INTERIM SUMMARY OF THE
U.S. DEPARTMENT OF ENERGY/U.S. NUCLEAR REGULATORY COMMISSION
TECHNICAL EXCHANGE ON THE PRECLOSURE INTERACTION PLANS AND
AIRCRAFT HAZARDS AT THE POTENTIAL YUCCA MOUNTAIN REPOSITORY
LAS VEGAS, NEVADA
JUNE 1, 2005

On June 1, 2005, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) held a public Technical Exchange (TE) meeting to discuss future preclosure interactions between DOE and NRC, and to discuss the approach for aircraft hazards analysis. The meeting was held at the DOE offices in Las Vegas, Nevada. The agenda and presentations for the meeting are enclosed as Enclosures 1 and 2, respectively.

To support staff and stakeholder interactions, the meeting included teleconference and video connections to the NRC office in Rockville, Maryland and at the Center of Nuclear Waste Regulatory Analyses in San Antonio, Texas. Participants at the meeting included representatives of NRC, DOE, State of Nevada, Nuclear Waste Technical Review Board, Nuclear Energy Institute, and public interest groups. Enclosure 3 contains a list of the attendees who were present at the meeting. Stakeholders provided comments and questions to NRC during the meeting.

During the TE, DOE presented a proposal for topics of future preclosure interactions between NRC and DOE in 2005. The proposed topics include (1) aircraft hazards, (2) preclosure safety analysis process, (3) non-standard equipment including material handling, and waste transporter and gantry, (4) preclosure criticality, (5) aging facility, (6) preclosure seismic design, (7) design and classification of electrical systems, (8) commercial spent nuclear fuel handling in a dry environment, (9) fuel behavior and release fractions, and (10) technical specifications. DOE provided target TE dates for the first five topics, and committed to provide target TE dates for the remaining topics at the DOE/NRC Quarterly Management meeting on June 6, 2005. For each topic, DOE presented future TE meeting objectives and a list of DOE documents associated with each topic. DOE indicated that it is actively making internally-issued documents publicly available on the internet. It also committed to have the relevant documents publicly available at least two weeks before each TE or transmit the documents to NRC three weeks before the TE. NRC indicated that it would likely not schedule a TE until the relevant documents were made available to the public. During the presentation, DOE and NRC agreed to hold a public meeting to discuss the level of preclosure design information that should be included in the potential Yucca Mountain (YM) repository license application (LA).

During the TE for aircraft hazard analysis, DOE presented its approach for estimating the frequency of aircraft crashes onto the surface facilities at the potential YM repository. The presentation was a follow-up of the aircraft hazard TE on September 30, 2003, and was based on two DOE documents addressing identification of aircraft-related hazards and aircraft crash frequencies.

The DOE's strategy for the hazard analysis is to screen-out aircraft hazards as Beyond-Category 2 under 10 CFR Part 63 (i.e., less than 1 in 10,000 chance of release during the preclosure period) and eliminate the need for further examination of any potential consequences. The aircraft hazard analysis approach assumes a "no-fly-zone" around the surface facilities to reduce the predicted crash frequency. DOE intends to implement the no-fly-zone through a Memorandum of Understanding (MOU) with the U.S. Air Force. DOE

plans to establish the MOU with the Air Force this year. The aircraft hazard analysis approach also takes credit for selected portions of the surface facilities to withstand an aircraft impact and reduce the potential for release. DOE indicated that it would determine the characteristics of the impacting aircraft at a later time. DOE also indicated that detailed structural impact analyses would be performed for a number of aircrafts and associated impact speeds to demonstrate structural robustness of the surface facilities after submittal of the LA.

NRC asked several questions regarding the hazard identification and crash frequency estimation methodologies, bases for different assumptions, potential discrepancies in the use of aircraft mishap data, and the pre-closure period. NRC also expressed a concern about the level of design information and structural analysis that will be available at the time of LA submittal in order to support the credit taken for structural robustness in the crash frequency analysis. NRC indicated that it would expect a technically adequate structural analysis to support the assumptions made in the aircraft frequency hazard analysis. NRC and DOE agreed to hold a future TE for the structural analyses under aircraft impacts.

During the closing remarks, NRC concluded its discussion by reiterating several important points identified during the meeting. It stated that: (1) the pre-licensing interactions are required by law to achieve NRC expectation of the safety cases, to gain a better appreciation of DOE approaches, and to seek clarification on some points where needed, (2) NRC will seek a technically sound, adequate structural analysis that demonstrates robustness of the structural designs for the assumptions used in the aircraft crash frequency analysis, (3) NRC expects adequate technical bases for assumptions and event sequences used in the analyses, (4) based on NRC's understanding of DOE's approach, the MOU with the U.S. Air Force should be a part of the design basis, and (5) NRC did not make any regulatory decisions during this TE meeting. DOE concluded its discussion with several proposed action items that included (1) DOE will provide NRC with schedule for vendor documents in support of interactions, (2) DOE will provide proposed dates for future interactions in the NRC/DOE Quarterly Management meeting on June 6, 2005, (3) NRC will schedule a meeting with DOE in the NRC offices in Rockville, Maryland, on the level of preclosure design information for LA, (4) DOE will present updated target TE dates at the beginning of each TE meeting, and (5) DOE would plan to discuss worker doses at a future interaction. A more detailed summary will be issued within 30 days of the meeting.

Enclosures:
1. Agenda
2. Presentations
3. Attendees

Agenda
NRC/DOE Technical Exchange on
Preclosure Interaction Plans and Aircraft Hazards

June 1, 2005
8:00 a.m. - 3:30 p.m. (PT)
11:00 a.m. - 6:30 p.m. (ET)

Bechtel SAIC Company, LLC
Conference Room 915
9960 Covington Cross
Las Vegas, Nevada

and via videoconferencing to

U.S. Nuclear Regulatory Commission
T-8 A1
11545 Rockville Pike
Rockville, MD

Center for Nuclear Waste Regulatory Analyses
Building 189
6220 Culebra Road
San Antonio, TX

INTERESTED PARTIES MAY PARTICIPATE IN THE MEETING VIA TELECON BY CALLING
1-800-638-8081, Passcode 8753# or 301-231-5539, Passcode 8753#

8:00 a.m.	Introductions*	All
8:10 a.m.	Opening Remarks	Haught/NRC
8:20 a.m.	Proposed Preclosure and Design Interactions* - Discussion of Interaction Plans - Target Dates for Technical Exchanges - Objectives - List and Scope of Documents	Gil/Harrington
9:30 a.m.	Public Comments on Proposed Interactions	Gil/Harrington
9:45 a.m.	BREAK	All
10:00 a.m.	Aircraft Hazards-Opening Remarks & Background	Harrington
10:15 a.m.	Overview & Status of Aircraft Hazard Analysis - Overview of Approach - Discussion of Aircraft Crash Documents - Status of open aircraft KTI - Status of future design/analyses to support hazard analysis	Harrington
10:45 a.m.	Discussion of Methodology and Approach for Analysis of Aircraft Hazards* - Principal Aircraft Hazards - Assumptions - Analyses - Conservatisms - Sensitivities	Wisenburg
12:00 p.m.	LUNCH	All
1:00 p.m.	Discussion of Methodology and Approach for Analysis of Aircraft Hazards-continued	Wisenburg
1:30 p.m.	Public Comments	Haught
1:45 p.m.	BREAK	All
2:00 p.m.	Caucus	NRC-DOE
2:45 p.m.	Summary Discussion - Action Items*	NRC-DOE
3:15 p.m.	Closing Remarks	NRC-DOE
3:30 p.m.	ADJOURN	All

* Items that have been added to agenda or differ from the Public Notice.

