YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DESIGN PACKAGE 1E SYSTEM SAFETY ANALYSIS
REVISION 00

June 1995

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Design Package 1E System Safety Analysis

Revision 00

June 1995

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**YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
SSA COVER SHEET**

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Page **i** of **vi**

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23 Jun 1995

11. REMARKS

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①

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2. DESIGN ANALYSIS TITLE		
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WARNING

ALTHOUGH EVERY EFFORT HAS GENERALLY BEEN MADE TO INCORPORATE SAFETY FEATURES INTO DESIGN, IT IS OFTEN NECESSARY TO RELY ON PROCEDURES AND TRAINING TO MITIGATE SITUATIONS THAT CAN PRODUCE HAZARDS. SAFETY IS, THEREFORE, HEAVILY DEPENDENT ON ADEQUATE TRAINING AND PROCEDURES. INADEQUATE TRAINING OR PROCEDURES OR FAILURE TO STRICTLY ADHERE TO TRAINING AND PROCEDURES CAN LEAD TO SEVERE INJURIES OR DEATH.

1. PURPOSE

The purpose of this analysis is to systematically identify and evaluate hazards related to the Yucca Mountain Project Exploratory Studies Facility (ESF) Design Package 1E, Surface Facilities, (for a list of design items included in the package 1E system safety analysis see section 3). This process is an integral part of the systems engineering process; whereby safety is considered during planning, design, testing, and construction. A largely qualitative approach was used since a radiological System Safety Analysis is not required. The risk assessment in this analysis characterizes the accident scenarios associated with the Design Package 1E structures/systems/components(S/S/Cs) in terms of relative risk and includes recommendations for mitigating all identified risks. The priority for recommending and implementing mitigation control features is: 1) Incorporate measures to reduce risks and hazards into the structure/system/component design, 2) add safety devices and capabilities to the designs that reduce risk, 3) provide devices that detect and warn personnel of hazardous conditions, and 4) develop procedures and conduct training to increase worker awareness of potential hazards, on methods to reduce exposure to hazards, and on the actions required to avoid accidents or correct hazardous conditions.

The scope of this analysis is limited to the Design Package 1E structures/systems/components during normal operations excluding hazards occurring during maintenance and "off normal" operations.

2. QUALITY ASSURANCE

A QAP-2-0 evaluation was performed to determine if the Design Package 1E System Safety Analysis is subject to QARD requirements. The results of the evaluation are presented in a "Quality Activity Evaluation Engineering Specialty", Revision 0, dated June 20, 1994.

Based on the results of the QAP-2-0 evaluation, this analysis is not considered to be important to radiological safety or waste isolation.

3. METHOD

The safety/risk assessment methodology used in this analysis is shown in Figure 1. The result of the analysis is a "risk evaluation" of the scenarios identified in this analysis in accordance with MIL-STD-882C. Three steps are required to complete the risk evaluation. The steps are hazard/scenario identification, consequence assessment, and frequency assessment. The word "accident" as used in this analysis refers to events, breakdowns, incidents, or any other occurrence that may have a negative effect on personnel safety.

PSARCH11.085/6-28-92

Figure 1. Risk Methodology Conceptual Overview

In addition to the guidance provided in DOE Orders, traditional methods of the System Safety Analysis were reviewed and adopted for this analysis, including those sources listed in sections 4 and 7.

The S/S/C design items included in the ESF Design Package 1E safety analysis are:

- Fuel Supply System Storage Tank
- Standby Power Generators
- Electric Supply Lines
- Fuel Supply System Piping

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Fuel supply system tanks and standby generators are also discussed in the Design Package 1D System Safety Analysis and the Design Package 1C System Safety Analysis, respectively. The tank and generators scenarios contained in this analysis are not duplicates of the scenarios presented in the Design Package 1D and 1C system safety analyses.

The Design Package 1E System Safety Analysis consists of accidents caused by both intrinsic (e.g., human error, equipment failure) and extrinsic (e.g., act of nature, airplane crash) surface occurrences. Each of the scenarios is contained in Attachment A of this System Safety Analysis has a scenario number which uniquely identifies the scenario. The scenario number not only uniquely identifies the scenario, it also provides information concerning the type of scenario, i.e., surface or subsurface, extrinsic or intrinsic. The format of the scenario number is:

where 1 = S or U and 2 = I or E.

3.1 Scenario Identification

The first step involves the identification of possible accident scenarios that can have negative consequences for the ESF personnel or facilities. It is important to provide assurance that potentially significant scenarios have been considered and the consequences are appropriately mitigated through design selection, safety design features or devices, detection and warning devices, and/or use of procedures and training. To identify the scenarios, the Design Package 1E documentation was reviewed, i.e., design specifications, drawings, Determination of Importance Evaluations and the BFD.

A systematic procedure has been used to identify the relevant scenarios. The identification of scenarios is a relatively complex task. Analogous scenarios were grouped together to determine if there were any significant differences among them. For example, a group of accident scenarios addresses rupture of the diesel fuel tank and/or lines. The tank and/or lines rupture may be caused by an act of nature (e.g., earthquake, winds), a component failure (e.g., tank leak, defective valve), or human error (e.g., puncturing the tank, opening/closing the a valve at the wrong time). Each of these scenarios could be included in the System Safety Analysis as a separate scenario, a subset of the group of scenarios could be included in the analysis, or a single representative sample scenario could be included in the System Safety Analysis. The decision of whether to include one or more scenarios from a group of potential scenarios in the System Safety Analysis was based on largely qualitative factors such as the probability that the scenarios will result in a significantly different risk designation, the accident can be associated with a

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particular situation or piece of equipment, and the probability that the accident cause(s) or result(s) will impact the frequency or consequence rating.

The scenarios are contained in Attachment A. Refer to the "System Safety Analysis Handbook," Scenario Analysis, page 3-241, for a description of scenario analysis.

3.2 Frequency Assessment

Bounding frequency estimates were developed for the accident scenarios and system failures. The frequency rating scale contains five levels of estimated frequency. The frequency levels are shown in Table 1.

Table 1. Frequency Rating Scale

Frequency		Description
A	Frequent	Likely to occur frequently
B	Probable	Will occur several times in the life of an SSC*
C	Occasional	Likely to occur some time in the life of an SSC*
D	Remote	Unlikely but possible to occur in the life of an SSC*
E	Improbable	So unlikely, it can be assumed occurrence may not be experienced

* SSC = system/structure/component (e.g., Design Package 1B, Design Package 2C)

On September 6-8, 1994, a System Safety Working Group met to review the TBM System Safety Analysis and the Design Package 2C System Safety Analysis. During this review the working group also defined a set of frequency and consequence scales. A major objective was to define the scales so that they could be applied to other system safety analyses with little or no modifications. Also during the review, DOE stated that the following new project phases and schedule were being established:

- Technical Site Suitability
- Environmental Impact Statement
- License Application.

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DOE further said that the Technical Site Suitability phase is synonymous with the ESF; and they directed us to use a life expectancy of four (4) years for the Design Package 2C System Safety Analysis.

Based on the System Safety Working Group definitions and the life expectancy of the ESF, the frequency rating scale definitions used for this analysis are the same as the frequency rating scale definitions used for the TBM and Design Package 2C system safety analyses. The definitions are:

- Frequent - Greater than 4.5 occurrences during the life of Design Package 1E or more than one occurrence per year.
- Probable - Greater than 2.25 but not more than 4.5 occurrences during the life of Design Package 1E or one or less occurrence per year.
- Occasional - Greater than 1.0 but not more than 2.25 occurrences during the life of Design Package 1E or one or two occurrences during the life of Design Package 1E.
- Remote - Greater than .25 but not more than 1.0 occurrences during the life of Design Package 1E or the occurrence may happen once.
- Improbable - From 0 to .25 occurrences during the life of Design Package 1E or very unlikely, probably no occurrence.

3.3 Consequence Assessment

The potential range of consequences, from minor health effects to injury and/or fatality, was determined by using a consequence rating scale. The rating scale and definitions are presented in Table 2. The consequence rating scale also addresses potential impacts to site characterization data ranging from no loss of data to an irretrievable loss of license application data. The determination of consequence for each scenario, like the frequency estimate, was based on engineering experience and judgment and historical operating data.

