Complete Only Applicable Items

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4. Title:
Classification of the MGR Health Safety System

5. Document Identifier (including Rev. No. and Change No., if applicable):
ANL-HSS-SE-000001 REV 00

6. Total Attachments:
Three (3)

7. Attachment Numbers - No. of Pages in Each:
I-1, II-4, III-2

8. Originator
Jo A. Ziegler

9. Checker
Donald A. Kalinich

10. Lead/Supervisor
Thomas D. Dunn

11. Responsible Manager
Dealis W. Gwyn

12. Remarks:
This analysis contains To Be Verified (TBV) design input as follows: TBV-228.

The DI for this document was previously BCB000000-01717-0200-00027 REV 00.

This analysis bases the classification of Monitored Geologic Repository structures, systems and components on the criteria of proposed rule 10 CFR 63 (64 FR 8640). A review has determined that the changes made to proposed rule 10 CFR 63 by Interim Guidance Pending Issuance of New U. S. Nuclear Regulatory Commission (NRC) Regulations for Yucca Mountain, Nevada (Dyer 1999) do not impact the classifications made in this analysis.
2. Analysis or Model Title:
Classification of MGR Health Safety System

3. Document Identifier (including Rev. No. and Change No., if applicable):
ANL-HSS-SE-000001 REV 00

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TABLES

1. Health Safety System QA Classification ..................................................................................... 7
1. PURPOSE

The purpose of this analysis is to document the Quality Assurance (QA) classification of the Monitored Geologic Repository (MGR) health safety system structures, systems and components (SSCs) performed by the MGR Safety Assurance Department. This analysis also provides the basis for revision of YMP/90-55Q, Q-List (YMP 1998). The Q-List identifies those MGR SSCs subject to the requirements of DOE/RW-0333P, Quality Assurance Requirements and Description (QARD) (DOE 1998).

This QA classification incorporates the current MGR design and the results of the Preliminary Preclosure Design Basis Event Calculations for the Monitored Geologic Repository (CRWMS M&O 1998a).

2. QUALITY ASSURANCE

This analysis is subject to the requirements of the QARD (DOE 1998) as determined by procedures QAP-2-0, Conduct of Activities, and NLP-3-18, Documentation of QA Controls on Drawings, Specifications, Design Analyses, and Technical Documents. Design Basis Event Definition & Analysis/QA Classification Analysis (1.2.1.11) Activity Evaluation (CRWMS M&O 1999a) presents the QAP-2-0 activity evaluation addressing the QA classification of MGR SSCs. This analysis is performed in accordance with procedures QAP-2-3, Classification of Permanent Items, and AP-3.10Q, Analyses and Models, and provides input to the design of SSCs included on the Q-List (YMP 1998). Unverified design inputs are identified and tracked in accordance with NLP-3-15, To Be Verified (TBV) and To Be Determined (TBD) Monitoring System.

3. COMPUTER SOFTWARE AND MODEL USAGE

This analysis uses no software which is required to be controlled in accordance with procedure AP-SI.1Q, Software Management.

4. INPUTS

4.1 PARAMETERS

The offsite radiological consequences of MGR Category 1 and 2 design basis events (DBEs), as calculated in Preliminary Preclosure Design Basis Event Calculations for the Monitored Geologic Repository (CRWMS M&O 1998a), are utilized in the QA classification of MGR SSCs. These results represent a conservative evaluation of MGR DBEs and the best information available. As discussed in Section 6.1 of this analysis, NUREG-1318, Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements (NRC 1998, Section 4.2(a)) allows the use of engineering judgement and conservative bounding assumptions in the QA classification of facility SSCs when data sources are limited. Also, procedure YAP-2.7Q, Item Classification and Maintenance of the Q-List (Attachment 3, Section a), directs the use of the highest level of detail available to support the conclusion of the QA classification analysis.
Currently, no DBEs associated with this system are identified by the preliminary DBE calculations (CRWMS M&O 1998a).

4.2 CRITERIA

The criteria used in the QA classification of MGR SSCs are provided in procedure QAP-2-3 as discussed in Section 6.1. These criteria satisfy the requirement of Section 2.2.2, Classifying Items, of DOE/RW-0333P (DOE 1998).

