

United States Government

Department of Energy  
Rocky Flats Field Office

# memorandum

DATE: FEB 01 2002

REPLY TO

ATTN OF: SP:NRD:RGB:02-00240

SUBJECT: Approval of Building 707/707A Decommissioning Basis for Interim Operation

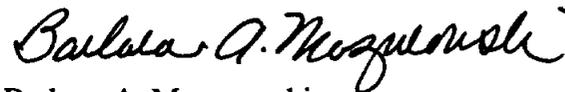
TO: Alan M. Parker  
President & CEO  
Kaiser-Hill Company, L.L.C.

- Reference: (1) Letter, Ferri to Mazurowski (01-RF-02523), dtd 10/17/01,  
subject: Transmittal of Building 707 Decommissioning Basis  
for Interim Operations, Revision, 4 – MSF-065-01
- (2) Letter, Ferri to Mazurowski (02-RF-00295), dtd 01/30/02,  
subject: Transmittal of Errata Sheets to the Building 707  
Decommissioning Basis for Interim Operations, Revision, 4 –  
MSF-005-02

The purpose of this memorandum is to provide the Department of Energy, Rocky Flats Field Office approval of the Building 707 Decommissioning Basis for Interim Operation (DBIO), which was transmitted in reference (1), and the errata sheets as transmitted in reference (2).

The Building 707 DBIO approval is based on the attached Safety Evaluation Report. The DBIO will replace the Building 707 Basis for Interim Operation upon satisfactory completion of the Implementation Validation Review.

Should you have any questions, please call me at extension 2025 or my point of contact on this matter, Ron Bostic, at extension 2009.



Barbara A. Mazurowski  
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## Attachment

cc w/Att:

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Revision No: 0  
Date: 1-31-02

# SAFETY EVALUATION REPORT

for

## Building 707/707A Decommissioning Basis for Interim Operation (DBIO) REVISION 4 (October 2001)

Rocky Flats Environmental Technology Site  
Kaiser Hill L.L.C.

PREPARED BY:

### DEPARTMENT OF ENERGY ROCKY FLATS FIELD OFFICE

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1/31/02  
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## 1.0 INTRODUCTION

This Safety Evaluation Report (SER) documents the Department of Energy (DOE) review and provides the rationale for the Rocky Flats Field Office (RFFO) approval of the Revision 4 Building 707/707A Decommissioning Basis for Interim Operations (DBIO) and the included Technical Safety Requirements (TSRs), dated 6/26/01. The DBIO/TSRs will supercede the Building 707 Facility Complex Basis for Interim Operation and TSRs initially approved in 1999 and periodically updated. Due to the extent of radioactive material holdup within the facility, Building 707/707A is anticipated to remain a Hazard Category 2 nuclear facility until all process and ventilation equipment is removed.

The Building 707 DBIO<sup>1</sup> was initially developed to comply with DOE Order 5480.23, *Nuclear Safety Analysis Reports* (Reference 1). It complies with the Nuclear Safety Rules promulgated effective 4/10/01 in 10 CFR 830, *Nuclear Safety Management*. The Building 707 DBIO was prepared using the format and content guidance of DOE-STD-3011-94, *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans* (Reference 2). DOE-STD-3011-94 is a "safe harbor" method to prepare a Documented Safety Analysis for compliance with 10 CFR 830 Subpart B, Safety Basis Requirements, for a facility in its deactivation phase to stabilize residual hazards. The facility is also concurrently performing decommissioning activities involving removal of contaminated equipment. DOE standards DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* (Reference 3) and DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports* (Reference 4) were also used in the determination of the hazard categorization of the facility and information content of the DBIO.

The TSR portion of the Building 707 DBIO was developed in accordance with DOE Order 5480.22, *Technical Safety Requirements* (Reference 5), and the *Document of Example Technical Safety Requirements*, Volume 1 (Reference 6). These TSRs also comply with the 10 CFR 830 Subpart B, Safety Basis Requirements.

The format and content of the DBIO SER was prepared in accordance with the RFFO Desktop Procedure AME-ABD-01, *Nuclear Safety Oversight and Review Process for Authorization Basis Related Submittals* (Reference 7). The RFFO procedure was based on the guidance provided in DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports* (Reference 8).

This approval is for Revision 4 of the DBIO. An addendum will be added to this Report for each subsequent revision (starting with Revision 5) to the Building 707 DBIO to provide the basis for approval.

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<sup>1</sup> Hereafter, reference to Building 707A will not be made unless a distinction is necessary for clarification.

## 2.0 SUMMARY CONCLUSION

The mission of Building 707 is to complete deactivation and decommissioning activities, and ultimate demolition of the facilities in the complex. Deactivation and decommissioning involves the removal of equipment and nuclear material from the building. Once the building physical equipment has been removed, and the interior surfaces have been decontaminated, the building will be demolished. This DBIO analyses the hazards that are present during the remaining deactivation and decommissioning mission of the building, and identifies the controls that are required to ensure that public and workers are adequately protected from hazards. The DBIO provides the authorization basis (AB) (or safety basis as referenced in 10 CFR 830) for planned activities through demolition. Due to the extent of radioactive material holdup within the facility, Building 707 is anticipated to remain a Hazard Category 2 nuclear facility until all process and ventilation equipment is removed.

In developing the DBIO, four accident scenario risk classes were defined: Risk Class I (major), Risk Class II (serious), Risk Class III (marginal), and Risk Class IV (negligible). The Risk Class is based on the frequency of occurrence of the event and the consequence of the event as defined in Table 2-1.

**Table 2-1: Risk Classes - Frequency versus Consequences**

Consequence	Frequency Of Occurrence (per year)		
	Extremely Unlikely <math>10^{-4}</math>	Unlikely <math>10^{-4} - 10^{-2}</math>	Anticipated >math>10^{-2}</math>
High	II	I	I
Moderate	III	II	I
Low	IV	III	III

Table 2-2 (Reference 2 as modified by Reference 9) shows how *High*, *Moderate*, and *Low* were defined for radiological accident consequences and Table 2-3 defines chemical accident consequence levels. The public receptor is for a Maximum Offsite Individual (MOI) at the minimum Site boundary or greater distance with the largest offsite exposure (e.g., from a lofted fire). The Collocated Worker is for a hypothetical worker located 100 m from the release (or greater distance to the Site boundary with the largest onsite exposure), either outdoors or in another facility but no reduction in dose estimates for sheltering. Immediate Workers represent those either involved in the accident or those that must be evacuated from the facility.

**Table 2-2: Radiological Accident Consequence Levels (50 year CEDE or TEDE)**

Consequence	Public Dose (rem at 2,034 m)	Collocated Worker Dose (rem at 100 m)	Immediate Worker Dose
High	> 5	> 25	Prompt death
Moderate	> 0.5	> 5	Serious injury
Low	< 0.5	< 5	< Moderate

**Table 2-3: Chemical Accident Consequence Levels**

Consequence	Public Exposure (at 2,034 m)	Collocated Worker Exposure (at 100 m)	Immediate Worker Exposure
High	> ERPG-2**	> ERPG-3**	Prompt death
Moderate	N/A*	N/A*	Serious injury
Low	< ERPG-2**	< ERPG-3**	< Moderate

\* - N/A means Not Applicable

\*\* - ERPG refers to the Emergency Response Planning Guidelines published by the American Industrial Hygiene Association. ERPG-1, ERPG-2, and ERPG-3 define the air concentrations for each chemical corresponding to low, moderate, and severe health effects in humans exposed for greater than one hour.

The Site Preliminary Hazards Analysis (PHA) (Reference 10) identifies and assesses a comprehensive set of hazards associated with activities conducted at the Site. Additionally, the PHA identifies a comprehensive set of available controls from which to select the most appropriate set of TSR controls for Site facility AB documents. The original Building 707 PHA was revised to identify and evaluate hazards and their controls associated with deactivation and decommissioning (Reference 11).

For Risk Class I and II scenarios, safety features were credited to reduce the risk of the accident to a Risk Class III or IV level, ensuring multiple layers of defense in depth, and then the safety features were developed into TSR controls. For the unmitigated analysis, Risk Class III or IV scenarios were not evaluated further in the DBIO. The risks associated with these scenarios are adequately controlled by safety management programs, as well as TSR controls on Safety Significant SSCs and Administrative Controls required to reduce the significance of Risk Class I and II accident scenarios. In some cases, there were no feasible and/or cost effective controls to reduce Class I or II risks to Class III or IV. These cases are identified as Risk Dominant Scenarios and Section 6.3 of the DBIO discusses them.<sup>2</sup> The Risk Dominant Scenarios are summarized in Table 2-4 including the controls that were credited for each of the scenarios.

**Table 2-4: Summary of Risk Dominant Scenarios**

Accident Scenario	Freq	Consequence (rem TEDE)	Risk Class	Credited Controls
1. Criticality – oil-moderated metal	U	P 8.3E-4 (Low) CW 1.8 (Low) IW High	III III I	Criticality Safety Program Criticality Accident Alarm System
2. Earthquake	U	P 0.6 (Mod) CW 62 (High)	II I	None identified. Seismic plus concurrent fire or criticality would result in slightly higher consequences.
3. Aircraft Crash	EU	P < 0.68 (Mod) CW < 67 (High)	III II	None identified. Qualitatively evaluated and determined to be bounded by the <i>Unlikely</i> earthquake plus fire.

A = Anticipated; U = Unlikely; EU = Extremely Unlikely; P = Public; CW = Collocated Worker; IW = Immediate Worker

<sup>2</sup> A review comment on this subject was corrected by the Reference 32 errata sheets for the DBIO Rev. 4.

**Risk Dominant Scenario 1** is an oil-moderated metal criticality involving recovered holdup from machining equipment during deactivation. This event bounds other potential criticalities such as a water-moderated metal criticality or a dry metal criticality that could occur during deactivation and decommissioning. When controls were not considered, the frequency of this scenario was *Anticipated*; however, after crediting the Criticality Safety Program, the frequency was reduced to *Unlikely*. Consequences are modeled using the RADDOSE defaults (e.g., single spike, fission product inventory, no airborne release of Plutonium and other actinides, etc.) to evaluate the dose contribution from a prompt dose and from a plume dose, except for a  $3 \text{ E}+17$  total fission yield (instead of the RADDOSE default  $1 \text{ E}+17$  fissions), based on a recommendation from the contractor's Criticality Safety Engineering. The dose to the Collocated Worker is estimated to be 1.8 rem (*Low* consequence and Risk Class III), primarily due to the prompt dose contribution. Dose to the MOI is estimated to be  $8.3 \text{ E}-4$  rem (*Low* consequence and Risk Class III). For the Immediate Worker, there are no means to mitigate the neutron/gamma pulse of a criticality resulting in a qualitative *High* consequence (Risk Class I). The Criticality Accident Alarm System (CAAS) is identified as Safety Significant to protect the Immediate Worker, and to provide defense in depth for the Collocated Worker. The CAAS emits an alarm signal to warn workers to leave the area immediately, which will result in a lower dose than if they remained in the area.

**Risk Dominant Scenario 2** is a seismic event that results in the collapse of Buildings 707 and 707A. The recurrence period for this earthquake is estimated to be greater than 385 years ( $2.6 \text{ E}-3/\text{yr}$ ), an *Unlikely* event. The magnitude of this earthquake is estimated to be greater than 0.10-g peak ground acceleration at bedrock (see the previous Building 707 BIO and SER for a further discussion of potential damages). This event involves the total holdup MAR either in situ or removed and in waste containers, and includes some dispersible powders recovered during deactivation to be temporarily stored in a glovebox due to their higher contribution to a release source term. All special nuclear materials that were previously stored in the facility have been removed. The dose to the MOI and Collocated Worker respectively is 0.6 rem (*Moderate*) and 62 rem (*High*), resulting in Risk Class II to the MOI and Risk Class I to the Collocated Worker. Fires and criticalities may occur that increase the consequence of the event, and these are qualitatively assessed. For a quantitative perspective, if the source term from the lathe fire scenario 707-2-2 as discussed in the DBIO were added to the seismic collapse source term, the consequences would be 0.68 rem to the MOI and 67 rem to the Collocated Worker – this does not change either the consequence or risk bin assignments. A lathe fire due to the residual oil could result in a seismic-initiated fire, but a major fire propagating throughout a module is not assumed to occur due to the building rubble and lack of combustibles present. If the criticality scenario 707-D&D-13 is added to the seismic collapse source term, the consequences would be 0.61 rem to the MOI and 62 rem to the Collocated Worker – this does not change the consequence bin assignments, but due to an expected lower frequency of occurrence (*Extremely Unlikely*) due to the low probability of a criticality, the Risk Classes would be reduced to III for the MOI and II for the Collocated Worker. Due to the deactivation, decommissioning, and demolition mission of the facility, it is impractical to enhance the ability of B707 to withstand a design basis earthquake. The mission of the facility lowers the MAR in the facility, which is the most effective and efficient means of lowering risk from earthquakes.

**Risk Dominant Scenario 3** is a small aircraft crash that penetrates some portion of the facility periphery confinement. The consequences of this scenario are dependent on the size and speed of the plane, the location of impact, and the amount of fuel on board the plane. It is reasonable to assume that this impact would only affect a portion of the facility, breach confinement, and involve nuclear material in that area in a fuel pool fire. The DBIO concludes that the consequences of this event can be qualitatively bounded by the consequences of an earthquake plus a fire. Consequences and risk class estimates are not presented in the DBIO. The estimated consequences and risk classes presented in Table 2-4 are based on the preceding discussion of a seismic-induced fire scenario. Since the aircraft crash scenario is another risk dominant event, it should be identified in the DBIO Section 6.3.<sup>2</sup> The mission of the facility lowers the MAR in the facility, which is the most effective and efficient means of lowering risk from this aircraft crash scenario.

The DOE recognizes the conservatism in the atmospheric dispersion modeling in that it does not take into account plume depletion mechanisms, such as dry and wet deposition and building wake effect. The analyses also do not account for in-facility transport modeling to credit deposition within the facility. Although the conservatism associated with these deposition or depletion factors is not quantified, the *High* or *Moderate* dose consequences associated with risk dominant scenarios are believed to be reduced significantly when these factors are considered. Thus, the risk associated with the few risk dominant scenarios are acceptable, and the Review Team agreed with the justifications for not requiring additional controls to further reduce the risk associated with the risk dominant scenarios.

The unmitigated risks associated with performing the activities required to complete the Building 707 mission are substantial. However, the DBIO identifies an adequate control set necessary to lower these risks to an acceptable level and to ensure safe facility operations.

With the inclusion of the revised page changes submitted in Reference 12, the Review Team concluded that the Building 707 DBIO adequately defines and documents the hazards of the facility and specifies the necessary controls in the TSRs. The safety features and controls will adequately reduce the risk to the MOI, Collocated Workers, and Immediate Workers to a level consistent with the expectations provided in DOE-STD-3011 (Reference 2) and the Nuclear Licensing Streamline Initiative (Reference 9), and to a level acceptable to the Review Team. The bases for this conclusion are presented in Section 5.0. The Review Team recommends DOE approval of Revision 4 of the Building 707 DBIO including the TSRs.

#### Major Issues:

There are not many new issues that are considered “major” that have not already been dispositioned in the Building 771 DBIO SER (Reference 13). The most significant issue from the cross-table review is related to the number of review comments that were based on unexpected 707 changes to text that should have been consistent with the 771 DBIO and TSRs – some were deliberate proposed changes (e.g., based on a different facility’s perspective or as a result of implementing the 771 TSRs) while others were inadvertent administrative errors. Examples of changes included some of the TSR generic descriptions (e.g., definitions or general rules), definition of suspend operations and associated TSR Required Actions, and lack of

consistency with 771 on some important Limiting Conditions for Operation/Surveillance Requirements or Administrative Controls. Those that were accepted by DOE resulted in a few revisions to the Building 771 TSRs to ensure consistency, but the DBIO accident analysis was not revised (which could cause some confusion for future Unreviewed Safety Question Determinations when sitewide discovery issues arise).

The scope of activities that would be authorized while under a suspension of operations was a major issue during the review of this DBIO. Revision 3 of the B707 DBIO proposed a definition for "Suspend Operations" that would have allowed far more activities to be performed than were agreed to in the B771 DBIO. This was discussed in detail during the cross-tables, and was left as an open item requiring reconsideration from facility management. A red-lined Revision 3 of the DBIO, dated September 19, 2001, was provided to DOE with changes to the scope of activities authorized under a suspension of operations. Although the scope was reduced, it was still broader than the B771 DBIO. Additional discussions were held, and despite coherent arguments from the contractor the Review Team requested the scope of suspensions be made consistent with the B771 DBIO. The primary reasons for limiting the scope include: 1) seemingly benign activities still have the potential to be accident initiators, 2) the number of entries into a "Suspend Operations" Required Action will be less than under previous authorization basis documents due to the limited number of hardware LCOs, 3) the affected areas under the "Suspend Operations" are limited per the LCOs, and 4) the facility should be focused on restoring the safety function while under a suspension, and this may be compromised if substantial work activities were to remain authorized.