Enclosure 1

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

NRC/DOE Technical Exchange on Proposed Preclosure Interactions and Aircraft Hazards

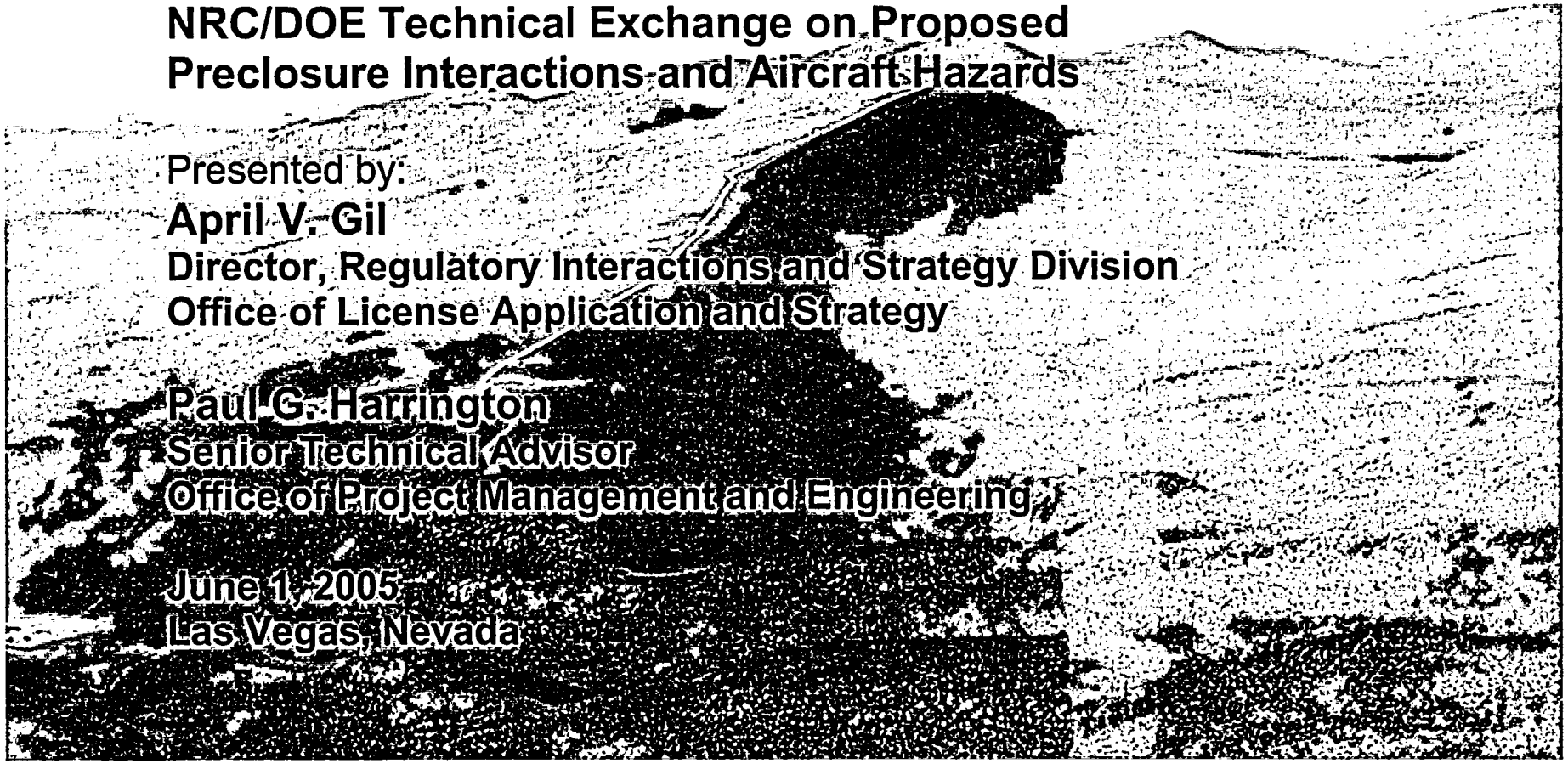
Enclosure 2

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

Proposed Preclosure Interactions

Presented to:
NRC/DOE Technical Exchange on Proposed Preclosure Interactions and Aircraft Hazards



Presented by:
April V. Gil
Director, Regulatory Interactions and Strategy Division
Office of License Application and Strategy

Paul G. Harrington
Senior Technical Advisor
Office of Project Management and Engineering

June 1, 2005
Las Vegas, Nevada

General Approach - Preclosure Interactions

- **Provide information on status, progress, and plans**
  - **Address questions regarding DOE's technical approach**
  - **Describe methodologies**
- **Document availability**
  - **Publicly available two weeks in advance of the scheduled interaction**
  - **Provide background and additional detail on topics to be discussed at interaction**
  - **List of supporting documents provided**
  - **Posted to Office of Civilian Radioactive Waste Management (OCRWM) Website or formally transmitted**

General Approach - Preclosure Interactions

(Continued)

- List of topics
  - Focus is on preclosure activities
  - Other topics may be added as needed
  - Topics may be combined
- Meeting objectives
  - May be revised or refined to reflect more specific goals as meeting preparation develops
- Meeting dates are tentative and will be announced as scheduled

Proposed Preclosure Topics for Technical Exchanges

1.	Aircraft Hazards	1 Jun 05 (S)
2.	Preclosure Safety Analysis (PCSA) Process	19 Jul 05 (T)
3.	Material Handling	16 Aug 05 (T)
4.	Non-Standard Equipment	16 Aug 05 (T)
5.	Waste Package Transporter and Gantry	16 Aug 05 (T)

S = Scheduled

T = Tentative

Proposed Preclosure Topics for Technical Exchanges
(Continued)

6.	Preclosure Criticality	Aug / Sep 05 (T)
7.	Aging	Oct 05 (T)
8.	Preclosure Seismic Design	TBD
9.	Design and Classification of Electrical Systems	TBD
10.	Commercial Spent Nuclear Fuel (CSNF) Handling in a Dry Environment	TBD
11.	Fuel Behavior & Release Fractions	TBD
12.	Technical Specifications	TBD

Aircraft Hazards

- **Objective**
  - Discuss data and analyses supporting estimated frequency of aircraft crashes into waste handling areas at the Geologic Repository Operations Area (GROA) at Yucca Mountain
  - Discuss the application of relevant screening criteria to aircraft hazards
  - Discuss assumptions and conservatisms in the analysis and sensitivity of the analysis results to assumptions
  - No-fly zone for military aircraft operations in the vicinity of the operations area and sensitivity of the crash frequency to no-fly zone parameters

Preclosure Safety Analysis Process

- **Objective**
  - **Describe the PCSA approach including:**
    - **Identification of hazards and potential event sequences**
    - **Categorization of event sequences into Category 1, Category 2 or beyond Category 2 (BC2)**
    - **Evaluation of radiological consequences and the identification of Structures, Systems and Components (SSCs) relied on to prevent or mitigate consequences**

Preclosure Safety Analysis Process
(Continued)

- **Objective** (Continued)
  - Describe approach for classification of Important to Safety (ITS) SSCs:
    - Relied on to continue to function in their normal operating mode during event sequences
    - Whose failure does not result in consequences for an extended time period following the initiation of an event sequence
    - Whose failure could impair the ability of an ITS SSC to perform its intended safety function

Material Handling

- **Objective**
  - Review design associated with typical ITS material handling equipment
  - Demonstrate that sufficient level of design detail exists to conclude that ITS functions will be met