4.3 CODES, STANDARDS, AND REGULATIONS


5. ASSUMPTIONS

This analysis assumes that the health safety system monitors, tests and manages personnel exposure to hazardous substances by monitoring the operational personnel areas for hazardous materials; providing emergency and maintenance breathing air; performing physical surveys and providing isolation areas for personnel contaminated with hazardous materials; and decontaminating personnel in response to emergency situations involving hazardous material (TBV-228). This analysis also assumes that the MGR architecture is established by Monitored Geologic Repository Architecture (CRWMS M&O 1999b) and that MGR operations are described by Monitored Geologic Repository Concept of Operations (CRWMS M&O 1998b). The assumption that the function of the system and the system architecture are preliminary and subject to future enhancements is utilized in Section 6.2 to define the system design configuration and functions, and is tracked by TBV-228.

6. ANALYSIS

6.1 METHOD

The basic process for classifying MGR permanent SSCs is provided by procedure QAP-2-3. Guidance provided by procedure YAP-2.7Q is also used in this analysis. The process consists of establishing the configuration and function of MGR SSCs and identifying the effect of the SSC on MGR radiological safety. This information is then evaluated against criteria provided in QAP-2-3 to determine the QA classification of the particular item. The classification criteria are provided in the form of checklists in procedure QAP-2-3. A copy of these criteria checklists is provided in Attachment II. The following classification categories are specified by QAP-2-3 to meet the requirements of Section 2 of the QARD (DOE 1998).
Quality Level 1 (QL-1) Those SSCs whose failure could *directly* result in a condition adversely affecting public safety. These items have a high safety or waste isolation significance.

Quality Level 2 (QL-2) Those SSCs whose failure or malfunction could *indirectly* result in a condition adversely affecting public safety, or whose *direct* failure would result in consequences in excess of normal operational limits. These items have a low safety or waste isolation significance.

Quality Level 3 (QL-3) Those SSCs whose failure or malfunction would not significantly impact public or worker safety, including those defense-in-depth design features intended to keep doses ALARA (As Low As is Reasonably Achievable). These items have a minor impact on public and worker safety and waste isolation.

Conventional Quality (CO) Those SSCs not meeting any of the criteria for Quality Levels 1, 2, or 3. Conventional quality items are not subject to the requirements of the QARD.

This analysis method is based on an iterative design-classification process where each analysis iteration is considered a final product for that phase of design. In this case, the system design and the DBE analysis are evaluated to determine which of the system’s SSCs require design control under the QA program. The analysis presented in this document, therefore, will be reevaluated as necessary using a methodology appropriate to the level of DBE analysis and system design detail. This approach is consistent with NUREG-1318, *Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements* (NRC 1998, Section 4.2(a)), which allows engineering judgement and conservative bounding assumptions to be used in cases where data are limited.

6.2 MGR DESIGN CONFIGURATION AND ARCHITECTURE

Prior to the QA classification of MGR SSCs, the system design configuration as well as the function of system’s SSCs are established. Verification of system functions is tracked by TBV-228. In the process of QA classification, if two or more subsystems perform similar functions or are similarly classified, these subsystems are classified as a group under the higher level system and not listed individually.

6.3 DESIGN BASIS EVENT ANALYSIS

A preliminary analysis of MGR DBEs (CRWMS M&O 1998a) has been performed to determine the effects of internal and external events on facility radiological safety and is utilized by this analysis in the classification of MGR SSCs. The DBE analysis addresses both the DBE frequencies and dose consequences at the site boundary.
This analysis utilizes the results of the DBE analysis to evaluate MGR SSCs against the classification criteria of procedure QAP-2-3.

6.4 QUALITY ASSURANCE CLASSIFICATION OF MGR SSCs

The MGR SSCs are evaluated against the criteria of QAP-2-3 to determine the item QA classification level. The results of the MGR preliminary DBE calculations (CRWMS M&O 1998a) are utilized in this evaluation.