Table 2. Consequence Rating and Definition

Consequence Level		Maximum Consequence
I	Catastrophic	Death, system/equipment loss, or severe environmental impact
II	Critical	Severe injury or illness, major system/equipment or environmental damage
III	Marginal	Minor injury or illness, minor system/equipment damage, minor delay of data collection or loss of data
IV	Negligible	Less than minor injury, occupational illness, or system damage

The definitions for the consequence ratings are the same as the definitions established by the System Safety Working Group for the TBM and Design Package 2C system safety analyses. They are:

- Catastrophic - Death
- Critical - Permanent partial or complete disability. Injury does not allow worker to return to same job (e.g., loss of limb or eye).
- Marginal - Nonpermanent, recoverable injury that would not preclude performing the same job (e.g., broken bones).
- Negligible - First aid injury with no loss of work time.

3.4 Risk Assessment

Risk is a function of frequency and consequence. The level of risk is determined by assigning a qualitative rating - high, medium, low, extremely low - to each of the frequency and consequence combinations. By determining each scenario's frequency of occurrence and level of consequence, the scenario's risk classification is determined by using the risk matrix in Figure 2. Within each risk category there is a precedence, based on consequence and frequency. For example, a scenario with a frequency = A and a consequence = I has a higher risk than a scenario with a frequency = A and a consequence = II.

FREQUENCY LEVELS	A	1	4	6	14
	B	2	5	10	15
	C	3	8	11	18
	D	7	9	16	19
	E	12	13	17	20
		I	II	III	IV
		CONSEQUENCE LEVELS

High*

Low*

Medium*

Extremely Low*

* DOE is responsible for defining the criteria for risk acceptability

Figure 2. Risk Rating Matrix

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Since the levels of risk are largely subjective, the risk designations must be viewed as relative. Relative risks are useful for determining the order in which risks are addressed; they are not absolute measures. Absolute risk is used when sufficient historical operating data is available on the same design as is currently being utilized and under the same operating conditions.

None-the-less, relative risk can be used as a management tool, especially when mitigation features have not been established and/or verified.

3.5 Exclusions

The following systems, structures, and components; processes; activities; and functions were not considered in this analysis:

- Trenches, manhole covers, and walkway covers associated with the standby power generators and fuel supply storage tanks;
- Conduits and piping (except for above ground piping directly associated with the Fuel Supply System(FSS) tank);
- Pipe hangers and supports;
- Equipment mounting and anchors;
- Lamps and lights;
- Surface lightning protection system;
- Maintenance procedures;
- Industrial hygiene exposure; and
- Emergency response/contingencies and off-normal operations.

In addition, this system safety analysis does not include determining hazards associated with construction, maintenance, maintenance facilities, training, testing, and support operations.

4. CODES AND STANDARDS

- 4.1 MIL-STD-882C; "System Safety Program Requirements," 19 January 1993
- 4.2 30 CFR 57, Subpart C
- 4.3 29 CFR 1910.106,.147
- 4.4 29 CFR 1910.23,24
- 4.5 29 CFR 1926, Subparts C and E
- 4.6 29 CFR 1926.200
- 4.8 Resource Conservation and Recovery Act (NCRA)
- 4.9 National Fire Protection Association NFPA 30-93
- 4.10 Underwriters laboratory, Inc. UL 142-93
- 4.11 Uniform Building Code UBC-91
- 4.12 Uniform Fire Code UFC-91

5. CRITERIA

- 5.1 ESFDR, 3.2.1.19 Rev. 1, ICN 1&2

6. ASSUMPTIONS

- 6.1 It is the designer's responsibility to implement the design based mitigation features, and it is the constructor's and operator's responsibility to verify and document that the hazards identified in this report have been mitigated.
- 6.2 The information, i.e., Analysis and Conclusions, contained in this System Safety Analysis are limited to only the scenarios identified.
- 6.3 Future design changes will need to be evaluated for risk to personnel.
- 6.4 It is the constructor's and operator's responsibility to ensure that all procedures, training, manuals, and other documentation identified as mitigation features are complete, comprehensive, and accurate.
- 6.5 The information contained in this System Safety Analysis covers the configuration items associated with Design Package 1E, excluding the tunnel conveyor system. An additional analysis will be required to identify hazards, safety features, and risks associated with the tunnel conveyor system.

7. REFERENCES

- 7.1 BAB000000-01717-6300-01018 REV 00, "Summary of Work Package 1E, Specification Section 01018".
Other appropriate specifications and drawings are referenced on applicable Accident Analysis Summary Sheets.
- 7.2 DOE Order 6430.1A, "General Design Criteria," 6 April 1989
- 7.3 YMP/CM-0019, "Exploratory Studies Facility Design Requirements," 15 July 1994
- 7.4 YMP/91-37, "Preliminary Safety Analysis Report for the Yucca Mountain Project Exploratory Studies Facility and Site Characterization Program"
- 7.5 DOE Order 5481.1B; "Safety Analysis and Review System," 23 September 1986
- 7.6 SYSTEM SAFETY HANDBOOK - A source book for safety practitioners, July 1993, published by the System Safety Society.

8. COMPUTER PROGRAMS

Computer programs were not used in conjunction with this analysis.

9. RESULTS

Based on the results of the analysis, existing Preliminary Safety Analysis Report scenarios were modified and the need for new scenarios was identified. Table 3 identifies the scenarios

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contained in Attachment A. Each scenario was assigned to a risk category based on the consequence and the frequency of occurrence, and the scenario identification number was plotted on the risk rating matrix shown in Figure 3. Table 4 lists the scenarios in rank order from high to low risk levels.

Detailed scenario descriptions for the Design Package 1E S/S/Cs are contained in Attachment A.

Based on the frequency and consequence ratings, there were no scenarios with a high or medium risk designation, (17) scenarios with a low risk designation, and (6) scenarios with an extremely low risk designation.

10. CONCLUSIONS

The Design Package 1E System Safety Analysis has identified hazards related to ESF Design Package 1E and mitigation measures to eliminate or control hazards by design or operational controls. The consequences of the hazards have been analyzed and an assessment of the risk(s) has been performed. Information concerning the design was obtained from the Design Package 1E 90% review documentation.

Table 3. List of Scenarios Evaluated (page 1 of 2)

Scenario ID Number	Description
SE0150	Fuel Supply System storage tank/lines leak/rupture due to earthquake or high winds in conjunction with ignition sources causing fire.
SE0151	Fuel Supply System diesel fuel ignites due to lighting strike (estimate 2 strikes per year)
SI0150	Fuel Supply System storage tank leak/rupture in conjunction with ignition sources causing fire
SI0151	Personnel injury/fatality due to fall while climbing stairs/walking on platform on outside of Fuel Supply System storage tank
SI0152	Rupture or leak from Fuel Supply System diesel fuel piping, fittings or valves in conjunction with ignition sources causing fire
SI0153	Contamination due to reactions causing system deterioration. The released materials could foster electrolytic/galvanic/stress corrosion or oxidation of materials or present a hazard to personnel.
SI0154	Contamination due to battery Off-Gassing; Release of volatile/condensable materials
SI0155	Explosion/Implosion/Shrapnel due to battery explosion
SI0156	Fire due to battery ignition sources in combination with fuel and oxidizer sources
SI0157	Fire due to electrical cable ignition sources in combination with fuel and oxidizer sources
SI0158	Fire due to transformer ignition source in combination with fuel and oxidizer sources

Table 3. List of Scenarios Evaluated (page 2 of 2)

Scenario ID Number	Description
SI0159	Fire due to Motor control center/relay ignition source in combination with fuel and oxidizer sources
SI0160	Fire due to flame/hot surface ignition source in combination with fuel and oxidizer sources
SI0161	Electrical shock from electrical cables
SI0162	Electrical shock from transformers
SI0163	Electrical shock from generators
SI0164	Electrical Shock from motor control center
SI0165	Electrical shock from paralleling switchgear
SI0166	Failure of offsite power and failure of standby generators causes a loss of power to facility: personnel injury trip/fall while evacuating due to loss of lighting in tunnel
SI0167	Failure of offsite power and failure of paralleling switchgear causes a loss of power to facility: personnel injury trip/fall while evacuating tunnel due to loss of lighting in tunnel.
SI0168	Personnel injury; Burns from diesel motor exhaust pipe or heat tracing on fuel pipes
SI0169	Personnel injury; contact with standby generator rotating parts
SI0170	Personnel injury; contact with fuel supply pump rotating parts