Non-Standard Equipment

- **Objective**
  - Describe the nuclear safety design bases for the non-standard ITS mechanical handling equipment
  - Describe how the design bases are met by the design methodology
    - Primary codes and standards used in the design will be identified and the basis for their use will be provided
  - Describe design development plans
    - Demonstrate the means by which design basis reliability will be obtained by the equipment
    - Outline testing planned in equipment development

Waste Package Transporter and Gantry

- **Objective**
  - Describe designs of the waste package (WP) transporter and emplacement gantry
    - Identify required safety functions, primary codes and standards used in the design, and the basis for their use
  - Describe design development plans
    - Demonstrate the means by which design basis reliability will be obtained by the equipment
    - Outline testing planned in equipment development

Preclosure Criticality

- **Objective**
  - Provide an overview of preclosure criticality analysis methodology as described in the Preclosure Criticality Analysis Process Report
  - Present results of preclosure criticality safety analyses for analyzed facilities, waste packages, and waste forms
  - Discuss distinction between use of burnup credit in preclosure versus postclosure safety analyses
    - Provide basis for use of burnup credit based on reactor records

Aging

- **Objective**
  - Describe the applicability of existing 10 CFR 72 storage cask designs for use on facility aging pads, based on cask vendors' evaluations of currently licensed cask designs to 10 CFR 63 requirements and site-specific requirements
  - Describe designs and specifications for a site-specific cask system and a site-specific canister system, and provide adequate information to demonstrate compliance with 10 CFR 63 requirements

Preclosure Seismic Design

- **Objective**
  - Provide an overview of site-specific ground motions
  - Describe the preclosure seismic design methodology

Design and Classification of Electrical Systems

- **Objective**
  - **Describe:**
    - **Design of electrical subsystems and equipment**
    - **Nuclear safety design bases assigned to electrical systems**
    - **Classification of electrical systems**
    - **Codes and standards**
    - **Reliability requirements**
    - **Maintenance issues**

Commercial Spent Nuclear Fuel Handling in a Dry Environment

- **Objective**
  - Describe handling commercial spent nuclear fuel (CSNF) assemblies in the Fuel Handling Facility (FHF) and the Dry Transfer Facilities (DTF), including:
    - Cladding defects
    - Spent fuel oxidation
    - Bounding analyses for fuel oxidation for both normal and off-normal events
    - Measures taken to prevent or minimize fuel oxidation
  - Address release fractions for mechanical damage and oxidation

Fuel Behavior and Release Fractions

- **Objective**
  - Discuss certain issues associated with spent fuel behavior and development of release fractions:
    - General spent fuel behavior
    - Effects of transportation and long-term storage
    - Time and temperature dependence of release fractions
    - Screening of events

Technical Specifications

- **Objective**
  - **Review plans for development of technical specifications**
  - **Describe the proposed structure for technical specifications**
    - **Sample technical specifications will be used to support discussion**

Backup
Documents to Support Interactions on Preclosure Activities

- Documents are listed by topic, presented alphabetically
- Document availability status will be updated prior to a Technical Exchange

Proposed Interactions – Document Lists*

- Aging
- Aircraft Hazards
- CSNF Handling in a Dry Environment
- Design and Classification of Electrical Systems
- Fuel Behavior and Release Fractions
- Material Handling
- Non-Standard Equipment
- PCSA Process
- Preclosure Criticality
- Preclosure Seismic Design
- Technical Specifications
- WP Transporter and Gantry

* Issue status as of 25 May 2005

Aging

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
SNF Aging SDD	170-3YD-HA00-00100-000-004	06-Apr-05	Issued
Design of a Concrete Slab for Storage of SNF and HLW Casks	170-00C-HAP0-00100-000-00B	14-Feb-05	Issued
Cask/MSCWaste Package Preparation SDD	110-3YD-HM00-00100-000-001	12-Apr-05	Issued
Aging System Design Development Strategy	170-PLN-HA00-00100-000-000	07-Feb-05	Issued
GROA Aging Site Plan	170-C00-MGR0-00101-000-00A	26-Mar-04	Issued
SNF Aging Area 1000 MTHM Aging Module Concrete Plan and Sections	170-DB0-HAP0-00101-000-00A	07-May-04	Issued
Aging Area Aircraft Barrier Evaluation	170-SYC-HAP0-00100-000-00A	29-Apr-05	Issued OUO
Cask vendor letter reports	TBD		July
Cask vendor calculations	TBD		October

OUO = Official Use Only

Aircraft Hazards

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Identification of Aircraft Hazards	000-30R-WHS0-00100-000-005	23-Mar-05	Publicly Available
Frequency Analysis of Aircraft Hazards for License Application	000-00C-WHS0-00200-000-00C	02-May-05	Publicly Available
Assessment of Effects of Aircraft Impact on Category 1 Structures	000-30R-D000-00100-000-000	31-Jul-03	Issued OUO
Consequence of an Aircraft Crash into YMR surface facilities	MIS-MGR-RL-000004-000	15-Jul-03	Issued OUO
Aging Area Aircraft Barrier Evaluation	170-SYC-HAP0-00100-000-00A	29-Apr-05	Issued OUO

OUO = Official Use Only

Commercial Spent Nuclear Fuel Handling in a Dry Environment

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Commercial Spent Nuclear Fuel Handling in Air Study	000-30R-MGR0-00700-000-000	06-May-05	Redacted Version Issued
General arrangement drawings	Numerous		Late 2005
Engineering documents including HVAC P&IDs	Numerous		Late 2005
Engineering and PCSA Calculations	Numerous		Late 2005

Design and Classification of Electrical Systems

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Facility Electrical Power Distribution Main Single Line	000-E10-EEN0-00101-000-00C	25-Apr-05	Issued
Electrical Power System Description Document	000-3YD-EE00-00200-000-002	22-Jun-04	Issued
Electrical Support System Description Document	000-3YD-EU00-00100-000-003	24-Jun-04	Issued

Fuel Behavior and Release Fractions

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Commercial SNF Accident Release Fractions	000-00C-MGR0-01700-000-000	05-Nov-04	Issued
Fuel Behavior Documents (DOE Reports,etc.)	NA-		
Preclosure Consequence Analyses for License Application	000-00C-MGR0-00900-000-00B	12-Jan-05	Issued
Commercial Spent Nuclear Fuel Handling in Air Study	000-30R-MGR0-00700-000-000	06-May-05	Redacted Version Issued
Analysis of Experimental Data. Volume 1 of Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities	DOE-HDBK-3010-94	01-Dec-94	DOE Handbook Publicly Available
BWR Source Term Generation and Evaluation	000-00C-MGR0-00200-000-00A	17-Jul-03	Issued
DOE High-Level Vitrified Waste Dose Calculation.	CAL-WPS-SE-000002-000	26-Aug-99	Issued
PWR Source Term Generation and Evaluation	000-00C-MGR0-00100-000-00B	18-May-04	Issued
Radiological Releases Due to Air and Silica Dust Activation in Emplacement Drifts	800-00C-EBS0-00100-000-00A	07-May-03	Issued
Canister Handling Facility Worker Dose Assessment	190-00C-CH00-00200-000-00A	27-Feb-04	Issued
Categorization of Event Sequences for License Application	000-00C-MGR0-00800-000-00B	14-Apr-05	Issued
Dry Transfer Facility Worker Dose Assessment	110-00C-CD00-00100-000-00B	23-Sep-04	Issued
Internal Hazards Analysis for License Application	000-00C-MGR0-00600-000-00B	17-Feb-05	Issued
Remediation Facility Worker Dose Assessment	130-00C-CR00-00100-000-00A	27-Feb-04	Issued
Seismic Analysis for Preclosure Safety	000-00C-MGR0-00700-000-00B	03-Dec-04	Issued
Subsurface Facility Worker Dose Assessment	800-00C-SS00-00100-000-00A	27-Feb-04	Issued
Transportation Cask Receipt and Return Facility Worker Dose Assessment	140-00C-CC00-00200-000-00B	24-Feb-05	Issued
Waste Package Misload Probability	CAL-WHS-MD-000001-000	20-Nov-01	Issued
Fuel Handling Facility Worker Dose Assessment	210-00C-FH00-00500-000-00B	04-Aug-04	Issued

