.DAT	DAT File	1/26/2007 12:44 PM	733	62%	281	A_Case_10_23\Case_10_23_5_12 - 021607\
3dec.lnk	Shortcut	2/16/2007 11:47 AM	625	36%	399	A_Case_10_23\Case_10_23_5_12 - 021607\
rerun.dat	DAT File	2/17/2007 10:28 AM	1,515	64%	548	A_Case_10_23\Case_10_23_5_12 - 021607\
Case23jointing5_ini.sav	SAV File	2/17/2007 3:51 PM	376,330,731	58%	159,596,534	A_Case_10_23\
Case23jointing51_eq.sav	SAV File	2/18/2007 1:50 PM	376,331,543	57%	160,533,703	A_Case_10_23\
Case23jointing5motion12step15.sav	SAV File	3/8/2007 3:36 AM	418,115,051	60%	166,116,090	A_Case_10_23\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_10_23\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_10_23\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_10_23\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_10_23\
Case 10_23 Rockfall Blocks Location.doc	Microsoft Word Document	3/15/2007 10:06 AM	33,280	54%	15,214	A_Case_10_23\
Region_77.txt	Text Document	4/25/2007 10:36 AM	753	55%	339	A_Case_10_23\
3dec.lnk	Shortcut	4/25/2007 10:37 AM	575	37%	365	A_Case_10_23\
C_10_23_r77.txt	Text Document	4/25/2007 10:39 AM	11,159	83%	1,852	A_Case_10_23\
Pfil_1.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:40 AM	96,113	82%	16,950	A_Case_10_23\
Pfil_2.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:40 AM	123,513	74%	31,804	A_Case_10_23\
Pfil_3.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:40 AM	138,132	76%	33,124	A_Case_10_23\
Pfil_4.pcx	Corel PHOTO-PAINT 8....	4/25/2007 10:40 AM	101,994	89%	10,787	A_Case_10_23\
C_10-_23_Blk_Vol_&_Elev_Dt.dat	DAT File	4/25/2007 10:41 AM	14,894	82%	2,659	A_Case_10_23\
driver.dat	DAT File	5/15/2007 7:54 AM	6,236	74%	1,652	A_Case_10_23\Case_10_23_5_12 - 021607\
Region_77_EQ.txt	Text Document	5/30/2007 11:13 AM	768	56%	335	A_Case_10_23\
C_10_23_r77_EQ.txt	Text Document	5/30/2007 11:15 AM	3,604	83%	615	A_Case_10_23\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:16 AM	91,593	84%	14,213	A_Case_10_23\
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:16 AM	116,117	77%	27,250	A_Case_10_23\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:16 AM	131,788	78%	28,462	A_Case_10_23\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 11:16 AM	102,049	89%	10,781	A_Case_10_23\
C_10_23_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 11:17 AM	5,135	81%	976	A_Case_10_23\
C_10_23_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksheet	5/30/2007 6:09 PM	29,184	68%	9,474	A_Case_10_23\

6/14/2007 7:36 AM D:\A_Case_10_23.zip Page 3

Name	Type	Modified	Size	Ratio	Packed	Path
C_10_23_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksheet	6/2/2007 1:00 PM	292,352	68%	93,936	A_Case_10_23\
C_10_23 - Summary.xls	Microsoft Excel Worksheet	6/4/2007 11:37 AM	185,856	71%	54,266	A_Case_10_23\
96 file(s)			**1,189,140,095**	**59%**	**489,712,508**	

6/14/2007 7:37 AM **D:\A_Case_11_24.zip** **Page 1**

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_11_24\Case_11_24_6_3 - 021807\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_11_24\Case_11_24_6_3 - 021807\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_11_24\Case_11_24_6_3 - 021807\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_11_24\Case_11_24_6_3 - 021807\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_11_24\Case_11_24_6_3 - 021807\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_11_24\Case_11_24_6_3 - 021807\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_11_24\Case_11_24_6_3 - 021807\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_11_24\Case_11_24_6_3 - 021807\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_11_24\Case_11_24_6_3 - 021807\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_11_24\Case_11_24_6_3 - 021807\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_11_24\Case_11_24_6_3 - 021807\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_11_24\Case_11_24_6_3 - 021807\

