

APPENDIX B

WITHDRAWN ASSUMPTIONS

9902240399 - Part 3

WITHDRAWN ASSUMPTIONS

The list below shows the identification numbers of assumptions that have been withdrawn in previous and current revisions. Assumption Rationale Sheets for these assumptions are contained in this appendix.

I	Key	006, 007, 010, 012, 014, 015, 018, 020, 021, 025, 026, 027, 028, 029, 032, 033, 034, 035, 036, 037, 038, 040, 041, 042, 043, 044, 045, 048, 049, 050, 051, 052, 054, 056, 062, 072
I	EBDRD	3.1.5.E, 3.2.3.5, 3.2.5.1.2.B.1.a-d, 3.3.9.A, 3.3.9.B, 3.4.2, 3.7.C, 3.7.F, 3.7.1.F, 3.7.1.1.G, 3.7.1.4
I	RDRD	3.2.1.6 D, 3.7.5.A.5
I	DCS	002, 003, 004, 005, 006, 007, 009, 010, 014, 015, 016, 017, 018
I	DCSS	002, 003, 004, 007*, 008*, 011*, 012*, 013, 021, 024*, 026, 034, 035
I	DCWP	003, 004, 005, 006
	TDS	001, 005, 009, 010, 011, 012, 013, 014, 015
	TDSS	013, 014, 015, 016*, 018, 019, 020, 023, 024
	REQSE	001, 002, 003
I	ALT	022, 025

* Never Issued

INTENTIONALLY LEFT BLANK

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 006(W)

Subject: MGDS Waste Receipt Period

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Covered by Key Assumptions 001, 002, 003.

II. BACKGROUND

Rev. 00

Waste Type and Quantity

Receipt at MGDS starting 2010 and ending 2033.

Requesting M&O organization: ☒ Surface, ☒ Subsurface, ☒ Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

In accordance with Nuclear Waste Policy Act, OCRWM Mission Plan, MPC concept, Proposed Program Approach, and MGDS Requirements Document and supporting requirements documents.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

☐ No Substantiation Required

☐ Substantiation Date _____

☒ Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 007(W)

Subject: No MPC Repackaging for
Heat Load Tailoring

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Consolidated with the Rationale for Key Assumption 003.

II. BACKGROUND

Rev. 00

Waste Type and Quantity

No repackaging of MPCs for purposes of heat load tailoring.

Requesting M&O organization: ☒ Surface, () Subsurface, ☒ Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Removes one performance objective to permit MPC and repository design criteria to proceed.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

In accordance with Nuclear Waste Policy Act, OCRWM Mission Plan, MPC concept, Proposed Program Approach, and MGDS Requirements Document and supporting requirements documents.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 010(W)

Subject: Subsurface WP Transport

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Subsurface rail transport has been incorporated in the baseline design. See the following drawings that have been baselined by the Level 3 Configuration Control Board: BCAF00000-01717-2700-85001 *Waste Package Transporter Plan and Elevations* and BCAF00000-01717-2700-85010 *Emplacement Gantry Interfaces, Emplacement Drift Plan & Elevations*.

Rail transport will be used for subsurface transport of waste packages.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Analysis and Modeling

Need for assumption (statement of intended use):

Establishes likely subsurface transportation mode to permit focused subsurface design to proceed without rubber tire transport options.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Rail system is:

- Compatible with handling of the current 21 and 12 PWR waste package.
- Well suited to in-drift emplacement mode.
- Ideal for supplying tunnel boring machine (TBM) operation and transportation of personnel.
- Repository subsurface gradient will allow use of rail system.
- Highly suitable for remote handled or automated operations.

**Controlled Design Assumption
Assumption Rationale Sheet**

| Assumption Identifier: Key 010(W) (continued)

Subject: Subsurface WP Transport

| **IV. RESPONSIBILITY AND WITHDRAWAL**

| Responsible Management and Operating Contractor (M&O) organization: Subsurface

| Document(s) Supporting Withdrawal of Assumption:

| BCAF00000-01717-2700-850001 and BCAF00000-01717-2700-85010

| Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 012(W)

Subject: Use of Robotics

I. STATEMENT OF ASSUMPTION

WITHDRAWN. This is a valid statement of design philosophy rather than a design assumption.

Use of robotics and/or remote control will be maximized to achieve the concept of ALARA (as low as reasonably achievable).

II. BACKGROUND

Requesting M&O organization: ☒ Surface, ☒ Subsurface, () Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Establishes the need to investigate practical uses of robotics and remote handling in MGDS operations.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

RDRD (YMP/CM-0023): GROA shall to the extent practicable achieve occupational doses that are ALARA.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Subsurface, Surface

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 014(W)

Subject: Preclosure Monitoring Activities - Robotics

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Included in Key Assumption 013.

II. BACKGROUND

Rev. 00

Surface Robotics

Robotics may be used to perform routine monitoring activities during the preclosure period.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Repository Design Requirement Document (RDRD) (YMP/CM-0023): GROA shall, to the extent practical, *achieve occupational* doses that are as low as reasonably achievable (ALARA).

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Subsurface

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 015(W)

Subject: Remote Handling Systems

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Included in Key Assumptions 012 and 013.

II. BACKGROUND

Rev. 00

Sub Surface Robotics

Remote handling systems will be used for operations not applicable to robotics and will provide a safe recovery and back up method for robotics systems.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Repository Design Requirement Document (RDRD) (YMP/CM-0023): GROA shall, to the extent practical, *achieve occupational doses* that are ALARA.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Subsurface

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 018(W)

Subject: Storage of Retrieved Packages

I. STATEMENT OF ASSUMPTION

WITHDRAWN. Retrieval design assumptions will be made when retrieval plans are specified.

Repository design will allow for the possibility of constructing facilities for temporary or lag storage storing of retrieved waste packages, if required.

II. BACKGROUND

Requesting M&O organization: ☒ Surface, () Subsurface, () Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Maintains the possible performance objective and dictates the need to allocate site space for this function.

This allocation should be coordinated with the possibility of an interim storage or thermal lag storage.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Consistent with Program Approach assumptions.
Meets 10 CFR 60 and DOE requirements.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Surface

☒ No Substantiation Required

☐ Substantiation Date _____

☒ Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 020(W)

Subject: Thermal Load Decision Date

I. STATEMENT OF ASSUMPTION

WITHDRAWN - See Key Assumption 019.

II. BACKGROUND

Rev. 02A

Repository Thermal Load

A preliminary repository operational thermal load decision will be made by 2008 license application update.

Final Thermal Load confirmation will be made during operations.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

- Premature to select thermal loading before heater testing complete.
- Proposed Program Approach (PPA) includes decision and confirmation times.
- Provide flexibility and cost effectiveness in repository layout.
- Preliminary analyses indicate a less favorable repository performance at intermediate thermal loads.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 021(W)

Subject: Performance Confirmation Areas
for Thermal Loads

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Assumption is not necessary. Compatibility with Key 019 is understood.

Performance confirmation areas will be designed for the range of thermal loads, consistent with Key Assumption 019.

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Performance confirmation planning must address the range specified in Key Assumption 019.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

- Premature to select thermal loading before heater testing complete.
- Program Approach includes decision and confirmation times.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 025(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONAL

**Rationale for assumption (source author, date, and report title) or statement of reasoning
behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base
or Reference Information Base):**

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 026(W) :

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: (☐)Surface, (☐)Subsurface, (☐)Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

(☒) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 027(W)

Subject: Mechanical Tunnel Excavation

I. STATEMENT OF ASSUMPTION

WITHDRAWN- Consolidated with assumption DCSS 005. The ESF main tunnel has already been excavated by tunnel boring machine (TBM), and the Enhanced Characterization Repository Block (ECRB) cross drift is also being excavated in the ESF by TBM. Excavation by TBM is the preferred means of mechanical excavation in the tuff at Yucca Mountain, and it will be used as the primary drift excavation method in the repository, as indicated in DCSS 005.

The primary method of tunnel excavation will be mechanical.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Analysis and Modeling

Need for assumption (statement of intended use):

Limits consideration of other primary excavation methods to permit focused underground design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- 10 CFR 60.133(e)(2): Openings shall be designed to reduce deleterious rock movement.
- 10 CFR 60.133(f): Use excavation methods that limit potential for creating preferential pathways for groundwater.
- NUREG 1347, *Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain* (NRC 1989) Comment 132: Compare the alternatives of drilling, blasting, and mechanical excavation methods.
- NWTRBs First Report to Congress: Maximize use of the most modern mechanical excavation techniques in studies of tunnel excavation methods.
- Results of the Exploratory Studies Facility (ESF) Alternatives Study recommended mechanical excavation.

**Controlled Design Assumption
Assumption Rationale Sheet**

Identifier: Key 027(W) (continued)

Subject: Mechanical Tunnel Excavation

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption: Assumption DCSS 005

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 028(W)

Subject: Tunnel Drill-and-Blast Option

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Consolidated with DCSS 005. The ESF main tunnel has already been excavated by tunnel boring machine (TBM), and the Enhanced Characterization Repository Block (ECRB) cross drift is also being excavated in the ESF by TBM. Other excavation methods, including drill-and-blast, were used in other ESF openings. DCSS 005 addresses drift excavation methods for the repository, which include TBM as the primary method and other mechanical and drill-and-blast as secondary methods.

Where it is impractical to use mechanical methods, drill-and-blast may be used to a limited degree primarily in non-emplacement areas of the repository.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Analysis and Modeling

Need for assumption (statement of intended use):

Establishes limited secondary excavation alternative limitations to permit focused underground design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- 10 CFR 60.133(e)(2): Openings shall be designed to reduce deleterious rock movement.
- 10 CFR 30.133(f): Use excavation methods that limit potential for creating preferential pathways for groundwater.
- NUREG 1347, *Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain* (NRC 1989), Comment 132: Compare the alternatives of drilling and blasting and mechanical excavation methods.
- NWTRBs First Report to Congress: Maximize use of the most modern mechanical excavation techniques in studies of tunnel excavation methods.