FREQUENCY LEVELS	A				
	B				
	C				
	D			SI0153 SI0169 SI0170	SI0168
	E	SE0150 SE0151 SI0150 SI0151 SI0152 SI0161 SI0162 SI0163 SI0164 SI0165	SI0154 SI0155 SI0156 SI0157 SI0158 SI0159 SI0160		SI0166 SI0167
		I	II	III	IV
CONSEQUENCE LEVELS					

Figure 3. Scenarios Distributed Over Risk Matrix

Table 4. Highest Risk Contributors (page 1 of 3)

Risk Level	Frequency Consequence	Scenario ID Number	Scenario Description
Low	E,I	SE0150	Fuel Supply System storage tank/lines leak/rupture due to earthquake or high winds in conjunction with ignition sources causing fire.
Low	E,I	SE0151	Fuel Supply System diesel fuel ignites due to lighting strike (estimate 2 strikes per year)
Low	E,I	SI0150	Fuel Supply System storage tank leak/rupture in conjunction with ignition sources causing fire
Low	E,I	SI0151	Personnel injury/fatality due to fall while climbing stairs/walking on platform on outside of Fuel Supply System fuel supply system tank
Low	E,I	SI0152	Rupture or leak from Fuel Supply System diesel fuel piping, fittings or valves in conjunction with ignition sources causing fire
Low	E,I	SI0161	Electrical shock from electrical cables
Low	E,I	SI0162	Electrical shock from transformers
Low	E,I	SI0163	Electrical shock from generators
Low	E,I	SI0164	Electrical Shock from motor control center
Low	E,I	SI0165	Electrical shock from paralleling switchgear
Low	E,II	SI0154	Contamination due to battery Off-Gassing; Release of volatile/condensable materials
Low	E,II	SI0155	Explosion/Implosion/Shrapnel due to battery explosion

Table 4. Highest Risk Contributors (page 2 of 3)

Risk Level	Frequency Consequence	Scenario ID Number	Scenario Description
Low	E,II	SI0156	Fire due to battery ignition sources in combination with fuel and oxidizer sources
Low	E,II	SI0157	Fire due to electrical cable ignition sources in combination with fuel and oxidizer sources
Low	E,II	SI0158	Fire due to transformer ignition source in combination with fuel and oxidizer sources
Low	E,II	SI0159	Fire due to Motor control center/relay ignition source in combination with fuel and oxidizer sources
Low	E,II	SI0160	Fire due to flame/hot surface ignition source in combination with fuel and oxidizer sources
Extremely Low	D,III	SI0153	Contamination due to reactions causing system deterioration. The released materials could foster electrolytic/galvanic/stress corrosion or oxidation of materials or present a hazard to personnel
Extremely Low	D,III	SI0169	Personnel injury; contact with standby generator rotating parts
Extremely Low	D,III	SI0170	Personnel injury; contact with fuel supply pump rotating parts
Extremely Low	D,IV	SI0168	Personnel injury; Burns from diesel motor exhaust pipe or heat tracing on diesel fuel pipes

Table 4. Highest Risk Contributors (page 3 of 3)

Risk Level	Frequency Consequence	Scenario ID Number	Scenario Description
Extremely Low	E,IV	SI0166	Failure of offsite power and failure of standby generators causes a loss of power to facility: personnel injury trip/fall while evacuating due to loss of lighting in tunnel
Extremely Low	E,IV	SI0167	Failure of offsite power and failure of paralleling switchgear causes a loss of power to facility: personnel injury trip/fall while evacuating tunnel due to loss of lighting in tunnel

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Attachment A

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SE0150 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fuel Supply System storage tank/lines leak/rupture due to earthquake or high winds in conjunction with ignition sources causing fire.

SYSTEM/COMPONENT FAILURE:

- Tank leak or rupture
- Piping system leak or rupture

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Tank is doubled walled.
- Fuel supply system designed to withstand UBC Zone 3 seismic requirements.
- Fuel supply system designed to withstand 80 mile per hour winds.
- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide fire emergency procedures
- Provide safety training (e.g., system/component isolation training).

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SCENARIO NUMBER: SE0150

MITIGATION DOCUMENTATION:

- 29 CFR 1910.106
- 30 CFR 57, Subpart C
- Operating and Maintenance Instructions*
- National Fire Protection Association NFPA 30-93
- Underwriters laboratory, Inc. UL 142-93
- Uniform Building Code UBC-91
- Uniform Fire Code UFC-91
- System Specifications*
 - Specification Section 15483, Fuel Supply System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29055 & -29052, Mechanical Fuel System
- General Safety Manuals and Training*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SE0151 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fuel Supply System diesel fuel ignites due to lighting strike (estimate 2 strikes per year).

SYSTEM/COMPONENT FAILURE:

- Failure to adhere to safety rules and procedures
- Failure of lighting protection system/grid

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide safety training
- Provide fire emergency procedures
- Lightning protection and electrical grounding provided (to the 25-16 Sub-Station Ground Grid)

MITIGATION DOCUMENTATION:

- National Fire Protection Association NFPA 30-93
- Uniform Fire Code UFC-91
- System Specifications*
 - Specification Section 15483, Fuel Supply System
- Title II Design Drawings*
 - BABBDA000-01717-2100-04704 & -24041, Electrical grounding plans

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- General Safety Manuals and Training*
- Operating and Maintenance Instructions*
- Electrical Subsurface Grounding Analysis, BABFAA000-01717-00109

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0150 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fuel Supply System storage tank leak/rupture in conjunction with ignition sources causing fire

SYSTEM/COMPONENT FAILURE:

- Leak or rupture in above ground tank
- Human error (e.g., puncturing tank with piece of equipment)
- Failure to adhere to safety procedures (e.g., driving vehicle in unauthorized area)
- Component failure (e.g. valve leak)
- Breakage of overhead electric power lines above fuel tank

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Tank is doubled walled.
- Leak detection is provided between the tank walls.
- Provide fire emergency procedures
- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide safety training (e.g. system/component isolation training).
- Do not route power lines above fuel storage tank

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SCENARIO NUMBER: SI0150

MITIGATION DOCUMENTATION:

- 30 CFR 57, Subpart C,K
- 29 CFR 1910.106
- Uniform Building Code UBC-91
- Uniform Fire Code UFC-91
- NFPA 30
- System Specifications*
 - Specification Section 15060, Mechanical Piping
 - Specification Section 15483, Fuel Supply System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29052 & -29055, Mechanical Fuel Supply System
 - BABBDA000-01717-2100-29057, Mechanical Fuel Supply System P&ID Sheet 1
 - BABBDA000-01717-2100-29058, Mechanical Fuel Supply System P&ID Sheet 2
- Operating and Maintenance Instructions*
- General Safety Manuals and Training*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0151 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Personnel injury/fatality due to fall while climbing stairs/walking on platform on outside of Fuel Supply System storage tank.

SYSTEM/COMPONENT FAILURE:

- Debris (e.g., oil, water, tools) on stairs or walkway
- Failure to adhere to safety procedures and rules
- Lack of non-skid surface on steps or walking surfaces
- Lack/failure of guard rails on walkway or stairs

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide adequate lighting in all areas.
- Provide guardrails/handrails and toe plates on all landings, platforms, and stairs per OSHA requirements.
- Require the use of safety belts/lines during work in unprotected areas.
- Provide non-skid surface on all landings, platforms, and steps.
- Post safety/warning signs.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, personnel exclusion areas, how to obtain medical assistance).
- Establish inspection, cleanup, and maintenance procedures (inspect for debris and fluids, loose/missing guard rails, wear of non-skid surface, water on walking surfaces, etc.) and schedule. Maintain inspection, cleanup, and maintenance records.

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SCENARIO NUMBER: SI0151

MITIGATION DOCUMENTATION:

- 29 CFR 1910.23, .24
- 29 CFR 1926, Subparts C and E
- System Specifications*
 - Section 15483, Fuel Supply System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29052 & -29055, Mechanical Fuel Supply System
- Operating and Maintenance Instructions*
- General Safety Manuals and Training*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0152 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Rupture or leak from Fuel Supply System piping, fittings or valves in conjunction with ignition sources causing fire.