6/14/2007 7:37 AM D:\A_Case_11_24.zip Page 2

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_11_24\Case_11_24_6_3 - 021807\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_11_24\Case_11_24_6_3 - 021807\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_11_24\Case_11_24_6_3 - 021807\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_11_24\Case_11_24_6_3 - 021807\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_11_24\Case_11_24_6_3 - 021807\
simulationQS.DAT	DAT File	1/26/2007 12:44 PM	733	62%	281	A_Case_11_24\Case_11_24_6_3 - 021807\
3dec.lnk	Shortcut	2/16/2007 11:47 AM	625	36%	399	A_Case_11_24\Case_11_24_6_3 - 021807\
rerun.dat	DAT File	2/17/2007 10:28 AM	1,515	64%	548	A_Case_11_24\Case_11_24_6_3 - 021807\
Case24jointing6_ini.sav	SAV File	2/19/2007 7:42 PM	345,347,339	58%	145,847,431	A_Case_11_24\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_11_24\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_11_24\
Case24jointing6motion3step15.sav	SAV File	3/10/2007 5:10 PM	383,988,891	60%	152,143,662	A_Case_11_24\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_11_24\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_11_24\
Region_77.txt	Text Document	4/25/2007 10:41 AM	753	56%	334	A_Case_11_24\
3dec.lnk	Shortcut	4/25/2007 10:42 AM	575	37%	365	A_Case_11_24\
C_11_24_r77.txt	Text Document	4/25/2007 1:27 PM	15,006	84%	2,417	A_Case_11_24\
Pfil_1.pcx	Corel PHOTO-PAINT 8.0 ...	4/25/2007 1:27 PM	102,130	80%	19,924	A_Case_11_24\
Pfil_2.pcx	Corel PHOTO-PAINT 8.0 ...	4/25/2007 1:27 PM	126,977	74%	33,642	A_Case_11_24\
Pfil_3.pcx	Corel PHOTO-PAINT 8.0 ...	4/25/2007 1:28 PM	139,176	75%	34,668	A_Case_11_24\
C_11_24_Blk_Vol_&_Elev_Dt.dat	DAT File	4/25/2007 1:28 PM	21,232	81%	4,052	A_Case_11_24\
Pfil_4.pcx	Corel PHOTO-PAINT 8.0 ...	4/25/2007 1:28 PM	104,419	89%	11,686	A_Case_11_24\
driver.dat	DAT File	5/15/2007 7:54 AM	6,235	74%	1,651	A_Case_11_24\Case_11_24_6_3 - 021807\
Case24jointing6_ini_2.sav	SAV File	5/25/2007 10:26 PM	345,422,087	58%	145,853,582	A_Case_11_24\
Case24jointing61_eq.sav	SAV File	5/26/2007 10:18 PM	345,423,091	58%	146,770,334	A_Case_11_24\
Region_77_EQ_1.txt	Text Document	5/29/2007 5:38 PM	784	57%	337	A_Case_11_24\
C_11_24_r77_EQ_1.txt	Text Document	5/29/2007 5:41 PM	2,464	83%	427	A_Case_11_24\
Pfil_1_EQ_1.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:42 PM	91,156	85%	13,841	A_Case_11_24\
Pfil_2_EQ_1.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:42 PM	114,543	77%	26,158	A_Case_11_24\
Pfil_3_EQ_1.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:42 PM	129,640	79%	27,243	A_Case_11_24\
Pfil_4_EQ_1.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:43 PM	104,514	89%	11,721	A_Case_11_24\
C_11_24_Blk_Vol_&_Elev_Dt_EQ_1.dat	DAT File	5/29/2007 5:43 PM	3,879	81%	751	A_Case_11_24\
Region_77_EQ_2.txt	Text Document	5/29/2007 5:45 PM	786	57%	339	A_Case_11_24\

6/14/2007 7:37 AM D:\A_Case_11_24.zip Page 3

Name	Type	Modified	Size	Ratio	Packed	Path
C_11_24_r77_EQ_2.txt	Text Document	5/29/2007 5:48 PM	2,463	83%	427	A_Case_11_24\
Pfil_1_EQ_2.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:48 PM	91,180	85%	13,918	A_Case_11_24\
Pfil_2_EQ_2.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:49 PM	114,567	77%	26,489	A_Case_11_24\
Pfil_3_EQ_2.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:49 PM	129,682	79%	27,589	A_Case_11_24\
Pfil_4_EQ_2.pcx	Corel PHOTO-PAINT 8.0 ...	5/29/2007 5:49 PM	104,529	89%	11,785	A_Case_11_24\
Case 11_24 Rockfall Blocks Location.doc	Microsoft Word Document	5/29/2007 6:01 PM	363,008	18%	298,671	A_Case_11_24\
C_11_24_Blk_Vol_&_Elev_Dt_EQ_2.dat	DAT File	5/31/2007 12:44 PM	3,876	81%	752	A_Case_11_24\
C_11_24_Blk_Vol_&_Elev_Dt_EQ_1.xls	Microsoft Excel Worksheet	5/31/2007 12:56 PM	24,064	77%	5,416	A_Case_11_24\
C_11_24_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksheet	6/4/2007 3:28 PM	385,024	68%	124,971	A_Case_11_24\
C_11_24 - Summary.xls	Microsoft Excel Worksheet	6/4/2007 3:34 PM	239,616	71%	70,261	A_Case_11_24\
104 file(s)			**1,439,481,361**	**59%**	**594,495,971**	