**Controlled Design Assumption
Assumption Rationale Sheet**

| Assumption Identifier: Key 028(W) (continued) Subject: Tunnel Drill-and-Blast Option

| **IV. RESPONSIBILITY AND WITHDRAWAL**

| Responsible Management and Operating Contractor (M&O) organization: Subsurface

| Document(s) Supporting Withdrawal of Assumption: Assumption DCSS 005

| Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 029(W)

Subject: Technical Baseline Change
(Remove Rod Consolidation)

I. STATEMENT OF ASSUMPTION

WITHDRAWN - See Key Assumption 008

II. BACKGROUND

Rev. 00

Rod Consolidation

The option for rod consolidation will be removed from the Technical Baseline.

- Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

- The concept of rod consolidation was based on the premise that it would cost less to develop, build and operate the facilities and equipment necessary for consolidation than it would to buy, load and emplace the larger number of waste packages required for intact fuel assemblies.
- Many studies have been conducted to evaluate the economics, and operations and schedule impacts related to rod consolidation.
- Study findings show that fuel disposal without rod consolidation reduces life cycle costs, shortens facility construction schedules, and offers additional operational advantages.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 032(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Renumbered prior to CDA, Rev. 00.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Additional shielding for personnel protection provided on transporter and in surface facilities.

- Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g.; midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

This assumption was combined with Key Assumption 031.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 033(W)

Subject: Individual Waste Package Shielding

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Consolidated with Key Assumption 031.

II. BACKGROUND

Rev. 00

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

- Cost, size, and weight of individually shielded waste packages would be excessive.
- MGDS will meet ALARA requirements.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 034(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Rev. 00

To the extent practical, locate repository openings to avoid faults that traverse a major portion of the potential emplacement area.

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Combined into Key Assumption 023, Rev. 02A.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 035(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Rev: 00

Where avoidance cannot be reasonably achieved, for Type I faults that intersect emplacement drifts, allow 15-m standoff distance of emplaced waste packages from the edges of the fault zone.

Requesting M&O organization: (☐) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

—Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Combined into Key Assumption 023, Rev. 02A.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 036(W)

Subject: Substantially Complete Containment
(10 CFR 60.113)

I. STATEMENT OF ASSUMPTION

Substantially complete containment, as referred to in 10 CFR 60.113, will not be defined quantitatively.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Analysis and Modeling

Need for assumption (statement of intended use):

Establishes requirement flexibility to allow studies to determine optimum containment criteria. Other containment assumptions may be used to fix an assumed performance objective for design analysis criteria.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- U.S. Department of Energy (DOE) position on definition of substantially complete containment has been given to the Nuclear Regulatory Commission (NRC).
- Consistent with multi-barrier approach to waste package design.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption: Key 074

Withdrawal Date: REV 4, JCN 1

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 037(W)

Subject: Expected Waste Package Lifetime

I. STATEMENT OF ASSUMPTION

Mean waste package lifetime will be well in excess of 1000 years.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Analysis and Modeling

Need for assumption (statement of intended use):

Establishes performance objective to permit development of waste package design criteria consistent with this objective.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- Meets 10 CFR 60 requirements for substantially complete containment for 300 to 1000 years, to be later determined by the Nuclear Regulatory Commission (NRC).
- U.S. Department of Energy (DOE) position on definition of substantially complete containment has been given to the Nuclear Regulatory Commission (NRC).
- Consistent with multi-barrier approach to waste package design.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package

Document(s) Supporting Withdrawal of Assumption: Key 074

Withdrawal Date: REV 4, ICN 1

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 038(W)

Subject: Waste Packages Breached at 1000 Years

I. STATEMENT OF ASSUMPTION

The fraction of waste packages breached at 1000 years shall be less than 1 percent (see Note below).

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Analysis and Modeling

Need for assumption (statement of intended use):

Establishes performance objective useful in containment probability analysis and waste package design criteria.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- Meets 10 CFR 60 requirements for substantially complete containment for 300 to 1000 years, to be later determined by the Nuclear Regulatory Commission (NRC).

Note: The Data Source, Thomson, B. H., Waste Package Performance Allocation/ Emplacement Mode System Study (CRWMS M&O 1994d), recommends that 3000 years is necessary to meet Repository Design Requirements Document (RDRD) (YMP 1994a) Requirement 3.2.1.6.C and Engineered Barrier Design Requirements Document (EBDRD) (YMP 1994b) Requirement 3.2.1.6.B using TSPA-1993 results. The 3000-year value was arrived at primarily due to the C-14 release requirements imposed via 40 CFR 191. However, this standard was remanded. The current assumption does not take the C-14 issue into consideration; it will be modified when the issue is resolved.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption: Key 074

Withdrawal Date: REV 4, ICN 1

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 040(W)

Subject: Period of Waste Isolation

I. STATEMENT OF ASSUMPTION

WITHDRAWN -- See Key Assumption 039.

II. BACKGROUND

Rev. 02A

Criticality Control Period

Period of isolation currently 10,000 years.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

- Assumption in accordance with 10 CFR 60.131(b)(7).
- Period of isolation in accordance with 40 CFR 191.13(a).
- Period of isolation consistent with DOE recommendation to the National Academy of Sciences for the repromulgation of the EPA Standard for Yucca Mountain.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 041(W)

Subject: Receipt and Emplacement Rates

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Consolidated with Key Assumptions 001, 002, 003.

II. BACKGROUND

Rev:00

Waste Type and Quantity

Receipt and emplacement rate in accordance with MGDS Requirements Document Table 3-3. Steady state rate 3000 MTU/yr SNF, 400 MTU/yr (equivalent) HLW glass.

Requesting M&O organization: (☒) Surface, (☒) Subsurface, (☒) Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

In accordance with Nuclear Waste Policy Act, OCRWM Mission Plan, MPC concept, Proposed Program Approach, and MGDS Requirements Document and supporting requirements documents.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 042(W) **Subject:** Waste Package Materials - High Thermal Load

I. STATEMENT OF ASSUMPTION

WITHDRAWN because this is a design solution rather than an assumption (see DCWP 003 rationale).

Waste Package materials for high thermal load are:

- Inner Containment Barrier - UNS N08825 (Alloy 825).
- Outer Containment Barrier for SNF packages - UNS G10200 (ASTM A 516).
- Outer Containment Barrier for HLW packages - UNS C71500 (70/30 copper-nickel).

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, (X) Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Establishes probable waste package material to permit development of thermal performance analysis and containment probabilities.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

UNS N08825 is highly resistant to general corrosion and in many environments is resistant to localized corrosion. It was chosen as a reasonable compromise between high corrosion resistance and low cost.

USN G10200 is the corrosion allowance material for SNF packages. Although it has an appreciable atmospheric corrosion rate, it is normally not subject to localized corrosion. The material was chosen because it provides predictable corrosion rates and low cost.

UNS C71500 is the outer barrier material for (HLW) glass packages. It provides significant corrosion resistance. An iron-based material was not chosen because there is evidence that active iron-base materials will promote the degradation of the waste glass.

Materials with distinctly different compositions and corrosion mechanisms were chosen for the inner and outer barriers so that protection will be provided over a wide range of environments.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 042(W) (continued)

Subject: Waste Package Materials -
High Thermal Load

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

☐ **No Substantiation Required**

☐ **Substantiation Date** _____

☒ **Withdrawal Date** 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 043(W) **Subject:** Waste Package Materials - Low Thermal Load

I. STATEMENT OF ASSUMPTION

WITHDRAWN because this is a design solution rather than an assumption (see DCWP 003 rationale).

Waste package materials for low thermal load are:

- Inner Containment Barrier - UNS N08825 (Alloy 825).
- Middle Containment Barrier for SNF packages - UNS G10200 (ASTM A 516).
- Middle Containment Barrier for HLW packages - UNS C71500 (70/30 copper-nickel).
- Outer Containment Barrier - UNS N04400 (Monel 400).

II. BACKGROUND

Requesting M&O organization: ()Surface, ()Subsurface, (X)Waste Package Development, or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Establishes probable waste package material to permit development of thermal performance analysis and containment probabilities.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

UNS N08825 is resistant to general corrosion in oxidizing and reducing acids. In many environments it is resistant to localized corrosion. It was chosen as a reasonable compromise between high corrosion resistance and low cost.

UNS G10200 is the corrosion allowance material for SNF packages. Although it has an appreciable atmospheric corrosion rate, it is normally not subject to localized corrosion. The material was chosen because it provides predictable corrosion rates and low cost.

UNS C71500 is the outer barrier material for (HLW) glass packages. It provides significant corrosion resistance. An iron-based material was not chosen because there is evidence that active iron-base materials will promote the degradation of the waste glass.

UNS N04400 was chosen as an additional corrosion resistant barrier for low thermal load conditions. It is corrosion resistant in various environments including alkalis.

Materials with distinctly different compositions and corrosion mechanisms were chosen for the inner and outer barriers so that protection will be provided over a wide range of environments.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 043(W) (continued)

Subject: Waste Package Materials -
Low Thermal Load

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

☐ No Substantiation Required

☐ Substantiation Date _____

☒ -Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 044(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Renumbered prior to Rev. 00.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Requirements, Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

- Alloy 825 as corrosion resistant barrier recommended in LLNL survey report.
- Carbon steel (A 516) as corrosion allowance barrier and provide structural and shielding function relatively inexpensively.
- Additional barrier to resist aqueous environments needed for low thermal load case.
- Ability to fabricate and weld materials satisfactorily.
- Other similar materials are being considered as alternatives.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 045(W)

Subject: Alternative Waste Package Materials

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Required by 10 CFR 60.21.