Material Handling

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Canister Handling Facility General Arrangement Legend and General Notes	190-P10-CH00-00101-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Key Plan	190-P10-CH00-00102-000-00A	11-Jun-04	Issued
Canister Handling Facility General Arrangement Ground Floor Plan	190-P10-CH00-00103-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Pit and Mezzanine Floorplans	190-P10-CH00-00104-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Second Floorplan	190-P10-CH00-00105-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Third Floorplan	190-P10-CH00-00106-000-00A	11-Jun-04	Issued
Canister Handling Facility General Arrangement Roof Plan	190-P10-CH00-00107-000-00A	11-Jun-04	Issued
Canister Handling Facility General Arrangement Section A & B	190-P10-CH00-00108-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Section C & D	190-P10-CH00-00109-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Section E	190-P10-CH00-00110-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Section F & G	190-P10-CH00-00111-000-00A	11-Jun-04	Issued
Canister Handling Facility General Arrangement Section H & J	190-P10-CH00-00112-000-00B	14-Sep-04	Issued
Canister Handling Facility General Arrangement Section K & L	190-P10-CH00-00113-000-00B	14-Sep-04	Issued
Canister Handling Facility Description Document	190-3YD-CH00-00100-000-002	21-Apr-05	Issued
Cask/MSC/WP Preparation System Description Document	110-3YD-HM00-00100-000-001	12-Apr-05	Issued
SNF/HLW Transfer System Description Document	110-3YD-HT00-00100-000-001	06-Apr-05	Issued

Non-Standard Equipment

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
ITS Gap Report - SRTC Rail	TBD		mid-June
ITS Gap Report - Trunnion Collar	TBD		mid-June
Engineering Study: Fuel Handling Facility Trolley Gap Analysis	210-30R-FH00-00200-000-00A	4/19/2005	Issued
ITS Gap Report - Turntables	TBD		mid-June
ITS Gap Report - DPC Cutting	TBD		mid-June
ITS Gap Report - WP Cutting	TBD		mid-June
ITS Gap Report - Cask/WP Tilting Station	TBD		mid-June
Design Dev Plan - DPC/WP Cutting	TBD		mid-June
Design Dev Plan - SRTC Rail	TBD		mid-June
Design Dev Plan - Trunnion Collar	TBD		mid-June
Design Dev Plan - Turntables	TBD		mid-June
Design Dev Plan - Trolleys & Rail	210-30R-FH00-00400-000-00A		mid-June
Design Dev Plan - Cask WP Tilting Station	TBD		mid-June

Preclosure Safety Analysis Process

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Internal Events Hazards Analysis for License Application	000-00C-MGR0-00600-000-00B	17-Feb-05	Issued
Nuclear Safety Design Basis for License Application	000-30R-MGR0-00400-000-001	08-Mar-05	Issued
Preclosure Consequence Analysis for License Application	000-00C-MGR0-00900-000-00B	12-Jan-05	Issued
Categorization of Event Sequences for License Application	000-00C-MGR0-00800-000-00B	14-Apr-05	Issued
Q-List	000-30R-MGR0-00500-000-001	17-Feb-05	Issued
PCSA Guide	TDR-MGR-RL-000002-001	31-Jul-03	Issued
Reliability Analysis of the Electrical Power Distribution System to Selected Portions of the Nuclear HVAC System	100-PSA-EE00-00100-000-00A	16-Dec-04	Issued
Reliability Analysis of the Mechanical System in Selected Portions of the Nuclear HVAC System	100-PSA-MGR0-00100-000-00A	14-Mar-05	Issued
General Arrangement drawings	Various		

Preclosure Criticality

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Preclosure Criticality Analysis Process Report	TDR-EBS-NU-000004-4	25-Oct-04	Issued
21-PWR Waste Package with Absorber Plates Loading Curve Evaluation	CAL-DSU-NU-000006 -00C	17-Dec-04	Issued
44-BWR Waste Package Loading Curve Evaluation	CAL-DSU-NU-000008-00A	25-Aug-04	Issued
Transporation Cask Receipt/Return Facility Criticality Safety Evaluations	140-00C-HCR0-00300-000-00B	26-Apr-05	Issued
Canister Handling Facility Criticality Safety Calculations	190-00C-CH00-00100-000-00B	7-Apr-05	Issued
Aging Facility Criticality Safety Calculations	170-00C-HA00-00100-000-00B	10-Sep-04	Issued
Source of Burnup Values for CSNF Assemblies	Enclosure to CCS # 0112054425	1-Dec-04	Issued
Fuel Handling Facility Criticality Safety Calculations	210-00C-FH00-00400-000-00A	30-Jun-04	Issued
Dry Transfer Facility Criticality Safety Calculations	100-00C-WHS0-00100-000-00C	17-May-05	Issued

Preclosure Seismic Design

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Seismic Analysis for Preclosure Safety	000-00C-MGR0-00700-000-00B	03-Dec-04	Issued

Technical Specifications

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Technical Specification structure and format	N/A		Under Development
Sample Technical Specifications for typical systems and facilities	N/A		Under Development