6/14/2007 7:37 AM D:\A_Case_14_27.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_14_27\Case_14_27_14_6 - 22007\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_14_27\Case_14_27_14_6 - 22007\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_14_27\Case_14_27_14_6 - 22007\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_14_27\Case_14_27_14_6 - 22007\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_14_27\Case_14_27_14_6 - 22007\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_14_27\Case_14_27_14_6 - 22007\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_14_27\Case_14_27_14_6 - 22007\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_14_27\Case_14_27_14_6 - 22007\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_14_27\Case_14_27_14_6 - 22007\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_14_27\Case_14_27_14_6 - 22007\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_14_27\Case_14_27_14_6 - 22007\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_14_27\Case_14_27_14_6 - 22007\

6/14/2007 7:37 AM **D:\A_Case_14_27.zip** **Page 2**

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_14_27\Case_14_27_14_6 - 22007\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_14_27\Case_14_27_14_6 - 22007\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_14_27\Case_14_27_14_6 - 22007\
rerun.dat	DAT File	1/26/2007 11:34 AM	1,460	64%	523	A_Case_14_27\Case_14_27_14_6 - 22007\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_14_27\Case_14_27_14_6 - 22007\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_14_27\Case_14_27_14_6 - 22007\
simulationQS.DAT	DAT File	1/26/2007 12:46 PM	733	62%	281	A_Case_14_27\Case_14_27_14_6 - 22007\
c_27_dir	File	1/29/2007 4:37 PM	4,086	78%	914	A_Case_14_27\Case_14_27_14_6 - 22007\
3dec.lnk	Shortcut	2/20/2007 2:58 PM	635	36%	409	A_Case_14_27\Case_14_27_14_6 - 22007\
Case27jointing14_ini.sav	SAV File	2/21/2007 11:28 PM	369,323,527	58%	156,408,562	A_Case_14_27\
Case27jointing141_eq.sav	SAV File	2/23/2007 12:13 AM	369,324,499	57%	157,294,845	A_Case_14_27\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_14_27\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_14_27\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_14_27\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_14_27\
Case27jointing14motion6step15.sav	SAV File	3/17/2007 1:02 PM	410,092,263	60%	162,987,051	A_Case_14_27\
Case 14_27 Rockfall Blocks Location.doc	Microsoft Word Document	4/7/2007 12:31 PM	70,656	28%	50,915	A_Case_14_27\
driver.dat	DAT File	5/15/2007 7:53 AM	6,259	74%	1,657	A_Case_14_27\Case_14_27_14_6 - 22007\
3dec.lnk	Shortcut	5/15/2007 9:55 AM	575	37%	365	A_Case_14_27\
Region_77.txt	Text Document	5/15/2007 12:46 PM	759	55%	342	A_Case_14_27\
C_14_27_r77.txt	Text Document	5/15/2007 12:49 PM	24,004	84%	3,893	A_Case_14_27\
Pfil_1.pcx	Corel PHOTO-PAINT 8.0 ...	5/15/2007 12:50 PM	102,769	80%	20,299	A_Case_14_27\
Pfil_2.pcx	Corel PHOTO-PAINT 8.0 ...	5/15/2007 12:50 PM	127,280	73%	33,831	A_Case_14_27\
Pfil_3.pcx	Corel PHOTO-PAINT 8.0 ...	5/15/2007 12:50 PM	141,909	75%	35,959	A_Case_14_27\
C_14_27_Blk_Vol_&_Elev_Dt.dat	DAT File	5/15/2007 12:50 PM	33,013	82%	5,994	A_Case_14_27\
Pfil_4.pcx	Corel PHOTO-PAINT 8.0 ...	5/15/2007 12:50 PM	102,753	90%	10,782	A_Case_14_27\
Region_77_EQ.txt	Text Document	5/30/2007 1:39 PM	825	56%	361	A_Case_14_27\
C_14_27_r77_EQ.txt	Text Document	5/30/2007 1:41 PM	5,438	83%	918	A_Case_14_27\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8.0 ...	5/30/2007 1:42 PM	95,153	83%	16,051	A_Case_14_27\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8.0 ...	5/30/2007 1:42 PM	133,002	78%	29,883	A_Case_14_27\
C_14_27_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 1:43 PM	9,859	80%	1,977	A_Case_14_27\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8.0 ...	5/30/2007 1:43 PM	102,822	89%	10,914	A_Case_14_27\
C_14_27_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksheet	5/31/2007 2:30 PM	40,960	67%	13,509	A_Case_14_27\