II. BACKGROUND

Rev. 00

An alternative to each of the component materials indicated will be identified in the CDA document since containment barriers are important to waste isolation.

Requesting M&O organization: () Surface, () Subsurface, (☒) Waste Package Development, or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

Identifies a need for flexibility in materials selection for containment barrier design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Alternatives are required by 10 CFR 60.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(☒) No Substantiation Required

() Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 048(W)

Subject: Aluminum Boron in First MPC Procurement

I. STATEMENT OF ASSUMPTION

WITHDRAWN for consistency with programmatic guidance in IOC #VA.SE.GUR.8/95.016.

Aluminum-boron will be the neutron absorber basket material in the First Procurement MPCs.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, () Subsurface, (☒) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Establishes neutron absorber basket design solution to permit first procurement of MPCs.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

The MPC Design Procurement Specification contained two possible materials for the SNF basket neutron absorber: Boron or B₄C finely dispersed in austenitic stainless steel or aluminum alloy matrix. For cost and thermal reasons, it is expected that the First Procurement MPCs will use aluminum-boron (A1-B).

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 049(W) **Subject:** Aluminum Boron not Acceptable Long Term

I. STATEMENT OF ASSUMPTION

WITHDRAWN for consistency with programmatic guidance in IOC #VA.SE.GUR.8/95.016.

Aluminum-boron is not acceptable as a long-term supplemental neutron absorbing material.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☒) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Defines a performance scenario that establishes Key Assumption 048 as not achieving neutron basket performance objective. This establishes the need for further material study for neutron basket prior to second MPC procurement (see Key Assumption 050). This also establishes need for design analysis to determine remedial criteria for the First Procurement of MPCs (see Key Assumption 051).

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

- As long as the interior of the MPC remains dry or the stainless steel cladding remains intact, the neutron absorber will be protected and no difficulties are expected. However, the interior of the MPC will be filled with water during the SNF loading process and may become wet due to the failure of the disposal container and MPC shell in the presence of water in the repository. If the stainless steel cladding is perforated by corrosion, which is expected, corrosion of the aluminum will occur. Aluminum is passive in neutral solutions, but its solubility increases rapidly as pH decreases. If nitrogen is present, as is expected if water enters through a breach in the disposal container, radiolysis will produce nitric acid and cause corrosion of the aluminum. Aluminum is thermodynamically very active, and the large available surface area of the stainless steel cladding will make it an excellent cathode for bimetallic corrosion of the aluminum. Corrosion of the aluminum is expected to cause loss of integrity of the neutron absorber, which would allow the remaining boron-containing material to sift to the bottom of the package where it would no longer be effective for criticality control.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(☐) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 050(W)

Subject: MPC Redesign in Second Procurement

I. STATEMENT OF ASSUMPTION

WITHDRAWN for consistency with programmatic guidance in IOC #VA.SE.GUR.8/95.016.

At the completion of the long-term materials testing program and after approval of the revised burnup credit topical report, the second procurement MPC will be redesigned such that the basket, with burnup credit, will achieve long-term criticality control without the need to open the MPC at the Repository.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, () Subsurface, (☒) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Establishes the performance objective of eliminating the need to re-open an MPC at the MGDS, thus permitting the development of MPC design criteria to achieve this objective.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Based on Key Assumption 049. In order for the repository not to have to open MPCs, both principal isotope burnup credit and supplemental neutron absorbers are expected to be required. After completion of these activities (long-term materials testing and revised burnup credit topical report), there is expected to be an increase in the knowledge in the MGDS requirements applicable to the MPC and an increase in the confidence that the MPC design will be emplaceable. The current MGDS concept of operations for surface facilities does not include the opening of all MPCs. In order for this to be the case, a redesign of the MPC must be planned.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 051(W)

Subject: First MPC Procurement Delivery Schedule

I. STATEMENT OF ASSUMPTION

WITHDRAWN for consistency with programmatic guidance in IOC #VA.SE.GUR.8/95.016.

The arrival scenario, quantity and type of the First Procurement MPCs will be as shown in the following table.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Establishes a waste flow rate upon which remedial performance objectives can be based. Objective is to minimize impact of remedial capacity on Repository Surface Waste Handling facility design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

The schedule for resolution of several burnup credit issues is September 1998. The schedule for completion of the long-term materials testing is also September 1998. At that time, there is expected to be an increase in the knowledge in the MGDS requirements applicable to the MPC and an increase in the probability of MPC design being emplaceable. There is also expected to be a three-year time frame to redesign, certify, and procure a second-generation MPC. Based on this and some conservatism, five years worth of MPCs in the first procurement have been used. The source of the table is "Systems Logistics and Waste Stream Data for MGDS CDA Update," CRWMS M&O Interoffice Correspondence from Jim Davis, Mark Fleming, John King, and Marc Rose, March 28, 1995, VA.SA.JK.03/95.038.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

(☐) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Key 051(W)

**First MPC Procurement Delivery/Emplacement Scenario
No MRS, 2010 MGDS, OFF (FY95DDAO)**

Year	MPCs					Total
	B-LG	P-LG	B-SM	P-SM	B-in-P	
2010	0	0	1	3	0	4
2011	0	0	10	3	0	13
2012	0	0	20	3	1	24
2013	0	3	24	7	1	35
2014	8	14	2	3	0	27
2015	1	10	2	4	0	17
2016	7	17	18	6	0	48
2017	1	2	6	6	0	15
2018	4	17	5	7	0	33
2019	1	14	0	5	0	20
2020	4	8	4	7	0	23
2021	6	25	4	0	0	35
2022	3	19	2	4	0	28
2023	7	23	2	0	0	32
2024	10	28	6	0	0	44
2025	2	28	3	0	0	33
2026	3	20	0	0	0	23
2027	2	12	0	0	0	14
2028	2	7	0	0	0	9
2029	6	4	0	0	0	10
2030	3	0	0	0	0	3
2031	0	0	0	0	0	0
2032	0	0	0	0	0	0
2033	0	0	0	0	0	0
Total	70	251	109	58	2	490

Key 051(W)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 051(W) (continued)

**Subject: First MPC Procurement
Delivery Schedule**

BASIS (Ref: VA.SA.JK.03/95.038 Memo, 28 Mar 95)

- Program Approach Scenario (NO MRS).
- First Procurement MPCs in the five-year period 1998-2002 are loaded with OFF and placed in reactor-dry storage.
- Pickup from dry storage is deferred until no fuel older than 10 years remains in spent fuel pools.
- Pickup from only four trucks (no-rail) purchasing utilities are assumed.
- Waste Package heat limit for emplacement is 14.2 kW.
- Transportation Casks are derated as shown.

Cask Derating

Operation	MPC Heat Limits (kW)			
	B-LG	P-LG	B-SM	P-SM
Storage	17.60	23.90*	10.56	13.68
Transportation	12.00	14.20	7.20	8.76
Emplacement	14.20	14.20	14.20	14.20

See Key Assumptions 001 to 003 for Legend

*17.85 kW used at various sites for post-shutdown dry storage

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 052(W)

Subject: Addition of Filler Material
at the Repository

I. STATEMENT OF ASSUMPTION

WITHDRAWN for consistency with removal of multi-purpose canisters from baseline and because filler addition is no longer applicable.

The following table provides a scenario for receipt of First Procurement MPCs. The table may be used to provide an upper bound for abnormal MPCs requiring remedial operations at the repository.

II. BACKGROUND

Requesting M&O organization:

(X) Surface, () Subsurface, () Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Establishes performance objectives permitting the development of design criteria for the MPC First Procurement and the Repository Waste Handling Remedial operations.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Based on programmatic guidance documented in IOC # VA.SE.GUR.8/95.016, verification assumptions made in that IOC and complete execution of the direction, this assumption should provide an upper bound on the number of MPCs needing remedial operations at the Repository. The table is based on several considerations: 1) the assumption that five years of MPCs from the first procurement could be deployed and loaded with fuel that may not meet final disposal requirements on MPCs, 2) several criticality control related activities must occur before disposal requirements on MPCs could be finalized, e.g., completion of the Disposal Criticality Control Topical Report, approval of a Burnup Credit Topical report that would include principal isotopes (including some fission products) and completion of basket material corrosion testing, 3) the analysis in the memo indicated below. Based on these assumptions and this analysis, 113 of the first procurement MPCs will require additional criticality control measures. This number was determined by comparing each of the 544 individual MPC k_{∞} values with an estimated value that reflected the demarcation point between those MPCs that should be opened and those that did not have to be opened. This estimated value, which assumes principle isotope burnup credit and no credit for engineered neutron absorbers, varied depending on whether the MPC being evaluated was large or small, and whether it contained BWR or PWR assemblies. This analysis is described in detail in the memo from M.A. Balady, "Update to Rationale for Selection of First Procurement MPCs to be Opened," CRWMS M&O Interoffice Correspondence, LV.SEA.MB.04/95.047, April 24, 1995. The reopening of MPCs will be an off-normal

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 052(W) (continued)

Subject: Addition of Filler Material
at the Repository

operation. Adding filler additives or other reactivity control additives will also be considered an off-normal operation.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering

☐ No Substantiation Required

☐ Substantiation Date _____

☒ Withdrawal Date 9/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

**Key
052(W)**

**First MPC Procurement Requiring Opening at Repository
No MRS, 2010 MGDS, OFF (FY95DAO)**

Years*	MPCs					Total
	B-LG	P-LG	B-SM	P-SM	B-in-P	
1	0	0	0	3	0	3
2	0	0	0	3	0	3
3	0	0	0	4	0	4
4	0	1	0	7	0	8
5	0	5	0	1	0	6
6	0	4	0	0	0	4
7	0	6	0	3	0	4
8	0	0	1	0	0	1
9	0	10	0	0	0	10
10	0	6	0	1	0	7
11	0	1	0	7	0	8
12	0	18	0	0	0	18
13	0	6	0	0	0	6
14	0	1	0	0	0	1
15	0	1	0	0	0	1
16	0	9	0	0	0	9
17	0	8	0	0	0	8
18	0	4	0	0	0	4
19	0	4	0	0	0	4
20	0	3	0	0	0	3
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0
Total	0	87	1	29	0	117

* Years of MGDS Operation

BASIS (Ref: VA.SA.JK.03/95.038 Memo, 28 Mar 95)

Program Approach Scenario (NO MRS).