SYSTEM/COMPONENT FAILURE:

- Failure/rupture of pipe and/or pipe fittings
- Failure/malfunction of valve or blind flange
- Human error (e.g., leaving valve open/closed, vehicle striking pipe)
- Failure of mechanical joint(s)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Locate isolation valves to minimize diesel fuel losses due to pipe rupture.
- Post safety/warning signs/control personnel access
- Provide lockout/tagout for valves.
- Locate valves so that they are easily accessible and labels are visible.
- Spill containment is provided for the volume of fuel contained in the pipes. While spill containment is a leak mitigation feature it also has a safety benefit by reducing the potential for personnel injury caused by the uncontrolled release of fuel.
- Position piping away from conveyances.
- Establish inspection, maintenance, and test procedures (e.g., valves, pipes) and schedule. Maintain inspection, maintenance, and test records.
- Provide safety training (e.g. system/component isolation, lockout/tagout)

SCENARIO NUMBER: SI0152

MITIGATION DOCUMENTATION:

- 29 CFR 1910.147, 1926.200
- DOE 6430.1A, General Design Criteria Manual
- Uniform Building Code UBC-91
- NFPA 30
- UL 142
- Resource Conservation and Recovery Act (RCRA)
- System Specifications*
 - Specification Section 15060, Mechanical Piping
 - Specification Section 15483, Fuel Supply System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29052 & -29055, Mechanical Fuel Supply System
 - BABBDA000-01717-2100-29057 & -29058, Mechanical Fuel Supply System P&ID
- General Safety Manuals and Training*
- Operating and Maintenance Instructions*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0153 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Contamination due to reactions causing system deterioration. The released materials could foster electrolytic/galvanic/stress corrosion or oxidation of materials or present a hazard to personnel.

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Battery leak
- Chemical contamination causing degraded factors of safety or disabled safety systems
- Sulfuric acid burns or eye injury

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Isolate batteries from critical equipment to the extent possible
- Isolate batteries from personnel to the extent possible.
- Use sealed batteries
- Batteries are within the standby power generator enclosure

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0153

MITIGATION DOCUMENTATION:

- General safety manuals and training*
- Maintenance procedures and periodic testing*
- System Specification Section 01800, Maintenance and Operation of Surface Facilities*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0154 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Contamination due to battery Off-Gassing; Release of volatile/condensable materials.

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Batteries; release of small amounts of hydrogen, may produce a fire/explosion

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide proper ventilation
- Isolate batteries from critical equipment to the extent possible
- Isolate batteries from personnel to the extent possible.
- Use sealed batteries
- Batteries are within the standby power generator enclosure

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0154

MITIGATION DOCUMENTATION:

- General safety manuals and training*
- Maintenance procedures and periodic testing*
- System Specification Section 01800, Maintenance and Operation of Surface Facilities*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0155 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Explosion/Implosion/Shrapnel due to battery explosion

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Battery explodes causing injury to personnel or safety system
- Battery overcharge or overdischarge, out of phase source connection
- Static charge, arcs, electrical component failure

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Isolate batteries from critical equipment to the extent possible
- Isolate batteries from personnel to the extent possible.
- Use sealed batteries
- Batteries are within the standby power generator enclosure

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0155

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Maintenance procedures and periodic testing*
- Battery charging safety procedures*
- System Specification Section 01800, Maintenance and Operation of Surface Facilities*

* It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0156 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fire due to battery ignition sources in combination with fuel and oxidizer sources

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Batteries sparking in the presence of hydrogen, lubricating oil, diesel fuel, flammable cleaning solvents, disposable clean up materials
- Chemical/catalytic reactions igniting fuel

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

Control of ignition spark:

- Isolate batteries from flammable material to the extent possible.
- Inspect battery condition when testing standby generators (operational procedure).
- Post safety warning signs/control personnel access
- Use sealed batteries.

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0156

Control fuel sources:

- Good housekeeping - prompt clean-up of spills (lubricating oil, hydraulic fluid, diesel fuel, flammable cleaning solvents, disposable clean up materials).
- Provide proper ventilation.

Damage control:

- Follow proper fire emergency procedures

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0157 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fire due to electrical cable ignition sources in combination with fuel and oxidizer sources

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Electrical faults/shorts, arcs in the presence of hydrogen, lubricating oil, diesel fuel, flammable cleaning solvents, disposable clean up materials
- Frayed insulation
- Temporary electrical power cords
- Improper cable splice

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

Control of ignition spark:

- Post safety warning signs/control personnel access
- Electrical connections and grounding per code requirements

SCENARIO NUMBER: SI0157

Control fuel sources:

- Good housekeeping - prompt clean-up of spills (lubricating oil, hydraulic fluid, diesel fuel, flammable cleaning solvents, disposable clean up materials).
- Provide proper ventilation.

Damage control:

- Follow proper fire emergency procedures

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0158 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fire due to transformer ignition source in combination with fuel and oxidizer sources

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Transformer sparking in the presence of transformer oil, lubricating oil, diesel fuel, flammable cleaning solvents, disposable clean up materials

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable (requires at least two events)

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

Control of ignition spark:

- Post safety warning signs/control personnel access
- Electrical connections and grounding per code requirements

Control fuel sources:

- Good housekeeping - prompt clean-up of spills (lubricating oil, hydraulic fluid, diesel fuel, flammable cleaning solvents, disposable clean up materials).
- Provide proper ventilation.

Damage control:

- Follow proper fire emergency procedures

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0158

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0159 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fire due to Motor control center/relay ignition source in combination with fuel and oxidizer sources

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT

- Motor control center/relay sparking in the presence of hydrogen, methane, hydraulic fluid, lubricating oil, diesel fuel, flammable cleaning solvents, disposable clean up materials

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable (requires at least two events)

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

Control of ignition spark:

- Post safety warning signs/control personnel access
- Electrical connections and grounding per code requirements

Control fuel sources:

- Good housekeeping - prompt clean-up of spills (lubricating oil, hydraulic fluid, diesel fuel, flammable cleaning solvents, disposable clean up materials).
- Provide proper ventilation.

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0159

Damage control:

- Follow proper fire emergency procedures

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0160 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Fire due to flame/hot surface ignition source in combination with fuel and oxidizer sources

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Extremely hot surfaces (lights, welding equipment, friction surfaces such as catalytic converters, exhaust pipes) in the presence of lubricating oil, diesel fuel, flammable cleaning solvents, disposable clean up materials

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable (requires at least two events)

Consequence Rating: II - Critical

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

Control heat sources (use appropriate codes and regulations):

- Use guards over lights, exhaust pipes, catalytic converters, and friction surfaces.
- Isolate to the extent possible.
- Post safety warning signs/control personnel access

Control fuel sources:

- Good housekeeping - prompt clean-up of spills (lubricating oil, hydraulic fluid, diesel fuel, flammable cleaning solvents, disposable clean up materials).
- Provide proper ventilation.

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0160

Damage control:

- Follow proper fire emergency procedures

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0161 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Electrical shock from electrical cables

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Cable connections (splices), through exposed wiring or water as a conductor
- Frayed insulation, shorts to ground
- High voltage arcs, static charges
- Faulty electrical outlets

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Installation in compliance with electrical codes and standards
- Operator/personnel training
- Post safety/warning signs
- Control personnel access

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0161

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0162 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Electrical shock from transformers

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Exposed wiring or through water as a conductor
- High voltage arcs, static charges
- Faulty Ground

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Installation in compliance with electrical codes and standards
- Post safety/warning signs
- Control personnel access

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0162

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0163 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Electrical shock from generators

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Exposed wiring or through water as a conductor
- High voltage arcs, static charges
- Faulty Ground

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Installation in compliance with electrical codes and standards.
- Post safety/warning signs
- Control personnel access

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0163

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear

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ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0164 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Electrical Shock from motor control center

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Exposed wiring or through water as a conductor
- High voltage arcs, static charges
- Faulty Ground
- Malfunction of fuses/breakers

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Installation in compliance with electrical codes and standards.
- MCCs are in weather-protective enclosures
- Post safety/warning signs
- Control personnel access

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0164

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0165 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Electrical shock from paralleling switchgear

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Exposed wiring or through water as a conductor
- High voltage arcs, static charges
- Faulty ground
- Malfunction of power bus, fuses/breakers

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Installation in compliance with electrical codes and standards.
- Paralleling switchgear are in weather-protective enclosures
- Post safety/warning signs
- Control personnel access

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER: SI0165

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0166 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Failure of offsite power and failure of standby generators causes a loss of power to facility: personnel injury trip/fall while evacuating due to loss of lighting in tunnel

SYSTEM/COMPONENT FAILURE:

- Electrical overload
- Internal component failure (e.g., generator windings, brushes)
- Human error

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable (double event)

Consequence Rating: IV - Negligible

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Emergency batteries on TBM provides lighting for TBM
- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Operator/personnel training
- Require personnel to wear protective clothing (e.g., cap lamps, hard hats, eye protection, hard toed shoes).

