

**APPENDIX M**

**IMPACT REVIEW DOCUMENTATION FOR  
PRECLOSURE SAFETY ASSESSMENT**

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OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT IMPACT REVIEW ACTION NOTICE				1. QA: QA Page: 1 Of: 1
2. Responsible Manager (print name) Miguel A. Lugo			3. Date 11/08/2001	
4a. Affected Manager (print name) Dennis C. Richardson		4b. Affected Manager (signature) <i>Dennis Richardson</i>		5. Reviewer (print name) DENNIS RICHARDSON
Review the document/data/software/parameter described below to determine the impact on technical products/data. Document results below, indicating required actions to ensure consistency between inputs and technical products/data or that no actions are required. Include document and revision numbers of technical products/data to be revised.				
6. Document/Data/ Software/Parameter to be Evaluated:	Title Summary of Recent Information Relevant to the Preliminary Preclosure Safety Assessment Inputs			7. Complete Impact Review by: (Date) 11/08/01
	Document Identifier (including Rev. No.) N/A	<input type="checkbox"/> Initial Issue <input type="checkbox"/> Supersession <i>N/A</i> <input type="checkbox"/> Revision or Change <input type="checkbox"/> Status Change <input type="checkbox"/> Cancellation		8. Technical Review in Process? (N/A for data reviews) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
9a. Impacted Documents				
Document No.	Rev.	Document Title	9b. Results of Impact Review	
TDR-MGR-SE-000009	REV 00 ICN 3	Preliminary Preclosure Safety Assessment for MGR SR	<i>NO IMPACT, SEE ATTACHED</i>	
9c. Proposed Trend Description				
10a. Reviewer (print name) DENNIS RICHARDSON		10b. Reviewer (signature) <i>Dennis Richardson</i>		11. Date 11/08/01
12. Affected Manager/Responsible Manager (signature) <i>Miguel Lugo</i>				13. Date 11/8/01

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## **IMPACT REVIEW DOCUMENTATION FOR PRECLOSURE SAFETY ASSESSMENT**

### **1. SUMMARY OF IMPACTS OF RECENT INFORMATION RELEVANT TO THE PRELIMINARY PRECLOSURE SAFETY ASSESSMENT INPUTS**

Additional and updated information concerning inputs to the preclosure safety analyses used to support the *Yucca Mountain Science and Engineering Report* (YMS&ER) (DOE 2001a) and the *Yucca Mountain Preliminary Site Suitability Evaluation* (YMPSSSE) (DOE 2001b), including the *Preliminary Preclosure Safety Assessment for Monitored Geologic Repository Site Recommendation* (PPSA) (BSC 2001a), have been evaluated for impacts on conclusions made in these documents. The following paragraphs summarize and discuss the implications of recent work relevant to inputs to preclosure safety analyses included in the PPSA.

#### **1.1 METEOROLOGICAL AND CLIMATOLOGICAL MEASUREMENTS**

The current meteorological monitoring program is continuing to document meteorological conditions in the vicinity of Yucca Mountain, including wind, temperature, humidity, barometric pressure, solar radiation, precipitation, and atmospheric dispersion conditions. However, there has been no analysis performed on the data since publication of *Engineering Design Climatology and Regional Meteorological Conditions Report* (CRWMS M&O 1997). A qualitative evaluation of the additional data concluded that it does not vary significantly from meteorological and climatological data collected in past years. New meteorological information could potentially affect the analysis of the atmospheric dispersion factors ( $\chi/Q_s$ ) used in the consequence analyses in the PPSA (BSC 2001a). However, since the new meteorological and climatological data do not vary significantly from the previously collected data used to calculate atmospheric dispersion factors, there is no impact on the results contained in the PPSA.

#### **1.2 PRECLOSURE ROCKFALL ANALYSIS**

There has been no new mapping of joint properties in the lithologic units of the potential site. Therefore, the keyblock analysis that has been performed to support the PPSA remains valid. However, the analysis of the probability of a waste package breach initiated by a rockfall has been continuing since the completion of *Preclosure Design Basis Events Related to Waste Packages* (CRWMS M&O 2000). This analysis supports the design by evaluating the performance of the preliminary ground support design in meeting the design basis requirement of preventing a 6-metric-ton rockfall or greater during the preclosure period. This is an iterative process leading to design features optimized to meeting all design requirements. This new analysis, currently in draft form (BSC, in preparation), is aimed primarily at revising the preliminary analysis in the *Update to Waste Package DBE Analysis* (BSC 2001b) that was cited in the PPSA (BSC 2001a).

The design basis for the monitored geologic repository ground support is to prevent a 6-metric-ton rock or larger from falling on the waste package during the preclosure period. The draft rockfall analysis (BSC, in preparation) results indicate that for the standard case/base case scenario (with 50-year preclosure period) loaded with 70,000 MTHM, the frequency of a rockfall of 6 metric tons or larger is less than  $1 \times 10^{-6}$  events per year. This met the ground support

design basis requirement. However, for other repository scenarios a rockfall of at least 6 metric tons is greater than  $1 \times 10^{-6}$  events per year (i.e., areas with lithophysal rock units supported only by steel sets, scenarios with larger footprints, longer preclosure periods, and/or greater spacing between waste packages). Based on the information at the time, it was concluded in the PPSA (BSC 2001a) that the frequency of a rockfall was less than  $1 \times 10^{-6}$  events per year for the cases with preclosure scenarios lasting 50 years (standard/base case scenario) and 125 years and greater than  $1 \times 10^{-6}$  events per year for the cases with preclosure scenarios lasting 325 years. However, it was stated in the PPSA that the final potential repository design is not complete and that design optimizations (such as use of more rock bolts, early placement of drip shields) are available to ensure that the frequency of this event remains less than  $1 \times 10^{-6}$  events per year such that the ground support design basis requirement is met. This conclusion remains valid. Therefore, there is no impact to the conclusions made in the PPSA concerning the rockfall event.