The B707 DBIO, Revision 3, intended to authorize storage of transuranic (TRU) waste (up to 1200 grams) in Building 778. Building 778 has not been authorized for TRU waste storage in previous AB documents, although it is acknowledged that the facility has contained hold-up radioactive material. It was agreed through the cross-table discussions that B778 would be authorized for transferring contaminated items between B707 and B776. As a result of this change B778 does not require TSRs on sprinklers.

### **3.0 REVIEW PROCESS**

The Building 707 was characterized, using DOE-STD-1027-92 (Reference 3) methodology, as a Hazard Category 2 nuclear facility (initially by Reference 14, and confirmed as discussed in the DBIO Section 5.2, PHA Summary of Hazards Analysis). The RFFO has been delegated approval authority for a Documented Safety Analysis for Hazard Category 2 and 3 nuclear facilities (Reference 15).

The RFFO and Contractor had several meetings during the development of the DBIOs for Buildings 707, 771/774, and 776/777 throughout the summer of 2000. These were similar in concept to a "50% Review" to discuss the direction of implementing the Nuclear Licensing Streamline Initiative that was adopted on June 12, 2000 (Reference 9). At that time, the RFFO Assistant Manager for Engineering (AME) organization expressed concern that the direction of the three DBIOs did not meet the Nuclear Licensing Streamline Initiative commitments #6 (performing an unmitigated hazards analysis for the MOI, Collocated Worker, and Immediate

Worker), #7 (selection of TSR controls to protect the Immediate Worker), #9 (control set selection preferences), and #12 (identifying support systems and removing them from the TSR Limiting Conditions for Operation). Specific controls that RFFO expected to be credited in the accident analysis or identified as providing defense in depth and addressed by TSRs were discussed. These issues were resolved during the review and approval of the Building 771 DBIO (Reference 13) and are applicable to the Building 707 DBIO.

The DOE RFFO review of the Building 707 DBIO Revision 4 was conducted in three phases: 1) review of initial draft Revision 2 submitted November 2000 (concurrent with draft DBIOs for Buildings 771/774 and 776/777); 2) review of the second draft Revision 3 June 2001 (and proposed red-lined TSR page changes in September 2001); and 3) review of the final DBIO Revision 4 submitted October 2001.

The RFFO DBIO Review Team consisted of personnel from the Nuclear Regulatory Division and supported by Subject Matter Experts from other RFFO departments. Ed Westbrook from the Nuclear Regulatory Division (NRD) was the Team Leader for this review and was responsible for reviewing all submitted documents from both a nuclear safety and DOE Facility Representative perspective. The team members were assigned specific areas based on their expertise. The other primary team members and the area they concentrated their review on are as follows:

- Mike Payne and Don Rack, NRD – DBIO and TSRs,
- Terry Foppe, NRD - hazard and accident analysis,
- Robert Wilson, Safety & Health Programs Division - criticality accident scenarios and Criticality Accident Alarm System controls,
- Robert Williams, Safety & Health Programs Division - fire scenarios, Fire Hazard Analysis, and the fire protection controls,
- Joe Sondag, Building 707 Facility Representative

The second draft DBIO Rev. 3 review was conducted over several months based on the guidelines from the RFFO “Rocky Flats Desktop Instruction” (Reference 7). Familiarization tours of Building 707 were initially provided to the Review Team members as necessary to ensure a minimum knowledge level of the facility to adequately review the DBIO, or team members previously toured the facility and were adequately knowledgeable of Building 707 and current operations. Follow-on tours were conducted as needed by the Review Team members to validate specific information contained in the DBIO.

In conjunction with the review of the Building 707 DBIO, the Review Team also reviewed the supporting documentation provided by the Contractor when the DBIO was delivered. This included the supporting accident analysis calculations, the Building 771 and Inner Tent Chamber Fire Hazards Analyses (References 16 and 17, respectively, which are applicable to Building 707 regarding contamination control structures), the Building 707 Preliminary Hazards Analysis (Reference 11), and the Site Preliminary Hazards Analysis (Reference 10). The DOE review included independent validation of these documents primarily focusing on the control set selection and the accident analysis calculations.

The Review Team members conducted independent technical reviews of the DBIO, providing the Team Leader with written comments. The initial review of the 11/00 submittal of the Buildings 771/774 and 776/777 DBIOs resulted in substantial comments particularly in the Hazard Identification, Accident Analysis, and TSR chapters, many of which were applicable to the 707 DBIO Rev. 2.

Kaiser-Hill revised the DBIO per the first review cycle comment resolution from the Buildings 771/774 and 776/777 cross-table reviews, including RFFO and K-H management resolution of issues elevated to them, and resubmitted the DBIO, TSRs, accident analysis calculation, and revised Fire Hazards Analyses in June, 2001. Most of the review comments were resolved by the 6/01 re-submittal of the 707 DBIO Rev. 3. The DBIO Rev. 3 also incorporated the resolution of policy issues that were established during the approval of the first DBIO (Building 771/774) by the RFFO Deputy Manager and the Kaiser-Hill Nuclear Safety Review Board (senior KH managers and nuclear industry consultants). The significant issues and their dispositions are not discussed in this SER, but are documented in the Building 771/774 DBIO SER (Reference 13) and are applicable to this 707 DBIO SER.

New comments on the DBIO Rev. 3 were consolidated, reviewed for consistency, and provided to the Contractor. A "cross-table" meeting format was used to resolve the DOE comments, where the Review Team met with Kaiser-Hill, L.L.C., the contractor authors of the DBIO, and Building 707 operations starting in July 2001. The majority of the Review Team's comments on Revision 3 were resolved at the cross-tables: some were withdrawn based upon clarifications provided during the meetings, others were incorporated into a red-lined version of Revision 3 dated September 18, 2001.

Issues that remained open were addressed during a subsequent meeting and incorporated into Revision 4. Revision 4 resolved the all but one item on the TSRs, but a number of issues on the accident analysis remained outstanding. These issues required additional meetings and the generation of errata sheets to Revision 4 (Reference 12).

Two members of the initial review team primarily conducted the last phase of the review, dispositioned the earlier comments as agreed at the cross-table review, and generated a few new comments. All RFFO review comments have now been dispositioned in the final revision of DBIO, which includes revised page changes (errata sheets) as submitted in Reference 12.

#### **4.0 DESCRIPTION OF FACILITY AND OPERATIONS**

The Building 707 Facility Complex was originally designed as a plutonium (Pu) manufacturing facility to build a finished weapons assembly. Operations in the Building 707 Facility Complex, which began in the early 1970s, were divided into eight categories: casting, forming, metallurgy, machining, assembly, inspection, nondestructive testing, and support. Operations began with Plutonium metal feed from various sources. The feed was cast into ingots of the required shapes that then proceeded through standard metalworking steps to become finished weapons parts. Finished Plutonium parts and parts made of other special nuclear materials and nonnuclear materials were assembled into subassemblies which were joined to become final assemblies.

Inspection and testing of the parts, subassemblies, and final assemblies were on-going throughout the entire production process.

The buildings in the Building 707 Facility Complex include Buildings 707 and 707A (referred to as 707, except when specific reference to 707A is required), 708, 711, 718, 731, and 778. Building 708 houses the Emergency Diesel Generators and support equipment, Building 711 is Tower Water System cooling towers, Building 718 is an auxiliary equipment shed, Building 731 contains the Process Drain System collection tanks and necessary transfer equipment, and Building 778 contains maintenance shops, locker rooms with showers, and a laundry facility (no longer in use). All SNM storage and processing operations take place in Building 707.

With the suspension of nuclear production operations in 1989 and the subsequent discontinuation of the production mission in 1992, the Building 707 Facility Complex was transitioned from a nuclear weapons production facility to an environmental restoration facility. The facility has completed its Plutonium residue stabilization mission and de-inventoried all of its accountable special nuclear materials. The current Building 707 mission is to complete deactivation, decommissioning and decontamination activities, and ultimate demolition of the facilities in the complex. Decommissioning involves the removal of equipment and nuclear material from the building. Once the building physical equipment has been removed, and the interior surfaces have been decontaminated, the building will be demolished. This DBIO analyses the hazards that are present during the remaining decommissioning mission of the building, and identifies the controls that are required to ensure that public and workers are adequately protected from hazards. The DBIO provides the AB/safety basis for planned activities through demolition.

To achieve these missions, Building 707 operations encompass the following approved DBIO Activities:

1. Administrative Operations
2. General Facility Operations
3. Non-radioactive, Hazardous Material Handling
4. Radioactive Waste Generation and Handling
5. Decommissioning (Decontaminate, Dismantle, and Demolish)

## **5.0 APPROVAL BASES**

The Building 707 DBIO satisfies the requirement of DOE Order 5480.23 (Reference 1) and 10 CFR 830 to develop a BIO for a facility undergoing deactivation and decommissioning, and includes TSRs that were prepared in accordance with DOE Order 5480.22 (Reference 5). The level of detail and scope of the Building 707 DBIO meets the guidance of the 10 CFR 830 safe harbor method for BIOs, i.e., DOE-STD-3011 (Reference 2). Upon DOE approval and full implementation, the Building 707 DBIO will become the AB/safety basis that will replace the current Building 707 BIO, Revision 1.

This SER was prepared in accordance with Appendix C of the RFFO Desktop Procedure (Reference 7). This procedure was based on Safety Analysis Report (SAR) review criteria and

guidance contained in DOE STD-1104 (Reference 8). In addition, the DBIO was evaluated against the criteria provided in Reference 18 to validate compliance with 10 CFR 830.

Reference 7 defines five approval bases for assessing the adequacy of a new AB. The five approval bases are presented below, along with an assessment of the adequacy of the Building 707 DBIO in meeting the requirements stated in each approval basis. A summary of the Building 707 DBIO information dealing with each approval basis topic is also presented.

## 5.1 Adequacy of Base Information

The criteria for accepting the adequacy of the base information is that it provides sufficient information to allow assessment of the other approval bases that rely on this information. Base information contained in a DBIO generally deals with technical information about facility and system configuration, current and past operation, and historical events of significance.

Base information found in the Building 707 DBIO consists of the technical information contained in the Facility Description (Chapter 2), Facility Activities (Chapter 4), and, to a lesser extent, descriptive information in other chapters. The following seven criteria were utilized in assessing the adequacy of the base information contained in the Building 707 DBIO:

- 1) The facility mission(s) and scope of operations for which safety basis approval is being sought are clearly stated and reflected in the type and scope of operations analyzed in the DBIO.

Assessment: The Building 707 missions and scope of operations were explicitly discussed in the Executive Summary and the entirety of Chapter 4, Facility Activities. The purpose of Chapter 4 was to list and describe the activities performed in the Building 707 to provide a fundamental understanding of the facility deactivation and decommissioning processes and activities subsequently analyzed in the hazard and accident analyses. The deactivation and decommissioning activities are adequately defined within the DBIO. During the RFFO review, revisions were required to clarify that only Section 4.1 Administrative Operations and Section 4.2 General Facility Operations are allowed during a Suspension of Operations. The RFFO considered many of the other activities to be potential accident initiators that should not be authorized during a Suspension. These changes were adequately addressed by the final DBIO revision.

The operations and activities defined and analyzed in the DBIO are consistent with the stated missions and are also consistent with the Site's Closure Plan (Reference 19). The activities listed in Chapter 4 of the DBIO adequately define what is authorized in the facility and contains sufficient detail to support the hazard identification process summarized in Chapter 5 and the subsequent accident analysis in Chapter 6.

Several of the activities in Chapter 4 of the DBIO (General Facility Operations) are not distinct activities, but rather a general category of activities. In these instances, the DBIO is authorizing the utilization of the Integrated Work Control Program, as described in Chapter 3

of the DBIO, to adequately evaluate these types of activities to ensure they are within the scope of work encompassed by the DBIO.

The scope of activity is also discussed further in Section 5.1 Criterion 6 and Section 5.2 Criterion 2.

Conclusion: The Building 707 DBIO statements of the mission, scope of operations, and activities are sufficient to analyze the hazards of operations. This criterion is adequately met.

- 2) The descriptions of the facility, operations, and primary structures, systems, and components that are important to safety provide a knowledgeable reviewer sufficient background material to understand the major elements of the safety analysis.

Chapter 2, Facility Description, provides descriptions of facility, supporting operations, and primary structures, systems, and components (SSCs) important to safety. Chapter 4, Facility Activities discussed above, describes the analyzed and authorized activities (operations) in the Building 707.

Assessment: The DBIO provides a similar level of detail that is found in other recently approved AB documents at the Rocky Flats Environmental Technology Site (RFETS or Site). The description of the original mission equipment/systems that are still in the facility, but not in use, was very general. This equipment and these process systems will be the focus of future remediation work in the Building 707 and are the source of many hazards. However, bounding estimates for material holdup were utilized in the accident scenarios, where appropriate, and the hazard identification process utilized by the Contractor is expected to have adequately identified the hazards associated with these systems.

The DBIO adequately identifies Safety Significant SSCs (there are no Safety Class SSCs), their boundaries, and interfacing systems as configured at the time of approval. Due to the decommissioning mission of the facility, SSC configuration will be continually changing. Rather than address these changes through the Page Change Process, a TSR level control, AC 5.6 Configuration Management, has also been added to ensure that SSCs providing credited or defense in depth safety functions are identified, maintained, and associated affected areas can be clearly determined. This AC applies to temporary systems that may be utilized in lieu of existing systems.

Conclusion: As supplemented by the Building 707 TSR AC 5.6, Configuration Management, the descriptions of the facility, operations, and primary structures, systems, and components that are important to safety contained in the DBIO are considered adequate. This criterion is met.

- 3) The status of the existing authorization basis is adequately identified to establish the current set of authorization basis documents, including specific versions and levels of approval.

Assessment: The current Authorization Basis Document List (ABDL) for Building 707 includes the following documents (and their DOE Safety Evaluation Reports):

1. Building 707 BIO, Rev. 1
2. Justification for Continued Operation (JCO) JCO-707-00.0812-SDG, Building 778 Authorization Basis Issues, approved 7/10/00
3. Unreviewed Safety Question Determination (USQD) USQD-RFP-01.0001-KBB, Evaluation of DCS-991-00.1888, Hydrogen Gas Turbulent Jet Explosion and DCS-RFP-01.0012-VLP, Sitewide Evaluation of Possible Turbulent Gas Jet Explosion, approved 8/14/01
4. DOE/RFFO letter FPA:NRD:DRR:01-01479, Approval of Unreviewed Safety Question Determination-01.0001-KBB, Revision 1, Evaluation of DCS-991-00.1888, Hydrogen Gas Turbulent Jet Explosion and DCS-RFP-01.0012-VLP, Sitewide Evaluation of Possible Turbulent Gas Jet Explosion, approved 8/14/01
5. Standing Order 72, Restrictions on the Use of Flammable Gas on Site, approved 8/14/01
6. USQD-707-00.1656-SDK, Inadequacy in Building 707 BIO Criticality Accident Scenario Frequency Assumptions, approved 7/13/00
7. JCO-707-02.0170-SRH, Permanently Disabled Sprinkler System in Module G of Building 707, approved 11/29/01
8. JCO-707-02.0539-KWG, Building 707 Use of Docks 185 and 197 with Dock Doors Open, approved 12/14/01
9. PGC-707-01.1026-SWC, Relaxation of CCA Minimum Staffing Requirements, Deleting MAR tracking LCO, Revising Combustible Storage Limits, approved 7/3/01

The BIO Rev. 1 will be replaced by the DBIO upon implementation. All of the positive Unreviewed Safety Questions (USQ), JCOs, and the BIO Rev. 1 page change have been adequately evaluated and addressed in the DBIO or TSRs, and do not need to be carried forward on the ABDL upon DBIO implementation. All of the JCOs were approved by DOE with an expiration date based on the DBIO implementation. It should be noted that JCO-707-00.1130-SDK, Performance of Proposed Activities in Gloveboxes with Non-Functional Safety Category 3 Equipment, is currently on the ABDL because Revision 1 was approved by RFFO -- however, the facility elected not to implement it; therefore, approval was rescinded and this JCO should be removed from the ABDL.

**Conclusion:** The documents on the Building 707 ABDL at the time of DBIO approval have no impact on the DBIO. This criterion is adequately met.

- 4) Correlation is established between actual facility arrangements and operations with those stated in the DBIO (i.e., the basic descriptions provided are fundamentally up-to-date and correct).

This criterion addresses the accuracy of the information primarily contained in Chapter 2 Facility Description and Chapter 4 Facility Activities.

**Assessment:** During the review process, the Review Team conducted walk-downs of the Building 707 and held significant discussion with the DBIO development team and other facility personnel. These walkdowns and discussions provided Team members with a familiarity level of the existing facility, planned locations for future activities, the general

approach to decommissioning the facility, and ability to verify the accuracy of the information contained in the DBIO. Several team members had past experience in the facility, as well as current involvement in the planning phase for deactivation and decommissioning activities in the facility.

**Conclusion:** The correlation between the actual facility arrangements and operations with those stated in the DBIO were fundamentally correct. This criterion is adequately met.