6/14/2007 7:37 AM **D:\A_Case_14_27.zip** **Page 3**

Name	Type	Modified	Size	Ratio	Packed	Path
C_14_27_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksheet	6/2/2007 1:14 PM	580,608	67%	190,581	A_Case_14_27\
C_14_27 - Summary.xls	Microsoft Excel Worksheet	6/4/2007 12:28 PM	369,664	70%	110,849	A_Case_14_27\
96 file(s)			**1,167,570,313**	**59%**	**480,341,564**	

Disk DVD_2 – List of Files

6/14/2007 7:41 AM D:\A_Case_15_33.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_15_33\Case_15_33_102_1 - 022307\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_15_33\Case_15_33_102_1 - 022307\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_15_33\Case_15_33_102_1 - 022307\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_15_33\Case_15_33_102_1 - 022307\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_15_33\Case_15_33_102_1 - 022307\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_15_33\Case_15_33_102_1 - 022307\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_15_33\Case_15_33_102_1 - 022307\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_15_33\Case_15_33_102_1 - 022307\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_15_33\Case_15_33_102_1 - 022307\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_15_33\Case_15_33_102_1 - 022307\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_15_33\Case_15_33_102_1 - 022307\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_15_33\Case_15_33_102_1 - 022307\

6/14/2007 7:41 AM **D:\A_Case_15_33.zip** **Page 2**

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_15_33\Case_15_33_102_1 - 022307\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_15_33\Case_15_33_102_1 - 022307\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_15_33\Case_15_33_102_1 - 022307\
rerun.dat	DAT File	1/26/2007 11:34 AM	1,460	64%	523	A_Case_15_33\Case_15_33_102_1 - 022307\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_15_33\Case_15_33_102_1 - 022307\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_15_33\Case_15_33_102_1 - 022307\
simulationQS.DAT	DAT File	1/26/2007 12:47 PM	734	62%	282	A_Case_15_33\Case_15_33_102_1 - 022307\
3decw 700.lnk	Shortcut	1/30/2007 2:20 PM	637	36%	407	A_Case_15_33\Case_15_33_102_1 - 022307\
Case33jointing102_ini.sav	SAV File	1/31/2007 7:49 PM	369,115,819	57%	156,944,375	A_Case_15_33\
Case33jointing1021_eq.sav	SAV File	2/2/2007 2:04 AM	369,116,727	57%	157,829,315	A_Case_15_33\
Case33jointing102motion1step17.sav	SAV File	2/23/2007 1:31 AM	409,786,003	60%	163,337,601	A_Case_15_33\
3dec_st2.log	Text Document	2/28/2007 5:34 PM	12,121	83%	2,066	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st3.log	Text Document	2/28/2007 5:45 PM	12,229	83%	2,074	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st4.log	Text Document	2/28/2007 5:47 PM	12,229	83%	2,078	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st5.log	Text Document	2/28/2007 5:48 PM	12,472	83%	2,110	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st6.log	Text Document	2/28/2007 5:50 PM	12,499	83%	2,114	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st7.log	Text Document	2/28/2007 5:54 PM	12,823	83%	2,177	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st8.log	Text Document	2/28/2007 5:55 PM	12,877	83%	2,185	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st9.log	Text Document	2/28/2007 5:58 PM	12,877	83%	2,188	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st10.log	Text Document	2/28/2007 6:00 PM	13,039	83%	2,210	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st11.log	Text Document	2/28/2007 6:21 PM	13,174	83%	2,228	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st12.log	Text Document	2/28/2007 6:22 PM	13,282	83%	2,244	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st13.log	Text Document	2/28/2007 6:24 PM	13,309	83%	2,252	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st14.log	Text Document	2/28/2007 6:25 PM	13,336	83%	2,251	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st15.log	Text Document	2/28/2007 6:26 PM	13,498	83%	2,275	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st16.log	Text Document	2/28/2007 6:28 PM	13,498	83%	2,276	A_Case_15_33\Case_15_33_102_1 - 022307\
3dec_st17.log	Text Document	2/28/2007 6:29 PM	13,498	83%	2,276	A_Case_15_33\Case_15_33_102_1 - 022307\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_15_33\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_15_33\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_15_33\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_15_33\
Case 15_33 Rockfall Blocks Location.doc	Microsoft Word Docum...	3/15/2007 1:23 PM	44,544	42%	25,918	A_Case_15_33\
driver.dat	DAT File	5/15/2007 8:00 AM	6,259	73%	1,660	A_Case_15_33\Case_15_33_102_1 - 022307\