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER : SI0166

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- Title II Design Drawings
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0167 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Failure of offsite power and failure of paralleling switchgear causes a loss of power to facility: personnel injury trip/fall while evacuating tunnel due to loss of lighting in tunnel.

SYSTEM/COMPONENT FAILURE:

- Electrical overload
- Breaker trips/malfunctions
- Human error (e.g., worker throws breaker)
- Loss of power to switchgear (e.g., feeder cable malfunction - burned/cut)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable (double event)

Consequence Rating: IV - Negligible

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Design switchgear in accordance with applicable codes.
- Protect breakers so that they can not be inadvertently thrown (e.g., cover on breaker box, use high resistance switches, recess breaker switches in switch box).
- Label breakers clearly.
- Post safety/warning signs.
- Provide safety training for all personnel.
- Establish regular test, inspection, and maintenance procedures and schedule. Maintain test, inspection, and maintenance records.

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER : SI0167

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- Title II Design Drawings
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 16313, Paralleling Switchgear
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0168 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Personnel injury; Burns from diesel motor exhaust pipe or heat tracing on diesel fuel pipes

SYSTEM/COMPONENT FAILURE:

- Human error
- Heat tracing insulation failure (e.g., cracked, frayed)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: IV - Negligible

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Installation in compliance with electrical codes and standards.
- Diesel motor are in enclosures
- Post safety/warning signs

Analysis: BAB000000-01717-0200-00003 REV.00

SCENARIO NUMBER : SI0168

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications*
 - Specification Section 16623, Standby Power Generators
 - Specification Section 15483, Fuel Supply System

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0169 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Personnel injury; contact with standby generator rotating parts.

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Human error
- Automatic standby generator start

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Standby generators are in enclosures
- Post safety/warning signs

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specifications Section 16623, Standby Power Generators*

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0170 REVISION: 00 REVISION DATE: 6/2/95

LOCATION:

North Pad

SCENARIO:

Personnel injury; contact with fuel supply pump rotating parts

SYSTEM/COMPONENT FAILURE OR HAZARDOUS EVENT:

- Human error
- Automatic start

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Operator/personnel training
- Post safety/warning signs

MITIGATION DOCUMENTATION:

- General safety manuals and training
- Operating and Maintenance Instructions*
- System Specification Section 15483, Fuel Supply System*

*It is the operating and maintenance contractor's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD

Signature on this document represents signers' acknowledgement that the applicable procedures have been read, understood and complied with.

Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
Document Number: BAB000000-01717-0200-00003 Governing Document: DOE Order 5481.1B Date: 6/1/95 ☒ Non Q

2. REVIEW CRITERIA

Standard Review Criteria Apply?

☐ Yes - Source: _____

☒ No

Additional Review Criteria Apply?

☒ Yes (attach or list below)

☐ No

Additional Review Criteria:

Review for adequate coverage of hazards.

Review for accurate consequence and frequency ratings.

Review for correct and sufficient mitigation features.

3. REVIEWING ORGANIZATIONS

Organization

Assigned Review Criteria (List)

Civil

Hector Montalvo

CMO

George Veatch

Kiweit

Dave York

Mining

Bob Saunders

M&O ES&H Compliance

Sid Dodd

Surface Design Supr

Gene Kimura

Organization

Assigned Review Criteria (List)

Surface Electric

Bob Howell

Surface Mechanical

Fuss Flye

4.

Return DRR To: Morris Salem, TES3 423, 5-9157

Due Date: 06/09/95

M Salem

Signature of Review Coordinator

6/16/95

Date

5. REVIEW COMPLETED BY:

THOMAS S MCCARTHY

Print Reviewer's Name

MFO ESHCD

Organization

Thomas S. McCarthy

Signature

4-7440

Phone

6/20/95

Date

6. COMMENT RESPONSES BY:

M Salem

Signature

6/19/95

Date

7. CONCURRENCE WITH DRAFT/REVISION:

Thomas S. McCarthy

Signature

6/22/95

Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

1. Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
Document Number: BAB000000-01717-0200-00003 Governing Document: DOE-Order 5481.1B Date: 6/1/95 ☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
1	SE0150 MIT. Doc.	MAY WANT TO REFERENCE 29 CFR 1910.106 SINCE TALKING ABOUT SURFACE TANKS.	Agree - comment incorporated also added to scenario SE0150	YAM 6/22/95

5. Comments by: Thomas S Mc Carthy Date: 06/05/95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT DOCUMENT REVIEW RECORD

Signature on this document represents signers' acknowledgement that the applicable procedures have been read, understood and complied with.

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Document Number: BAB000000-01717-0200-00003 Governing Document: DOE Order 5481.1B Date: 6/1/95 ☒ Non Q

2. REVIEW CRITERIA

Standard Review Criteria Apply?

☐ Yes - Source: _____
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☒ Yes (attach or list below)
☐ No

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Review for accurate consequence and frequency ratings.

Review for correct and sufficient mitigation features.

3. REVIEWING ORGANIZATIONS

Organization	Assigned Review Criteria (List)
<u>Civil</u>	<u>Hector Montalvo</u>
<u>CMO</u>	<u>George Veatch</u>
<u>Kiweit</u>	<u>Dave York</u>
<u>Mining</u>	<u>Bob Saunders</u>
<u>M&O ES&H Compliance</u>	<u>Sid Dodd</u>
<u>Surface Design Supr</u>	<u>Jene Kimura</u>

Organization	Assigned Review Criteria (List)
<u>Surface Electric</u>	<u>Bob Howell</u>
<u>Surface Mechanical</u>	<u>Fuss Flye</u>
_____	_____
_____	_____
_____	_____

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

M. Salem 6/13/95
Signature of Review Coordinator Date

5. REVIEW COMPLETED BY:

Samuel M. Williams
Print Reviewer's Name
REECO CLD 5-9658
Organization Phone
S. Williams 6/9/95
Signature Date

6. COMMENT RESPONSES BY:

M. Salem 6/16/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 00
E. Kimura 22 June 95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

1. Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
Document Number: BAB000000-01717-0200-00003 Governing Document: DOE-Order 5481.1B Date: 6/1/95 ☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
		<i>No Comment</i>		

5. Comments by: *[Signature]* Date: 6/9/95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD

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Document Number: BAB000000-01717-0200-00003 Governing Document: DOE Order 5481.1B Date: 6/1/95 ☒ Non Q

2. REVIEW CRITERIA

Standard Review Criteria Apply?

☐ Yes - Source: _____☒ No

Additional Review Criteria Apply?

☒ Yes (attach or list below)☐ No

Additional Review Criteria:

Review for adequate coverage of hazards.

Review for accurate consequence and frequency ratings.

Review for correct and sufficient mitigation features.

3. REVIEWING ORGANIZATIONS

Organization	Assigned Review Criteria (List)
Civil	Hector Montalvo
CMO	George Veatch
Kiweit	Dave York
Mining	Bob Saunders
M&O ES&H Compliance	Sid Dodd
Surface Design Supr	Gene Kimura

Organization	Assigned Review Criteria (List)
Surface Electric	Bob Howell
Surface Mechanical	Fuss Flye
_____	_____
_____	_____
_____	_____

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

M. Salem 6/20/95
Signature of Review Coordinator Date

5. REVIEW COMPLETED BY:

ROBERT S. SAUNDERS

Print Reviewer's Name

M&O ESF SUBSURFACE DESIGN

Organization

Robert S. Saunders

Signature

4-1865

Phone

6-20-95

Date

6. COMMENT RESPONSES BY:

M. Salem 6/20/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 0
Robert S. Saunders 6-21-95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
		No Comments		

5. Comments by: Robert S. Saunders Date: 6-20-95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT DOCUMENT REVIEW RECORD

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☐ Yes - Source: _____
☒ No

Additional Review Criteria Apply?