- 5) **The facility Contractor development and approval processes demonstrate sufficient commitment to establish the facility safety basis.**

This criteria addresses the Contractor process used for development and approval of the DBIO, rather than a specific chapter or aspect of the DBIO. The adequacy/inadequacy of the process is not necessarily reflective of the adequacy and quality of the product (i.e., the Building 707 DBIO). However, it is reflective of the efficiency of producing a quality document and the level of DOE involvement required in producing an acceptable AB/safety basis for the Building 707 complex.

**Assessment:** The previous AB for the Building 707, the BIO Revision 1 and subsequent page changes, allowed limited decommissioning and decontamination activities included in the DBIO. Major stripout of gloveboxes, safety and support systems, and facility demolition was not authorized by the BIO, except by specific page changes approved by DOE. The submitted DBIO and TSRs reflect the current missions and activities of the facility, and establish a more efficient safety basis to support facility closure. The development of a DBIO for Building 707 was a major priority for Kaiser Hill, and significant resources and management attention were devoted to its development.

The RFFO review of the first two submittals resulted in substantial comments on each. The nature and number of comments generated led to the series of cross-tables and subsequent discussions as discussed in Section 3.0, Section 2.0, and throughout Section 5.0.

**Conclusion:** With significant 707 management involvement and DOE input, an adequate AB/safety basis was developed. This criterion is adequately met.

- 6) **A description of the facility's life-cycle stage, mission(s), and operation(s) is presented, including explanation of the impact on the facility safety basis.**

This criterion primarily addresses the information contained in Chapters 1, 2, 3, and 4.

**Assessment:** Full deactivation and decommissioning activities through demolition of the structure are authorized in the DBIO. The activities described are adequate to support the current missions of the facility. The DBIO identifies potential accident scenarios associated with mission activities, and provides hazard and accident analysis to identify the controls necessary to minimize their risk. However, several activities, (specifically in Section 4.3, Hazardous Material Handling) originally allowed during a Suspension of Operations included several potential accident initiators. The first two DBIO submittals identified

activities that may be performed during a Suspension of Operations per the Technical Safety Requirements. The RFFO Review Team determined that many of these activities (e.g., stabilizing chemicals, characterizing and disposing of hazardous materials, handling and using chemicals, etc.) were potential accident initiators that should not be allowed during a Suspension. The DBIO has been revised to authorize storage of chemicals in Section 4.2, General Facility Operations, which are authorized during a Suspension and to delete Section 4.3 from activities authorized during a Suspension. The DBIO also provides a clearly defined process to step out of TSR level controls as the risk associated with activities within areas of the facility are reduced to an acceptable level. The TSR control AC 5.5, Operationally Clean, identifies the criteria that must be satisfied to meet and maintain that lower risk level.

**Conclusion:** The DBIO provides a clear description of the Building 707 mission and planned activities to support demolition. This criterion is adequately met.

7) Clear basis for and provisions of exemptions, consent agreements, and open issues are presented.

**Assessment:** No exemptions were requested in the DBIO; however, the DBIO does reference the approved exemptions that affect the Building 707. During the DOE review of the exemption database maintained by the RFFO Nuclear Regulatory Division, exemptions applicable to Building 707 were identified and compared to those listed in the DBIO. The DBIO identifies three exemptions applicable to Building 707:

- EX-045, Building 707/707A HVAC Ductwork and Chainveyors – approved automatic sprinkler spacing noncompliances with NFPA 13
- EX-1, Lack of Fire Dampers within Heating, Ventilating, and Air Conditioning (HVAC) Ductwork
- EX-046, Non-listed Deluge Valves and Kates Flow Control Valves (for plenum deluge systems)

In addition, the Site Safety Analysis Report (Site SAR) (Reference 20) identifies the following exemptions that are applicable to Building 707:

- EX-033F, Criticality Alarm System (ANSI/ANS Standard 8.3 noncompliances)
- EX-051, RFETS Compliance with Outdated Revisions of Criticality Safety ANSI Standards Cited in DOE Order 420.1A
- EX-067, Maintenance Craft Qualification Program

These exemptions to DOE Orders do not have a significant affect on the DBIO hazards and accident analysis, or are used as a Basis for the TSRs (e.g., EX-033F).

Consent agreements are not addressed explicitly in the DBIO and are in general addressed at the Safety Management Program level (e.g., consent agreements with the State of Colorado would be captured in the Waste Management and Environmental Protection Program).

Conclusion: The DBIO adequately discusses deficiencies and exemptions. This criterion is adequately met.

## 5.2 Adequacy of Hazard and Accident Analyses

The hazard analyses and accident analyses contained in a DBIO are the foundation upon which the remaining bases (i.e., Safety SSCs, TSRs, and programmatic controls) rely. The primary objective of the DOE review of this portion of the DBIO is that it contains sufficient information with appropriate references to supporting details. The following five criteria, as discussed below, were used to evaluate the adequacy of the hazard and accident analyses presented in the Building 707 DBIO.

- 1) The hazard analysis includes hazard identification that specifies or estimates the hazards relevant for DBIO consideration in terms of type, quantity, and form, and also includes properly performed facility hazard classification.

This criterion addresses: 1) the DBIO Chapter 5 Hazard Identification and Analysis (including hazard classification), 2) the Chapter 4 DBIO Facility Activities (hazards identification), 3) the Building 707 PHA (Reference 11), and 4) the Site PHA (Reference 10).

Assessment: Facility hazard classification information is found in Section 5.2 (PHA Summary of Hazards Analysis), the Executive Summary of the DBIO, and Section 1.1 (Facility Hazard Classification). A preliminary classification (Reference 14) was performed in 1994 to support development of an implementation plan for DOE Orders 5480.23 and 5480.22. This effort concluded that the facility hazard classification per DOE STD-1027 (Reference 3) is Hazard Category 2. The DBIO confirms that although deactivation has resulted in the removal of stored special nuclear materials and much of the plutonium holdup, the estimated quantity of remaining plutonium holdup is sufficient to exceed the Hazard Category 2 threshold as well as presenting a nuclear criticality hazard.

Details of hazard identification information are found in the Building 707 PHA and are summarized in Chapter 5. Hazard identification was accomplished using a checklist and results of identified hazard categories are summarized in Table 5.1 of the DBIO. The checklist is similar to that presented in the *Safety Analysis and Risk Assessment Handbook SARAH* (Reference 21) which was developed for the Site SAR and other ABs at the Site. The hazard identification information from walk-downs, document reviews, and personnel interviews is summarized in the DBIO Table 5-3.

These presentations provide a relatively good identification of the hazards in the complex, as to type and location, but lack detailed information on quantities and form. From the Review Team walk-down and the cross-tables, no additional hazards were identified. The hazard identification process was considered complete to the extent that any hazards that may have been missed or not characterized adequately is considered to be bounded by those listed. Hazard identification is also discussed throughout the Chapter 4 Facility Activities.

The DBIO and 707 PHA do not list the hazardous chemicals that have existed in or may be used during the decommissioning of the 707 Complex. However, the PHA Section 3.1.3 (Screening of Hazards) concludes that existing and expected quantities of those materials do not exceed Threshold Planning Quantity (TPQ) or Threshold Quantity (TQ) levels of 40 CFR 355, 40 CFR 68, and 29 CFR 1910.119, therefore do not require further hazards analysis or being carried forward to the accident analysis. The 707 PHA Chapter 4.0 (Assumptions) states that the hazardous materials in the Complex will be maintained below the TQ/TPQ thresholds.

The Site PHA summarizes hazard identification from a sitewide perspective for all nuclear facilities, including decommissioning activities. The DBIO does not rely solely upon the Site PHA to identify Building 707 Complex specific hazards.

Conclusion: Hazard identification for the Building 707 was adequate for the analysis and derivation of TSR controls. The hazard classification for the facility was adequately determined and justified as nuclear Hazard Category 2. This criterion is adequately met.

- 2) The hazard analysis includes hazard evaluation that covers the activities for which approval is sought, is consistent in approach with established industrial methodologies, identifies preventive and mitigative features for the spectrum of events examined, and identifies dominant accident scenarios through ranking.

This criterion deals with the content of the DBIO Chapter 5 Hazard Identification and Analysis, Chapter 4 Facility Activities, the Building 707 PHA (Reference 11), and the Site PHA (Reference 10).

Assessment: Chapter 4 of the DBIO lists and describes those activities which are planned to be performed within the Building 707 Complex. The primary mission is deactivation and decommissioning, which requires General Facilities Operations to maintain the safety envelope. Should additional activities be identified in the future, they will need to be reviewed and evaluated against this list to determine whether the hazards and potential accidents associated with the proposed activity is bounded or not, and whether any additional controls/requirements are needed in order to perform the activity within the prescribed or new safety envelope.

Review comments related to the scope of activities to be authorized were resolved at the cross-table review. Examples include:

1. As discussed in Section 5.1 Criterion 6, General Facilities Operations during suspension of operations would authorize activities that could initiate an accident involving significant quantities of plutonium holdup or TRU waste containers, and therefore were not authorized.
2. The DBIO Chapter 6 Accident Analysis and TSR AC 5.2.1.2 Exception (b) state that outside LLW storage of metal containers will be addressed by the Site SAR, which currently does not authorize that activity. The PHA Section 5.1.3 (Screening of Hazards) concluded that outside LLW storage at the time was less than Hazard Category 3 thresholds, however, this could easily be exceeded in the future depending

- on the number of containers stored. This should be confirmed during the Implementation Validation Review (see Appendix B technical direction).
3. 707 PHA Scenarios 707-D&D-15, -16, and -17 evaluated fires in a "parking lot" to authorize outdoor storage of TRU waste containers. Per agreement at the Building 771/774 DBIO cross-table, the 707 DBIO was revised to evaluate only one lofted fire scenario involving 30 TRU drums staged outdoors for loading onto a truck. Normally, drums will be on the dock and loaded directly into the truck, but SWBs usually need to be staged outdoors to load onto a flatbed truck (however, the 30 drum scenario is more bounding).
  4. 707 PHA Scenarios 707-USQD-1, -2, -3, and -4, and TSR AC 5.2.1.2 Exception (a), would allow contaminated items with up to 1200 g Pu to be stored in Building 778. The TSR AC was revised to only permit pass-thru to Building 776/777 for size reduction.

The hazards associated with the activities are briefly discussed in Chapter 4 and summarized in the 707 PHA, but the level of specificity has the same shortcomings as other ABs recently developed at the Site. For example, the activity description may indicate hazardous chemicals, compressed gases, flammable liquids, etc., are used without a detailed discussion of the hazards, their characteristics, respective quantities, and what standard controls are being implemented. Comparing these hazard identifications with the hazard sources discussed in the DBIO Chapters 4 or 5 or in the 707 PHA, one can not readily determine the link between the activity and the specific hazards listed (such as what chemicals are used in various activities). A linkage is provided of activities to general hazard types and to potential accident scenarios (spill, fire, etc.). Although a more comprehensive characterization/linkage of the activity hazards would provide for added assurance, types and quantities of radioactive materials assumed in the accident scenarios are bounding and are adequate to identify preventive/mitigative features for the spectrum of postulated accidents. The Integrated Work Control Program is being relied upon for activity-specific hazards evaluation and specifications of controls for activity-specific jobs.

From the hazard identification and analysis, a spectrum of events was identified for further evaluation. The methodology for performing the hazard analysis is illustrated in Figure 5.1 of the DBIO. Seven categories of accidents were selected for evaluation: fires, explosions, criticalities, loss of confinement (spills), natural phenomena, external events, and direct radiation exposures.

A detailed hazards evaluation was developed in the Building 707 PHA to relate activities with corresponding hazard types in order to derive 46 potential accident scenarios<sup>3</sup>. A preliminary hazards analysis was conducted using a team of individuals with expertise in varying disciplines. The team reviewed existing AB documentation as well as other pertinent information related to operational histories, facility design documents, procedures, etc., augmented by facility walk-downs with the results summarized in the PHA Appendix B hazard identification tables. Given the nature of these hazards as well as standard accident

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<sup>3</sup> The original 170 PHA scenarios that included 707's previous Pu residue stabilization missions were revised to eliminate those no longer applicable, and to address deactivation and decommissioning hazards.

scenario considerations, the selected postulated accidents cover a spectrum of radiological releases from small consequence events, to reasonable worst case conditions.

The hazards evaluation is a conservative analysis that generally only credited inherent (primarily passive) preventive or mitigative controls that reduce risk to the Collocated Worker or MOI, rather than crediting required controls.<sup>4</sup> The hazards analysis approach is consistent with established industrial methodologies, i.e., applies the Preliminary Hazards Analysis (PHA) technique as discussed in DOE Standard 3011. The hazard evaluation methodology is presented in the PHA Section 3.2 (Hazard Evaluation) and Appendix A (Methodology Tables).

The hazards analyses (and accident analyses discussed in Section 5.2 Criterion 5) used in the BIO applied a four level risk classification approach (Risk Class I through IV) found in DOE-STD-3011 (Reference 2) for both radiological and chemical releases. The general hazards analysis (and accident analysis) method used is consistent with that used in other new ABs being developed at RFETS and for those BIOs being developed at other DOE sites using the DOE-STD-3011 PHA approach. The major elements of each scenario analyzed in the hazards analysis (PHA Appendix C) are as follows:

- Hazard/MAR:** The specific hazard type (such as drum of residues) and MAR quantity was listed.
- Accident No./Accident Category:** A numerical and descriptive scenario identifier. The specific accident category was listed (such as small fire involving waste drums).
- Accident Description:** The specific hazard sources were listed (such as drum of TRU waste or glovebox with holdup), location, quantity involved in the accident, and summary of the accident category (such as small fire).
- Initiator or Energy Source:** The specific initiator (cause) is described (such as electrical short, pyrophoric materials, earthquake).
- Vulnerable Activities:** Identifies the decommissioning activities or General Facilities Operations affected.
- Receptor:** The two receptors analyzed for each scenario was the MOI and the Collocated Worker.
- Potential Prevention and Mitigation:** Each with their own columns that identify all controls considered available or feasible for either lowering the scenario frequency or scenario consequences. These considerations could either be design features (such as installed hardware) or administrative controls (such as a program or specific program attribute).
- Scenario Frequency:** The frequency of the accident was qualitatively judged (given operational history and industrial data) without crediting preventive features.
- Consequences:** The consequences were qualitatively or quantitatively evaluated without crediting mitigative features. Consequences were assigned for two receptors: MOI and Collocated Worker.
- Risk Class:** The risk class was qualitatively judged for each receptor without crediting preventive or mitigative controls.

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<sup>4</sup> Further discussions on inherently crediting controls are presented later in response to Section 5.2 Criterion 5 related to the accident analysis.

The Section 2 Summary/Conclusions in this Review Report presents the methodology for accident frequency, consequences, and risk assignments.<sup>5</sup>

DOE Standard 3011 was used to rank risks from unprevented/unmitigated scenarios and are evaluated in the PHA Appendix C. The Building 707 PHA results from the unmitigated hazards analysis concluded that 14 of the 46 accidents are potential risk dominant events (i.e., Risk Class I or II) for the MOI or Collocated Worker. Four of these scenarios were determined to be bounded by other similar scenarios, and 11 additional Risk Class III scenarios with higher frequencies or other considerations were included to identify 21 “bounding accidents” as presented in the PHA Table 7.0.1. These 21 accidents were further binned into 8 “representative or unique” bounding accident scenarios<sup>6</sup> in the PHA Table 7.0-2 and DBIO Table 6.1.5-1 for further evaluation in the DBIO accident analysis. The DBIO includes a summary of the unmitigated scenarios that are bounded by one of the 8 bounding accidents in the Chapter 6 “Table 6.x.x-B” tables. These tables also show which preventive and mitigative controls need to be credited to reduce the unmitigated Risk Class I and II scenarios that are being bounded by one of the 8 bounding accidents.

The approach that the contractor used to bin accidents and their presentations in the Chapter 6 accident summary tables did not fully support the Unreviewed Safety Question (USQ) Determination process. For example, USQ issues could result from not considering the criterion of greatest consequences within the same frequency bin for an accident category (fires, explosions, etc.), or attempting to bound a similar accident category within the same Risk Class but a higher frequency even though a lower frequency event has greater consequences. Some of the concerns were resolved in the final DBIO by moving several scenarios to different Table 6.x.x-B tables in order to facilitate future USQDs. What is not addressed is how similar control sets should be considered for future USQDs per the new 10 CFR 830 Implementation Guide G 424.1-1 – this concern is being addressed sitewide as it impacts all ABs/USQDs.

The binning approach also did not address that all controls as identified on the 46 PHA scenario tables were carried forward to the 8 bounding accidents in the DBIO. Those not carried forward were reviewed during the cross-table and determined to fall under TSR AC 5.4 requiring Safety Management Programs, and specific attributes were determined to not warrant a separate TSR AC.

The hazards analysis identifies preventive and mitigative features for the spectrum of events examined. Those features that could reduce risks are identified on the PHA hazard evaluation tables if the unmitigated Risk Class is I or II<sup>7</sup>. The accident analysis further considers these controls in the BIO Chapter 6 (Accident Analysis). Those specifically credited in the accident analysis to reduce risk are identified as “Specific Credited Controls.”