6/14/2007 7:41 AM **D:\A_Case_15_33.zip** **Page 3**

Name	Type	Modified	Size	Ratio	Packed	Path
Region_77.txt	Text Document	5/15/2007 10:03 AM	755	55%	336	A_Case_15_33\
3dec.lnk	Shortcut	5/15/2007 10:03 AM	575	37%	365	A_Case_15_33\
C_15_33_r77.txt	Text Document	5/15/2007 10:05 AM	20,925	84%	3,367	A_Case_15_33\
Pfil_1.pcx	Corel PHOTO-PAINT 8...	5/15/2007 10:05 AM	99,916	81%	19,378	A_Case_15_33\
Pfil_2.pcx	Corel PHOTO-PAINT 8...	5/15/2007 10:06 AM	126,102	73%	34,060	A_Case_15_33\
Pfil_3.pcx	Corel PHOTO-PAINT 8...	5/15/2007 10:06 AM	142,358	74%	36,441	A_Case_15_33\
Pfil_4.pcx	Corel PHOTO-PAINT 8...	5/15/2007 10:06 AM	101,055	89%	10,774	A_Case_15_33\
C_15_33_Blk_Vol_&_Elev_Dt.dat	DAT File	5/15/2007 10:07 AM	24,840	83%	4,289	A_Case_15_33\
Region_77_EQ.txt	Text Document	5/30/2007 12:58 PM	772	56%	338	A_Case_15_33\
C_15_33_r77_EQ.txt	Text Document	5/30/2007 12:59 PM	5,543	83%	929	A_Case_15_33\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 1:00 PM	93,188	84%	15,346	A_Case_15_33\
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 1:00 PM	117,734	76%	28,416	A_Case_15_33\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 1:01 PM	134,380	78%	29,821	A_Case_15_33\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8...	5/30/2007 1:01 PM	101,046	89%	10,790	A_Case_15_33\
C_15_33_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 1:01 PM	8,112	82%	1,449	A_Case_15_33\
C_15_33_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksh...	5/31/2007 2:41 PM	38,912	67%	12,679	A_Case_15_33\
C_15_33_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksh...	6/2/2007 1:32 PM	462,848	67%	151,676	A_Case_15_33\
C_15_33 - Summary.xls	Microsoft Excel Worksh...	6/4/2007 12:33 PM	292,352	70%	86,973	A_Case_15_33\
112 file(s)			**1,166,925,159**	**59%**	**481,732,411**	

6/14/2007 7:41 AM D:\A_Case_16_43.zip Page 1

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_16_43\Case_16_43_59_4 - 022007\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_16_43\Case_16_43_59_4 - 022007\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_16_43\Case_16_43_59_4 - 022007\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_16_43\Case_16_43_59_4 - 022007\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_16_43\Case_16_43_59_4 - 022007\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_16_43\Case_16_43_59_4 - 022007\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_16_43\Case_16_43_59_4 - 022007\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_16_43\Case_16_43_59_4 - 022007\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_16_43\Case_16_43_59_4 - 022007\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_16_43\Case_16_43_59_4 - 022007\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_16_43\Case_16_43_59_4 - 022007\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_16_43\Case_16_43_59_4 - 022007\