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 052(W) (continued)

Subject: Addition of Filler Material
at the Repository

First Procurement MPCs in the five-year period 1998-2002 are loaded with OFF and placed in reactor dry storage.

Pickup from dry storage is deferred until no fuel older than 10 years remains in spent fuel pools.

Pickup from only four trucks (no-rail) purchasing utilities are assumed.

Waste Package heat limit for emplacement is 14.2 kW.

Transportation casks are derated as shown.

Cask Derating

Operation	MPC Heat Limits (kW)			
	B-LG	P-LG	B-SM	P-SM
Storage	17.60	23.90*	10.56	13.68
Transportation	12.0	14.20	7.20	8.76
Emplacement	14.20	14.20	14.20	14.20

See Key Assumptions 001 to 003 for Legend

*17.85 kW used at various sites for post-shutdown dry storage

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 054(W)

Subject: Normal Waste Handling Building
Capability (No Filler Material)

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Filler material is no longer a consideration in processing commercial SNF.

The design for the Waste Handling Building's (WHB's) standard canister and disposal container handling operations is based on no capability to add filler material to the canistered waste or the disposal container (MPCs) at the repository.

II. BACKGROUND

MGDSRD 3.2.3.2.3.1.1.L

The Repository Segment shall have the capability to handle any abnormal disposable canister and other canistered waste forms that require remedial processing. Such processing may include opening the canister, transferring the waste form, adding filler material and resealing. [10CFR60.135(a)(1)] [CRD 3.7.4.2.D]

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, or Other
(specify: _____)

Need for assumption (statement of intended use):

Defines a probable path for continued development of the repository Waste Handling Building (WHB).

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Programmatic guidance defines an approach where filler material may be unnecessary (IOC #VA.SE.GUR.8/95.016).

A separate cell for accommodating unusual or off-normal operations is presently planned (see Key Assumption 053). Such limited operations could include performance confirmation examinations, bare fuel assembly handling, and opening damaged waste form canisters.

This assumption complies with the intended interpretation of the MGDS-RD 3.2.3.2.3.1.1.L requirement as found in Section 3.2.3.2.3.1.1.L of the Transportation Site Requirements Document (SRD). The project's position is not to choose the option of adding filler material to a disposable waste canister that does not meet disposal requirements. Instead, the loaded canister will be opened, the spent nuclear fuel (SNF) will be removed, and the canister will be discarded. This modification of the project's approach is a result of the "MPC Policy Change" Baseline Change Proposal (#BCP 00-96-0002, BCP Rev. 0).

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 054(W) (continued)

Subject: Normal Waste Handling
Building Capability
(No Filler Material)

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: ..

Withdrawal Date: (09/30/96) (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 056(W)

Subject: Interim Fuel Storage

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Assumptions regarding interim storage will be deferred until the decision regarding interim storage is made. If there is an ISF, interface requirements are expected to first be established in the CRD.

The Repository will interface with an interim Storage Facility which is located outside the State of Nevada.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Requirements, Systems Engineering

Need for assumption (statement of intended use):

Surface Repository Design

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Interim storage is a Congressional program requirement.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date: 09/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 062(W)

Subject: DOE SNF

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Consolidated with Key Assumption 005

The direction and assumptions given in BCP-00-96-0005, *Implementation of the Program Approach* (DOE 1994b) will be used as a basis for Mined Geologic Disposal System (MGDS) design for the U.S. Department of Energy (DOE) spent nuclear fuel (SNF) disposal.

The baseline change proposal (BCP) calls for the disposal at MGDS of 2333 MTHM of mostly canistered DOE SNF, replacing a similar amount out of the 7000 MTHM of high-level waste (HLW) previously planned for the repository. However, the exact fuel characteristics and forms of DOE SNF to be delivered to the repository are not presently known. Therefore, incorporation of the DOE SNF into the MGDS design will be delayed until further information is received. In the interim, Key Assumption 005 (7000 MTU of HLW) will be assumed to hold.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
(X) Surface, (X) Subsurface, (X) Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Design requirements specific to the DOE SNF needed for repository waste package design do not yet exist in the Mined Geologic Disposal System (MGDS) Design Requirements Documents (DRDs).

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This key assumption is based on BCP-00-96-0005, *Implementation of the Program Approach* (DOE 1994b).

Characteristics of most of the fuel are known. However, the characteristics of a few hundred MTU of the DOE waste are not understood as well as the characteristics of the commercial SNF. In addition, the characteristics of another few hundred MTU are not known. Negotiations with DOE/EM for characterization of the various SNF are currently underway.

It is further assumed that the acceptability criteria for DOE SNF which is properly conditioned will result in no impact on MGDS Viability Assessment (VA) efforts. For this reason, no attempt was made to incorporate the DOE SNF into the MGDS design at this time.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 062(W) (continued)

Subject: DOE SNE

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption: Key Assumption 005

Withdrawal Date: REV 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: Key 072(W)

Subject: Repository Subsurface Layout

I. STATEMENT OF ASSUMPTION

WITHDRAWN -Drawing BCAA00000-01717-2700-81024, which includes these features, has been baselined by the Level 3 Configuration Control Board.

The current subsurface repository layout contains the following features:

- Long parallel emplacement drifts
- Only upper emplacement block (no lower emplacement block)
- In-drift waste package emplacement
- Central exhaust main below emplacement drifts
- Two shafts and two ramps
- One upper block perimeter/access drift

The configuration of these items is shown in the *Subsurface Repository VA Design Layout Plan*, drawing BCAA00000-01717-2700-81024 (CRWMS M&O 1997t).

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

Needed to focus Viability Assessment (VA) design work.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The layout described above allows for potential backfill, facilitates retrieval, facilitates performance confirmation, and provides access for routine maintenance and inspection as well as off-normal situations.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface Repository

Document(s) Supporting Withdrawal of Assumption: BCAA00000-01717-2700-81024

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.1.5.E(W)

Subject: Shielding Allocations

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Systems Analysis and Modeling)

Rev. 00

The waste package will not be self-shielded.

Original Version

E. Shielding allocations between the Repository Segment and the Engineered Barrier Segment have not been determined. Currently, the waste package will not be required to be self-shielded. The assumption is that if the waste package is not self-shielded, the repository will provide the required shielding for radiological protection for all modes of facility operation. Shielding allocations will be determined by future trade studies.

Need for assumption (statement of intended use):

Requirement EBDRD 3.1.5.E is written as an "if" statement, and thus provides the design organizations with the opportunity to select from several options.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

The repository's role in providing shielding is sufficiently covered by Key Assumptions 031 and 033.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.2.3.5(W)

Subject: Engineered Barrier/Transportation
Physical Interfaces

I. STATEMENT OF ASSUMPTION

WITHDRAWN - No interface requirements between the EBS and transportation have been identified to date; hence, the TBD in the original EBDRD version is still applicable.

The Engineered Barrier Segment (EBS) interfaces with transportation are with the disposable canister portion of the Transportation System element.

II. BACKGROUND

Original Version

**3.2.3.5 ENGINEERED BARRIER SEGMENT - TRANSPORTATION INTERFACE
REQUIREMENTS**

The Engineered Barrier Segment interfaces with transportation are (TBD).

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify):
Systems Analysis and Modeling

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

There are dimensional, weight, material compatibility, thermal, criticality, and other interfaces between the Engineered Barrier Segment (EBS) and the Transportation System element.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering
/Requirements

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.2.5.1.2.B.1.a(W)

Subject: Waste Form Reliability

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The corresponding EBDRD requirement does not apply to ACD.

II. BACKGROUND

Original Version - -
EBDRD 3.2.5.1.2

B. Reliability of the EBS shall be as follows:

1. Waste Package (TBD)
 - a. Waste Form (TBD)

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Detail specified in this requirement is too specific for Engineered Barrier requirement. Recommendation to delete this requirement has been forwarded to the Requirements Organization.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.2.5.1.2.B.1.b(W)

Subject: Waste Container Reliability

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The corresponding EBDRD requirement does not apply to ACD.

II. BACKGROUND

Original Version

EBDRD 3.2.5.1.2

B. Reliability of the EBS shall be as follows:

1. Waste Package (TBD)

b. Waste Container (TBD)

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Detail specified in this requirement is too specific for Engineered Barrier requirement. Recommendation to delete this requirement has been forwarded to the Requirements Organization.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.2.5.1.2.B.1.c(W)

Subject: Waste Package Internal
Structure Reliability

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The corresponding EBDRD requirement does not apply to ACD.

II. BACKGROUND

Original Version
EBDRD 3.2.5.1.2

B. Reliability of the EBS shall be as follows:

1. Waste Package (TBD)
 - c. Internal Structure (TBD)

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Detail specified in this requirement is too specific for Engineered Barrier requirement. Recommendation to delete this requirement has been forwarded to the Requirements Organization.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.2.5.1.2.B.1.d(W)

Subject: Waste Package
Packing Reliability

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The corresponding EBDRD requirement does not apply to ACD.