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<sup>5</sup> Further discussions on these topics are presented later in response to Section 5.2 Criterion 4 related to the Immediate Worker safety and defense-in-depth controls, and in Section 5.2 Criterion 5 related to the accident analysis.

<sup>6</sup> Discussed further in Section 5.2 Criterion 5.

<sup>7</sup> See Section 5.2 Criterion 4 for a further discussion on identifying defense-in-depth controls.

discussed in the scenario description, and have a basis for TSR development presented in the DBIO Chapter 7. Other controls that were identified in the accident analysis but not specifically credited to reduce frequency or consequences provide defense in depth and are identified as such in the Chapter 6 accident analysis and in the DBIO Chapter 7 TSR development.<sup>8</sup>

A number of review comments on the hazards analysis were provided during the cross-table review and satisfactorily resolved, and are reflected in a revision of the Building 707 Complex PHA (Reference 11). These included “inherently crediting controls” or “assumed initial conditions” that allowed a lower frequency estimate, not evaluating unmitigated consequences because of the assumed control, or unmitigated consequence estimates not consistent with the 771 DBIO or previously approved ABs. As discussed later in Section 5.2 Criterion 5, the effect of these assumptions was an unmitigated/unprevented Risk Class III or IV that did not warrant further consideration, instead of higher frequency, consequence, and risk estimates that would warrant consideration of additional controls. Affected scenarios were revised for the final DBIO to resolve the concerns.

Conclusion: With respect to the Collocated Worker and MOI, the hazard analysis adequately evaluated the hazards associated with the activities supporting the decommissioning of Building 707, and identified preventive and mitigative features for the full spectrum of events. A spectrum of accident scenarios was identified for further accident analysis. This criterion is adequately met for the Collocated Worker and MOI, but not for the Immediate Worker and identification of all defense-in-depth controls which is addressed in the Section 5.2 Criterion 4.

- 3) The analysis identifies assumptions made in characterizing the response of controls for the set of dominant accident scenarios, and justifies the adequacy of existing controls or identifies specific commitments directed at further reducing facility risk, i.e., describes the administrative controls, compensatory measures, or restrictions on interim operations implemented as a result of identified vulnerabilities.

This criterion deals primarily with DBIO Chapter 6 Accident Analysis.

Assessment: The accident analysis adequately identifies and characterizes the safety functions of the credited safety features. The accident analysis evaluates the effectiveness of credited controls by evaluating the mitigative and preventative impacts the controls have on the risk of each of the accident scenarios. Historically, a Vulnerability Assessment (VA) of the specific credited control set was performed to further validate the adequacy of the control set and determine if additional controls or risk scenarios needed to be considered. This evaluation postulated the failure of each credited control (unless its failure was previously included as a preventive control to reduce frequency estimates) and qualitatively/quantitatively assessed the results to the MOI, Collocated Worker, or Immediate Worker. Due to the decommissioning mission and short lifecycle of the facility, the KH Nuclear Safety Review Board recommended that a VA not be performed for the DBIO. The RFFO

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<sup>8</sup> These controls are further discussed in response to Section 5.2 Criterion 4.

agreed with this recommendation since little or no value would be added by performing a VA on Safety SSCs whose configuration would change throughout decommissioning.

Conclusion: The analysis adequately addressed the assumed response characteristics of credited controls. It evaluates the effectiveness of credited controls for reducing the frequency and consequences of the analyzed scenarios. This criterion is adequately met.

- 4) The hazard analysis results are clearly characterized in terms of defense in depth, worker safety, and environmental protection and the logic behind assessing the results in terms of Safety Significant SSCs and designation of TSRs is understandable and internally consistent.

This criterion addresses the content found in DBIO Chapter 5 (Hazard Identification and Analysis), Chapter 6 (Accident Analysis), and Chapter 7 (Derivation of TSRs), and the TSR Bases. It is also supported by the Building 707 PHA and the Site PHA.

Assessment: For the MOI and Collocated Worker, the results of the accident analysis are summarized on PHA-type tables in the 707 PHA Appendix C, and are also summarized in the DBIO Accident Analysis Chapter 6 for the unmitigated/unprevented evaluations. Each table also summarizes the engineered features and the administrative controls that prevent or mitigate the consequences of postulated accidents for unmitigated Risk Class I or II events only. In the DBIO Chapter 6 Accident Analysis, the tables then define which controls are specifically credited to lower the frequency of the accident (preventive) or to lower the consequences of the accident (mitigative), thus attempting to lower the Risk Class to III or IV, to meet the Nuclear Licensing Streamline Initiative commitments #4 and #5 (Reference 9). The controls listed in the tables but not specifically credited to reduce frequency or consequences are identified as defense-in-depth controls for that accident scenario, based on the goal of requiring a minimum of two defense-in-depth controls in addition to credited controls.

Immediate worker safety is addressed to some extent but not to the rigor of identifying those accidents or hazards that have little impact to the Collocated Worker or MOI but have significant impact to the Immediate Worker. Exceptions to this are the accident scenarios like inadvertent criticality where significant consequences to the Immediate Worker cannot be precluded. Chapter 3 of the DBIO covers the safety management programs whose construct is to establish disciplined methods of conducting business and operations. Implementation of these programs result in an infrastructure to ensure that work is performed safely. Therefore, worker safety is an integral part of these institutional processes.

When the Building 707 PHA was revised to address decommissioning, the contractor decided to delete the Immediate Worker as a receptor. Previously, the 707 PHA included an unmitigated hazards evaluation for the Immediate Worker by identifying accident scenarios, frequencies, consequences, risks, and available controls – as required by DOE-STD-3011 (and DOE-STD-3009) so that a Safety Significant SSC determination can be made, and the remaining controls constitute defense-in-depth for all receptors. Since the Building 707 PHA does not provide the required information, the Site PHA is being relied upon to provide the unmitigated hazards analysis for the Immediate Worker and identification of available

controls to protect them. Section 5.2 (PHA Summary of Hazards Analysis) of the DBIO addressed this reliance on the Site PHA to complete the unmitigated hazards analysis for the Immediate Worker.<sup>2</sup>

Another deficiency with the Building 707 PHA is that when the Building 707 PHA was revised to address decommissioning, the contractor decided to not address the identification of all feasible preventive and mitigative controls to protect all receptors. The 707 PHA inappropriately applies the 6/12/00 Nuclear Licensing Streamline Initiative commitments 4 and 5 to conclude that preventive and mitigative controls are "NOT REQUIRED" (as listed on the PHA tables) for unmitigated/unprevented Risk Class III and IV scenarios. This is noncompliance to commitments 6 and 7 that the unmitigated analysis needs to meet DOE Standards 3011 and 3009 methodologies which require that the unmitigated analysis identify all available controls so that a Safety Significant SSC, defense in depth, and TSR determination can be made. Commitments 4 and 5 are to be applied in the Accident Analysis for selection of controls to reduce risks. All PHA tables should be revised to identify all available controls that prevent or mitigate accidents, similar to the previous versions of the PHA and the 771 DBIO unmitigated/unprevented hazard evaluations. Instead, rather than revising the 707 PHA to provide the required information, RFFO accepted a DBIO revision that states that the Site PHA is being relied upon for the identification of defense-in-depth controls to protect all receptors. Section 5.2 of the DBIO also addressed this reliance on the Site PHA to comprehensively identify all feasible and available controls to prevent and mitigate accidents.<sup>2</sup>

Chapter 7 of the DBIO presents the approach for derivation of TSRs for engineered safety features identified in the accident analysis to Safety SSCs in the facility that are capable of providing the safety functions credited in the analysis, and for Administrative Controls. Limiting Conditions for Operation (LCO) were only developed for active engineered safety features that were credited or identified as defense-in-depth to protect the public or the Collocated Worker (e.g., HEPA filtration), or to protect the Immediate Worker from prompt death (e.g., from a criticality), serious injuries (from a radiological hazard), or as required by RFFO during resolution of review comments.

Safety classification of engineered safety features as Safety Significant SSCs per the Nuclear Licensing Streamline Initiative commitments #4 and #5 are documented in the Chapter 7 (Derivation of TSRs) and the Bases for the TSRs. These safety classifications were consistently and logically applied to define and categorize the Safety Significant SSCs required by the accident analysis. Only one safety system, the Criticality Accident Alarm System (CAAS), was identified from the 707 PHA in the DBIO Section 5.2 as necessary to protect the Immediate Worker and designated as a Safety Significant SSC with appropriate TSRs.<sup>2</sup>

DBIO Section 5.2 also documents the conclusion that there are no administrative controls identified in the 707 PHA that warrant TSR coverage.<sup>2</sup> Although there are no TSR ACs and only one engineered safety feature specifically credited to protect the Immediate Worker, other preventive and mitigative administrative and engineered controls that were credited or identified as defense in depth to protect the MOI and Collocated Worker will also be

available to protect the Immediate Worker for as long as the TSRs on them are applicable. It should also be noted that there are other controls required by safety management programs available to protect the Immediate Worker, as stated earlier.

The Site PHA supports the development of AB/safety basis documents for Hazard Category 2 and 3 nuclear facilities at the Site. The PHA documents the unmitigated hazards analysis and identifies a suite of engineered and administrative controls available to prevent accident scenarios and/or mitigate accident consequences for the evaluated receptor. The PHA focused on the identification of controls to protect the Immediate Worker, based on a qualitative assessment of frequencies, consequences, and risks to the Immediate Worker. From this list of available controls, an evaluation can be made to select the most appropriate set of TSR controls for facility AB documents to protect the Immediate Worker and to provide defense-in-depth for the MOI and Collocated Workers. The contractor compared the controls listed in the Site PHA against the controls identified in the 707 PHA and DBIO, and determined that an adequate hazard evaluation was performed; RFFO concurred. Except for the CAAS, no other engineered safety features or administrative controls identified in the Site PHA warranted Safety Significant SSC designation or TSR ACs.<sup>2</sup>

A purpose of the DBIO is to demonstrate that the health and safety of the public is not adversely impacted from operations involving radioactive materials in the building. Thus, the DBIO does analyze the environmental impact from accidental releases of radioactivity as far as the health and safety of the public is concerned. For plutonium releases, the dose consequence from the direct inhalation pathway dominates dose contributions from all other pathways. For conservatism in the consequence analysis, plume depletion mechanisms such as dry and wet deposition have not been included in the atmospheric dispersion model, which lead to increased airborne radioactive concentrations and no settling of radioactivity. However, the credited controls that prevent or mitigate the consequences of postulated accidents for the Collocated Worker and the MOI will significantly reduce the potential for an uncontrolled release that could impact the environment. Although the environmental protection is not explicitly evaluated in the DBIO, DOE views those features that protect the health and safety of the MOI and the Collocated Workers are adequate to protect the environment.

**Conclusion:** This criterion on defense in depth, worker safety, environmental protection, and safety significant SSCs is adequately met.

- 5) Subsequent accident analysis clearly substantiates the findings and delineations of hazard analysis for the subset of events examined, confirms their potential consequences, and for events potentially exceeding Evaluation Guidelines there is a clear identification of associated Safety Class SSCs and basis of TSR derivations.

Chapter 6 (Accident Analyses) and Chapter 7 (Derivation of TSRs) and the Bases of the TSRs primarily address this criterion.

**Assessment:** The methodology for performing accident analysis is illustrated in Figure 6.1 of the DBIO. The Chapter 6 Accident Analysis evaluated potential scenarios based on the

deactivation and decommissioning activities, identified hazards, and preventive and mitigative controls, to assess risk to the MOI and Collocated Workers and to derive TSR controls. From the 46 accident scenarios evaluated for the hazards evaluation, eight “representative or unique” bounding accident scenarios were selected for subsequent accident analysis. A comparison was made to the Evaluation Guidelines (Reference 9) to identify Safety Class and Safety Significant SSCs and to establish TSR Limiting Conditions for Operation, Administrative Controls, or Design Features that would reduce risks to Risk Class III or IV. Each scenario identifies the activities that are linked with the scenario, details the accident scenario, establishes the accident frequency, defines the MAR, performs a consequence and risk evaluation, establishes the credited control set, and identifies defense-in-depth controls.

Section 6.1 of the DBIO describes the accident analysis methodology. The accident analysis results are documented on PHA-like tables. The major elements of each scenario analyzed in the accident analysis are as follows:

- Hazard/MAR:** The specific hazard type (such as drum of TRU waste or contaminated glovebox) and MAR quantity was listed, along with any adjustments due to a Damage Ratio.
- Accident Type:** The specific accident category was listed (such as small fire involving gloveboxes or waste drums). Accident categories included fires, explosions, spills or loss of confinement, criticalities, natural phenomena events, and other external events (e.g., vehicle crash into facility, aircraft crash, etc.).
- Dominant Initiator:** The specific initiator most likely to cause the accident is described (such as electrical short).
- BIO Activities:** Identified applicable Chapter 4 activities that would contribute to or potentially be impacted by the scenario of concern.
- Receptor:** The two receptors analyzed for each scenario are the MOI and the Collocated Worker. In general the DBIO uses the term “Worker” throughout the Chapter 6 Accident Analysis to refer to the Collocated Worker outside the facility at 100 m. Chapter 6 evaluates Immediate Workers that could be involved in the accident or would be elsewhere within the facility for nuclear criticalities only.
- Scenario Frequency:** The frequency of the accident was qualitatively judged (given operational history and industrial data) for the scenario both without crediting prevention (i.e., from the unmitigated hazards analysis) and with crediting prevention.
- Consequences:** The consequences were quantitatively estimated for each receptor both without crediting mitigation (i.e., from the unmitigated hazards analysis) and with crediting mitigation.
- Risk Class:** The risk class was qualitatively judged for each receptor both without crediting prevention or mitigation (i.e., from the unmitigated hazards analysis) and with crediting prevention and mitigation.
- Credited Controls:** This column listed those features that were formally credited for lowering the risk class (e.g., to a Category III or IV risk level). These controls could either be engineered features (such as installed hardware and Design Features) or administrative controls (such as a program or specific program attribute).

**Defense-in-Depth Controls:** Those features that are not credited as specific controls are considered features that provide defense-in-depth. These controls could either be engineered features or administrative controls. Those features that were considered available or feasible for either lowering the scenario frequency or scenario consequences were listed as necessary to meet the Nuclear Licensing Streamline Initiative commitments #4 and #5 (Reference 9) with the goal of identifying a minimum of two defense-in-depth controls in addition to credited controls to reduce the unmitigated Risk Class I or II events. For those scenarios that do not identify a minimum of two defense-in-depth controls, they were reviewed during the cross-table and agreements reached that the credited controls along with the one (or no) defense-in-depth control(s) were adequate.

The following discussion summarizes the methodology, assumptions, and significant issues identified during review of the first two draft DBIO submittals, which have been resolved in the final DBIO submittal. Major issues already summarized in Section 2.0 are not repeated in this section unless further clarification is provided.

There were numerous review comments on the draft and final versions of the DBIO. In general, review criteria related to the accident analysis were adopted such that resolution of the comment could be expected to warrant additional control set considerations for the scenario (e.g., need to credit a LPF), justifications for risk acceptance (e.g., unfiltered accidents on the dock or outside), or would eliminate a potential Discovery USQ if it were not evaluated. Other consistency issues related to accident analysis assumptions or methods that did not meet this criteria were discussed at the cross-table but are not addressed in this Review Report – these comments and their dispositions are informally documented in backup files.

The DBIO Chapter 6 Accident Analysis, and its supporting documentation (e.g., CALC-707-00-1710-SWF, CALC-707-01.1801-SWF, and Fire Hazards Analysis), were reviewed based on its application of accident scenarios from recently-approved AB documents, as modified by the new methodologies established by the 6/12/00 Nuclear Licensing Streamline Initiative. See the Building 771/774 DBIO Safety Evaluation Report (Reference 13) for a discussion on the change in accident analysis methodology and resolution of review comments applicable to all new ABs applying the Nuclear Licensing Streamline Initiative, and not repeated in this SER.

Assumptions are embedded throughout the analyses and calculations. Major assumptions relative to the accident categories are detailed in each scenario description in the DBIO. The supporting calculations for the various accident scenarios also contain assumptions by the analyst, or additional discussions on the phenomenology (e.g., unconfined gas explosions). Any key assumptions made that were questioned during the review were resolved during the cross-table comment resolution phase and incorporated into the final DBIO. There were two separate Nuclear Safety calculation documents, CALC-707-00.1710-SWF (November 2000) and CALC-707-01.1801-SWF (June 2001), that duplicate some scenarios with identical or revised results. This causes confusion and could make future USQDs more prone to errors. The DBIO did not reference the specific calculation that was being relied upon, but instead

they were identified as footnotes to the 707 PHA Table 6.0-1. For the final DBIO Rev. 4 submittal, all applicable scenarios were incorporated into a revision of CALC-707-01.1801-SWF (October 2001).