☒ Yes (attach or list below)
☐ No

Additional Review Criteria:

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Review for accurate consequence and frequency ratings.

Review for correct and sufficient mitigation features.

3. REVIEWING ORGANIZATIONS

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CMO	George Veatch
Kiweit	Dave York
Mining	Bob Saunders
M&O ES&H Compliance	Sid Dodd
Surface Design Supr	Gene Kimura

Organization	Assigned Review Criteria (List)
Surface Electric	Bob Howell
Surface Mechanical	Fuss Flye

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

M. Salem 6/13/95
Signature of Review Coordinator Date

5. REVIEW COMPLETED BY:

BHARAT H. MAJUMDAR (FOR BOB
Print Reviewer's Name HOWELL)
SURFACE ELECTRIC 4-1981
Organization Phone
Bharat H. Majumdar 6/8/95
Signature Date

6. COMMENT RESPONSES BY:

M. Salem 6/21/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 0
Bharat H. Majumdar 6/21/95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

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Document Number: BAB000000-01717-0200-00003 Governing Document: DOE-Order 5481.1B Date: 6/1/95 ☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
		No comment.		

5. Comments by: Bharat G. Majumdar Date: 6/21/95

YMP-109-R3 06/20/94		YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT DOCUMENT REVIEW RECORD		Page 1 of 1																													
Signature on this document represents signers' acknowledgment that the applicable procedures have been read, understood and complied with.																																	
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Document Number: <u>BAB000000-01717-0200-00003</u>		Governing Document: <u>DOE Order 5481.1B</u>		Date: <u>6/1/95</u> ☒ Non D																													
2. REVIEW CRITERIA <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>Standard Review Criteria Apply?</p> <p>☐ Yes - Source: _____</p> <p>☒ No</p> </div> <div style="width: 48%;"> <p>Additional Review Criteria Apply?</p> <p>☒ Yes (attach or list below)</p> <p>☐ No</p> </div> </div> <p>Additional Review Criteria: Review for adequate coverage of hazards. Review for accurate consequence and frequency ratings. Review for correct and sufficient mitigation features.</p>																																	
3. REVIEWING ORGANIZATIONS <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%;">Organization</th> <th style="width: 25%;">Assigned Review Criteria (List)</th> <th style="width: 25%;">Organization</th> <th style="width: 25%;">Assigned Review Criteria (List)</th> </tr> <tr> <td><u>Civil</u></td> <td><u>Hector Montalvo</u></td> <td><u>Surface Electric</u></td> <td><u>Bob Howell</u></td> </tr> <tr> <td><u>CMO</u></td> <td><u>George Veatch</u></td> <td><u>Surface Mechanical</u></td> <td><u>Foss Flye</u></td> </tr> <tr> <td><u>Kiwek</u></td> <td><u>Dave York</u></td> <td>_____</td> <td>_____</td> </tr> <tr> <td><u>Mining</u></td> <td><u>Bob Saunders</u></td> <td>_____</td> <td>_____</td> </tr> <tr> <td><u>M&O ES&H Compliance</u></td> <td><u>Sid Dodd</u></td> <td>_____</td> <td>_____</td> </tr> <tr> <td><u>Surface Design Supr</u></td> <td><u>Gene Kimura</u></td> <td>_____</td> <td>_____</td> </tr> </table>						Organization	Assigned Review Criteria (List)	Organization	Assigned Review Criteria (List)	<u>Civil</u>	<u>Hector Montalvo</u>	<u>Surface Electric</u>	<u>Bob Howell</u>	<u>CMO</u>	<u>George Veatch</u>	<u>Surface Mechanical</u>	<u>Foss Flye</u>	<u>Kiwek</u>	<u>Dave York</u>	_____	_____	<u>Mining</u>	<u>Bob Saunders</u>	_____	_____	<u>M&O ES&H Compliance</u>	<u>Sid Dodd</u>	_____	_____	<u>Surface Design Supr</u>	<u>Gene Kimura</u>	_____	_____
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<u>Surface Design Supr</u>	<u>Gene Kimura</u>	_____	_____																														
4. Return DRR To: <u>Morris Salem, TES3 423, 5-9157</u> Due Date: <u>06/09/95</u>		5. REVIEW COMPLETED BY: <u>GEORGE VEATCH</u> <small>Print Reviewer's Name</small> <u>M&O/CMO</u> <u>5-6765</u> <small>Organization Phone</small> <u>George Veatch</u> <u>6-20-95</u> <small>Signature Date</small>		6. COMMENT RESPONSES BY: <u>M. Salem</u> <u>6/20/95</u> <small>Signature Date</small> 7. CONCURRENCE WITH DRAFT/REVISION: <u>0</u> <u>George Veatch</u> <u>6-21-95</u> <small>Signature Date</small>																													
<u>M. Salem</u> <u>6/20/95</u> <small>Signature of Review Coordinator Date</small>																																	

YMP-110-R3
06/20/94YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEETPage 2 of 21. Document Title: Design Package 1E System Safety AnalysisDraft/Revision: 0A☐ QDocument Number: BAB000000-01717-0200-00003Governing Document: DOE-Order 5481.1BDate: 6/1/95☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
510150	Bullet (2)	IS LEAK DETECTION BETWEEN A DOUBLE WALLED TANK REQUIRED?	Leak detection is required ^{per} section 2.02 of specification #1548 ² "Fuel Supply System"	Cell. 6-21-95
510151	Bullet (2)	CAN BE INTERPRETED AS NEEDING TOE PLATES ON STAIRS.	Added "per OSHA" to clarify	Cell. 6-21-95
510152 510151	Bullet (2) BULLET (5)	THERE IS NO AUTHORIZED CONTAINMENT AREA	Agree, there is no containment area only limited This scenario is piping leak only, will delete "Failure/leak of diesel fuel storage tank" and will delete bullet #5 since bullet #6 describes limited containment provisions	Cell. 6-21-95
510161	Bullet (2)	NOT ALL CABLES WILL BE IN CONDUIT (i.e. BATTERY CABLES)	Agree - will delete "... wiring to be run in conduit"	Cell. 6-21-95
510166	Bullet (3)	WHERE SHOULD SIGNS BE POSTED AND WHAT SHOULD THEY SAY?	added "Operator/personnel training"	Cell. 6-21-95
510167	Bullet (3)	NOT PRACTICAL TO ENCASE ALL CABLES IN CONCRETE, BULLET #1 SHOULD SUFFICE	Agree - will delete	Cell. 6-21-95

5. Comments by: GEORGE VENTCHDate: 6-20-95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT DOCUMENT REVIEW RECORD

Signature on this document represents signers' acknowledgement that the applicable procedures have been read, understood and complied with.

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2. REVIEW CRITERIA

Standard Review Criteria Apply?

☐ Yes - Source: _____
☒ No

Additional Review Criteria Apply?

☒ Yes (attach or list below)
☐ No

Additional Review Criteria: -
Review for adequate coverage of hazards.
Review for accurate consequence and frequency ratings.
Review for correct and sufficient mitigation features.