6/14/2007 7:41 AM **D:\A_Case_16_43.zip** **Page 2**

Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_16_43\Case_16_43_59_4 - 022007\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_16_43\Case_16_43_59_4 - 022007\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_16_43\Case_16_43_59_4 - 022007\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_16_43\Case_16_43_59_4 - 022007\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_16_43\Case_16_43_59_4 - 022007\
simulationQS.DAT	DAT File	1/26/2007 12:48 PM	734	62%	282	A_Case_16_43\Case_16_43_59_4 - 022007\
c_43_dir	File	1/29/2007 4:38 PM	4,086	78%	914	A_Case_16_43\Case_16_43_59_4 - 022007\
3dec.lnk	Shortcut	2/20/2007 2:56 PM	635	36%	409	A_Case_16_43\Case_16_43_59_4 - 022007\
rerun.dat	DAT File	2/21/2007 9:35 AM	1,462	64%	526	A_Case_16_43\Case_16_43_59_4 - 022007\
Case43jointing59_ini.sav	SAV File	2/21/2007 9:57 PM	325,577,815	58%	136,977,279	A_Case_16_43\
Case43jointing591_eq.sav	SAV File	2/22/2007 4:44 PM	325,578,563	58%	137,867,475	A_Case_16_43\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_16_43\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_16_43\
Case43jointing59motion4step17.sav	SAV File	3/11/2007 3:54 AM	361,219,647	61%	142,419,239	A_Case_16_43\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_16_43\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_16_43\
Case 16_43 Rockfall Blocks Location.doc	Microsoft Word Document	3/15/2007 2:04 PM	41,472	43%	23,499	A_Case_16_43\
C_16_43_Blk_Vol_&_Elev_Dt.txt	Text Document	3/15/2007 2:07 PM	19,842	82%	3,644	A_Case_16_43\
driver.dat	DAT File	5/15/2007 7:52 AM	6,259	74%	1,658	A_Case_16_43\Case_16_43_59_4 - 022007\
Region_77.txt	Text Document	5/15/2007 12:53 PM	753	55%	337	A_Case_16_43\
3dec.lnk	Shortcut	5/15/2007 12:53 PM	575	37%	365	A_Case_16_43\
C_16_43_r77.txt	Text Document	5/15/2007 12:55 PM	15,633	84%	2,533	A_Case_16_43\
Pfil_1.pcx	Corel PHOTO-PAINT 8....	5/15/2007 12:56 PM	96,794	82%	17,509	A_Case_16_43\
Pfil_2.pcx	Corel PHOTO-PAINT 8....	5/15/2007 12:56 PM	123,736	74%	32,659	A_Case_16_43\
Pfil_3.pcx	Corel PHOTO-PAINT 8....	5/15/2007 12:56 PM	137,771	75%	34,111	A_Case_16_43\
C_16_43_Blk_Vol_&_Elev_Dt.dat	DAT File	5/15/2007 12:56 PM	21,232	80%	4,145	A_Case_16_43\
Pfil_4.pcx	Corel PHOTO-PAINT 8....	5/15/2007 12:56 PM	102,197	89%	11,059	A_Case_16_43\
EQ_Volume.dat	DAT File	5/15/2007 1:00 PM	3,157	80%	621	A_Case_16_43\
Region_77_EQ.txt	Text Document	5/30/2007 1:15 PM	777	55%	348	A_Case_16_43\
C_16_43_r77_EQ.txt	Text Document	5/30/2007 1:17 PM	3,474	83%	594	A_Case_16_43\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 1:18 PM	90,914	85%	13,875	A_Case_16_43\
Pfil_2_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 1:18 PM	114,827	77%	26,866	A_Case_16_43\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 1:18 PM	102,223	89%	11,080	A_Case_16_43\

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Name	Type	Modified	Size	Ratio	Packed	Path
C_16_43_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 1:19 PM	5,306	81%	1,008	A_Case_16_43\
C_16_43_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksheet	5/31/2007 3:48 PM	29,696	75%	7,359	A_Case_16_43\
C_16_43_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksheet	6/2/2007 2:18 PM	392,192	67%	127,655	A_Case_16_43\
C_16_43 - Summary.xls	Microsoft Excel Worksheet	6/4/2007 12:37 PM	252,928	71%	73,539	A_Case_16_43\
98 file(s)			**1,030,819,502**	**59%**	**420,770,487**	