*Frequency Assumptions:* The DBIO Section 6.1.2 (Frequency Evaluation) and Section 6.1.5 (Selection of Controls) identify those assumptions made relative to reducing scenario frequencies. They are as follows:

- Administrative controls are typically credited with a 10% probability of failure due to human error.
- An engineered feature that is covered by a surveillance to ensure operability / functionality will reduce the frequency by 1% (i.e.,  $1E-2$  or a full frequency bin).

These assumptions are consistent with other AB documents developed at RFETS and with the DOE Standard 3011 general guidance. A new change in methodology is that previous ABs would credit a preventive control to reduce frequency for all receptors if required for any one receptor. This approach is not applied for the 707 DBIO where the controls are required for the Collocated Worker to reduce risks but are not required for the MOI because the unmitigated/unprevented case is Risk Class III or IV.

The current 707 decommissioning plans are based on the assumption that very little dispersible powders in quantities exceeding WIPP TRU waste container limits will be recovered. Therefore, all accident scenarios involving recovered holdup that are dispersible and stored in an 8801 can inside a glovebox or in 10-gallon drums while waiting transfer to Building 371 are based on an assumption that the frequency without preventive controls is *Unlikely*. This assumption on "limited window of vulnerability" is expected to be properly controlled via the Unreviewed Safety Question process to evaluate proposed changes.

*Dose Assessment:* Quantitative dose consequences (radiological) were calculated using the Radiological Dose Template (RADIDOSE version 1.4 spreadsheet) that has been previously reviewed and agreed to by the RFFO (Reference 22). The RADIDOSE default airborne release fractions (ARFs) and respirable fractions (RFs) are based on DOE Standard 3010 (Reference 23) with some modifications agreed upon for RFETS new ABs. The 50-year Committed Effective Dose Equivalent (rem CEDE), or Total Effective Dose Equivalent (rem TEDE) for nuclear criticalities, is calculated using conservative assumptions for material-at-risk (MAR), damage ratio (DR), release fractions, leak path, 95 percentile-equivalent weather condition, dose conversions for material types, and breathing rates. ICRP 68 dose conversion factors were used consistent with the Nuclear Licensing Streamline Initiative commitment #8. A heavy activity breathing rate is assumed for the MOI and Collocated Worker dose estimate.

*MAR Estimates:* MAR estimates assumed for the DBIO are conservative. These estimates are based on equivalent WG Pu which include contributions from americium (or the americium contribution to dose is calculated separately and added to the plutonium dose) that are more significant than the WG Pu contribution. These MAR estimates are expected to allow for operational flexibility and prevent unnecessary Discovery Unreviewed Safety Questions. MAR uncertainties due to field assays were assumed such that one TRU

container could be overloaded by 25%. Holdup estimates were based on a 95<sup>th</sup> percentile or 2 sigma uncertainty. Although the criticality safety limit for dry unmoderated powders is 3 kg Pu for oxide stored in a 8801 can in a glovebox, the MAR was revised to assume 1 kg Pu for fires, explosions, spills, and natural phenomena events, based on the 1 kg moderated criticality safety limit and maximum expected recovery from a single glovebox. A similar approach was assumed for 10-gallon drums where the criticality safety limits permit up to 5 kg based on 2 cans @ 2.5 kg, but were evaluated as 2 kg if only involving one drum, or 6 kg/multiple drums due to the Safeguards material control limit.

*Control Selection:* The Nuclear Licensing Streamline Initiative commitment #9 established preferences for selection of TSR controls, based on the following criteria:

1. Preventive controls over mitigative
2. Passive controls over active controls
3. Engineered controls over administrative controls
4. Controls with the highest reliability
5. Controls closest to the hazard
6. Controls with the lowest implementation and maintenance cost.

The set of defense-in-depth controls will be selected based on effectiveness at preventing (preferred) or mitigating the accident. The controls closest to the hazard are preferred. The set will then be evaluated for opportunities to minimize the number of controls without reducing overall safety. Through the cross-table review process, the DBIO Rev. 4 reflects the RFFO/Kaiser-Hill agreements on the control set to prevent or mitigate accidents.

*Inherently Credited Controls:* The detailed analyses also include some “assumed initial conditions” which were inherently credited controls. These controls or assumptions were made to define the boundary conditions for the postulated scenario and generally affected the damage assessment (e.g., number of waste containers or gloveboxes involved) or ARFs/RFs (e.g., confined vs. unconfined materials). Generally, these are related to certain generic design features (passive features) such as the presence of drums, containers, walls, floors, etc., for containment and generic administrative controls (programs and attributes) such as organization and management, training, work control, radiation protection, configuration management, etc., for an in place program infrastructure. For those assumed initial conditions not directly attributed to an inherently credited control and not included in the TSRs (e.g., not stacking TRU drums, no specific TSR inventory ACs, oil storage with secondary containment, etc.), they were determined to be addressed by the Chapter 3, Safety Management Programs (SMPs) and not elevated to TSR controls. These assumptions are stated in the scenario description and are expected to be properly controlled via the Unreviewed Safety Question process to evaluate proposed changes.

*Dispersibility of Holdup:* The DBIO assumes that holdup in the ductwork and in the gloveboxes, drained tanks, piping, etc. is 30% loose contamination and 70% is relatively fixed contamination on metal. Building 707 remediated hold-up in the ductwork for resumption of plutonium operations in the early 1990s. Since that time only limited plutonium operations were performed in the facility, such as thermal stabilization of pyrophoric Pu forms and size reduction of Pu metal for transfer to Building 371, and residue

processing (Pu salt thermal stabilization) and repacking (ash and dry residues) for offsite shipment as TRU wastes. In addition, the facility recently completed a deactivation cycle that recovered a significant amount of glovebox hold-up. Therefore, it is expected that readily accessible surfaces should be primarily fixed contamination. Some scenarios were revised to address the different DRs as assumed for the 771 DBIO for room explosions and earthquakes.

*Fire Scenarios:* Of all the accident categories evaluated, the most significant change in accident analysis methods and assumptions for the DBIO were for evaluation of potential fires. The new methodology that was accepted for the 771 DBIO is based on the SARAH Task T19 (Reference 24), as well as other changes affecting frequencies and control selection strategy. These are discussed in the SER for the 771 DBIO and will not be discussed here, except for differences with the 707 DBIO.

*Waste Container Fire Modeling:* The 707 DBIO Rev. 3 method in general applied the 771 DBIO / SARAH Task T19 methodology, with the following exceptions:

- (a) Did not consistently apply the 0.2 DR for drum seal failures.
- (b) Did not consistently apply the overloaded MAR assumption for one waste container, but instead generally applied one wood-crated legacy glovebox with 500 g holdup that more than offset the overloaded waste container MAR.
- (c) Evaluated 12 SWBs (i.e., maximum for the airlock/dock) for the 5 MW Medium Fire instead of 5 as recommended by SARAH Task T19 and evaluated for the 771 DBIO.
- (d) The DBIO Rev. 3 underestimated consequences of dock fires by evaluating them as lofted assuming that there is no heat loss to any surrounding enclosure. The DBIO included the dock with the evaluation of drums being stored or staged outdoors. Generally, fires on the dock that has an enclosure should not be lofted per the cross-table comment resolution during 707 BIO Rev. 1 and SER. At the cross-table, the Contractor stated that SWBs are staged outdoors only during the shift for loading onto a truck, but evaluated a truckload of 30 TRU drums that would have greater consequences.
- (e) Not evaluating the 10-gallon drum fires, both inside the facility and on the dock, similar to how the 771 DBIO did for the unmitigated analysis that includes TRU wastes, then credit the TSR AC so that the basis is clearly established?

All of these review comments were resolved in the DBIO Rev. 4.

*Pool Fires:* There were significant disagreements on the possibility of pool fires impacting drums or contaminated gloveboxes. For controlled drum storage areas, RFFO agreed during the 771 DBIO cross-table that the unmitigated analysis need not address a flammable liquid pool fire engulfing drums because there is no operational or maintenance need for such materials, and the facility combustible control program will strictly limit quantities outside of flammable liquid storage cabinets. An exception to not evaluating engulfing pool fires is for the oils recovered from equipment (e.g., lathes, Mod B presses, Mod H, etc.). A scenario was added such that the unmitigated analysis assumed that oils have been recovered, are stored in drums that could be involved in a fire and cause ejection of contents (like the 771 DBIO does), then credits a TSR control to eliminate the potential ejection of contents (e.g.,

segregation of oil drums from other waste containers). The 707-D&D-7A major pool fire scenario that does not engulf drums was revised to apply the NSTR-008-01 (Reference 25) methodology to determine the consequences associated with potential ejection of contents (e.g., number of drums, DRs, ARFs) and releases from drums inside the pool that do not eject contents, or are exposed by the edge of the pool fire.

*Automatic Sprinklers:* See the Building 771 DBIO SER related to crediting automatic sprinklers and reduction in frequencies of large and major fires. Room automatic sprinklers, however, are considered as defense in depth for the 5 MW Medium Fire, but this was not reflected in the DBIO discussion.<sup>2</sup>

*DBIO/FHA Conflict:* Per DOE Order O 420.1, the 707 draft DBIO considered the conclusions of the 707 FHA. However, the FHA evaluated a Maximum Possible Fire Loss (MPFL) which postulates that the worst fire would propagate to all holdup throughout the facility, which is more than the two Module Major Fire evaluated in the DBIO. This is contrary to the FHA discussions that concluded that a fire should not propagate Module-to-Module due to the corridors and interior fire barriers. The DBIO did consider the FHA assessment of significant amount of oils, Benelex shielding, and sprinkler deficiencies. The FHA Appendix C evaluation of separation distances is based on a less conservative criterion than the DBIO assumes for seal failures that could cause a radiological release. The contractor should disposition these discrepancies related to the MPFL/DBIO scenarios and separation distance recommendations, and this should be verified during the DBIO Implementation Validation Review (see Appendix B Technical Direction).

*Inner Tent Chamber FHA:* In September 2000, Kaiser-Hill performed a Readiness Assessment of the Inner Tent Chamber operation, with an activity oversight by RFFO. The Contractor prepared a project-specific FHA (Reference 17) to support the design and adequacy of fire protection features. This also included subcontracting a fire test of the flame retardant plastic construction materials (Reference 26). RFFO brought in a Fire Protection Engineer consultant to review the ITC design and tent fire test results – his recommendations from surveying the Building 771 systems and review were provided to the Contractor and adequately resolved prior to startup. One new concern was included in the consultant's final review report (Reference 27) regarding smoke plugging impacts on the nuclear ventilation system. The 707 FHA concluded that no Module exhaust HEPAs would be plugged by existing combustible loading at the time (including a large plastic tent in Module B) which should also bound other Inner Tent Chambers that may be created for dismantlement of gloveboxes or size reduction of equipment; however, most size reduction is anticipated to be performed in Building 776/777. The 707 BIO also concluded that if one Module were to plug the exhaust HEPAs, the modular design of Building 707 is such that adjacent Modules should compensate and result in a filtered release pathway through their exhaust plenums. Also, the fire test results showed that the plastic tents were slow burning and did not propagate a fire, and that the amount of smoke generated was fairly light according to the videotaped test results.

*Hydrogen Gas Explosions in Drums:* RFFO did not concur with the SARAH Task T24 recommendation that a hydrogen deflagration in a TRU waste drum is *Extremely Unlikely*

when preventive controls such as vents are not credited. The frequency should be *Unlikely* as accepted for all previous ABs. However, for decommissioning facilities, RFFO did accept that the frequency when preventive controls are not credited can be *Extremely Unlikely* due to waste drums being newly generated and no long term storage mission. Also, the drum explosion was modeled with a 0.01 DR instead of the 0.1 DR assumed for previously approved ABs, which was revised. Standard waste boxes are not evaluated for hydrogen gas buildup due to their more robust construction.

*Flammable Gas Explosions:* The flammable gas explosion scenario was revised to address the accident frequency and potential consequences. RFFO did not concur with the *Extremely Unlikely* assignment for an unconfined vapor cloud explosion (deflagration) or turbulent jet detonation when preventive controls are not credited – should be *Unlikely* due to the DOT cylinder design features as approved for all previous ABs. Also, the scenario did not address the potential to store a can of recovered oxides in a glovebox.<sup>2</sup>

*Criticality, Solution versus Oil-Moderated Metal:* The draft DBIO presented a solution criticality with  $2E+18$  fissions and 2 kg Pu, which was greater than that evaluated for the 771 DBIO (i.e., 1 kg Pu collected in a drum resulting in  $1.3E+18$  total fissions). This scenario is not feasible for Building 707. Therefore, the final 707 DBIO scenario is an oil-moderated metal criticality with  $3E+17$  fissions, modeled similar to how the Building 776 draft DBIO evaluates a single-spike oxide-coated metal criticality from lathe holdup. For this revised scenario, the unmitigated/unprevented Risk Class to the Collocated Worker and MOI is Risk Class III therefore, no preventive or mitigative controls were identified. However, it is recognized that the Criticality Safety Program is being relied upon to prevent criticalities.

The draft 707 DBIO proposed to credit relocation after a 1 hour exposure, but this methodology is different than the methodology previously used for another AB, and not consistent with the RADIDOSE guidance in CALC-RFP-00.0958-VLP. RFFO did not concur with the SARAH Upgrade Task T 30. The final DBIO does not credit relocation of the Collocated Worker due to the revised scenario.

The DBIO was also revised to address frequency, consequences, and risks to the Immediate Worker, and to include the criticality scenario as a risk dominant event in Section 6.3 and the Executive Summary, as well as in the Chapter 7 and TSR Bases discussions.<sup>2</sup>

*Crane Load Drop Outside, DR and DCF:* The draft DBIO assumed that a cargo container drop would impact 40 drums stored outside. The final DBIO revised the analysis to address staging one shipment of TRU drums (30).

*Station Blackout:* MAR was revised to 1 kg oxide, and if assumed to be in an open 8801 can (not a flat tray like used for thermal stabilization), a 0.1 DR was applied for the amount in the can affected by the airflow. Also, per the 771 DBIO new method, loose contamination DR was revised to 0.1 and fixed contamination was revised to 0.01.

*Seismic:* The seismic collapse scenario was revised as follows:

- Evaluated 1 kg oxide in a glovebox (consistent with fire, spill, explosion, windborne missile, and station blackout scenarios)
- ARFxRF for oxide in a glovebox changed to 2.7E-3 (a weighted calculation from 3 source terms, as used in the current 707 BIO).
- Per the 771 DBIO new method, the 30% loose contamination DR was assumed to be 0.1 and the remaining 70% fixed contamination DR is 0.01.
- Earthquake plus Fire: Revised the discussion to replace the TRU waste fire with a lathe fire as bounded by the 707-D&D-4 scenario, but retained the *Unlikely* estimate due to potential electrical ignition sources near lathes.
- Earthquake plus Criticality: Revised the frequency assignment to *Extremely Unlikely* as discussed in the 707 BIO Rev. 1 Safety Evaluation Report.

*High Wind:* Revised the DR to 1.0 and MAR to 1 kg for an 8801 can of oxide being struck by a windborne missile.

*Risk Acceptance Criteria:* When comparing the consequences and frequencies of accidents to the 6/12/00 Nuclear Licensing Streamline Initiative, the draft DBIO described the Evaluation Guidelines as if they were risk acceptance criteria. The use of the DOE-STD-3011 (or 6/12/00 Streamline Initiative) frequency, consequence, and risk methodology as “surrogate Evaluation Guidelines” as defined in DOE-STD-3009 are not intended to be risk acceptance criteria. Instead, they are used as selection criteria for TSR derivation to achieve the goal of reducing risks to Risk Class III (Marginal) or IV (Negligible) whenever controls are readily available or can be feasibly implemented. The final DBIO was revised to identify them as evaluation guidelines.<sup>2</sup> The DOE-STD-3011 risk methods are also used to identify risk dominant events (i.e., Risk Class I [major] or II [serious]) when all available preventive and mitigative controls are credited, and providing discussions for management acceptance of these residual risks by approving the AB/safety basis document – this is presented in the DBIO discussion of risk dominant events in Section 6.3, High Risk Scenarios.

Conclusion: Overall, the accident analysis is comprehensive and thorough, and evaluates a broad spectrum of accidents in order to provide a defensible basis for required controls and development of TSRs. This criterion is met.

### 5.3 Adequacy of Safety Structures, Systems, and Components

Identification of safety structures, systems, and components (SSCs) is a product of the hazard and accident analyses, which provide the bases for their designation. Determining the adequacy of Safety SSCs defined by the AB generally entails being able to conclude that the BIO contains sufficient documentation and basis to meet the following criteria:

- 1) The Safety SSCs identified and described are consistent with the logic presented in hazard and accident analyses.

This criterion is addressed in each accident scenario (Chapter 6) with overall SSC identification addressed in Chapter 7 Derivation of TSRs and in Appendix A, Technical Safety Requirements.