II. BACKGROUND

Original Version
EBDRD 3.2.5.1.2

- B. Reliability of the EBS shall be as follows:**
1. Waste Package (TBD)
 - d. Packing, shielding, and absorbing materials (TBD)

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development,
or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Detail specified in this requirement is too specific for Engineered Barrier requirement. Recommendation to delete this requirement has been forwarded to the Requirements Organization.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package
(X) No Substantiation Required
() Substantiation Date _____
(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.3.9.A(W)

Subject: Government-Furnished Property

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Resolution of TBD with corresponding EBDRD requirement not required for ACD.

II. BACKGROUND

Original Version

EBDRD 3.3.9 PROPERTY TO BE FURNISHED BY U.S. GOVERNMENT

- A. Property to be furnished by the U.S. Government is TBD.
[MGDS-RD 3.3.9.B][CRD 3.3.9.B]

Requesting M&O organization: () Surface, () Subsurface, (☒) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

This requirement is at a level of detail below that to be addressed during ACD.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(☒) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.3.9.B(W)

Subject: Handling of Government-
Furnished Property

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Resolution of TBD with corresponding EBDRD requirement not required for ACD.

II. BACKGROUND

Original Version
EBDRD 3.3.9

- B. Requirements pertaining to the receipt, maintenance, operation, and disposition of Government-furnished property are TBD.
[MGDS-RD 3.3.9.C][CRD 3.3.9.C]

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

This requirement is at a level of detail below that to be addressed during ACD.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.4.2(W)

Subject: Drawings

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The corresponding EBDRD requirement is deleted.

The details governing design drawing standards have been captured in Quality Assurance procedures per the QARD. The requirement does not need to be repeated in the EBDRD.

II. BACKGROUND

Original Version

EBDRD 3.4.2 DRAWINGS

Implementing documents shall be established to ensure that applicable regulatory requirements, design basis requirements, and other requirements as specified herein are correctly translated into drawings. These implementing documents shall ensure that appropriate quality standards are specified and included in design documents and that deviations from these standards are properly controlled. An OCRWM standard for drawings is being developed (TBD) and will be referenced when available.

[MGDS-RD 3.4.2][DOE/RW-0333P]

NOTE: This OCRWM Standard now exists: "OCRWM Engineering Drawings and Associated Lists Requirements," DOE/RW-0461, DIA00000000-00811-5000-00008, Rev. 00, January 1995.

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Systems Engineering)

Need for assumption (statement of intended use):

The requirement is not needed as it does not impact design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Systems Engineering/Requirements

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.7.C(W)

Subject: Substantially Complete Containment

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The corresponding EBDRD requirement is deleted.

The requirement is provided quantitatively by CDA Assumption EBDRD 3.7.D and EBDRD Requirement 3.7.E.

II. BACKGROUND

Original Version
EBDRD 3.7.C

The EBS shall be designed so that assuming anticipated processes and events: (1) containment of HLW will be substantially complete (TBD) during the period when radiation and thermal conditions in the EBS are dominated by fission product decay (TBD); and (2) any release of radionuclides for the EBS shall be a gradual process that results in small fractional releases (TBD) to the geologic setting over long times.

[Derived][10 CFR 60.113(A)(1)(D)]

Requesting M&O organization: (☐)Surface, (☐)Subsurface, (☐)Waste Package Development, or Other (specify: Systems Engineering)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Note: This assumes the definition of HLW as found in 10 CFR 60:

High-level radioactive waste or HLW means: (1) irradiated reactor fuel; (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel; and (3) solids into which such liquid wastes have been converted.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.7.F(W) **Subject:** Rock-Induced Waste Package Loading

I. STATEMENT OF ASSUMPTION

WITHDRAWN: The result of a rock fall event is a concentrated dynamic impact load on the waste package. The magnitude of the dynamic impact load depends on the size and the initial height of the rock falling onto the waste package. Since the maximum credible rock size has not yet been determined, this assumption should be withdrawn.

The waste package must be able to withstand a uniform external pressure of 0.50 MPa and a dynamic load of 50 kN and still maintain structural integrity.

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, (X) Waste Package Development, or Other (specify: System Engineering)

Original Version
EBDRD 3.7

F. The EBS shall maintain performance under rock-induced loading.

Need for assumption (statement of intended use):

This assumption is needed to support the design of the waste package.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Initial stress calculations have been performed for the multi-barrier waste package with an equivalent wall thickness of 100 mm. These calculations indicate that the multi-barrier waste package can withstand this pressure and load. A pressure of 0.5 MPa includes a factor of safety of 3. A dynamic load value of 50 kN is based on what, at this time, is the expected load from a rock falling onto the waste package. As the ACD design options are further evaluated, the values listed above may change.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package
() No Substantiation Required
() Substantiation Date _____
(X) Withdrawal Date 9/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.7.1.F(W)

Subject: Waste Package Information Label

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Resolution of the TBD in the corresponding EBDRD requirement not required for ACD.

II. BACKGROUND

Original Version

EBDRD 3.7.1.F WASTE PACKAGE INFORMATION LABEL

A label or other means of identification shall be provided for each waste package. The identification shall not impair the integrity of the waste package, shall not damage the waste package, and shall be applied in such a way that the information shall be legible at least to the end of the period of retrievability. Each waste package's identification shall be consistent with the waste package's permanent written records. The information on the label shall be TBD.

[MGDS-RD 3.7.3.3.F][10 CFR 60.135b(0(4))]

Requesting M&O organization: (☐)Surface, (☐)Subsurface, (☐)Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Not needed for ACD

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

The requirement is at a level of detail below that to be addressed during ACD.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(☒) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.7.1.1.G(W)

Subject: Postclosure Seismic Loads on
Waste Package

I. STATEMENT OF ASSUMPTION

WITHDRAWN: This assumption is superseded by Key Assumption 064.

Waste package seismic design for postclosure (through the substantially complete containment phase) performance shall be compatible with Design Basis Earthquake for surface and subsurface repository. Potential repository peak horizontal accelerations for design are currently estimated at 0.66 g for surface and subsurface depths. Vertical component of acceleration is assumed to be equal to horizontal component.

II. BACKGROUND

Original Version

**EBDRD 3.7.1.1 SPENT NUCLEAR FUEL (SNF) AND HIGH-LEVEL WASTE (HLW) THAT IS
EMPLACED IN THE UNDERGROUND FACILITY SHALL MEET THE
FOLLOWING CRITERIA:**

- G. Seismic loads (To Be Determined [TBD]) shall not decrease the postclosure performance of the waste form.**

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, (X) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

An assumption of the seismic loads is required to evaluate the short- and long-term performance of the waste package under possible dynamic loading conditions after emplacement.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The 0.66 g peak ground acceleration is obtained from the document: *Seismic Design Inputs for the Exploratory Studies Facility at Yucca Mountain*, BAB000000-01717-5705-00001 REV. 02. Instead of using the reduction factors for changing depth, the subsurface peak ground acceleration is conservatively assumed to be 0.66 g.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.7.1.1.G(W) (continued)

Subject: Postclosure Seismic
Loads on Waste Package

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization:
Waste Package, SPI

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date: 09/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: EBDRD 3.7.1.4(W)

Subject: Waste Container Absorbent Materials

I. STATEMENT OF ASSUMPTION

WITHDRAWN - No initial assumptions required for ACD.

II. BACKGROUND

Original Version

EBDRD 3.7.1.4 Specific allocations of requirements to any containers, packages, shielding, and other absorbent materials immediately around an individual waste container will result from trade studies and engineering analyses during ACD.

Requesting M&O organization: ()Surface, ()Subsurface, (☒)Waste Package Development, or Other (specify: Developed)

Need for assumption (statement of intended use):

Not required for ACD. Requirement will be reviewed and reissued.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

As the requirement notes the values will be developed during ACD. The values will not directly affect the waste package ACD design.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Waste Package

(☒) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 12/19/95 (Rev.02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: RDRD 3.2.1.6.D(W)

Subject: Physical Barriers

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The assumption had been written in a previous CDA Document revision with the intent to address physical barrier requirements applicable to the preclosure period. However, the requirement RDRD 3.2.1.6.D is part of the post-closure mode requirements in the RDRD. (The heading in the original version of the requirement had inadvertently been shown as "Physical Barriers" in the Background section of the assumption rationale sheet.) The physical barriers requirements in the RDRD that are applicable to the preclosure period are provided in RDRD 3.2.4.3.1.2. Clarification of the original postclosure requirement is not needed for purposes of VA design.

D. Facilities shall be provided to support active institutional controls at the repository site, including physical barriers to human intrusion. Facilities to maintain the institutional controls and physical barriers shall also be provided.

1. Little or no material tracking internal to Radiologically Controlled Area (RCA)/Protected Area.

2. A single fence perimeter is adequate for Radiologically Controlled Area (RCA)/Protected Area.

3. No International Atomic Energy Agency (IAEA) Inspection Design impact.

II. BACKGROUND

Original Version

RDRD 3.2.1.6 POST-CLOSURE MODE REQUIREMENTS

D. Facilities shall be provided to support active institutional controls at the repository site, including physical barriers to human intrusion and maintenance facilities (To Be Verified [TBV]).

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

The original statement is unclear; it appears to require physical barriers to maintenance facilities. Security measure levels have not been defined by a security analysis to date.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: RDRD 3.2.1.6.D(W) (continued)

Subject: Physical Barriers

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The assumption sets a modest security level for waste material until a security analysis determines that a stricter system is required.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: RDRD

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: RDRD 3.7.5.A.5(W)

Subject: Men-and-Materials Shaft
Hoist Limits

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Included in Assumption RDRD 3.7.5.A.