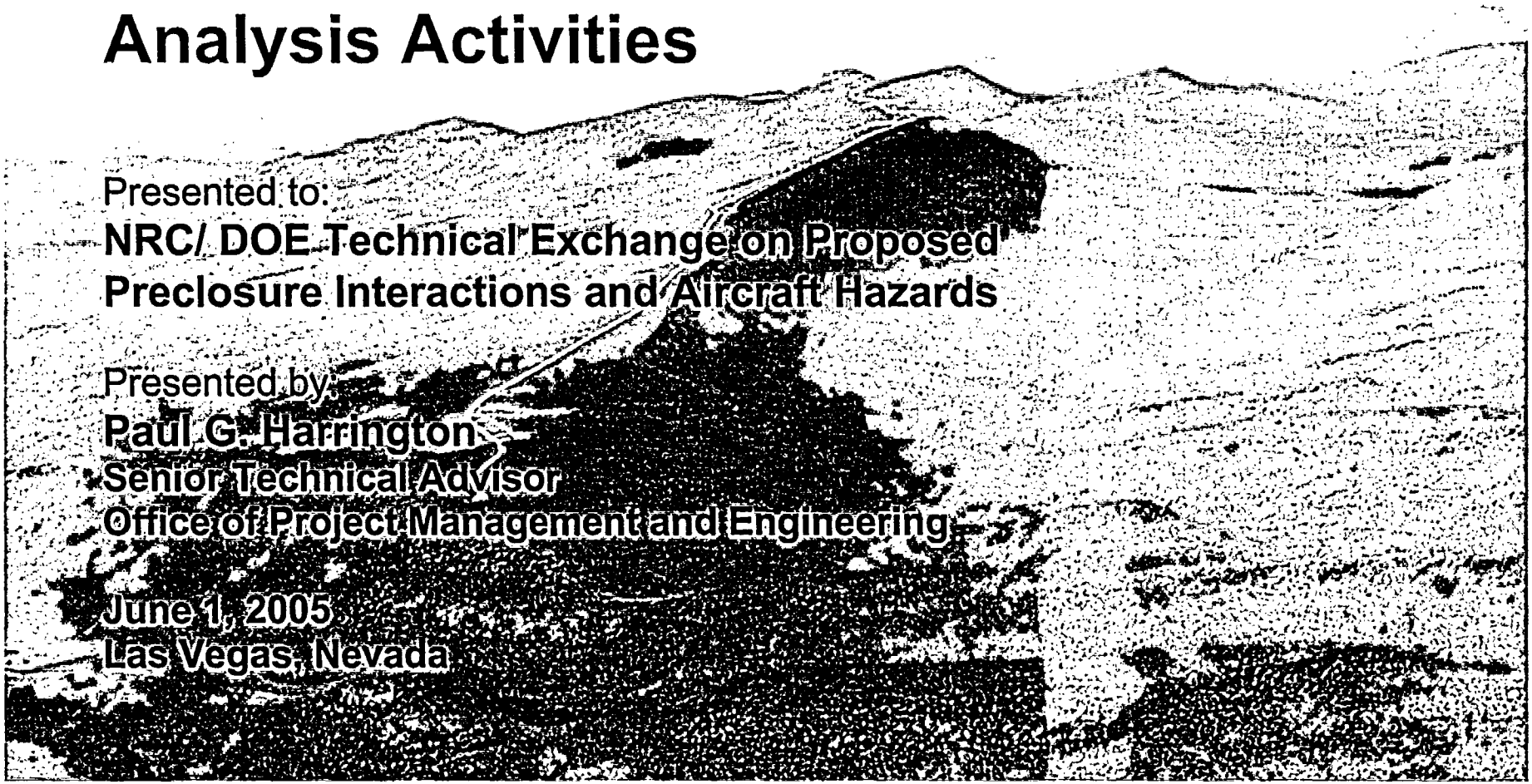
Waste Package Transporter and Gantry

Detailed List of Work Products	Document Identifier	Rev Date	Work Product Status
Transport Locomotive and Waste Package Transporter ITS Standards Identification Study	800-30R-HE00-00400-000-000	31-Mar-05	Issued
Transport Locomotive and Waste Package Transporter Gap Analysis Study	800-30R-HE00-00600-000-000		June
Transport Locomotive and Waste Package Transporter Design Development Plan	800-30R-HE00-00700-000-000		June
Emplacement and Retrieval General Arrangement Emplacement Gantry	800-MQ0-HET0-00101-000-00B	27-Feb-04	Issued
Emplacement Gantry ITS Standards Identification Study	800-30R-HE00-00200-000-00A	6-Apr-05	Issued
Gantry ITS Requirements Gap Study	800-30R-HE00-00300-000-000		June
Waste Package Emplacement Gantry Design Development Plan	800-30R-HE00-00500-000-000		June
Emplacement and Retrieval General Arrangement Emplacement Gantry Carrier	800-MQ0-HEE0-00101-000-00B	27-Feb-04	Issued

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

Overview and Status of Aircraft Hazard Analysis Activities



Presented to:
NRC/ DOE Technical Exchange on Proposed Preclosure Interactions and Aircraft Hazards

Presented by:
Paul G. Harrington
Senior Technical Advisor
Office of Project Management and Engineering

June 1, 2005
Las Vegas, Nevada

Overview and Status of Aircraft Hazard Analysis Activities

- Department of Energy (DOE) received letters dated September 16 and 17, 2003, from the Nuclear Regulatory Commission (NRC) on the DOE response related to Key Technical Issue (KTI) Preclosure (PRE) 3.01 Identification and Estimation of Aircraft Hazards
  - September 16, 2003, letter contained 16 comments on the DOE report on the Identification of Aircraft Hazards
  - September 17, 2003, letter contained 22 comments on the DOE report on the Frequency Analysis of Aircraft Hazards

Key Technical Issue Preclosure (PRE) 3.01

- "Provide a plan for identification and estimation of aircraft hazards for the License Application. This plan should be consistent with the guidelines in NUREG-0800 and other applicable DOE standards, as appropriate, to a nuclear waste repository. Provide a map delineating the vicinity to be considered in the detailed analysis, taking into consideration available information for civilian and military aircraft, including information from federal and local agencies concerning how such activities may reasonably change. Participate in an Appendix 7 meeting to discuss the aircraft hazards plan, initial data collection and analysis, development of the vicinity map, and the appropriate level of detail for analyses to be presented in the License Application assessment. DOE agrees with the request and will provide the plan and the map in June 2002. DOE agrees to participate in an Appendix 7 meeting which will be scheduled after the plan and map are provided."

Overview and Status of Aircraft Hazard Analysis Activities

- A DOE/NRC Technical Exchange on Aircraft Hazards Analysis was held on September 30, 2003
- The NRC issued the Technical Exchange summary on October 7, 2003
- The DOE responded to the 38 comments received in the September 16 and 17, 2003, NRC letters in a letter dated August 31, 2004

Overview and Status of Aircraft Hazard Analysis Activities

(Continued)

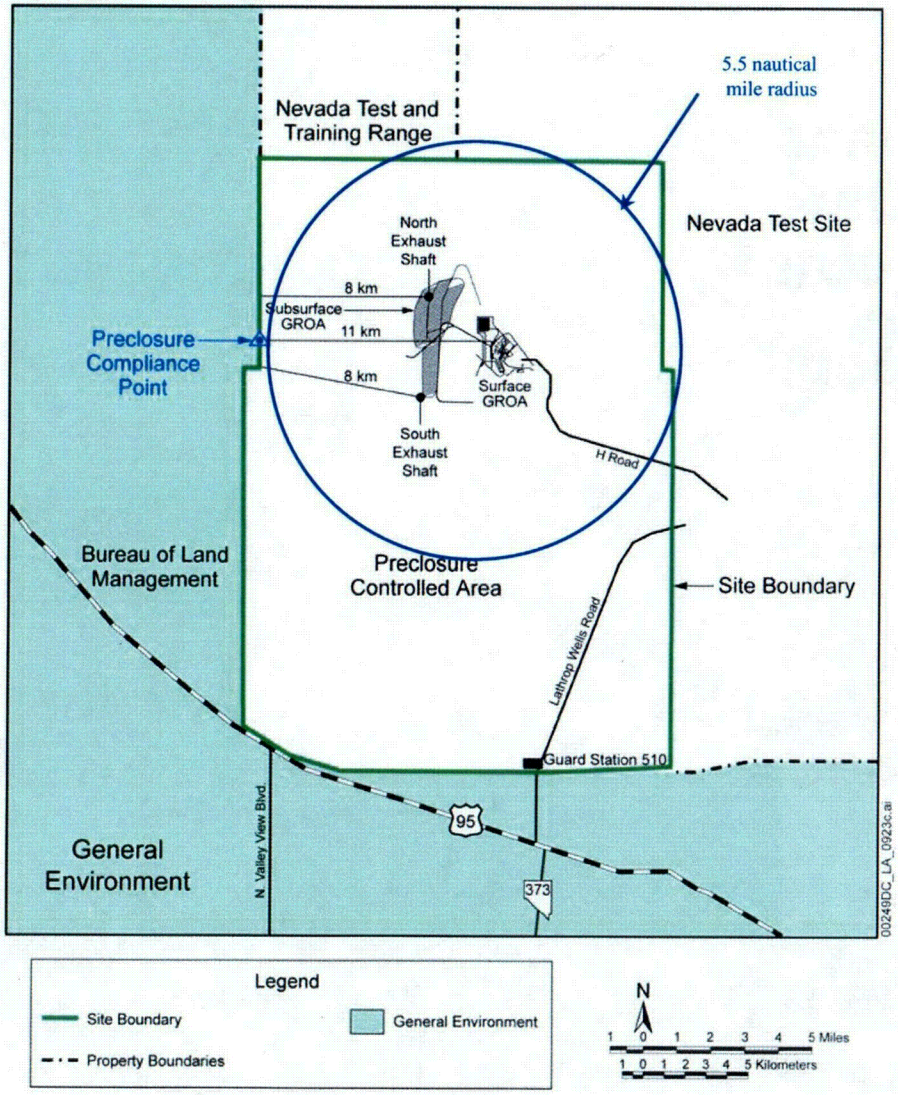
- The September 2003 letters and the Technical Exchange summary emphasized the need for additional information in support of aircraft hazards analyses
- The DOE requested and obtained additional information from:
  - U.S. Air Force (USAF)
  - Federal Aviation Administration (FAA)
- USAF information acquired from Nellis Air Force Base and the Air Force Safety Center in Albuquerque, New Mexico
- Newly obtained information was used to update the Identification of Aircraft Hazards report and the Frequency Analysis of Aircraft Hazards