**Assessment:** Each accident scenario analyzed explicitly identifies the credited preventive and mitigative features, as well as those considered defense-in-depth. These features are classified per the criteria in Chapter 6 and the safety functions are delineated in the TSR Bases. The DBIO defines Safety Class SSCs as those SSCs whose preventive or mitigative function is necessary to limit radioactive hazardous material exposure to the public as identified by safety analysis. Limiting exposure means that Evaluation Guidelines (EG) are not exceeded, therefore Safety Class SSCs are SSCs whose safety function is necessary to keep exposure to the MOI below the (EG). The radiological EG used for this classification is 5 rem to the MOI based upon the Nuclear Licensing Streamline Initiative (Reference 9). There are no Safety Class SSCs identified in the DBIO. The DBIO defines Safety Significant SSCs whose preventive or mitigative function is a major contributor to Defense in Depth and/or worker safety as determined by the safety analysis. Safety Significant SSC classification based on Defense in Depth includes those SSCs necessary to reduce dose consequence to the MOI to Risk Class III or IV. As the facility accomplishes its decommissioning mission, the status of the Safety SSCs will change. AC 5.6, Configuration Management, requires that SSCs, including temporary systems, providing safety functions be identified.

**Conclusion:** The current Safety SSCs required for prevention and/or mitigation of the hazards and risks associated with decommissioning activities are clearly identified and described. AC 5.6 provides the requirements to ensure that this identification and description are maintained as Safety SSC status changes during decommissioning. This criterion is adequately met.

2) **Safety functions for Safety SSCs are defined with clarity and are consistent with the bases derived in the hazard and accident analyses.**

This criterion is addressed by Chapter 2 Facility Description, the Bases for each Safety SSC contained in Appendix A, Technical Safety Requirements, and AC 5.6, Configuration Management.

**Assessment:** The descriptions of the safety functions provided in the TSR Bases are consistent with the functions detailed in the accident analysis. Chapter 2 discusses each facility system required to support the accident analysis. This discussion includes: 1) a system diagram, 2) system boundary identification, 3) explanation of system operation, and 4) identification of interfacing systems. The safety functions for these systems, the credited Safety SSCs, are then defined in the TSR Bases. The Bases also identify those support systems required for a Safety SSC to meet its LCO requirements.

Due to the facility's decommissioning mission, SSC configuration will be frequently modified. To ensure that SSC safety functions are maintained, the Configuration Management AC requires the identification of the SSCs and support systems providing safety functions. The RFFO expects that this AC will ensure the following are satisfied at all times:

1. Facility personnel are cognizant of Safety SSC status,
2. Facility personnel are able to determine the area affected by any Safety SSC, and

3. The operability of Safety SSC required to perform its intended safety function is demonstrated.

Conclusion: The safety functions for the credited SSCs are defined and are consistent with the safety bases defined in the accident analyses. This criterion is adequately met.

- 3) Functional requirements and system evaluations are derived from the safety functions and provide evidence that the safety functions can be performed.

This criterion is addressed in the DBIO Appendix A, Technical Safety Requirements.

Assessment: The DBIO defines the acceptance criteria for Safety SSCs in the Surveillance Requirement section of the Limiting Condition for Operations. The acceptance criteria are readings, indications, or measurements that demonstrate that a surveilled function meets its applicable TSR. In order for a Safety SSC to be considered operable (capable of performing its safety function on demand), its Surveillance Requirements and associate acceptance criteria must be met. The inclusion of acceptance criteria in the TSRs ensures that the criteria can not be changed without DOE approval. In addition, the intent of the activities authorized by this DBIO is to remove equipment, including equipment providing a safety function, from the facility. This effort will require declaring equipment Out of Service and implementing the controls defined in the ACs (e.g. AC 5.3, AC 5.6, etc.)

Conclusion: The acceptance criteria for Safety SSCs is adequately defined to ensure associated safety function(s) are maintained. This criterion is adequately met.

#### 5.4 Adequacy of Derivation and Development of Technical Safety Requirements

TSR identification is a product of the hazard and accident analyses. TSRs are derived from the most significant preventive and mitigative features identified in the hazard and accident analyses and from the designation of Safety SSCs. The DBIO not only provides the bases for deriving the TSRs, but also contains the full set of TSRs as Appendix A of the DBIO. This section of the DOE Safety Evaluation Report provides the bases for approval for both the TSR derivation portion of the DBIO (Chapters 5, 6, and 7) as well as the TSRs themselves (BIO Appendix A).

- 1) The bases for deriving TSRs that are identified and described in the hazard and accident analyses and Safety SSC discussions are consistent with the logic and assumptions presented in the analyses.

This criterion addresses the consistency and logic of taking the safety features (administrative and engineered) identified in Chapters 5 and 6 of the DBIO and mapping them to specific controls in the TSRs as accomplished in Chapter 7. Chapter 7 lists the credited Safety SSC controls, administrative controls, and design features derived from the accident analyses.

The driver for the development of this DBIO is the need to decontaminate, and demolish Building 707 and its support facilities. The facility was designed with numerous safety systems to provide assurances that its pit production mission could be accomplished with an

acceptable degree of risk to the workers and the public. These safety systems must be removed to accommodate the demolition of the facility. However, these systems must also remain in place long enough to provide for the protection of the workers, the public, and the environment during the process of eliminating the hazards the systems were designed to protect against. The DBIO was developed with these considerations in mind, and takes care to define the criteria for “stepping out of” TSR controls. In addition, the DBIO has considered the ultimate objective of hardware removal and placed a greater emphasis on Administrative Controls than was done in previous generations of authorization basis documents. The Administrative Controls are effectively tied to the hazards in order to prevent or mitigate potential accidents. ACs 5.5 and 5.6 address the requirements for Operationally Clean and Configuration Management, respectively. AC 5.5 defines the requirements and criteria for discontinuing TSR requirements in an area. AC 5.6 defines the requirements for managing changes to the equipment, systems, and structures as they are shut down and removed from the facility. The Review Team has accepted the logic presented in the analysis for dismantling the facility and increasing the reliance within the authorization basis on ACs as the project progresses.

Assessment: Chapters 5 and 6 define the controls credited for reducing the risk associated with each accident scenario for each receptor (MOI, Collocated Worker, and Immediate Worker). This information was summarized and further developed in Chapter 7. Chapter 7 provides a mapping function, mapping the control credited in each accident scenario to a Limiting Condition for Operation, an Administrative Control, or a Design Feature in the TSRs. Chapter 7 also identifies the controls as either credited, defense in depth, or an assumed initial condition.

Conclusion: The controls identified in Chapters 5 and 6 of the DBIO are appropriately identified in Chapter 7 as TSR controls. This criterion is adequately met.

- 2) Bases for deriving safety limits, limiting control settings, limiting conditions for operation, surveillance requirements, and administrative controls are provided as appropriate.

This criterion is addressed in Chapters 5, 6, 7, and Appendix A of the DBIO.

Assessment: No safety limits or limiting control settings were required based on the hazard and accident analyses performed in Chapters 5 and 6 of the DBIO. The logic and strategy for developing the TSRs is briefly discussed in Chapter 7 of the DBIO. The TSRs (Appendix A of the DBIO) identify the Limiting Conditions for Operations (LCOs) and associated Surveillance Requirements (SRs) for all active Safety SSCs. These LCOs and SRs adequately define the functional capability or performance level of each safety SSC required to ensure safe facility operation. The LCOs provide Required Actions and associated Completion Times for the facility to enter for a Planned Out-of-Tolerance (POOT) or upon discovery of an out-of-tolerant condition. The TSRs also identify the Administrative Controls (ACs) necessary to implement specific attributes of SMPs credited in the accident analysis or to protect assumptions of the analysis. The ACs provide Required Actions and associated Completion Times for the facility to enter for a POOT or upon discovery of a AC Noncompliance. The LCOs and ACs contain Applicability statements describing when the

stated controls apply. The SRs associated with AC 5.3, Combustible Material and Hot Work Controls, and AC 5.5, Operationally Clean, provide assurance that these ACs are being adequately implemented in the facility.

The final DBIO Rev. 4 revision resolved review comments related to TSR Bases. Numerous comments were generated on initial submittal of the TSRs, and have been successfully dispositioned in Revision 4 of the DBIO. The intent of many of the comments was to ensure that all involved parties had a consistent understanding of the intent, use and application of the described controls. ACs 5.2, and 5.3 underwent considerable evolution from Revision 3 to Revision 4 of the DBIO. The Revision 4 versions of these ACs contain fewer exception statements, and should be significantly easier for operations personnel to implement than their predecessor ACs.

Conclusion: The DBIO methodology for determining the LCOs, ACs, and associated SRs relied upon in the accident analysis to ensure safe facility operations is adequate. This criterion is adequately met.

- 3) The controls are consistent with other Site AB documents, are consistent with controls established for other facilities, and are appropriate to maintain an acceptable operational safety envelope for the facility.

This criterion is addressed in Chapters 5, 6, 7, and the Appendix A of the DBIO.

Assessment: The DBIO and TSRs establish a robust safety envelope commensurate with the risks associated with the facility at time of approval. As decommissioning activities progress in the facility, and associated risk is reduced, the DBIO provides the requirements (AC 5.5 Operationally Clean) that must be met to step out of TSR level controls in areas determined to meet those criteria. The DBIO also provides an Administrative Control, AC 5.3 Combustible Material and Hot Work Controls, that allows for the removal of sprinkler systems in support of the facility's mission while maintaining safe facility configuration.

Building 707's current activities are authorized by the existing BIO (and other documents previously mentioned in the ABDL), and prior to that were controlled by a FASR. These two primary AB documents had a greater reliance on hardware controls than this DBIO. The mission supported by the documents is the basis for the difference in philosophy. This significant change in mission, from authorizing production activities and residue processing to decommissioning, reduces the significance of comparing controls between the DBIO and its predecessor documents. The Site AB documents of most relevance for such a comparison are the B771 DBIO and the B779 Cluster BIO. There were a number of comments related to TSRs that were not consistent with the controls of the B771 DBIO – these were resolved in the DBIO Revision 4 or the Reference 13 submittal of revised page changes. In addition, several of the deviations from the B771 DBIO were determined to be improvements, and incorporated into the B771 DBIO. Refer to the B771 DBIO for a discussion of the control differences with the B779 Cluster BIO and other facility TSRs.

The following LCOs and associated Surveillance Requirements contained in the TSRs define the functional capability of Safety SSCs required for safe operation of the facility:

1. LCO 3.1.1 Confinement Pressure Differential
2. LCO 3.1.2 Confinement Exhaust Filtration
3. LCO 3.2 Fire Sprinkler Systems
4. LCO 3.3 Plenum Deluge Systems
5. LCO 3.4 Criticality Accident Alarm Systems (CAAS)

The LCOs are accepted because they adequately provide preventive and/or mitigative safety functions, Required Actions, Completion Times, Surveillance Requirements, and Bases.

LCO-required equipment must be calibrated per TSR 3.0.6, Calibration. The following are RFFO expectations for the implementation of this requirement:

1. If the facility decides to utilize the 24-hour grace period prior to entering Required Actions without verifying and formally documenting (e.g., CCA and/or SOE logs) that the out-of-calibration indicator reads as expected and within required parameters, it is a Violation of the TSRs.
2. The 24-hour grace period for out-of-calibration indicator does not extend the required Surveillance Requirement frequency.

The following are RFFO expectations for the implementation of LCO 3.4, Condition E, and AC 5.7 regarding Required Actions for CAAS deficiencies:

1. The failure to adequately determine the affected area for this condition is a violation of the TSRs.
2. The failure to appropriately post the affected area per the Nuclear Criticality Safety Manual is a violation of the TSRs.

LCO 3.4, Condition E concerns hardware inadequacies for CAAS annunciation in combination with AC 5.7 requirements not being met. AC 5.7 addresses the compensatory measures required to be in place for entries into such areas. AC 5.7 applies to temporary inaudible CAAS annunciation areas as well as permanent ones. For temporary high noise areas (i.e., areas created by a short-term or intermittent work activity) the determination of affected area, area posting, and implementation of compensatory measures must be performed prior to beginning the work creating the inaudible CAAS annunciation area. This is analogous to the philosophy behind General Application TSR 3.0.8. The intent of AC 5.7 is to relieve the facility of the requirement to declare a TSR violation when individuals improperly enter areas (intentionally or inadvertently) that are correctly identified, posted, and controlled as inaudible for CAAS annunciation.

The following Administrative Controls (ACs) and associated Surveillance Requirements specified in the TSRs define the specific attributes of programs identified within the safety analysis or relied upon to protect assumptions in the analysis:

- AC 5.1 Minimum Staffing
- AC 5.2 Material Management
- AC 5.3 Combustible Material and Hot Work Controls

AC 5.4 Safety Management Programs  
AC 5.5 Operationally Clean  
AC 5.6 Configuration Management  
AC 5.7 Inadequate Criticality Accident Alarm System Annunciation

The ACs are accepted because they adequately provide the program elements necessary for safe facility operation, Required Actions, Completion Times, Surveillance Requirements, and Bases.

The following Design Features (DFs) define the passive SSCs that are used in the analysis to reduce risk or provide Defense in Depth:

DF 6.1 Periphery Confinement Barriers  
DF 6.2 Waste Container Integrity

The DFs are accepted because they adequately provide passive mitigative and/or preventive safety functions.

The final DBIO Rev. 4 revision resolved review comments related to TSRs and their Bases.

Conclusions: The TSRs adequately implement the controls identified in the accident analysis sufficient to maintain the operational safety envelope in the Building 707. This criterion is met.

## 5.5 Adequacy of Programmatic Controls

Programmatic controls encompass the elements of institutional programs and facility management that are necessary to ensure safe operations based on assumptions made in the hazards and accident analyses. In the DBIO, programmatic controls are identified as Safety Management Programs in Chapter 3.

The Safety Management Programs described in Chapter 3 of the DBIO provide worker protection and defense-in-depth. The DBIO emphasizes the entire program, which will ensure that not only the controls identified by the analyst are included, but also the programmatic controls that may have been overlooked or the controls that are indirectly involved but were not recognized would be included. The program manager will be responsible to ensure the program is established, will track, trend and correct noncompliances, and perform periodic self-assessments to verify continuing compliance. An Administrative Control, AC 5.4 Safety Management Programs, links the SMPs to the TSRs; however, the specific attributes of these programs are no longer listed. Also, the Safety Management Programs will be enforced through the Price Anderson Amendment Act.

### 1) The major programs needed to provide programmatic safety management are identified.

Assessment: Chapter 3 of the DBIO describes and commits to the implementation of the Site Safety Management Programs within Building 707. The DBIO evaluates each SMP at the Site level, and determines if there are any specific attributes of the SMP required in the

accident analysis. The DBIO also identifies any facility specific differences between the Site SMP and implementation in the facility. The contract between the DOE and Kaiser-Hill identifies the Orders and requirements that are applicable. The Program manuals for the various Safety Management Programs provide the mechanism to flow requirements from orders and regulations down to any Contractor performing work at Rocky Flats. The program manuals are implemented at the facility and project level. The compliance status of facilities and projects is assured through self and independent assessments. Issues identified regarding compliance of the Safety Management Programs will be managed through established processes, such as corrective action process or exemption process, and enforced through the Price Anderson Amendment Act.

Conclusion: This criterion is adequately met.

- 2) The major safety programs are noted, and references to facility or site program documentation are provided.

This criterion is addressed in Chapter 3 of the DBIO.

Assessment: The DBIO evaluates each SMP at the Site level, and determines if there are any specific attributes of the SMP required in the accident analysis. The DBIO also identifies any facility specific differences between the Site SMP and implementation in the facility. The DBIO established the link between the Site programs, the Site SAR that formally implements the Site programs, and the SMP program owner's responsibilities.

Conclusion: This criterion is adequately met.

## 6.0 REFERENCES

1. Department of Energy Order, DOE Order 5480.23, *Nuclear Safety Analysis Reports*, April 30, 1992, U.S. Department of Energy, Washington, D.C.
2. Department of Energy Standard, DOE-STD-3011-94, *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans*, November 1994, U.S. Department of Energy, Washington, D.C.
3. Department of Energy Standard, DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, December 1992, U.S. Department of Energy, Washington, D.C.
4. Department of Energy Standard, DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, July 1994, U.S. Department of Energy, Washington, D.C.
5. Department of Energy Order, DOE Order 5480.22, *Technical Safety Requirements*, September 15, 1992, U.S. Department of Energy, Washington, D.C.