The corresponding Repository Design Requirements Document (RDRD) requirement is considered to be not applicable.

II. BACKGROUND

Original Version

RDRD 3.7.5.A SIZE AND WEIGHT OF HOISTING SYSTEM

5. The size and weight limits of the hoisting system in the men-and-materials (To Be Verified [TBV]) shaft for materials handling shall be To Be Determined (TBD).

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

At the very least, the requirement is mislocated. 3.7.5.A deals with requirements for shaft conveyances handling radioactive waste. No radioactive waste will, or should, be handled in a men-and-materials shaft. Even if the requirement were in a more suitable location, the limits referred to are design and function dependent. Such detail does not belong as a requirement at the Repository Design Requirements Document (RDRD) level.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption: Assumption RDRD 3.7.5.A

Withdrawal Date: REV 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 002(W)

Subject: Wet and Dry SNF Handling

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Rev. 02A

Both dry and wet (underwater) concepts will be considered for SNF handling at the MGDS.

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Some handling steps might be easier, simpler, and safer if they are performed in a fuel basin.

Fuel handling at the utility sites, at reprocessing plants, and other nuclear facilities is usually conducted underwater. This option will be considered in the design of certain surface facilities.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Surface Facility Design

(☐) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 003(W)

Subject: Occupational Exposure Limits

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Incorporated in Key Assumption 089 which applies to all facilities.

The Surface Facilities that house radioactive materials or in which work is performed on radioactive materials will be designed to control occupational exposures to as low as reasonably achievable (ALARA) and less than 500 millirem per year.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

This assumption provides the allowable exposure allowed for occupational dose and is the basis for calculations involving radiological safety.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The assumptions in conformance to the U.S. Department of Energy (DOE) Radiological Control Manual, the Nevada (NV)/Yucca Mountain Site Characterization Project (YMP) Radiological Control Manual, and 10 CFR 20.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: Key Assumption 089

Withdrawal Date: REV 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 004(W)

Subject: ALARA Studies

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Replaced by Key Assumption 090 and Key Assumption 091, which provide additional guidance and apply to all systems, facilities, and processes.

As low as reasonably achievable (ALARA) studies will be conducted as needed to establish the allowable-dose rates upon which various radiological safety calculations will be based.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

☒ Surface, ☐ Subsurface, ☐ Waste Package Development, ☐ Other (specify):

Need for assumption (statement of intended use):

ALARA is a requirement that is established to ensure that radiological safety is adhered to in the design and operation of nuclear facilities.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

ALARA is required in the U.S. Department of Energy (DOE) Radiological Control Manual, the Nevada (NV)/Yucca Mountain Site Characterization Project (YMP) Radiological Control Manual, and 10 CFR 20.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: Key Assumptions 090 & 091

Withdrawal Date: REV. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 005(W)

Subject: One Waste Handling Building

I. STATEMENT OF ASSUMPTION

WITHDRAWN: This assumption is no longer necessary since the consolidation of WHBs 1 and 2 was the result of ACD. This result is documented in the ACD.

Surface Facilities Structures - WHB.

WHBs 1 and 2 in the Site Characterization Plan Conceptual Design Report will be consolidated into a single structure.

II. BACKGROUND

Requesting M&O organization: ☒ Surface, () Subsurface, () Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

The need for two WHBs in the SCP/CDR was predicated upon an initial high receipt rate, smaller waste packages, and no MPC. This condition is no longer appropriate.

The WHB will be designed to receive and handle SNF and HLW contained in MPCs, waste packages, and shielded casks. These units are larger and heavier than those used in the SCP/CDR and require different operations.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Surface

☒ No Substantiation Required

☐ Substantiation Date _____

☒ Withdrawal Date 9/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 006(W)

Subject: CMF Requirement

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Required in the program approach. See DCS 014.

A Transportation Cask Maintenance Facility (CMF) will be required at the MGDS.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Identification of Surface Facilities

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

A CMF is needed to inspect, repair, and maintain transportation casks shipped back to the waste suppliers. This facility will be similar to that designed for the MRS but will be updated to reflect the casks that will be used for shipping currently conceived canisters and waste packages.

The CMF is required at the MGDS as part of the Program Approach. Therefore, it is assumed that this requirement will be carried through to the RDRD and DCS 006, then will no longer be necessary.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Surface

(☒) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 007(W)

Subject: Waste Treatment Building

I. STATEMENT OF ASSUMPTION

WITHDRAWN ~ Consolidated with Key Assumption 024.

A Waste Treatment Building (WTB) will be incorporated into the Geologic Repository Operations Area (GROA) to treat solid and liquid low-level radioactive wastes in preparation for transport to a government approved offsite facility for treatment, storage, and disposal.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

This defines the need to add a facility to the baseline to satisfy Key Assumption 024.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Consistent with revised Key Assumption 024, the facility will provide for treatment and temporary accumulations of low-level waste stream in preparation for transport to offsite facility for disposal.

Some quantities of low-level radioactive waste will be created during the course of repository operations. This waste will include liquid and solid material that will be prepared by concentration or other means for safe offsite disposal. Gaseous process waste will be filtered and treated as needed within the facility in which it is produced. Waste flows and types need to be defined to support License Application (LA) and Environmental Impact Statement (EIS).

IV. RESPONSIBILITY AND WITHDRAWAL

--- Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: Key Assumption 024

Withdrawal Date: Rev. 04, ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 009(W)

Subject: Disposal of Low-Level Radioactive Waste

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Consolidated with DCS 007. All site-generated, low-level radioactive waste will be disposed of at or near the MGDS site.

II. BACKGROUND

This assumption is consistent with Key Assumption 024, which states that this waste will be collected, treated, packaged, and disposed of at the site, but leaves the exact location and method of disposal unspecified.

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Low-level waste disposal cost estimates need to be based on a preliminary concept until further resolution.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

On-site disposal appears to have some advantages (see Key Assumption 024). Further investigation is needed to determine the best on-site or near-by NTS disposal option.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Surface

(☐) No Substantiation Required

(☐) Substantiation Date

(☒) Withdrawal Date 12/19/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 010(W)

Subject: Hazardous Waste Disposal

I. STATEMENT OF ASSUMPTION

WITHDRAWN • Consolidated with Key Assumption 024.

Hazardous waste will be accumulated and staged, for up to 90 days, at the source of generation. These wastes will be periodically transported to a Resource Conservation and Recovery Act of 1976 (RCRA) approved offsite treatment, storage, and disposal facility. Subsurface hazardous wastes will be collected at a surface staging area outside the radiologically controlled area (RCA).

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Hazardous wastes will be generated in both the radiologically controlled area (RCA) and general support areas. An assumption is needed to design the collecting and handling operations for hazardous wastes.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Consistent with Key Assumption 024, hazardous wastes will be accumulated, packaged, and transported to a Resource Conservation and Recovery Act of 1976 (RCRA) approved offsite treatment, storage, and disposal facility. To avoid inadvertent creation of mixed wastes, subsurface hazardous wastes will be staged outside the radiologically controlled area (RCA) for transport to an approved offsite facility.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: Key Assumption 024

Withdrawal Date: Rev. 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 014(W)

Subject: Cask Maintenance Operations

I. STATEMENT OF ASSUMPTION

- I **WITHDRAWN** - This assumption is superseded by Key Assumption 080.

Cask maintenance facilities may be integrated into related facilities rather than in a separate, stand-alone structure.

Note: This assumption will be updated when cask transportation and maintenance requirements are redefined.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Identification of Surface Facilities

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

A Cask Maintenance Facility (CMF) is needed to inspect, repair, and maintain transportation casks shipped back to the waste suppliers. These operations are similar to those designed for the monitored retrievable storage (MRS) but will be updated to reflect the casks that will be used for shipping currently conceived canisters and waste packages.

The MGDS-RD, Rev. 2, (Sections 3.1.5.B and 3.2.3.2.3.1.2.A) requires a Cask Maintenance Facility (CMF) at the Mined Geologic Disposal System (MGDS). However it is assumed that the intent is to require cask maintenance operations without dictating the solution that a stand-alone facility is necessary.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

- I Document(s) Supporting Withdrawal of Assumption: Key Assumption 080

Withdrawal Date: Rev. 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 015(W)

Subject: Transportation Cask Fleet Inventory

I. STATEMENT OF ASSUMPTION

I WITHDRAWN - This assumption is superseded by Key Assumption 080.

The cask fleet inventory is based on a sealed canister system (disposable canister or dual purpose canister) and consists of a maximum of 12 truck casks and 72 rail casks.

Note: This assumption will be updated when cask transportation and maintenance requirements are redefined.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

☒ Surface, ☐ Subsurface, ☐ Waste Package Development, ☐ Other (specify):

Need for assumption (statement of intended use):

The cask fleet inventory is used to size not only the cask maintenance operations area but also the on-site generated waste treatment operations area. In addition, the cask fleet size could be used in the development of the Total System Life Cycle Cost (TSLCC).

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The transportation cask fleet inventory was identified in the *"Monitored Retrievable Storage Facility Cask Maintenance Facility Design Study Report Final Draft"* dated February 28, 1993 as 35 truck and 50 rail casks. This system was based on bare fuel assembly transfers. However, in September 1993, the Monitored Retrievable Storage (MRS) Conceptual Design Report (CDR) was updated. Within this update the above requested assumption was identified as an interface between the Monitored Retrievable Storage and the Transportation System. The above requested assumption can be found in section 3.2.2.4 of the *"Multi-Purpose Canister (MPC) Implementation Program Conceptual Design Phase Report Volume II.C - MPC MRS Facility Conceptual Design Report Final Draft"* dated September 30, 1993.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

I Document(s) Supporting Withdrawal of Assumption: Key Assumption 080

Withdrawal Date: Rev. 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 016(W) **Subject:** Trans. Cask Fleet Maintenance Frequency

I. STATEMENT OF ASSUMPTION

- I WITHDRAWN -** This assumption is superseded by Key Assumption 080.