7. CONCLUSIONS

7.1 MGR QA CLASSIFICATION

The results of this QA classification analysis are provided in Table 1. This analysis is based on current MGR system design and the preliminary DBE analysis (CRWMS M&O 1998a). As the design of the MGR proceeds and further analyses of MGR hazards are performed, this classification analysis will be reviewed for impact and revised as necessary. The MGR classification checklists included in procedure QAP-2-3 are reproduced in Attachment II. The basis for the classification evaluation is provided in Attachment III.

Table 1. Health Safety System QA Classification

<table>
<thead>
<tr>
<th>Health Safety System (HSS)</th>
<th>QL-1</th>
<th>QL-2</th>
<th>QL-3</th>
<th>CQ</th>
<th>TBV</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>228</td>
</tr>
</tbody>
</table>

7.2 IMPACT OF UNVERIFIED DATA

This analysis is based on system design and configuration information that has not been issued as a system description document (SDD). Use of unverified SDD information is being tracked by TBV-228. The impact of TBV-228 on the classification of the SCCs of this system is expected to be minor. The functions of the system are developed and major changes are not expected. Future development of draft SDDs may result in changes to the system architecture, however, this is not necessarily associated with QA classification changes. Changes in architecture will be incorporated as the SDDs are approved.

8. REFERENCES

8.1 DOCUMENTS CITED


Civilian Radioactive Waste Management System
Management & Operating Contractor
8.2 CODES, STANDARDS, AND REGULATIONS


8.3 PROCEDURES

AP-3.10Q, Rev. 0, ICN 0. Analyses and Models. ACC: MOL.19990225.0335.

AP-SI.1Q, Rev. 1, ICN 0. Software Management. ACC: MOL.19990520.0164.

NLP-3-15, Rev. 5. To Be Verified (TBV) and To Be Determined (TBD) Monitoring System. ACC: MOL.19981117.0148.
9. ATTACHMENTS

Attachment I  Acronyms
Attachment II MGR Classification Checklists
Attachment III MGR QA Classification
Attachment I

Acronyms

ALARA As Low As is Reasonably Achievable
CFR Code of Federal Regulations
CQ Conventional Quality
CRWMS Civilian Radioactive Waste Management System
DBE Design Basis Event
DOE U. S. Department of Energy
M&O Management and Operating Contractor
MGR Monitored Geologic Repository
NLP Nevada Line Procedure
NRC U. S. Nuclear Regulatory Commission
QA Quality Assurance
QAP Quality Administrative Procedure
QARD Quality Assurance Requirements and Description
QL Quality Level
SDD System Description Document
SSCs Structures, Systems, and Components
TBD To Be Determined
TBV To Be Verified
TEDE Total Effective Dose Equivalent
YAP YMP Administrative Procedure
YMP Yucca Mountain Site Characterization Project

Civilian Radioactive Waste Management System
Management & Operating Contractor
### Importance to Safety or Waste Isolation Evaluation

**Pre-Screening Checklist**

*Complete only applicable items.*

<table>
<thead>
<tr>
<th>1. Classification Analysis ID:</th>
<th>2. SDD/SSC Evaluated:</th>
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<th>3. Description of SDD/SSC (or reference):</th>
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<table>
<thead>
<tr>
<th>4.</th>
<th>PS1. Is the item directly or indirectly relied upon to provide one of the following Important to Safety functions for radioactive wastes received or handled?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Confinement or containment</td>
</tr>
<tr>
<td></td>
<td>b. Criticality control</td>
</tr>
<tr>
<td></td>
<td>c. Shielding</td>
</tr>
<tr>
<td></td>
<td>d. Heat transfer</td>
</tr>
<tr>
<td></td>
<td>e. Structural integrity</td>
</tr>
<tr>
<td></td>
<td>f. Operations support necessary for waste handling safety (refer to Quality Level 3 checklists in Attachments II, III, or IV for guidance)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.</th>
<th>PS2. Is the item directly or indirectly relied upon to provide an Important to Waste Isolation function?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>6.</th>
<th>Do the answers to Blocks 4 and 5 indicate the need for an Importance to Safety evaluation?</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>7. Comments/Justification:</th>
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**Civilian Radioactive Waste Management System**