6/14/2007 7:41 AM **D:\A_Case_17_44.zip** **Page 1**

Name	Type	Modified	Size	Ratio	Packed	Path
Block.fin	FIN File	10/20/1998 8:59 AM	11,207	74%	2,860	A_Case_17_44\Case_17_44_65_9 - 030807\
Contact.fin	FIN File	10/20/1998 1:58 PM	6,231	73%	1,713	A_Case_17_44\Case_17_44_65_9 - 030807\
Cable.fin	FIN File	10/20/1998 2:27 PM	4,607	71%	1,336	A_Case_17_44\Case_17_44_65_9 - 030807\
Reinf.fin	FIN File	10/20/1998 2:56 PM	2,947	69%	910	A_Case_17_44\Case_17_44_65_9 - 030807\
Plot.fin	FIN File	10/20/1998 2:57 PM	2,167	73%	575	A_Case_17_44\Case_17_44_65_9 - 030807\
Liner.fin	FIN File	10/20/1998 2:57 PM	6,007	72%	1,656	A_Case_17_44\Case_17_44_65_9 - 030807\
Hist.fin	FIN File	10/20/1998 2:58 PM	1,180	56%	524	A_Case_17_44\Case_17_44_65_9 - 030807\
locations.fis	FIS File	7/22/2002 5:21 PM	6,639	74%	1,694	A_Case_17_44\Case_17_44_65_9 - 030807\
functions.fis	FIS File	6/12/2003 8:49 AM	27,288	87%	3,539	A_Case_17_44\Case_17_44_65_9 - 030807\
all_frac.dat	DAT File	10/17/2003 9:26 AM	9,648,083	85%	1,467,713	A_Case_17_44\Case_17_44_65_9 - 030807\
Boun.fin	FIN File	11/4/2003 6:08 PM	4,165	75%	1,048	A_Case_17_44\Case_17_44_65_9 - 030807\
Cut.fis	FIS File	11/15/2003 11:50 PM	19,243	83%	3,293	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_1.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,689	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_10.vel	VEL File	1/6/2005 4:35 PM	34,000	77%	7,935	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_11.vel	VEL File	1/6/2005 4:35 PM	140,080	77%	32,412	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_12.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,966	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_13.vel	VEL File	1/6/2005 4:35 PM	271,694	77%	62,107	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_14.vel	VEL File	1/6/2005 4:35 PM	272,000	77%	61,804	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_15.vel	VEL File	1/6/2005 4:35 PM	222,037	79%	45,716	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_16.vel	VEL File	1/6/2005 4:35 PM	108,800	77%	25,018	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_17.vel	VEL File	1/6/2005 4:35 PM	216,000	79%	46,225	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_2.vel	VEL File	1/6/2005 4:35 PM	140,080	76%	33,047	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_3.vel	VEL File	1/6/2005 4:35 PM	68,000	77%	15,729	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_4.vel	VEL File	1/6/2005 4:35 PM	88,808	77%	20,509	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,740	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,537	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,658	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,221	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h1_9.vel	VEL File	1/6/2005 4:36 PM	203,862	77%	47,143	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	32,964	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,017	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,660	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_12.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,927	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_13.vel	VEL File	1/6/2005 4:36 PM	271,694	77%	62,415	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_14.vel	VEL File	1/6/2005 4:36 PM	272,000	77%	62,412	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_15.vel	VEL File	1/6/2005 4:36 PM	222,037	79%	46,503	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_16.vel	VEL File	1/6/2005 4:36 PM	108,800	77%	25,089	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_17.vel	VEL File	1/6/2005 4:36 PM	216,000	78%	46,533	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_2.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,533	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_3.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,552	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_4.vel	VEL File	1/6/2005 4:36 PM	88,808	77%	20,616	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_5.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,836	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_6.vel	VEL File	1/6/2005 4:36 PM	68,000	77%	15,876	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_7.vel	VEL File	1/6/2005 4:36 PM	110,602	77%	25,652	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_8.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,745	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5h2_9.vel	VEL File	1/6/2005 4:36 PM	203,864	77%	47,332	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_1.vel	VEL File	1/6/2005 4:36 PM	140,080	76%	33,043	A_Case_17_44\Case_17_44_65_9 - 030807\