Maintenance requirements for the transportation fleet (as identified in DCS 015) will be comparable to those for existing casks.

- Each truck cask is serviced a maximum of three times per year. During one visit the cask system Certificate of Compliance inspection is performed.
- Each rail cask is serviced once per year during the Certificate of Compliance inspection.

Note: This assumption will be updated when cask transportation and maintenance requirements are redefined.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

To properly size the cask maintenance operations area, it is necessary to know the maintenance frequency and requirements of the cask fleet. By assuming comparable requirements for existing casks, it is possible to size a facility and then make incremental changes as cask designs change.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Section 3.2.2.4 of the *"Multi-Purpose Canister (MPC) Implementation Program Conceptual Design Phase Report Volume II.C - MPC MRS Facility Conceptual Design Report Final Draft* dated September 30, 1993" assumes that the maintenance requirements for the transportation fleet will be comparable to those for existing casks. In addition, section 4.2.22.22.1 of the above referenced September 30, 1993 report assumes the maintenance frequency for trucks as a maximum of three times per year and rail cars as once per year.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

- I Document(s) Supporting Withdrawal of Assumption:** Key Assumption 080

Withdrawal Date: Rev. 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 017(W)

Subject: WHB Dry Handling

I. STATEMENT OF ASSUMPTION

WITHDRAWN - This assumption is superseded by assumption DCS 020.

The Waste Handling Building (WHB) will use a dry contained hot cell concept for performing the waste handling operations.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Clarification that the WHB will use a dry hot cell as opposed to pool.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The use of a dry hot cell as opposed to pool handling is preferred because it promotes a dry canister and container interior and allows for more flexible operations.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption: Key Assumption 020

Withdrawal Date: Rev. 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCS 018(W)

Subject: CMF Wet Handling

I. STATEMENT OF ASSUMPTION

- I **WITHDRAWN** - This assumption is superseded by Key Assumption 080.

The Cask Maintenance Facility (CMF) will use a small pool for cask maintenance including decontamination and certification.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

Clarification that the CMF will use a pool for some of its operations.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The CMF will use a pool as a standard practice at the utilities. There is no concern about insuring a dry canister environment, as it is in the WHB.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface Repository

- I Document(s) Supporting Withdrawal of Assumption: Key Assumption 080

Withdrawal Date: Rev. 04 ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 002(W)

Subject: Repository Horizon

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Deletion of the corresponding requirement is assumed.

Requesting M&O organization: () Surface, (X) Subsurface, () Waste Package Development,
or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Limiting the repository horizon to the TSw2 geologic unit is covered by Key Assumption 022.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 003(W)

Subject: Underground Excavation
Crown

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Potential conflict with Assumption Key 022

The crown of an underground excavation at any given location within the repository block will be: (1) no higher than the contact between the TSw1 and TSw2 thermal/mechanical units at that location, and (2) at least 5 m below rock strata containing significantly greater than 10% lithophysal cavities at that location.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Affects vertical and horizontal location of repository. It is being assumed that excavation within the repository block will be within the TSw2 rock unit. There has been considerable discussion as to the definition of the top of the TSw2 unit.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Criteria for establishing the TSw1/TSw2 contact must consider the need for a well-defined, mappable contact, as well as the effect of high lithophysal cavity content on rock properties. In regard to mappability, the USGS criteria is used, namely that the TSw1/TSw2 contact is the gradational contact between the upper lithophysal and middle nonlithophysal zones [Buesch, et.al. (TBD)]. In regard to lithophysal cavities, indications are that the base of strata containing greater than 10% lithophysal cavities lies above the USGS lithostratigraphic contact, but may be at the contact [Sandia National Laboratories (SNL), (TBD a and b)]. Stability considerations require that there should be about 5 m of low lithophysal rock between the repository block excavation and the high lithophysal cavity areas. Thus, the need for a two-part assumption.

Buesch, D.C., R. W. Spengler, T. C. Moyer, and J. K. Geslin (publication date TBD), Revised Stratigraphic Nomenclature and Macroscopic Identification of Lithostratigraphic Units of the Paintbrush Group Exposed at Yucca Mountain, Nevada: USGS Open-File Report.

SNL (TBD a), Data Transmittal Package for Yucca Mountain Site Characterization Project Geology and Rock Structure Log for Drill Hole UE25 NRG-6: DTN: SNF29041993002.006.

SNL (TBD b), Data Transmittal Package for Yucca Mountain Site Characterization Project Geology and Rock Structure Log for Drill Hole UE25NRG-7/7A: DTN: TBD.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 003(W) (continued)

Subject: Underground Excavation
Crown

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Subsurface

☐ **No Substantiation Required**

☐ **Substantiation Date** _____

☒ **Withdrawal Date** 12/18/95 (Rev. 02)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 004(W)

Subject: Stand-Off Distance

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Deletion of the corresponding requirement is assumed.

Requesting M&O organization: () Surface, (☒) Subsurface, (☒) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Revision 00 was an attempt at interpreting the configuration required to comply with DCSS 025. The repository floor standoff distance will be whatever is needed to comply with DCSS 025. DCSS 025 is sufficient by itself.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

() Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 013(W)

Subject: In-Drift Emplacement

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Deletion of the corresponding requirement is assumed.

Requesting M&O organization: () Surface, (X) Subsurface, (X) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., *midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

In-drift emplacement of waste packages is covered by Key Assumption 011.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 021(W)

Subject: Underground Air Quality

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Cooling power requirement has been deleted from the Exploratory Studies Facility Design Requirements, and is inherently covered by DCSS 020. Oxygen content and TLV values both come from 30 CFR 57 and are to be implemented through program/project decision to comply with 30 CFR 57.

Underground air quality in drifts occupied by personnel during:

Construction: $O_2 > 19.5\%$, air cooling power $> 260 \text{ W/m}^2$, contaminants $< \text{TLV values}$
Operations: $O_2 > 19.5\%$, air cooling power $> 260 \text{ W/m}^2$, contaminants $< \text{TLV values}$
Caretaker: $O_2 > 19.5\%$, air cooling power $> 260 \text{ W/m}^2$, contaminants $< \text{TLV values}$
Retrieval: $O_2 > 19.5\%$, air cooling power $> 260 \text{ W/m}^2$, contaminants $< \text{TLV values}$
Backfilling: $O_2 > 19.5\%$, air cooling power $> 260 \text{ W/m}^2$, contaminants $< \text{TLV values}$

II. BACKGROUND

Requesting M&O organization: () Surface, (X) Subsurface, () Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Affects ventilation system design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Oxygen content from 30 CFR 57.5015.

Cooling power from ESFDR 3.2.5.5.4.K.

TLV values from 30 CFR 57.5001.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Subsurface
(X) No Substantiation Required
() Substantiation Date _____
(X) Withdrawal Date 9/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 026(W)

Subject: Emplacement Drift Backfill

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Deletion of the corresponding requirement is assumed.

Requesting M&O organization: ()Surface, (☒)Subsurface, (☒)Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Key Assumption 046 states that emplacement drifts will not be backfilled. The need to maintain the option for backfilling of emplacement drifts is part of the substantiation effort for Key Assumption 046.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 034(W)

Subject: Emplacement Drift Ground Support

I. STATEMENT OF ASSUMPTION

WITHDRAWN - *Repository Ground Support Analysis for VA, BCAA00000-01717-0200-00004* concluded that precast concrete lining should be used in the emplacement drifts that are not to be mapped and steel sets should be used in the emplacement drifts that are to be mapped. The design baselined by the Level 3 Configuration Control Board incorporated this concept in the following baseline drawings: BCAA00000-01717-2700-83018 *Emplacement Drift Ground Support Precast Concrete Lining* and BCAA00000-01717-2700-83020 *Emplacement Drift Ground Support Steel Sets*.

A single ground support type will be used in emplacement drifts.

Candidate ground support types under consideration:

- Precast concrete
- Cast In Place concrete
- Steel sets

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

Needed to focus ground support design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Using a single ground support type greatly simplifies design and construction by eliminating field decisions regarding ground classification and support type to be installed.

A single ground support type allows for efficient application of materials, emphasis on longevity, and minimization of maintenance.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 034(W) (continued)

Subject: Emplacement Drift ..
Ground Support

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption: BCAA00000-01717-2700-83018 and
BCAA00000-01717-2700-83020

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCSS 035(W)

Subject: Emplacement and Development
Area Ventilation

I. STATEMENT OF ASSUMPTION

WITHDRAWN - The assumed concept has been incorporated in the baseline design, as reflected in drawing BCA000000-01717-2700-86012 *Subsurface Ventilation Emplacement & Development Schematic*, which has been baselined by the Level 3 Configuration Control Board.

The ventilation systems for the development and emplacement areas will be provided by two separate and independent systems that are physically separated in the underground.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

10 CFR 60.133(g)(3) states "The ventilation system shall be designed to separate the ventilation of excavation and waste emplacement areas."

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Reduces risk of radioactive release into development area.

Allows each fan system to be optimized for emplacement and development activities.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption: BCA000000-01717-2700-86012

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCWP 003(W)

Subject: Alternate Waste Package
Disposal Container Materials

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Reference materials for Viability Assessment design have been documented in a design analysis, *Waste Package Materials Selection Analysis*, DI: BBA000000-01717-0200-00020 REV. 00.