Management & Operating Contractor
## MGR Quality Level 1 Checklist

<table>
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<tr>
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<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Preclosure Phase:</strong></td>
<td></td>
</tr>
<tr>
<td>1.1. Can failure of the item directly result in loss of waste package containment or criticality control for the spent nuclear fuel, high-level wastes, or other radioactive materials received for emplacement at the MGR?</td>
<td></td>
</tr>
<tr>
<td>1.2. Is the item required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 100 mrem Total Effective Dose Equivalent (TEDE), per event, to any member of the public located on or beyond the site boundary (10 CFR 63.111(b)(1) and 20.1301(a)(1))? Category 1 DBE &quot;per event&quot; limits are interpreted as the sum of the normal operating dose and anticipated operational occurrences plus the consequences from any single additional low frequency Category 1 DBE. This sum is stated on an annual basis and consistent with 10 CFR 63.111(a) or 10 CFR 20.</td>
<td></td>
</tr>
<tr>
<td>1.3. Is the item required to prevent or mitigate a Category 2 DBE that could result in offsite doses greater than or equal to 5 rem TEDE, 50 rem combined deep dose equivalent and committed dose equivalent to any individual organ or tissue (other than the lens of the eye), 15 rem dose equivalent to the lens of the eye, or 50 rem shallow dose equivalent to the skin, per event (10 CFR 63.111(b)(2)) to any individual located on or beyond any point on the boundary of the site?</td>
<td></td>
</tr>
<tr>
<td><strong>5. Postclosure Phase:</strong></td>
<td></td>
</tr>
<tr>
<td>1.4. Does the item perform a waste isolation function that is required to meet the performance objectives in 10 CFR 63.113(b)?</td>
<td></td>
</tr>
<tr>
<td>a. forming part of the natural barriers or an engineered barrier system required by 10 CFR 63.113(a)?</td>
<td></td>
</tr>
<tr>
<td>b. being directly credited in the performance assessments required by 10 CFR 63.113(c) and 10 CFR 63.113(d) to demonstrate the ability of the geologic repository to limit expected annual dose to the average member of the critical group to less than 25 mrem TEDE at any time during the first 10,000 years after permanent closure?</td>
<td></td>
</tr>
<tr>
<td>6. Do the answers to Blocks 4 and 5 qualify the item as a Quality Level 1 item?</td>
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</tr>
<tr>
<td>7. Comments/Justification:</td>
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</tr>
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</table>

**QA-2-3 (Effective 06/26/1999)**

0973 (Rev. 05/06/1998)

Civilian Radioactive Waste Management System

Management & Operating Contractor
Importance to Safety or Waste Isolation Evaluation 
for MGR

Complete only applicable items.

MGR Quality Level 2 Checklist

<table>
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<tr>
<th>Yes</th>
<th>No</th>
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</table>

8. Preclosure Phase:

2.1. Does the item function to provide control and management (i.e., collection and/or confinement) of site-generated liquid, gaseous, or solid low-level or mixed radioactive waste?

NOTE: Systems with trace concentration of radionuclides, the failure of which could result in offsite doses less than 0.25 mrem per year, are not considered to perform radioactive waste management or control functions for the purpose of this quality level determination.

2.2. Does the item provide fire detection, fire suppression, or otherwise protect the important-to-radiological safety or waste isolation functions of Quality Level 1 SSCs from the hazards of a fire?

2.3. As a result of a DEE, could consequential failure of the item, which is not intended to perform a Quality Level 1 radiological safety function, prevent Quality Level 1 SSCs from performing their intended radiological safety function?

2.4. Is the item required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 25 mrem TEDE per event, to any member of the public located on or beyond the site boundary (10 CFR 63.111(a) and 10 CFR 20.1301(a)(1))? Category 1 DBE "per event" limits are interpreted as the sum of the normal operating dose and anticipated operational occurrences plus the consequences from any single additional low frequency Category 1 DBE. This sum is stated on an annual basis and consistent with 10 CFR 63.111(a) or 10 CFR 20.