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Name	Type	Modified	Size	Ratio	Packed	Path
1e-5up_10.vel	VEL File	1/6/2005 4:36 PM	34,000	76%	8,040	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_11.vel	VEL File	1/6/2005 4:36 PM	140,080	77%	32,250	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_12.vel	VEL File	1/6/2005 4:37 PM	68,000	76%	16,057	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_13.vel	VEL File	1/6/2005 4:37 PM	271,694	77%	62,394	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_14.vel	VEL File	1/6/2005 4:37 PM	272,000	77%	61,733	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_15.vel	VEL File	1/6/2005 4:37 PM	216,036	79%	45,837	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_16.vel	VEL File	1/6/2005 4:37 PM	108,800	77%	24,980	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_17.vel	VEL File	1/6/2005 4:37 PM	216,000	78%	46,856	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_2.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,855	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_3.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,598	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_5.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,772	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_6.vel	VEL File	1/6/2005 4:37 PM	68,000	77%	15,732	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_7.vel	VEL File	1/6/2005 4:37 PM	110,602	77%	25,458	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_8.vel	VEL File	1/6/2005 4:37 PM	140,080	77%	32,817	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_9.vel	VEL File	1/6/2005 4:37 PM	203,864	77%	46,997	A_Case_17_44\Case_17_44_65_9 - 030807\
edgelength.fis	FIS File	1/26/2007 11:30 AM	42,793	85%	6,359	A_Case_17_44\Case_17_44_65_9 - 030807\
qstatic.fis	FIS File	1/26/2007 11:31 AM	10,469	77%	2,387	A_Case_17_44\Case_17_44_65_9 - 030807\
1e-5up_4.vel	VEL File	1/26/2007 12:07 PM	86,196	76%	20,694	A_Case_17_44\Case_17_44_65_9 - 030807\
geometry.fis	FIS File	1/26/2007 12:12 PM	7,466	74%	1,945	A_Case_17_44\Case_17_44_65_9 - 030807\
simulationQS.DAT	DAT File	1/26/2007 12:48 PM	734	62%	282	A_Case_17_44\Case_17_44_65_9 - 030807\
c_43_dir	File	1/29/2007 4:38 PM	4,086	78%	914	A_Case_17_44\Case_17_44_65_9 - 030807\
3dec.lnk	Shortcut	2/20/2007 2:56 PM	635	36%	409	A_Case_17_44\Case_17_44_65_9 - 030807\
rerun.dat	DAT File	2/21/2007 9:35 AM	1,462	64%	526	A_Case_17_44\Case_17_44_65_9 - 030807\
deleted1.fis	FIS File	3/8/2007 8:55 AM	532	53%	252	A_Case_17_44\
deleted2.fis	FIS File	3/8/2007 8:55 AM	750	59%	309	A_Case_17_44\
Case44jointing65_Ini.sav	SAV File	3/8/2007 9:16 PM	332,074,711	58%	139,680,915	A_Case_17_44\
Case44jointing65motion9step13.sav	SAV File	3/8/2007 9:59 PM	368,457,575	61%	145,507,425	A_Case_17_44\
deleted2m.fis	FIS File	3/12/2007 4:15 PM	736	59%	303	A_Case_17_44\
deleted1m.txt	Text Document	3/14/2007 11:16 AM	532	53%	252	A_Case_17_44\
C_17_44_r77.txt	Text Document	3/28/2007 3:33 PM	27,731	84%	4,444	A_Case_17_44\
Pfil_1.pcx	Corel PHOTO-PAINT 8....	3/28/2007 3:34 PM	97,342	82%	17,392	A_Case_17_44\
Pfil_2.pcx	Corel PHOTO-PAINT 8....	3/28/2007 3:35 PM	125,408	73%	33,530	A_Case_17_44\
Pfil_3.pcx	Corel PHOTO-PAINT 8....	3/28/2007 3:36 PM	139,223	75%	34,744	A_Case_17_44\
Pfil_4.pcx	Corel PHOTO-PAINT 8....	3/28/2007 3:37 PM	100,407	90%	10,275	A_Case_17_44\
C_17_44_Blk_Vol_&_Elev_Dt.dat	DAT File	3/28/2007 3:37 PM	25,604	82%	4,610	A_Case_17_44\
Case 17_44 Rockfall Blocks Location.doc	Microsoft Word Document	4/17/2007 9:34 AM	312,832	19%	253,004	A_Case_17_44\
Region_77.txt	Text Document	4/23/2007 4:39 PM	753	55%	336	A_Case_17_44\
Case44jointing651_eq.sav	SAV File	5/8/2007 11:09 PM	332,075,483	58%	140,592,401	A_Case_17_44\
driver.dat	DAT File	5/15/2007 7:52 AM	6,259	73%	1,659	A_Case_17_44\Case_17_44_65_9 - 030807\
Region_77_EQ.txt	Text Document	5/30/2007 1:45 PM	825	56%	362	A_Case_17_44\
3dec.lnk	Shortcut	5/30/2007 1:45 PM	575	37%	365	A_Case_17_44\
C_17_44_r77_EQ.txt	Text Document	5/30/2007 1:46 PM	4,119	84%	678	A_Case_17_44\
Pfil_1_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 1:47 PM	90,361	85%	13,416	A_Case_17_44\
Pfil_3_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 1:47 PM	129,742	79%	27,850	A_Case_17_44\
Pfil_4_EQ.pcx	Corel PHOTO-PAINT 8....	5/30/2007 1:48 PM	101,470	90%	10,607	A_Case_17_44\
C_17_44_Blk_Vol_&_Elev_Dt_EQ.dat	DAT File	5/30/2007 1:48 PM	5,969	81%	1,152	A_Case_17_44\
C_17_44_Blk_Vol_&_Elev_Dt_EQ.xls	Microsoft Excel Worksheet	5/31/2007 4:12 PM	32,768	68%	10,516	A_Case_17_44\

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Name	Type	Modified	Size	Ratio	Packed	Path
C_17_44_Blk_Vol_&_Elev Data.xls	Microsoft Excel Worksheet	6/2/2007 2:28 PM	480,768	67%	159,258	A_Case_17_44\
C_17_44 - Summary.xls	Microsoft Excel Worksheet	6/4/2007 12:41 PM	306,176	70%	91,035	A_Case_17_44\
96 file(s)			**1,051,477,820**	**59%**	**429,568,004**	