Overview and Status of Aircraft Hazard Analysis Activities

(Continued)

- Credit is taken for robust waste transfer building walls and for a barrier surrounding the aging pads. The effect of this credit is to minimize that part of the geologic repository operations area (GROA) that may be affected by an aircraft crash
- The DOE and the USAF are negotiating establishment of a no-fly zone encompassing the surface GROA
- The update of the Frequency Analysis of Aircraft Hazards reflects the presence of a 5.5 nautical mile radius no-fly zone, with an upper limit of 14,000 feet above mean sea level, and a maximum number of 5,000 overflights per year

No-fly Zone in Context



C01

Overview and Status of Aircraft Hazard Analysis Activities

- The DOE intends to monitor flight activity used as the basis of the aircraft hazards analyses and update these analyses as necessary
- The DOE intends to keep its aircraft flight information current through a memorandum of understanding (MOU) with the FAA
- The proposed DOE and USAF MOU includes:
  - Establishment of a no-fly zone around the surface GROA, to be implemented upon beginning of waste receipt
  - Mutual review of potential changes to flight activity prior to implementation of these changes
  - Periodic collection of flight activity information

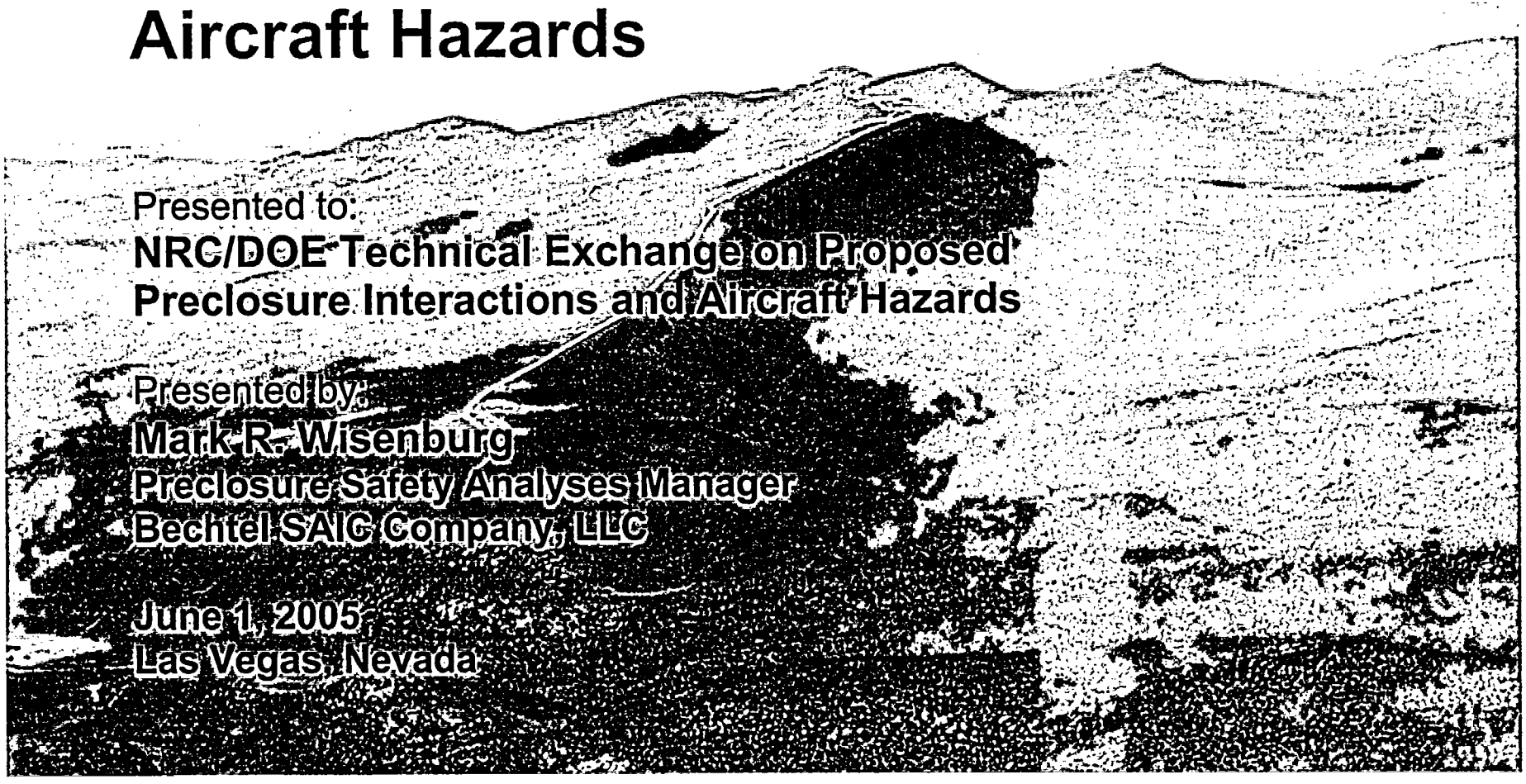
Key Technical Issue Preclosure (PRE) 3.01

- The DOE considers the elements of KTI agreement PRE 3.01 to have been satisfied. Specifically:
  - The "Identification of Aircraft Hazards" report provides:
    - Initial collection of relevant information
    - Vicinity map
    - Updated information from USAF and FAA
  - The "Frequency Analysis of Aircraft Hazards for License Application" analysis provides:
    - Estimation of aircraft hazards
    - Updated information from USAF and FAA
  - A DOE/NRC Technical Exchange on Aircraft Hazards Analysis was held on September 30, 2003
  - This Technical Exchange provides an update to the aircraft hazards methodology and incorporates more comprehensive information
- The DOE requests closure of KTI agreement PRE 3.01

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

Yucca Mountain Repository
Aircraft Hazards



Presented to:
NRC/DOE Technical Exchange on Proposed Preclosure Interactions and Aircraft Hazards

Presented by:
Mark R. Wisenburg
Preclosure Safety Analyses Manager
Bechtel SAIC Company, LLC

June 1, 2005
Las Vegas, Nevada

Overview of Approach

- Aircraft crash has been identified as a potential hazard
- 10 CFR 63 requires that hazards be evaluated to determine basis for Preclosure Safety Analysis (PCSA)

Overview of Approach

(Continued)