6. Department of Energy Guide, *Document of Example, Technical Safety Requirements, Volume 1: Examples*, Defense Programs, November 1993, U.S. Department of Energy, Washington, D.C.
7. Rocky Flats Field Office Desktop Procedure, AME-ABD-01, *Nuclear Safety Oversight and Review Process for Authorization Basis Related Submittals*, Revision 0, September 1998, U.S. Department of Energy, Rocky Flats Field Office, Golden CO.
8. Department of Energy Standard, DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports*, February 1996, U.S. Department of Energy, Washington, D.C.
9. Memorandum, AME:NRD:MP:00-02784, Mazurowski (RFFO) to Card (Kaiser-Hill), "Authorization Basis Development," June 12, 2000, U.S. Department of Energy, Rocky Flats Field Office, Golden, CO.
10. *Site Preliminary Hazards Analysis to Support Hazard Category 2 and 3 Nuclear Facilities' Authorization Basis Development*, Nuclear Safety Technical Report NSTR-007-01, Revision 0, May 2001, Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO.
11. *Building 707 Preliminary Hazards Analysis (PHA)*, Nuclear Safety Technical Report NSTR-005-98, Revision 4, October 2001, Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO. (note: some revisions are being made to resolve DBIO review comments as agreed at the cross-table review meetings)
12. Letter, 02-RF-00295, Ferri (Kaiser-Hill) to Mazurowski (RFFO), "Transmittal of Errata Sheets to the Building 707 Decommissioning Basis for Interim Operations, Revision 4 – MSF-005-02," January 31, 2002, Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO.
13. Memorandum, AMFPA:NRD:DRR:01-01165, Mazurowski (RFFO) to Parker (Kaiser-Hill), "Approval of Building 771/774 Decommissioning Basis for Interim Operation," June 15, 2001, U.S. Department of Energy, Rocky Flats Field Office, Golden, CO.
14. *Rocky Flats Environmental Technology Site, Site SAR Project Phase I Summary Report, Facilities Hazards Assessment and Classification*, Nuclear Safety Technical Report, NSTR-016-94, Revision 0, December 16, 1994, EG&G Rocky Flats Inc., Golden, CO.
15. Memorandum, Jessie Hill Roberson (Headquarters EM) to Barbara Mazurowski (RFFO), "Delegation of Authority", November 20, 2001, U.S. Department of Energy, Washington, D.C.
16. *Fire Hazards Analysis, Building 707 Complex*, FHA-707-002, Revision 4, June 2001, Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO.

17. *Fire Hazards Analysis, Evaluation of Fire Protection Features for the Inner Tent Chambers Located in Building 771*, FHA-000-043, Revision 9, November 28, 2000, Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO.
18. "Documented Safety Analysis Adequacy and Compliance Review Criteria," 10 CFR 830 checklist, January 18, 2001, U.S. Department of Energy, Environmental Management, Washington, D.C.
19. Memorandum, AMP:PAPS:GM:01-01628, Mazurowski (RFFO) to Parker (Kaiser-Hill), "Acceptance of the Closure Project Baseline," September 18, 2001, U.S. Department of Energy, Rocky Flats Field Office, Golden, CO.
20. *Rocky Flats Environmental Technology Site Safety Analysis Report*, Revision 2, November 2000 (with September 2001 approved page changes), Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO.
21. *Safety Analysis and Risk Assessment Handbook*, Nuclear Safety Technical Report NSTR-007-96, RFP-5098, Revision 2, December 6, 1999 (with subsequent page changes), Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO.
22. Memorandum, NSEPD:JCS:12672, McEahern (RFFO) to Zimmer (Kaiser-Hill), "Comments on the Basis for Interim Operation Consequence Spreadsheet Template," October 5, 1995, U.S. Department of Energy, Rocky Flats Field Office, Golden, CO.
23. Department of Energy Standard, DOE-STD-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, December 1994, U.S. Department of Energy, Washington, D.C.
24. Cutonilli, J and D. Foti, "Standard Drum/Crate Fire Methodology," Nuclear Safety Engineering Calculation CALC-RFP-00.1796-DJF, September 18, 2000, Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO
25. Marr, J. *Applicable Airborne Release Fractions (ARFs) and Respirable Fractions (RFs) For Surface-Contaminated, Combustible Waste in 55-Gallon Metal Drums During Fires*, Nuclear Safety Technical Report NSTR-008-01, May 1, 2001, prepared by TENERA Federal Services for Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO
26. *D&D Contamination Tent Fire Hazard Analysis*, June 29, 2000 prepared by Hughes Associates for Kaiser-Hill Company, Rocky Flats Environmental Technology Site, Golden, CO
27. Letter, Hoynoski to Rogers (RFFO), "Building 771 Inner Tent Chamber Fire Protection Features," November 30, 2000, High Country Engineering, Golden, CO

**APPENDIX A**  
**DIRECTED CHANGES TO THE BUILDING 707/707A DBIO**

The following list presents changes that must be made to the Building 707 DBIO and TSRs as a condition for the Rocky Flats Field Office (RFFO) approval of the document.

1. The Reference 13 errata sheets along with the Building 707 DBIO are approved, and the errata sheets need to be incorporated prior to distribution of the DBIO.

## APPENDIX B

### ISSUES TO BE ADDRESSED UPON BUILDING 707/707A DBIO IMPLEMENTATION

The following list presents controls or issues that will receive special emphasis by the RFFO Activity Oversight Team during implementation of the Building 707 DBIO. The RFFO Review Team considered adequate implementation of these controls critical in safe operation of Building 707 under the DBIO.

1. Adequate implementation of AC 5.3, Combustible Material and Hot Work Controls.
2. Adequate implementation of AC 5.5, Operationally Clean.
3. Adequate implementation of AC 5.6, Configuration Management.
4. Adequate implementation of SMP 3.16.2, Americium Waste Packaging.
5. Adequate implementation of the Safety Management Programs within the facility and at the Site level.
6. Verify that the Site SAR has been revised and approved to authorize outside handling and storage of LLW in metal containers.

**APPENDIX C-1  
COMMENTS TO BE INCLUDED IN ANNUAL UPDATE OF DBIO**

The following list presents issues that should be evaluated prior to the next annual update of the Building 707 DBIO and any required changes to the DBIO or TSRs incorporated at that time.

1. None

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**Appendix C-2  
ADDITIONAL COMMENTS THAT THE INTEGRATOR SHOULD ADDRESS**

The following list presents issues that were identified during the review of the DBIO but did not directly effect the approval of the DBIO. The contractor should address these issues.

1. None

RFOF 1325.6

United States Government

Department of Energy  
Rocky Flats Field Office

# memorandum

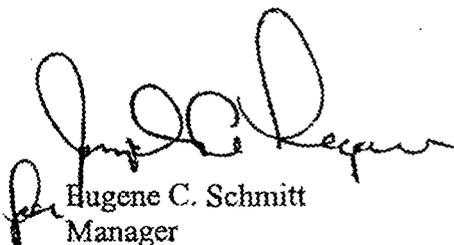
DATE: OCT 11 2002

REPLY TO

ATTN OF: SP:NRD:DEF:02-01586

SUBJECT: Approval of Building 707/707A Decommissioning Basis for Interim Operations Page Change  
PGC-707-02.2527-SRH, Revision 0TO: Alan M. Parker  
President and Chief Executive Officer  
Kaiser-Hill Company, LLCReference: Letter, Ferri to Schmitt, 02-RF-02137, dtd 09/26/02, subject: Transmittal of  
Building 707/707A Decommissioning Basis for Interim Operation Page  
Change, Proposed Change to Administrative Control 5.2.1.1 for Spent  
Decontamination Solutions - MSF-059-02

This memorandum transmits the Rocky Flats Field Office (RFFO) approval of Page Change PGC-707-02.2527-SRH, Revision 0, to the Building 707/707A Decommissioning Basis for Interim Operations to the Kaiser-Hill Company, L.L.C.. After review, RFFO concludes that the submitted page change satisfies the requirements of 10 CFR 830. The attached Addendum to the Building 707/707A Decommissioning Basis for Interim Operation Safety Evaluation Report documents the RFFO basis for approval. Should you have any questions, please contact me at extension 2025, or my point of contact on this matter, David Faulkner, at extension 2011.



Eugene C. Schmitt  
Manager

Attachment

cc w/Att:

M. Frei, EM-30, HQ  
N. Larson, EM-33, HQ  
D. Owen, DNFSB, RFFO  
R. Bostic, NR, RFFO  
A. Geis, K-H  
M. Ferri, K-H

Revision: 0  
Date: 01/31/02

# REVIEW REPORT

## Addendum A

FOR

### DECOMMISSIONING BASIS FOR INTERIM OPERATION

#### BUILDING 707/707A, REVISION 4

Dated: October 8, 2001

Rocky Flats Environmental Technology Site  
Kaiser Hill L.L.C.

Prepared by:

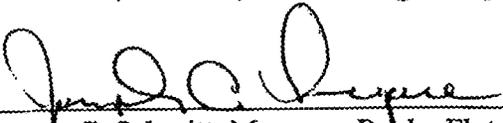
### DEPARTMENT OF ENERGY ROCKY FLATS FIELD OFFICE

Prepared by:   
David E. Faulkner, Nuclear Regulatory Division

Date: 10/9/02

Reviewed by:   
Ron Bostic, Director, Nuclear Regulatory Division

Date: 10/10/02

Approved by:   
*for* Eugene C. Schmitt, Manager, Rocky Flats Field Office

Date: 10/10/02

Safety Evaluation Report  
Building 707/707A Decommissioning Basis for Interim Operation, Revision 4  
PGC-707-02.2527-SRH, Revision 0

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## ADDENDUM A

### Approval of the Building 707/707A Decommissioning Basis for Interim Operation, Page Change PGC-707-02.2527-SRH, Revision 0

References: 1. Letter, Ferri to Schmitt, 02-RF-02137, dtd 09/26/02, subject: Transmittal of Building 707/707A Decommissioning Basis for Interim Operation Page Change, Proposed Change to Administrative Control 5.2.1.1 for Spent Decontamination Solutions - MSF-059-02

#### 1.0 INTRODUCTION

This Addendum documents the review and basis for approval of the changes outlined in Reference 1, PGC-707-02.2527-SRH, a page change to the Building 707/707A Decommissioning Basis for Interim Operations (707 DBIO). The page change allows wastes from personnel decontamination and decontamination shower wastes to be stored in Building 778.

#### 2.0 SUMMARY CONCLUSION

The submitted page change, PGC-707-02.2527-SRH, Revision 0, to the 707 DBIO is approved. The proposed change has an adequate technical basis in Reference 1.

#### 3.0 APPROVAL BASES

The proposed change was reviewed and there are no new accidents analyzed, and no changes to the bounding accidents or accident categories. The change allows waste from personnel decontamination and decontamination shower wastes to be stored in Building 778 as an allowed exception to Administrative Control (AC) 5.2.1.1. The type of wastes produced by personnel decontamination and operation of a decontamination shower contain very small amounts of radioactive materials and are not expected to result in a discernible change to accident conditions evaluated for the facility.

#### 4.0 CONCLUSION

Page change PGC-707-02.2527-SRH, Revision 0, to the 707 DBIO is approved. The change has an adequate technical basis.

#### 5.0 DOE TECHNICAL DIRECTION

NONE.

United States Government

Department of Energy  
Rocky Flats Field Office

# memorandum

DATE:

NOV 20 2002

REPLY TO

ATTN OF:

SP:NRD:DEF:02-01613

SUBJECT:

Approval of Building 707/707A Decommissioning Basis for Interim Operations Annual Update

TO:

Alan M. Parker  
Vice President and Chief Executive Officer  
Kaiser-Hill Company, LLC

Reference: Letter from M. Ferri to E. Schmitt, 02-RF-02038, dated September 12, 2002,  
subject: Transmittal of Building 707/707A Decommissioning Basis for Interim  
Operation First Annual Update, PGC-707-02.2306-SRH - MSF-056-02

This memorandum transmits the Rocky Flats Field Office (RFFO) approval of page change PGC-707-02.2306-SRH, Revision 0, to the Building 707/707A Decommissioning Basis for Interim Operations (DBIO) to the Kaiser-Hill Company, LLC. The submitted page change satisfies the requirements of 10 CFR 830.202 for an annual update. Addendum B to the Building 707 DBIO Safety Evaluation Report, attached, documents the RFFO bases for approval of page change PGC-707-02.2306-SRH, Revision 0, and the associated technical direction. Should you have any questions, please contact me at extension 2025, or my point of contact on this matter, Mr. David Faulkner, at extension 2011.



Eugene C. Schmitt  
Manager

Attachment

cc w/Att:

M. Frei, EM-30

N. Larson, EM-33, HQ

D. Owen, DNFSB, RFFO

R. Goldsmith, AMSP, RFFO

R. Bostic, NR, RFFO

J. Geis, K-H

M. Ferri, K-H

Revision: 0  
Date: 01/31/02

# REVIEW REPORT

## Addendum B

FOR

### DECOMMISSIONING BASIS FOR INTERIM OPERATION

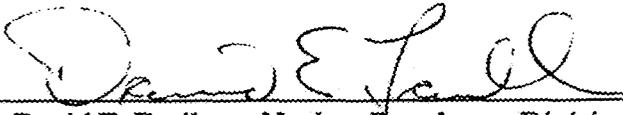
#### BUILDING 707/707A, REVISION 4

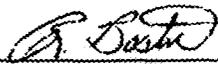
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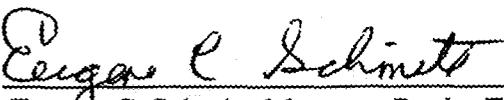
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Kaiser Hill L.L.C.

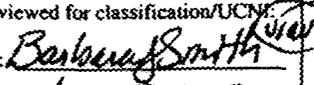
Prepared by:

### DEPARTMENT OF ENERGY ROCKY FLATS FIELD OFFICE

Prepared by:  Date: 11/20/02  
David E. Faulkner, Nuclear Regulatory Division

Reviewed by:  Date: 11/20/02  
Ron Bostic, Director, Nuclear Regulatory Division

Approved by:  Date: 11/20/02  
Eugene C. Schmitt, Manager, Rocky Flats Field Office

Reviewed for classification/UCM:  
By:   
Date: Nov 20, 2002

## ADDENDUM B

### Approval of the Building 707/707A Decommissioning Basis for Interim Operation Annual Update, Page Change PGC-707-02.2306-SRH, Revision 0

- References:
1. Letter, Ferri to Schmitt, 02-RF-02038, dtd 09/12/02, subject: Transmittal of Building 707/707A Decommissioning Basis for Interim Operation, Page Change PGC-707-02.2306-SRH - MSF-056-02
  2. Safety Evaluation Report, Building 707/707A Decommissioning Basis for Interim Operation, dtd 01/31/02

#### 1.0 INTRODUCTION

This Addendum documents the review and basis for approval of the changes outlined in Reference 1, PGC-707-02.2306-SRH, a page change to the Building 707/707A Decommissioning Basis for Interim Operations (707 DBIO). The page change was prepared to complete the annual update to the facility authorization basis as required by 10 CFR 830.202, Safety Basis, and includes changes as a result of DOE Technical Directions and clarifications/corrections required as a result of the 707 DBIO Implementation Validation Review (IVR). This page change also incorporates changes necessary as a result of activities authorized by the Unreviewed Safety Question (USQ) process in accordance with 10 CFR 830.203. The USQ process is used to determine if DOE authorization for an activity is required. When DOE authorization is not required, necessary changes to the facility safety basis are rolled up annually in an update to the facility safety basis. This Page Change satisfies the requirements of 10 CFR 830.203 for an annual update.

This page change also includes editorial corrections which do not affect the inputs, assumptions, and/or conclusions of the hazards and accident analyses. Editorial corrections are adequately described in Reference 1. This page change also includes clarifications identified during the DBIO implementation effort. Areas requiring clarification involve the TSR bases, ACCEPTANCE CRITERIA, and specific AC text.

#### 2.0 SUMMARY CONCLUSION

The submitted page change, PGC-707-02.2306-SRH, Revision 0, to the 707 DBIO is approved and satisfies the requirements of 10 CFR Subpart B for an annual update. The proposed changes have adequate technical bases as described in Reference 1.

### 3.0 APPROVAL BASES

This page change includes editorial corrections which do not affect the inputs, assumptions, and/or conclusions of the hazards and accident analyses. Editorial corrections are adequately described in Reference 1. Examples of these editorial corrections include:

- Deleting reference to Building 709 (Cooling Tower) which has been demolished,
- Correcting improper reference citations,
- Correcting the Material At Risk description for the Major Pool Fire in Chapter 6,
- Correcting accident scenario descriptors in Chapter 7,
- Correcting the listing of areas supplied by specific Fire Suppression Risers in the Bases for LCO 3.2, and
- Capitalizing "ACCEPTANCE CRITERIA" throughout the TSRs since this is a TSR definition and the convention for use is all capital letters.

This page change also includes clarifications identified during the DBIO implementation effort. Areas requiring clarification involve the TSR bases, ACCEPTANCE CRITERIA, and specific AC text. These clarifications include:

- Adding a 4-Hour Nominal Frequency to Section 1.3, *Frequency Notation*, and its associated grace period.
- The ACCEPTANCE CRITERIA of SR 4.2 are directly related to satisfying the operability requirements of LCO 3.3. LCO 3.3 relies upon SRs 4.2.1 through 4.2.3 to demonstrate the operability of the Plenum Deluge System. SRs 4.2.1 and 4.2.3 include conditions (i.e., oil storage) for when the D Riser static/residual pressure requirements are met for LCO 3.2. Riser D supports the Plenum Deluge Systems for FU-27 and PL-107 which brings into question whether these Plenum Deluge Systems are OPERABLE when the static/residual pressures are less than the ACCEPTANCE CRITERIA for the "oil storage" condition of SRs 4.2.1 and 4.2.3.
- The Exception statement for AC 5.2.1.1, *Material Management Controls*, and the Bases for AC 5.2.1.1 were modified to include "personnel decontamination solutions/decontamination shower wastes.
- AC 5.2.1.2 was clarified to specify "TRU" waste containers consistent with CONDITION B of AC 5.2.1.
- AC 5.2.1.3 was modified to address only the "handling" of 10-gallon drums and the Pu gram limit was revised from " $\geq 200$  g Pu" to " $\geq 200$  g Pu and  $\leq 2000$  g Pu". The spacing requirement for stored/staged 10-gallon drums was deleted and the Bases revised since there was no technical basis for the requirement. The accident analysis considered 10-gallon drums co-mingled with other waste containers.
- The wording in SR 5.3.1.4.c was changed from "...with ceiling tiles removed..." to "...with permanent sprinkler deficiencies..." This change broadens the SR to capture any type of permanent deficiency rather than only those caused by the absence of ceiling tiles.