2.5. Is the item, in conjunction with an additional item or administrative control (i.e., indirect impact), required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 100 mrem TEDE, per event, to any member of the public located on or beyond the site boundary? Category 1 DBE "per event" limits are interpreted as the sum of the normal operating dose and anticipated operational occurrences plus the consequences from any single additional low frequency Category 1 DBE. This sum is stated on an annual basis and consistent with 10 CFR 63.111(a) or 10 CFR 20.

2.6. Is the item, in conjunction with an additional item or administrative control (i.e., indirect impact), required to prevent or mitigate a Category 2 DBE that could result in offsite doses greater than or equal to 5 rem TEDE, 50 rem combined deep dose equivalent and committed dose equivalent to any individual organ or tissue (other than the lens of the eye), 15 rem dose equivalent to the lens of the eye, or 50 rem shallow dose equivalent to the skin, per event, to any individual located on or beyond any point on the boundary of the site?

9. Postclosure Phase:

2.7. As a result of a DEE, could consequential failure of the item, which is not intended to perform a Quality Level 1 waste isolation function, result in:

a. the inability of Quality Level 1 engineered barriers to perform their intended long-term waste isolation function in the postclosure phase?

b. long-term changes to the hydrological characteristics of natural barriers by creating significant ponding or the possibility of drainage into the postclosure underground?

c. the introduction of fluids or other materials that could adversely affect the long-term geo-mechanical characteristics of natural barriers in the postclosure phase?

d. compromising the ability of the natural barriers to isolate waste in the postclosure phase?

10. Do the answers to Blocks 8 and 9 qualify the item as a Quality Level 2 item?
# Importance to Safety or Waste Isolation Evaluation for MGR

*Complete only applicable items.*

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## MGR Quality Level 3 Checklist

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<td>12.</td>
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<tr>
<td>3.1.</td>
<td>Does the item function to provide an alarm to warn of significant increases in radiation levels or concentrations of radioactive material?</td>
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<tr>
<td>3.2.</td>
<td>Does the item function to monitor variables to verify that operating conditions are within technical specification limits?</td>
<td></td>
</tr>
<tr>
<td>3.3.</td>
<td>Is the item used in MGR emergency response to provide prompt evacuation of personnel, or to monitor variables used in helping to determine the cause or consequences of DBEs (during post-accident investigations)?</td>
<td></td>
</tr>
<tr>
<td>3.4.</td>
<td>Does the item function as a part of the radiological, meteorological, or environmental monitoring systems required to assess radionuclide release or dispersion following a DBE?</td>
<td></td>
</tr>
<tr>
<td>3.5.</td>
<td>Is the item part of the design or design objectives for keeping levels of radioactive material in effluent to unrestricted areas as low as practicable during normal operations?</td>
<td></td>
</tr>
<tr>
<td>3.6.</td>
<td>Is the item required to limit onsite worker doses from normal operations and during Category 1 DBEs, including planned recovery operations, to less than 5 rem per year TEDE, 50 rem per year combined deep dose equivalent and committed dose equivalent to any individual organ or tissue (other than the lens of the eye), 15 rem per year dose equivalent to the lens of the eye, or 50 rem per year shallow dose equivalent to the skin or any extremity?</td>
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### 13.

Do the answers to Block 12 qualify the item as a Quality Level 3 item?

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### 15.

Do the answers to Block 12 qualify the item as a Quality Level 3 item?

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<td>16.</td>
<td>Comments/Justification:</td>
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Civilian Radioactive Waste Management System

Management & Operating Contractor
This item is not directly or indirectly relied upon to provide one of the following Important to Safety functions for radioactive wastes received or handled at the MGR: confinement or containment, criticality control, shielding, heat transfer, structural integrity, or operations support necessary for waste handling safety.

This item is not directly or indirectly relied upon to provide an Important to Waste Isolation function.

If only No answers are given, the item is not subject to QARD requirements. The item is classified as CQ and an Importance to Safety or Waste Isolation evaluation is not required. Stop Here.

### QL1 - Quality Level 1: High Safety or Waste Isolation Significance

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### QL2 - Quality Level 2: Low Safety or Waste Isolation Significance

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**QL3 - Quality Level 3: Minor Safety Significance or Occupational Exposure Significance**

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