- **Part 63 Requirements**
  - 63.2 Definition of Event Sequence
    - Event sequences that have at least 1 chance in 10,000 of occurring before permanent closure are referred to as Category 2 event sequences
  - 63. 112 - Requirements for Preclosure Safety Analysis (PCSA)
    - Specifically 63.112 (d) specifies that the PCSA must include the technical basis for either inclusion or exclusion of specific, naturally occurring and human-induced hazards in the safety analysis
  - 63. 111(b) (2) - Performance objectives for the Geologic Repository Operations Area (GROA) through permanent closure
    - No member of the public will receive, as a result of a single Category 2 event sequence a total effective dose equivalent of 5 rem

Overview of Approach

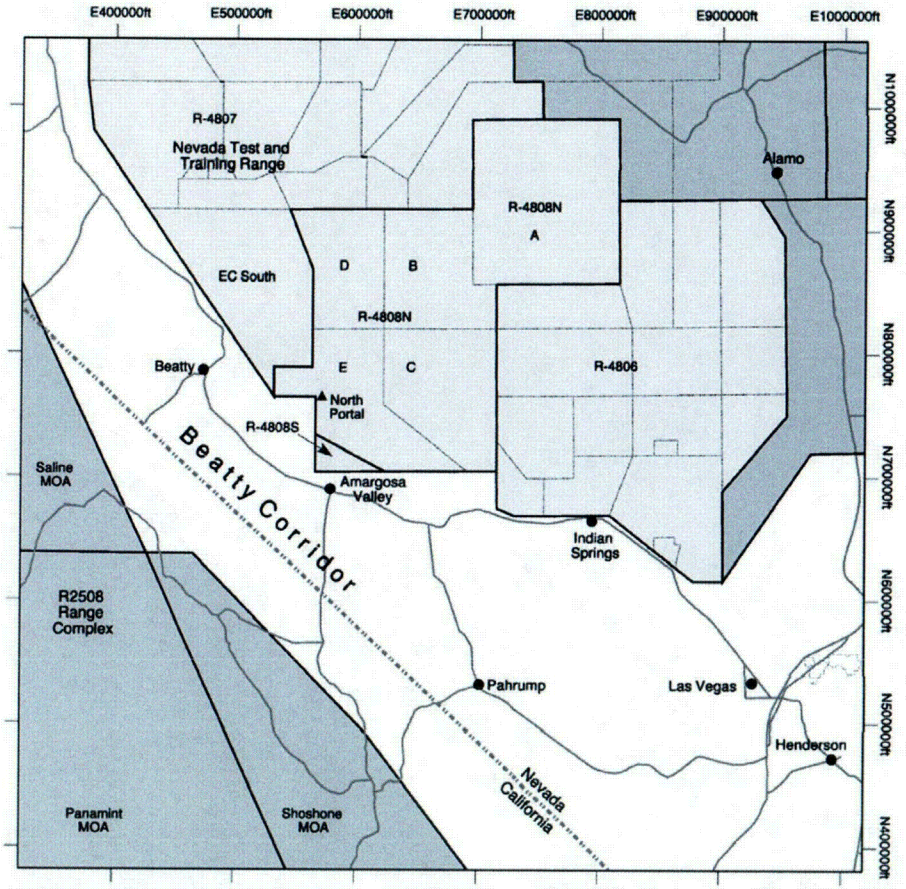
(Continued)

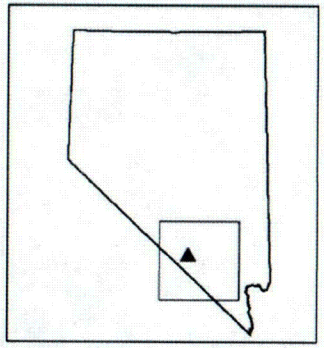
- Aircraft Hazards analysis objective is to demonstrate that event sequences related to aircraft hazards which result in a radiological release have a probability of less than 1 in 10,000 before permanent closure of the repository (beyond Category 2)
- Beyond Category 2 event sequences can be screened out and not included in 63.111(b) (2) public dose calculations
  - Probability < 1 in 10,000 before permanent closure
    - Time period is duration of emplacement operations
    - Not to exceed 50 years
    - Frequency < 2×10^{-6} per year
  - Objective is met if aircraft crash frequency is < 2×10^{-6} per year

Principal Aircraft Hazards

- **Air traffic on Beatty Corridor**
  - **Heavily traveled airway**
  - **Corridor edge 5 miles from North Portal**
  - **NUREG-0800 methodology modified by the Solomon equation**
  - **Hazard relatively insignificant:**
    - **Frequency of aircraft crash is 9.2×10^{-9} per year**

Regional Setting





Legend

- Military Operations Area (MOA)
- Restricted Airspace
- North Portal, Yucca Mountain
- State Boundary
- Highway

Regional Setting
Surrounding Yucca Mountain

N

10 0 10 20 30 40 Miles

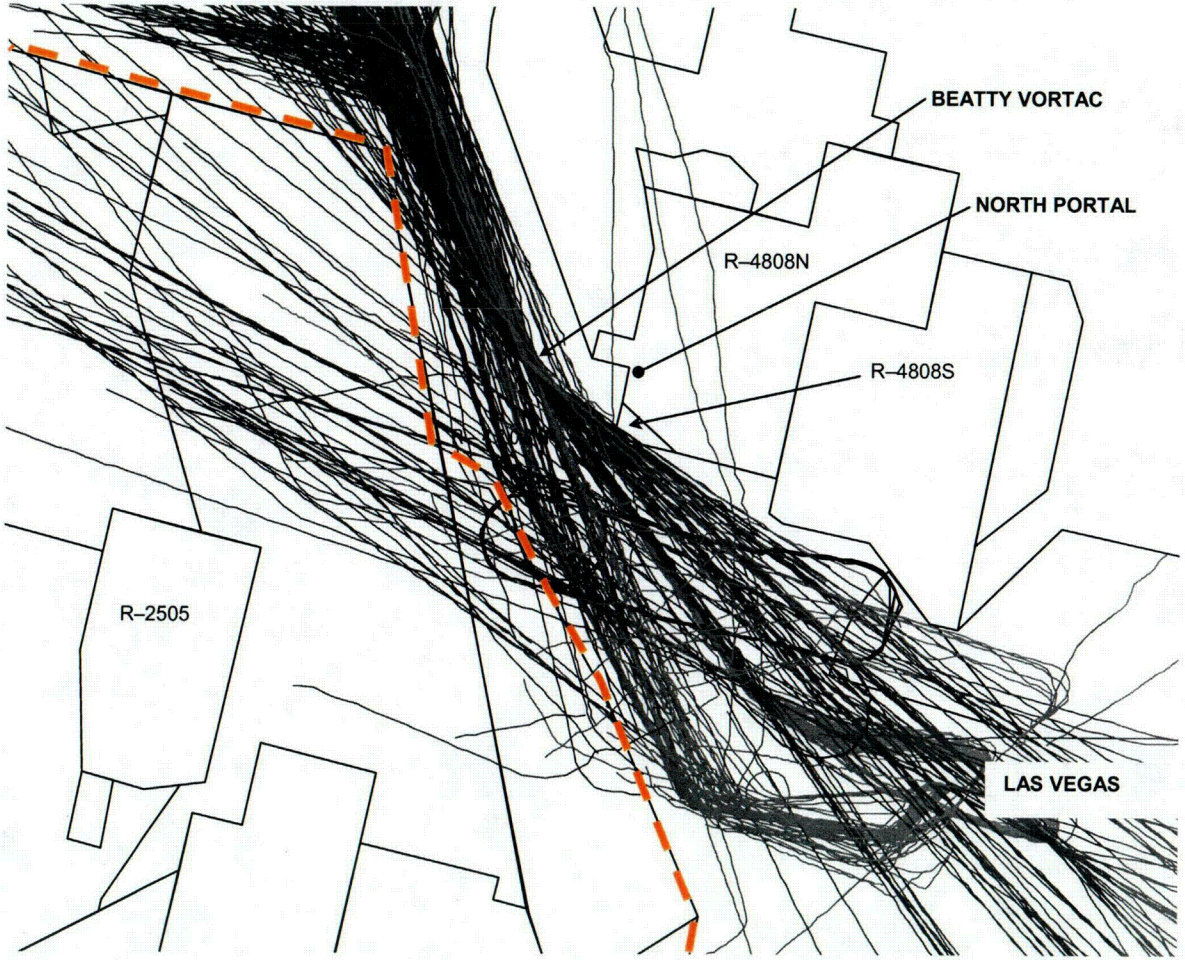
10 0 10 20 30 40 Kilometers

Projection : Nevada State Plane, Central, Coordinates in Feet, NAD27.