- The wording in SR 5.3.1.4.a was revised "...periphery barrier deficiencies are clearly defined." to "...periphery confinement barrier deficiencies are clearly identified." to be consistent with AC 5.3.1.4.
- SR 5.5.1.b was revised to read "Only waste containers generated in an OPERATIONALLY CLEAN area are stored or staged in the OPERATIONALLY CLEAN area." to be consistent with Exception statement for AC 5.5.1.2.b.
- AC 5.6.1.4 was revised to read, "DOE-RFFO shall be notified a least 7-calendar days prior to replacing existing equipment performing safety functions or essential support equipment listed in LCO Bases with temporary equipment (i.e., not like-for-like)." This change is consistent with the 771/774 DBIO language. Also included in this change is a list of the essential support systems and the respective LCOs relying upon them. The previous language unnecessarily required notification prior to replacing non-LCO Equipment with temporary systems.
- The BASES for DF 6.1 was modified to comply with DOE, RFFO Technical Direction. The following was deleted from the BASES for DF 6.1:

"The periphery door to the vestibules must be physically separated from TRU waste to keep accidents involving TRU waste from challenging the vestibule or to keep fires in the vestibule from propagating to process of waste storage areas."

After submission of the page change, it was realized that openings may have to be introduced into the periphery confinement of the facility in order to support decommissioning activities. The attached "redlines" reflect the request from the facility. These changes are technically acceptable as they further clarify the requirements to be met for periphery deficiencies intentionally introduced while performing decommissioning activities. See technical direction #1.

The page change was reviewed and there are no new accidents analyzed, and no changes to the bounding accidents or accident categories. The TSR changes are the result of previous DOE Technical direction and implementation review lessons learned. The justifications for changes proposed in page change PGC-707-02.2306-SRH are included by reference and are judged to be technically adequate to support the requested changes. The remaining changes are editorial (consistency and clarity) and do not affect the accepted risk of operations.

There are no Justifications for Continued Operations (JCO) conditions or actions affected by page change PGC-707-02.2306-SRH.

#### 4.0 CONCLUSION

Page change PGC-707-02.2306-SRH, revision 0 to the Building 707/707A DBIO, satisfies the requirements of 10 CFR 830.202 for an annual update. The changes are technically adequate and PGC-707-02.2306-SRH is approved subject to implementation of the DOE technical direction.

## 5.0 DOE TECHNICAL DIRECTION

1. Approval is contingent on the verbatim incorporation of the changes in the attached "redlines." The "redline" changes are to the DBIO TSRs. Pagination and format may be altered.

## 6 DESIGN FEATURES (DF)

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This section contains DFs that implement requirements or assumptions in the accident analysis. DFs are passive SSCs that provide preventive or mitigative functions, and whose failure could adversely affect the health and safety of the public or workers. The accident scenarios were reviewed to identify assumptions or requirements and determine what factors need to be controlled. The passive features credited in the accident analyses are discussed below:

### 6.1 Periphery Confinement Barriers:

Periphery confinement barriers (e.g., walls, roof, doors, floors, and penetrations) work in conjunction with the ventilation system to contain radiological releases consistent with the building leak path factors used in the accident analyses. Periphery confinement concrete barriers provide shielding as DEFENSE-IN-DEPTH to reduce exposure to co-located workers from nuclear criticality accidents.

**Applicability:** This requirement is applicable at all times in Building 707/707A except as allowed in the exception statement. Periphery Confinement Barrier requirements may be discontinued in an AFFECTED AREA when the area is determined to be OPERATIONALLY CLEAN.

**Exception:** Fire rating deficiencies in periphery confinement barriers may be handled in accordance with AC 5.3.1.4.

### 6.2 Waste Container Integrity:

Waste containers (e.g., IP-1 cargo, IP-2 metal crates, SWBs, 55-gallon drums, 10-gallon drums) contain radiological releases consistent with accident frequency and damage ratio assumptions in the accident analysis. Drum vents are credited with a reduction in frequency for hydrogen deflagration accidents.

**Applicability:** Waste Container Integrity DFs are applicable at all times for containerized waste.

Any process that might alter, modify, or affect the integrity of these DFs shall be evaluated for possible safety impact in accordance with the Unreviewed Safety Question Determination (USQD) process.

**6 DESIGN FEATURES (DF)**

**ACTIONS:**

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Building Structure or credited ducts degraded.	A.1 Suspend Hot Work in the AFFECTED AREA(s).	IMMEDIATELY
	<u>AND</u> A.2 Implement controls from AC 5.3.1.4 in the AFFECTED AREA(s).	4 hours
	<u>AND</u> A.3 Restore the degraded Building Structure or credited ducts.	30 days

**SRs:**

None Required

**6 DESIGN FEATURES (DF)**

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**Bases:**

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## DF 6.1

**Overview:**

The accident analysis considers "confinement" to be a building leakpath factor of 0.1. The following basic functions are required to maintain a building leakpath factor of 0.1:

- a. Periphery confinement barriers (DF 6.1);
- b. Confinement pressure differential (LCO 3.1.1); and
- c. Confinement exhaust filtration (LCO 3.1.2).

Periphery confinement barriers (e.g., walls, roof, doors, and floors) work in conjunction with the ventilation system to contain radiological releases. Periphery confinement barriers provide the boundary for maintaining pressure differentials and must contain airborne contamination as credited in the accident analysis. The accident analysis does not credit the periphery confinement barriers with a specific fire rating. It assumes that combustible materials will not challenge the periphery confinement barriers. Therefore, combustible materials will be controlled in areas with fire rating deficiencies to keep from challenging the barrier. This process is allowed by the Exception which hands off to AC 5.3.1.4. Features included as part of periphery confinement barrier include structural integrity, fire resistance, and the ability to maintain pressure differentials. In addition, the periphery confinement concrete barriers provide shielding for areas with potential criticalities. The credited periphery confinement barriers are identified in the Building 707 Complex Fire Hazards Analysis (Ref. 6).

Redundant, non-credited HEPA filters in exhaust ventilation filter plenums and filter units provide an additional passive confinement barrier. These additional filters provide a layer of defense-in-depth for the tested/credited filter stage that is part of the periphery confinement barrier. SCO Vestibules may be constructed outside the periphery confinement barriers. The vestibules may be made of various material (e.g., fire retardant plywood and plastic, corrugated metal, concrete block). Plastic and tape are generally used to form a seal between the SCO container and the vestibule. A door in the periphery barrier provides access to the vestibule for loading the waste containers. When the periphery barrier door is open, the vestibule and waste container (e.g., cargo container) form the periphery barrier and maintain the pressure differential. The periphery barrier door may be open for long periods of time while the containers are loaded.

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**6 DESIGN FEATURES (DF)****Bases: (continued)**DF 6.1  
(continued)**Applicable Areas:**

Periphery Confinement Barriers must be maintained in Building 707/707A at all times until an AFFECTED AREA has been determined to be OPERATIONALLY CLEAN. Since the Periphery Confinement Barriers ensure that airborne contamination is channeled through the exhaust ventilation system and HEPA filters, the AFFECTED AREA would be any area with ventilation communication to areas that have removable contaminated waste. An interior wall could become the new Periphery Confinement Barrier to isolate airborne communication between areas if approved by FPE. Building 778 has no credited Periphery Confinement Barriers, therefore, material Management Controls of AC 5.2.1.1 must be followed.

DF 6.2

Waste containers are assumed to reduce the frequency of releases and the severity of releases that occur from analyzed accidents. The integrity of waste containers is a credited control in some accidents (i.e., drum vent maintains container integrity). The integrity of waste containers is an implicit assumption in other scenarios involving waste containers.

There are no detailed specifications for container integrity in the accident analysis, but the credit given to waste container integrity can be determined through accident frequency damage ratios and release fractions used in the accident analysis. Any special features such as vents, seals, lid retainers, and liners can affect the integrity of the containers and are considered part of the waste container integrity. Damaged waste containers do not need to be evaluated if the waste is repackaged or the container is repaired in accordance with waste packaging requirements.

ACTIONS A.1, A.2,  
and A.3

A degraded Building Structure or credited duct is considered an opening or a set of openings if  $\geq 160$  cumulative square inches in area within a ten foot radius. This value is based on engineering judgment rather than analysis and is intended to represent a reasonable threshold of concern for openings in confinement barriers. This value does not include doors open for less than five minutes. The set of openings is intended to cover planned degradations involving multiple penetrations in the Building Structure associated with a single evolution. Multiple evolutions involving concurrent, planned degradations are not intended to be authorized, regardless of the size of the penetrations. The requirements of LCO 3.1.1 must continue to be met.

**6 DESIGN FEATURES (DF)**

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**Bases: (continued)**ACTIONS A.1, A.2,  
and A.3 (continued)

If the Building Structure or a credited duct is planned to be degraded, the credited function will be unavailable to perform its intended function and REQUIRED ACTIONS A.1 and A.2 must be met prior degrading the function. If a degradation of the Building Structure or a credited duct is DISCOVERED, ACTION A.1 must be met IMMEDIATELY. The IMMEDIATE COMPLETION TIME is considered reasonable amount of time since Hot Work in the AFFECTED AREA(s) can be readily suspended. The AFFECTED AREAs for ACTION A.1 are those areas with air communication directly to the unfiltered leak-pathway. ACTION A.2 requires implementation of the controls of AC 5.3.1.4) in the AFFECTED AREA within 4-hours of DISCOVERY of a degraded CONDITION. The 4-hour COMPLETION TIME is considered reasonable since Hot Work has been suspended in accordance with REQUIRED ACTION A.1. ACTION A.3 requires that the DISCOVERED or intentionally degraded system be restored to its credited function within 30 days of being DISCOVERED or intentionally degraded. The 30 day COMPLETION TIME is considered a reasonable period of time as it places a limit on the duration the function is degraded yet it affords time to complete the activity requiring the planned degradation or to design a modification to restore a DISCOVERED CONDITION. However, the COMPLETION TIME should not be used as an operational convenience for any planned degradations and the restoration of the DESIGN FEATURE should be accomplished in a reasonable time period.

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Revised 02/03

States Government

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Department of Energy  
Rocky Flats Field Office

CORRES. CONTROL  
INCOMING LTR NO.

# Memorandum

CORRESPONDENCE  
CONTROL

00333RF03

APR 04 2003

DUE DATE

ACTION

SP:NRD:RB:03-00390

Approval of Page Change to Building 707 Decommissioning Basis for Interim Operations to Correct Vapor Cloud Explosion Scenario Calculation Error

Alan M. Parker  
President & CEO  
Kaiser-Hill Company, L.L.C.

Reference: Letter, Ferri to Schmitt, 03-RF-00091, "Transmittal of Notification of the Unreviewed Safety Question Involving the Building 707 Vapor Cloud Explosion Calculation Error - MSF-005-03," dated: January 21, 2003, Kaiser-Hill, L.L.C.

The Department of Energy Rocky Flats Field Office (RFFO) has reviewed the Unreviewed Safety Question Determination (USQD) and associated page change as transmitted in the reference. The page change is intended to correct an existing error in the Building 707 Decommissioning Basis for Interim Operations (DBIO) accident analysis involving a vapor cloud explosion scenario. The USQD and page change to the Building 707 DBIO are approved without technical direction.

The RFFO bases for approval are provided in the attachment. If you have any questions, please contact Ron Bostic, at extension 2109.

Eugene C. Schmitt  
Manager

Attachment

DIST.	LTR	ENG
BERARDINI, J.	X	X
BOGNAR, E.	X	X
CIUCCI, J. A.	X	X
COLALANGIA, M.	X	X
DEGENHART, K.	X	X
DEICHLER, C.	X	X
DIETER, T. J.		
FERRERA, D.		
FERRI, M. S.	X	X
GEIS, J. A.	X	X
GERMAN, A. L.		
GIACOMINI, J.		
LINDSAY, D.		
LONG, J. W.		
LYLE, J. L.	X	X
MARTINEZ, L. A.	X	X
MILLER, G. M.		
MILLER, J. C.	X	X
NAGEL, R. E.	X	X
PARKER, A. M.	X	X
PLAPPERT, R. D.	X	X
POWERS, K.	X	X
SHELTON, D. C.		
SNYDER, D.	X	X
SPEARS, M. S.		
TRICE, K. D.		
TUOH, N. R.	X	X
VOORHEIS, G. M.		
WELK, D.	X	X
SWANSON, E.	X	X

COR. CONTROL	X	X
ADMN. RECORD		
PATS/130		

cc w/Att:

- M. Fraci, EM-30
- S. Stadler, EH-2
- D. Owen, DNFSB
- R. Goldsmith, AMSP, RFFO
- J. Schneider, AMP, RFFO
- R. Bostic, NRD, RFFO
- E. Westbrook, FAD, RFFO
- M. Ferri, K-H
- A. Geis, K-H

Reviewed for Addressee  
Corres. Control RFP

4/4/03  
Date By *leg*

Ref. Ltr. #  
03RF00091

DOE ORDER #  
5480-22

**Basis for Approval**  
**Building 707 Decommissioning Basis for Interim Operations**  
**Page Change PGC-707-03.0664-SRH, Rev. 0**

- References:
- 1) USQD-707-03.0648-SRH, "Building 707 Vapor Cloud Explosion Calculation Error, DCS-707-03.7253-SRH," Rev. 0, Kaiser-Hill L.L.C., January 21, 2003.
  - 2) PGC-707-03.0664-SRH, "Page Change to Correct Module Vapor Cloud Explosion Dose Consequences, DBIO Section 6.2.3.1," Rev. 0, Kaiser-Hill L.L.C., January 20, 2003.

## 1.0 INTRODUCTION

The Unreviewed Safety Question Determination (USQD) submitted in Reference 1 evaluated the impact of an error in the Building 707 Decommissioning Basis for Interim Operations (DBIO) accident analysis and supporting calculations. This error involved the damage ratio (DR) applied in the dose consequence component from an 8801 can of Pu powder that is impacted as a result of a vapor cloud explosion (VCE) in a module. The DR used in the calculation was 0.1 whereas the accident analysis in the Building 707 DBIO correctly states that a DR of 1.0 should be used. The error in the DR resulted in a dose consequences determination that was incorrect.

Pending resolution of this issue, Kaiser-Hill implemented compensatory measure via shift order that restricted the introduction of flammable gas cylinders into Module K of Building 707. This compensatory measure will be discontinued upon implementation of the Page Change.

## 2.0 APPROVAL BASES

The Page Change submitted in Reference 2 provides a detailed description of the proposed changes to the Building 707 DBIO accident analyses and resulting consequences including supporting calculations. Since there is no resulting increase in risk class, no changes to the Technical Safety Requirements (TSRs) are warranted. The Page Change and supporting justification were judged to be technically adequate and acceptable. The following is a summary of the changes and the RFFO justification for approval of each:

- 2.1 The first change increases the dose consequences in the Module Vapor Cloud Explosion accident scenario in the Building 707 DBIO. This change increases the unmitigated dose consequences from 33 rem (CW) and 0.33 rem (MOI) to 38 rem (CW) and 0.38 rem (MOI). Mitigated dose consequences were increased from 3.3 to 3.8 rem (CW). The accident analysis does not include mitigated doses to the public for this scenario. These increases in dose consequences are consistent with the revised calculation discussed in paragraph 2.2 below and do not represent an increase in risk class.

REVIEWED FOR CLASSIFICATION/UCM

By Terry Foppe (2/24)

Date 14-3-03 Attachment

2.2 The second change modifies the calculation (CALC-707-01.1081-SWF) that supports the Building 707 DBIO accident analysis described above. The changes to this calculation involve: 1) increasing the 8801 can damage ratio (DR) value from 0.1 to 1.0 consistent with the accident analysis in the DBIO, and 2) decreasing the airborne release fraction (ARF) from 5E-3 to 2E-3 consistent with a free-fall spill involving the 8801 can containing Pu powder (that was knocked over by the VCE). The respirable fraction (RF) value remains unchanged at 0.3. These changes are consistent with other Pu facility DBIO accident analyses.

### **3.0 CONCLUSION**

The Page Change (Reference 2) adequately resolves issues identified in the USQD (Reference 1). Therefore, the RFFO approves the USQD and Page Change as submitted.

### **4.0 DOE TECHNICAL DIRECTION**

None.