### **1.3 SEISMIC PARAMETERS**

Seismic analyses are being completed to establish improved estimates of vibratory ground motion parameters for earthquakes. Data collection and analyses are being carried out in accordance with controlling quality assurance procedures. Review of the data, submittal to the Technical Data Management System, and documentation of data collection and analyses in a report have not yet been completed. The amount of uncertainty incorporated into the site-specific ground motions for the repository block (based on limited velocity data available in 1999) appears to be greater than is warranted based on the additional data for the repository block, as discussed in Section 4.3 of Appendix I. Higher ground motions resulting from this uncertainty, therefore, should be reduced, although it is noted that other changes associated with the expanded data set may offset this effect. The expanded geotechnical data set and the ongoing analyses are expected to result in added confidence in the ground motion estimates (as described in Appendix I). Therefore, there is no impact to the conclusions reached in the PPSA concerning earthquake-related events.

### **1.4 AIRCRAFT ACTIVITY IN THE VICINITY OF THE POTENTIAL SITE**

Information on flight frequencies and pathways for Nellis Air Force Base and other aircraft activity in the vicinity of the potential monitored geologic repository site is being collected as part of an ongoing program at Nellis Air Force Base. Recent information indicates that the average number of flights over the Nevada Test Site (based on 2 more years of recorded information) has increased from 12,717 flights per year used to support the PPSA (BSC 2001a) to about 17,394 flights per year. Based on this flight count increase, the mean aircraft crash frequency will increase by approximately 37 percent. The PPSA concluded that the frequency of an aircraft crash event is less than  $1 \times 10^{-6}$  events per year based on the use of 12,717 flights per year. The mean frequency of an aircraft crash event (NUREG model) increases from  $2.8 \times 10^{-7}$  events per year to  $3.84 \times 10^{-7}$  events per year based on the increase in flights per year. However, the frequency of this event remains less than  $1 \times 10^{-6}$  events per year, even with a 37 percent increase in the annual aircraft activity. Therefore, there is no impact to the conclusions reached in the PPSA concerning aircraft related events.

## 1.5 RISK OF HEAVY LOAD DROPS

The U.S. Nuclear Regulatory Commission (NRC) issued a draft report (Lloyd 2001) on the risk of heavy load drops that updates the estimates of crane failures beyond the information used in the PPSA (BSC 2001a). This report conservatively assumes one load drop during the period of data collection and calculates the load drop frequency (drops/number of lifts) to be approximately  $2 \times 10^{-5}$  (1/47,400 lifts). The estimated heavy lift crane failure rate used to estimate event sequences in the PPSA is  $1.4 \times 10^{-5}$  drops per lift. Thus, the estimate from the draft NRC report is a factor of 1.4 higher than used in the PPSA. However, using a Bayesian statistical model, the drop frequency based on the additional information provided in the draft NRC report results in a drop frequency of  $1.1 \times 10^{-5}$  drops per lift (based on 47,400 lifts with no drops of any consequence). This drop frequency is smaller than the value used in the PPSA ( $1.4 \times 10^{-5}$  drops per lift). Therefore, no significant impact is expected to the conclusions reached in the PPSA based on the recalculation of the heavy load drop frequency using data from the NRC draft report.

## 2. REFERENCES

BSC (Bechtel SAIC Company) 2001a. *Preliminary Preclosure Safety Assessment for Monitored Geologic Repository Site Recommendation*. TDR-MGR-SE-000009 REV 00 ICN 03. Las Vegas, Nevada: Yucca Mountain Site Characterization Office. ACC: MOL.20010705.0172.

BSC 2001b. *Update to Waste Package DBE Rockfall Analysis*. Transmittal 00459.T. Las Vegas, Nevada: Bechtel SAIC Company. ACC: MOL.20010524.0105.

BSC (in preparation). *Analysis of Preclosure Design Basis Rock Fall onto Waste Package*. ANL-EBS-MD-000061 REV 00. Las Vegas, Nevada: CRWMS M&O.

CRWMS M&O (Civilian Radioactive Waste Management System Management and Operating Contractor) 1997. *Engineering Design Climatology and Regional Meteorological Conditions Report*. B00000000-01717-5707-00066 REV 00. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.19980304.0028.

CRWMS M&O 2000. *Preclosure Design Basis Events Related to Waste Packages*. ANL-MGR-MD-000012 REV 00. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.20000725.0015.

DOE (U.S. Department of Energy) 2001a. *Yucca Mountain Science and Engineering Report*. DOE/RW-0539. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20010524.0272.

DOE 2001b. *Yucca Mountain Preliminary Site Suitability Evaluation*. DOE/RW-0540. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20011101.0082.

Lloyd, R.L. 2001. *Technical Assessment Generic Issue 186: Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants*. Pre-draft NUREG-XXXX (ML012620352). Washington, DC: U.S. Nuclear Regulatory Commission. ACC: MOL.20011107.0009.