YMP-04-023.0

C02

Federal Aviation Administration Flight Information for 08/08/02



Scale

10 0 10 20 30 40 Miles

10 0 10 20 30 40 Kilometers

C03

Principal Aircraft Hazards

(Continued)

- **Military aircraft combat training operations on the Nevada Test and Training Range (NTTR) and the Nevada Test Site (NTS)**
  - **Recent change in Air Force plans regarding the use of NTS airspace make it necessary to assume that training activities in NTTR will be extended into NTS airspace**
  - **No-fly zone centered on the surface GROA**
  - **Military operations outside the no-fly zone**
  - **Military flights over the no-fly zone**

Design Basis

- Duration of emplacement operations is 50 years or less
- No-fly zone centered on the surface GROA
  - 5.5 nautical mile radius (6.3 statute miles)
  - 14,000 foot ceiling above mean sea level (MSL)
  - 5,000 military overflights per year above the ceiling
    - No armed ordnance (unarmed ordnance acceptable)
    - No maneuvering (straight and level flight)
- Helicopter flights within 0.5 miles of relevant repository surface facilities are prohibited, therefore no further consideration of potential helicopter crashes is required

Design Bases

(Continued)

- The following repository surface facilities are considered in the Frequency Analysis:
  - DTF*, CHF*, FHF*, TCRRF*, Aging Pads
  - Waste Package and Cask transporters
  - Low Level Radioactive Waste handling area
- Facilities are assumed to be in continuous use
- Credit is taken for the following features to reduce the effective target area of the repository surface facilities:
  - Aging pads are surrounded by barriers and designed to withstand the 95th percentile aircraft impact speed
  - An aging pad utilization factor of 0.87 is used to account for loading and emptying the pads and reflects licensing limits on waste receipt and emplacement rates
  - Exterior walls (but not roofs) of DTF, FHF, and CHF are designed to withstand the 95th percentile aircraft impact speed

*DTF- Dry Transfer Facility, CHF- Canister Handling Facility

FHF - Fuel Handling Facility, TCRRF - Transportation Cask Receipt and Return Facility

Assumptions

- Uniform distribution of overflights across the no-fly zone
- Crashes are uniformly distributed across the no-fly zone for those aircraft that experience crash initiating events during overflight of the no-fly zone and that crash within the no-fly zone
- A uniform crash density based on crash information for the NTTR is assumed for the frequency of NTTR and NTS crash initiating events for military operations outside the no-fly zone

Assumptions

(Continued)

- Flight paths on Beatty Corridor straight and parallel near Yucca Mountain
- Flight paths on Beatty Corridor uniformly distributed across the width of the corridor near Yucca Mountain
- Projected annual air-traffic counts in the Beatty Corridor are based on 2002 information multiplied by a factor of 2

Analytical Results

- Frequency of aircraft crash equals the sum of:
  - Frequency of aircraft crashes originating in Beatty Corridor: 9.2×10^{-9} per year
  - Frequency of NTTR and NTS aircraft crashes originating outside the radius of the no-fly zone: 5.9×10^{-7} per year
  - Frequency of aircraft crashes resulting from overflights of the no-fly zone: 7.0×10^{-7} per year
- Total crash frequency = 1.3×10^{-6} per year
- Analysis demonstrates that aircraft crash frequency less than 2×10^{-6} per year, therefore, aircraft hazard is screened out

Conservatisms in Analysis

- No credit for site-specific casks to withstand crash without breach
- No credit for robustness of roofs of DTF, CHF or FHF
- All overflights of no-fly zone are at 14,000 feet above MSL
- Immediate pilot ejection over the no-fly zone
- No credit for phased construction
- Distance to Beatty Corridor is conservatively short
- F-16 crash rate used for military aircraft overflights of no-fly zone
- Other repository facilities present are not included as barriers

Sensitivity to Design Bases and Assumptions

- Analysis is insensitive to flight operations on Beatty Corridor
- Results directly proportional to duration assumed for emplacement activities
- Results directly proportional to effective target area
- Area of aging pads dominates results
- Radius of no-fly zone is a major factor
- Number of no-fly zone overflights is a major factor
- Ceiling of no-fly zone is a factor

ATTENDANCE LIST FOR NRC
NRC/DOE Preclosure Interaction Process and Aircraft Hazards
June 1, 2005

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Enclosure 3

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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
MEETING ATTENDANCE

702-295-4226

SUBJECT OF MEETING: NRC/DOE Technical Exchange on Preclosure Intrusion Plans & Aircraft Hazard

DATE: June 1, 2005 LOCATION: Bldg. 189

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2	Michael Waters		NRC / Rockville
3	MALIK WISENBURG		BSC PCSA / SUMMERLIN
4	JIM YORK		BSC / D.C.
5	MYRLE RICE		LINCOLN WHITE PINE COUNTIES
6	APRIL GIL		DOE
7	PAUL HARRINGTON		DOE / ORD
8	DENNIS RICHARDSON		BSC
9	STEVE HANAUER		DOE/ORD
10	Kathy Ashley		BSC
11	Asadul H. Chowdhury		CNWRA / San Antonio
12	THOMAS D. DUNN		BSC / PCSA
13	P.A. COX		CNWRA / SAN ANTONIO
14	MARISSA BAILEY		NRC
15	GEORGE HELLSTROM		DOE/OGC
16	JO ANN BIGGS		Huntsman / Williams
17	KAZIMIERZ CAMPE		NRC
18	AMITAVA GHOSH		CNWRA
19	RICHARD LOOS		BSC / ENGR
20	Dave Darling		BSC / Engr
21	Steve Frishman		State of NV
22	Judy Treichel		NCAW TF
23	Yong Kim		NRC
24	JIM LINHART		USNFP
25	Bob Bradbury		MTS

DOE/NRC Technical Exchange on Preclosure Interaction Plans and Aircraft Hazards
06/01/05
Las Vegas, NV

	Printed Name	Signature	Organization/Location
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27	Don Beckman		BSC
28	DAVE DANCER		NRC
29	Gene Hawkins		DOE
30	JOE PRICE		DOE/ORD
31	Tish Morgan		MTS
32	RM. / NUTA		NRC
33	Guy Ragan		BSC
34	Jack Parrott		NRC
35	MARIAN ZOBACK		NRC
36	LAWRENCE E. KOKAJKO		NRC
37	David Ferris		BSC
38	RICHARD ZIEBARTH		USAF/DOE Liaison Office
39	Guy Martin, Jr.		BSC
40	JOHN BISSERT, JR.		BSC
41	Lisa Kraemer		BSC
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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
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