3. REVIEWING ORGANIZATIONS

Organization	Assigned Review Criteria (List)
Civil	Hector Montalvo
CMO	George Veatch
Kiweit	Dave York
Mining	Bob Saunders
M&O ES&H Compliance	Sid Dodd
Surface Design Supr	Gene Kimura

Organization	Assigned Review Criteria (List)
Surface Electric	Bob Howell
Surface Mechanical	Fuss Flye

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

M. Salem 6/13/95
Signature of Review Coordinator Date

5. REVIEW COMPLETED BY:

HECTOR R. MONTALVO
Print Reviewer's Name
M&O/FD 4-1988
Organization Phone
[Signature] 6/9/95
Signature Date

6. COMMENT RESPONSES BY:

M. Salem 6/20/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 0
[Signature] 6/20/95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
		<i>No Comments</i>		

5. Comments by: HECTOR R. MONTALVO
[Signature] Date: 6/9/95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT DOCUMENT REVIEW RECORD

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Organization	Assigned Review Criteria (List)
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CMO	George Veatch
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M&O ES&H Compliance	Sid Dodd
Surface Design Supr	Gene Kimura

Organization	Assigned Review Criteria (List)
Surface Electric	Bob Howell
Surface Mechanical	Fuss Flye

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

M. Salem
Signature of Review Coordinator

6/16/95
Date

5. REVIEW COMPLETED BY:

David L York
Print Reviewer's Name

Kimura / PB 5-7835
Organization Phone
[Signature] 6/20/95
Signature Date

6. COMMENT RESPONSES BY:

M. Salem 6/20/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 0
[Signature] 6/20/95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
		No comments		

5. Comments by:

SD York

Date:

6/20/95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD

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3. REVIEWING ORGANIZATIONS

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CMO	George Veatch
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Mining	Bob Saunders
M&O ES&H Compliance	Sid Dodd
Surface Design Supr	Gene Kimura

Organization	Assigned Review Criteria (List)
Surface Electric	Bob Howell
Surface Mechanical	Fuss Flye

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

M. Salem 6/16/95
Signature of Review Coordinator Date

5. REVIEW COMPLETED BY:

Tony SALTIKOV (for G Kimura)
Print Reviewer's Name
M&O ESF SURFACE 4-7367
Organization Phone
Tony Saltikov 4/20/95
Signature Date

6. COMMENT RESPONSES BY:

M. Salem 6/20/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 0

Tony Saltikov 6/20/95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
		<u>None</u>		

5. Comments by: Tony Salteba Date: 6/20/95

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT DOCUMENT REVIEW RECORD

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Surface Design Supr	Gene Kimura

Organization	Assigned Review Criteria (List)
Surface Electric	Bob Howell
Surface Mechanical	Fuss Flye

4. Return DRR To: Morris Salem, TES3 423, 5-9157
Due Date: 06/09/95

5. REVIEW COMPLETED BY:

RUSSELL E. FLYE
Print Reviewer's Name
M&O MGDS SURF MECH 4.5353
Organization Phone

6. COMMENT RESPONSES BY:

M Salem 6/20/95
Signature Date

7. CONCURRENCE WITH DRAFT/REVISION: 00

M Salem 6/13/95
Signature of Review Coordinator Date

Russell E. Flye 6.13.95
Signature Date

Russell E. Flye 6.20.95
Signature Date

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-1	SECTION 3 (Pg 2)	REVISE DESIGN ITEMS TO READ <ul style="list-style-type: none"> • FUEL SUPPLY TANK • STANDBY POWER GENERATORS • ELECTRIC SUPPLY LINES • FUEL SUPPLY SYSTEM(FSS) PIPING 	Agree - Comments incorporated	REA 6.20.95

5. Comments by:

Russell E. Flye

Date: JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-2	SECTION 3.5 (Pg 8)	2 ND BULLET CHANGE DIESEL FUEL STORAGE TANK TO FSS. GENERAL: THROUGHOUT THIS ANALYSIS CHANGE DIESEL FUEL STORAGE TO FUEL SUPPLY SYSTEM (FSS)	Agree - Comments incorporated	RET 6.20.95

5. Comments by

Russell E. Flye

Date:

JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-3	SECTION 4 (Pg 8)	<p>^{4.430.1A} ADD DOE ORDERS 5480.7A, UL-142, NFPA 30, AND APPLICABLE OSHA CODES TO THIS SECTION. ALSO, 4.3 (SYSTEM SAFETY HANDBOOK) SHOULD BE LISTED AS A REFERENCE.</p> <p>ADD UBC-91 & UFC-91 TO SECTION 4</p>	<p>Agree - comments incorporated</p> <p>Agree - comments incorporated</p>	<p>Q&A 6-20-95</p> <p>Q&A 6-20-95</p>

5. Comments by:

Russell E. Flye

Date:

JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-4	SECTION 5 (Pg 9)	USE ESFDR REV. 1, ICN 1 & 2 SAME COMMENT FOR SECTION 7.3.	Agree - comments incorporated	PEI 6-20-95

5. Comments by: Russell E. Flynn Date: JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-5	SECTION 6 (Pg 9)	PROVIDE NUMBERS (e.g. 6.1) TO EACH ASSUMPTION. THE FIRST AND FOURTH ASSUMPTIONS ARE CONFUSING, RECOMMEND THAT THE ASSUMPTION STATE M+O RESPONSIBILITY INSTEAD OF DESIGNER'S AND CONSTRUCTOR'S AND OPERATOR'S.	agree - comments incorporated deleted "MEO's" from bullet one (now 6.1).	Q&A 6.20.95

5. Comments by:

Russell E. Flye

Date:

JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEETPage 6 of 11

1. Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-6	SECTION 7 (Pg 9)	ADD PKG 1E FIRE HAZARD ANALYSIS (BAB0- D0000-01717-0200-00004 REV.00 TO REFERENCE SECTION. ALSO LIST ALL SPECIFICATIONS USED IN ATTACHMENT A. LIST DWGS USED IN ATTACHMENT A. 7.1 SPECIFICATION 0101B SHOULD BE LISTED AS REV. 00 7.3 ESFOR IS NOW REV. 1, ICM 2	Agree - has been added Added following statement to 7.1 (after title) "other ^{appropriate} specifications and drawings are referenced on applicable accident analysis summary sheets" Agree - comment incorporated Agree - comment incorporated	REA 6.20.95 REA 6.20.95 REA 6.20.95 REA 6.20.95

5. Comments by:

Russell E. FlyeDate: JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	5. RESPONSE	7. ACCEPT
SM-7	SE0150 (Pg A-2)	ADD 30 CFR 57, SUBPART C TO SECTION 4. CORRECT BULLET No. 8 TO READ: BABBDAC00-01717-2100-29052 - 29055, MECHANICAL FUEL SUPPLY SYSTEM	Agree - added to Sec. 4, Agree - comment incorporated	RE 6-20-95 RE 6-20-95

5. Comments by:

Russell E. Flye

Date: JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
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1. Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
Document Number: BAB000000-01717-0200-00003 Governing Document: DOE-Order 5481.1B Date: 6/1/95 ☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-8	SI0151 (Pg A-7)	IN SCENARIO: DELETE THE WORDS "DIESEL FUEL"	Agree - comment included	RES 6.20.95

5. Comments by:

Russell E. Hlye

Date:

JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

1. Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
Document Number: BAB000000-01717-0200-00003 Governing Document: DOE-Order 5481.1B Date: 6/1/95 ☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-9	SI0152 (Pg A-10)	IN MITIGATION DOCUMENTATION: ADD RCRA TO SECTION 4	Agree - comment incorporated	Ref 6-20-95

5. Comments by: _____ Date: JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

1. Document Title: Design Package 1E System Safety Analysis

Draft/Revision: 0A ☐ Q

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2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-10	SI0156 (Pg A-18)	ADD SPECIFICATION SECTION 01800 TO MITIGATION DOCUMENTATION. THIS COMMENT APPLIES TO SI0157, PAGE A-20.	Agree - comments incorporated	OK 6-20-95

5. Comments by:

Arnold E. Hylle

Date:

JUNE 13, 1995

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT REVIEW RECORD COMMENT SHEET

1. Document Title: Design Package 1E System Safety Analysis Draft/Revision: 0A ☐ Q
Document Number: BAB000000-01717-0200-00003 Governing Document: DOE-Order 5481.1B Date: 6/1/95 ☒ Non Q

2. NO. CODE	3. SECT./ PARA.	4. COMMENT	6. RESPONSE	7. ACCEPT
SM-11	SI0163 (Pg. A-32) SI0165 (Pg. A-36)	DELETE REFERENCE TO SPECIFICATION SECTION 15483 FOR THESE TMD SCENARIOS.	Agree - Comment incorporated	Q& 6-20-95

5. Comments by: Russell E. Flye Date: JUNE 13, 1995

Participant M&O
Database - TRW
Prepared - 9-NOV-94:14:33:12

Yucca Mountain Site Characterization Project
Planning and Control System (PACS)
Participant Planning Sheet (PSA03)

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Inc. Dollars in Thousands (Unesc.)

P&S Account - 1.2.1.8 M&O
P&S Account Title - Specialty Engineering
PWBS Element Number - 1.2.1.8
PWBS Element Title - Specialty Engineering

Baseline Start - 01-oct-1994
Baseline Finish - 30-sep-1995

QA - YES

					Fiscal Year Distribution								At
Annual Budget	Prior	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	Future Complete	
	0	649	0	0	0	0	0	0	0	0	0	649	

Statement of Work

QARD Applies to the effort.
All deliverables accepted in accordance with DOE procedures for acceptance reviews unless otherwise noted.

COORDINATE, SUPERVISE, AND DIRECT THE RAM, HUMAN FACTORS, AND SYSTEM SAFETY ACTIVITIES TO SUPPORT THE ESF DESIGN AND CONSTRUCTION.

PROVIDE RELIABILITY, AVAILABILITY AND MAINTAINABILITY SUPPORT FOR THE ESF, GENERAL SUPPORT FACILITIES COMPLEX, REPOSITORY AND WASTE PACKAGE. DEVELOP/REVISE AND ALLOCATE RAM REQUIREMENTS, REVISE RAM PLAN AS REQUIRED AND PERFORM FMEA/FMECA AS REQUIRED TO SUPPORT THE DESIGN AND SYSTEM SAFETY ANALYSIS EFFORTS.

PROVIDE SYSTEM SAFETY SUPPORT FOR ESF AND GENERAL SUPPORT FACILITY COMPLEX DESIGNS, REPOSITORY AND WASTE PACKAGE ACD. DEVELOP/REVISE AND ALLOCATE SYSTEM SAFETY REQUIREMENTS. REVISE PROJECT SYSTEM SAFETY PLAN AS REQUIRED. SYSTEM SAFETY IS A MUST TO ENSURE SAFETY ISSUES ARE ADDRESSED IN THE DESIGN PROCESS.

PROVIDE HUMAN ENGINEERING SUPPORT FOR THE PROJECT DESIGN EFFORT. TASK WILL INCLUDE ESTABLISHING/REVISING HUMAN FACTORS REQUIREMENTS AND ALLOCATION OF THE REQUIREMENTS TO THE DESIGN PACKAGES. SUPPORT INCLUDES ESF DESIGN, REPOSITORY AND WASTE PACKAGE ACD, GENERAL SUPPORT FACILITIES COMPLEX AND SAFETY ANALYSES. HUMAN FACTORS ENGINEERING WILL PARTICIPATE IN THE DESIGN TO ENSURE REQUIREMENTS ARE INCORPORATED INTO THE DESIGN. HUMAN FACTOR MUST BE AVAILABLE TO COMPLETE THE SYSTEM SAFETY ANALYSIS AND ENSURE HUMAN FACTORS ISSUES ARE PROPERLY ADDRESSED IN THE DESIGN PROCESS.

CONDUCT SYSTEM SAFETY ANALYSES ON THE ESF PACKAGES 8A, 1E, AND GHOST DANCE FAULT. COMPLETED ANALYSES ARE REQUIRED 30 DAYS AFTER THE 90% DESIGN REVIEW CLOSE OUT.

DEVELOP A PROCEDURE FOR COMPLETING SYSTEM SAFETY ANALYSES AND DELIVER FOR AP-6.2 REVIEW ON 10/31/94.

UPDATE AND REVISE THE ESF PACKAGES 2B, 1C AND 2C SYSTEM SAFETY ANALYSES TO REFLECT THE RELEASED DESIGN.

CONDUCT A SYSTEM SAFETY ANALYSIS ON THE TBM MAPPING GENTRY.

DEVELOP SYSTEM SAFETY PLAN.

DEVELOP SYSTEM SAFETY ANALYSIS PROCEDURE.

PERFORM HUMAN FACTORS ANALYSES ON THE ESF DESIGN PACKAGES 8A AND 1E. REVISE AND UPDATE THE ESF DESIGN PACKAGE 2C HUMAN FACTORS ANALYSES TO REFLECT THE RELEASED DESIGN.

Participant M&O
Database - TRW
Prepared - 9-NOV-94:14:33:12

Yucca Mountain Site Characterization Project
Planning and Control System (PACS)
Participant Planning Sheet (PSA03)

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Inc. Dollars in Thousands (Unesc.)

TR18 Specialty Engineering (continued)
DEVELOP AND DELIVER HUMAN FACTORS PROJECT PLAN.

DELIVERABLES

Deliv ID	Description/Completion Criteria	Due Date
TM123	SYSTEM SAFETY ANALYSIS PROCEDURE Criteria - TM123 - DEVELOP A PROCEDURE FOR COMPLETING SYSTEM SAFETY ANALYSES FOR AP-6.2 REVIEW BY 10/31/94.	23-dec-1994
TM126	SYS SAFETY ANALYSIS FOR PCK 8A Criteria - TM126 - COMPLETE THE SYSTEM SAFETY ANALYSIS FOR REVIEW WITH THE DESIGN PACKAGE. COMPLETED ANALYSIS TO BE SUBMITTED WITHIN 30 DAYS AFTER THE DESIGN REVIEW CLOSE OUT.	30-sep-1995
TM127	SYS SAFETY ANA FOR DESIGN PCK 1E Criteria - TM127 - COMPLETE THE SYSTEM SAFETY ANALYSIS FOR REVIEW WITH THE DESIGN PACKAGE. COMPLETED ANALYSIS TO BE SUBMITTED WITHIN 30 DAYS AFTER THE DESIGN REVIEW CLOSE OUT.	31-may-1995
TM133	SAFETY ANALYSES FOR 2B & 1C UPDATE Criteria - TM133 - UPDATED AND REVISED 2B & 1C SAFETY ANALYSES TO REFLECT THE RELEASED DESIGN.	22-dec-1994
TM134	HUMAN FACTORS PROJECT PLAN (PRELIMINARY) Criteria - TM134 - DEVELOP THE HUMAN FACTORS PROJECT PLAN AND PROVIDE FOR AP 6.2 REVIEW BY 7/31/95,,	28-jul-1995
TM139	HFE DESIGN PACKAGE 2C UPDATE Criteria - TM139 - THE HUMAN ENGINEERING ANALYSIS WILL BE DELIVERED FOR REVIEW WITH THE DESIGN PACKAGE AT THE 90% DESIGN REVIEW.	27-feb-1995
TM145	HFE ANALYSIS PACKAGE 8A Criteria - TM145 - THE HUMAN ENGINEERING ANALYSIS WILL BE DELIVERED FOR REVIEW WITH THE DESIGN PACKAGE AT THE 90% DESIGN REVIEW.	28-sep-1995
TM146	HFE PACKAGE 1E Criteria - TM146 - THE HUMAN ENGINEERING ANALYSIS WILL BE DELIVERED FOR REVIEW WITH THE DESIGN PACKAGE AT THE 90% DESIGN REVIEW.	28-apr-1995
TM199W	SAFETY ANALYSES FOR 2C UPDATE Criteria - TM199W - UPDATED AND REVISED PACKAGE 2C SYSTEMS SAFETY ANALYSES TO REFLECT THE RELEASED DESIGN.	27-feb-1995

Participant M&O
Database - TRW
Prepared - 9-NOV-94:14:33:12

Yucca Mountain Site Characterization Project
Planning and Control System (PACS)
Participant Planning Sheet (PSA03)

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Inc. Dollars in Thousands (Unesc.)

TR18 Specialty Engineering (continued)

DELIVERABLES

Deliv ID	Description/Completion Criteria	Due Date
TM199X	MAPPING GENTRY SYSTEM SAFETY ANALYSES Criteria - TM199X - SUBMITTED ANALYSES DELINEATES THE SAFETY EVALUATION AND CRITERIA NECESSARY TO PERFORM THE MAPPING GENTRY.	22-dec-1994
TR60	YMP SYSTEM SAFETY PLAN Criteria - THE SYSTEM SAFETY PLAN WILL DEFINE THE SYSTEM SAFETY PROGRAM FOR THE YUCCA MOUNTAIN PROJECT (YMP). IT WILL IDENTIFY THE INTERFACES AND METHODOLOGY REQUIRED TO ENSURE SAFETY IS DESIGNED INTO YMP FACILITIES, SYSTEMS, AND EQUIPMENT. COMPLETED SYSTEM SAFETY PLAN DELIVERED TO DOE FOR APPROVAL FOR 6.2 REVIEW.	23-dec-1994

Approvals

Dennis C. Raza 11/14/94
Technical Reviewer Date

John A. Jany 11/20/94
QA Reviewer Date