Alternate waste package disposal container materials:

Corrosion allowance materials:

UNS G10200 (ASTM A 516 Grade 55)

UNS J02501 (ASTM A 27 Grade 70-40)

UNS K21590 (ASTM A 387 Grade 22)

Moderately corrosion resistant materials:

UNS C70600 (ASTM B 171)

UNS C71500 (ASTM B 171)

UNS N04400 (ASTM B 127) (Monel 400)

Corrosion resistant materials:

UNS N06022 (ASTM B 575, AWS ERNiCrMo-10)

UNS N06030 (ASTM B 582, AWS ERNiCrMo-11)

UNS N06455 (ASTM B 575)

UNS N06985 (ASTM B 582, AWS ERNiCrMo-9)

UNS N08065 (AWS ERNiFeCr-1)

UNS N08221 (ASTM B 424) (not in commercial production)

UNS N08825 (ASTM B 424)

UNS R53400 (ASTM B 265 Grade 12, AWS ERTi-12)

Titanium Grade 16

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, (X) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

The primary materials recommended for the inner and outer containment barriers of multi-barrier waste package are identified to focus the designer's attention to the list provided.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCWP 003(W) (continued)

Subject: Alternate Waste Package
Disposal Container Materials

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The list includes all materials mentioned in the *Updated Candidate List for Engineered Barrier Materials* (September, 1994, milestone MOL01, attachment to letter LLYMP9412023 from W. L. Clarke to Robert M. Nelson, November 30, 1994) or in *Report on Preliminary Selection of Waste Package Materials* (BBA000000-01717-5705-00007 REV 00, July 21, 1995). The ASTM specifications apply to wrought products, except for ASTM A 27, which is for cast products. The AWS grades apply to welding electrodes.

Current baseline waste package materials are:

Inner Containment Barrier - UNS N08825 (Alloy 825).

Outer Containment Barrier for SNF packages - UNS G10200 (ASTM A 516).

Outer Containment Barrier for DHLW packages - UNS C71500 (70/30 copper-nickel).

Alternative waste package materials for low thermal load are:

Inner Containment Barrier - UNS N08825 (Alloy 825).

Outer Containment Barrier for SNF packages - UNS G10200 (ASTM A 516).

Outer Containment Barrier for DHLW packages - UNS C71500 (70/30 copper-nickel).

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date: 09/30/96 (Rev. 04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCWP 004(W)

Subject: Waste Package Materials

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Revision 01 of the *Waste Package Material Selection Analysis*, (BBA000000-01717-0200-00020 REV 01) (CRWMS M&O 1998b) changed the material for corrosion resistant barriers to C-22, ASTM B 575 N06022 (Alloy 622) which had previously been identified as an alternate concept for VA design issue #17, as indicated in Table C-1 in Appendix C of this CDA Document. Rather than modifying DCWP 004 for this change, it has been withdrawn because analysis BBA000000-01717-0200-00020 REV 01, which contains the information on waste package materials, has been baselined by the Level 3 Configuration Control Board.

The following materials will be used in future waste package (WP) design work:

Component	Material
Corrosion allowance barrier for SNF waste forms	ASTM A 516 Grade 55 or 70
Corrosion resistant barrier for SNF waste forms	ASTM B 443
Fuel basket tubes for SNF waste forms	ASTM A 516 Grade 55 or 70
Fuel basket plates for SNF waste forms	Neutronit A 978 or equivalent
Waste container fill gas for SNF waste forms	Helium
Basket guides for SNF waste forms	ASTM A 516 Grade 55 or 70
Corrosion allowance barrier for HLW glass	ASTM A 516 Grade 55 or 70
Corrosion resistant barrier for HLW glass	ASTM B 443
Canister guide for HLW glass	ASTM A 516 Grade 55 or 70

HLW - High-Level Waste, SNF - Spent Nuclear Fuel

Where a choice is indicated (ASTM A 516 Grade 55 or 70), either of these materials could be used; a choice between them will require additional engineering analysis.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, (X) Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCWP 004(W) (continued)

Subject: Waste Package Materials

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Materials selected in *Waste Package Material Selection Analysis* (BBA000000-01717-0200-00020 REV-00).

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package

Document(s) Supporting Withdrawal of Assumption: BBA000000-01717-0200-00020 REV 01

Withdrawal Date: REV. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCWP 005(W)

Subject: Tentative Co-Disposed
DOE SNF WP Dimensions

I. STATEMENT OF ASSUMPTION

WITHDRAWN - This assumption is superseded by and incorporated in assumption
EBDRD 3.7.1.J.1

This assumption is pending coordination and resolution of BCP-00-96-0005 implementation issues. The designs are recent and have not been reconciled with other assumptions in this version of the CDA.

The external dimensions of the waste package containing DOE SNF that is co-disposed with defense HLW shall not exceed:

Outer Diameter: 1970 mm
Outer Length: 5350 mm

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, (X) Subsurface, (X) Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

Needed to focus MGDS design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Current dimensions for the largest waste package are based on IOC # LV.WP.WEW. 9/96 - 227 by Wayne Wallin.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package

Document(s) Supporting Withdrawal of Assumption: Assumption EBDRD 3.7.1.J.1

Withdrawal Date: Rev 04, ICN 2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: DCWP 006(W)

Subject: Tentative WP External
Dimensions for Canistered SNF

I. STATEMENT OF ASSUMPTION

WITHDRAWN - This assumption is superseded by and incorporated in assumption EBDRD 3.7.1.J.1

This assumption is pending coordination and resolution of BCP-00-96-0005 implementation issues. The designs are recent and have not been reconciled with other assumptions in this version of the CDA.

The external dimensions of the waste package for commercial SNF that is canistered and not repackaged (based on vendor development) shall not exceed:

Outer Diameter: 1950 mm

Outer Length: 5850 mm

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, (X) Subsurface, (X) Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

Needed to focus MGDS design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Current dimensions for the largest waste package are based on IOC # LV.WP.WEW. 9/96 - 227 by Wayne Wallin.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization:

Document(s) Supporting Withdrawal of Assumption: Assumption EBDRD 3.7.1.J.1

Withdrawal Date: Rev 04 ICN2

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 001(W)

Subject: Fault Displacement, Locations,
Attitudes

I. STATEMENT OF ASSUMPTION

WITHDRAWN: Seismic design is covered by Key Assumption 064.

The Surface Facilities fault displacements, fault locations, and fault attitudes shall be as described in Section 1.23 of the Reference Information Base (RIB).

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

The assumption is needed as input to surface facilities seismic design and site layout.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

The information in this section of the Reference Information Base (RIB) includes a litany of data sources that reflect the current knowledge of the seismic characteristics of the site.

This assumption affects:

Design Basis Earthquake, Operating Basis Earthquake, and Standard Earthquake design requirements related to the fault locations.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: SPI

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date: 9/30/96 (Rev.04)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 005(W)

Subject: Seismic Environment..

I. STATEMENT OF ASSUMPTION

WITHDRAWN -- The information in the RIB has been superseded by "Seismic Design Inputs for the Exploratory Studies Facility at Yucca Mountain," May 20, 1994 (DI BAB000000-01717-5705-00001, Rev. 02A).

II. BACKGROUND

Rev. 00

The Surface Facilities Seismic Environment which includes the ground motion design basis, the ground motion probability, and earthquake characteristics that will be used for calculations for Design Base Earthquake, Operating Base Earthquake, and Standard Earthquake is defined in section 1.22 of the RIB.

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

The assumption is needed to establish the seismic design features of the surface facilities and associated equipment.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

This material is found directly in the RIB.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization SPI

(☐) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 009(W)

Subject: Surface Facilities/ALARA -
Reclassified as DCS 002

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCS 003, Rev. 00.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

This assumption provides the allowable exposure allowed for occupational dose and is the basis for calculations involving radiological safety.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

TDS 009, Rev. 00 was a Design Concept Assumption.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization TDM

(☒) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 010(W)

Subject: ALARA Studies -
Reclassified as DCS 004

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCS 004, Rev. 00.

II. BACKGROUND

Requesting M&O organization: ☒ Surface, ☐ Subsurface, ☐ Waste Package Development,
or Other (specify: _____)

Need for assumption (statement of intended use):

ALARA is a requirement that is established to ensure that radiological safety is adhered to in the design and operation of nuclear facilities.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

TDS 010, Rev. 00 was a Design Concept Assumption.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

☒ No Substantiation Required

☐ Substantiation Date _____

☒ Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 011(W)

Subject: Waste Handling Building -
Reclassified as DCS 005

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCS 005, Rev. 00.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development,
or Other (specify: _____)

Rev. 00

The WHBs 1 and 2 in the SCP/CDR will be consolidated into a single structure.

Need for assumption (statement of intended use):

The need for two WHBs in the SCP/CDR was predicated upon an initial high receipt rate, smaller waste packages, and no MPC. This condition is no longer appropriate.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

TDS 011 was a Design Concept Assumption.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 012(W)

Subject: Transportation Cask Maintenance
Facility - Reclassified as DCS 006

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCS 006, Rev. 00.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, () Subsurface, () Waste Package Development, or Other (specify: _____)

Rev. 00

A transportation CMF will be required at the MGDS.

Need for assumption (statement of intended use):

Identification of Surface Facilities.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

TDS 012, Rev. 00 was a Design Concept Assumption.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 013(W)

Subject: Waste Treatment Building -
Reclassified as DCS 007

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCS 007, Rev. 00.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Rev. 00

A waste treatment building will be incorporated into the Geologic Repository Operations area.

Need for assumption (statement of intended use):

The facility will be used to prepare low level waste materials generated at the MGDS for disposal at a designated on-site disposal area.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

TDS 013, Rev. 00 was a Design Concept Assumption.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 014(W)

Subject: Decontamination

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCS 008, Rev. 00.

II. BACKGROUND

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development, or Other (specify: _____).

Need for assumption (statement of intended use):

Decontamination activities will be conducted in area as close to the source of contamination as possible using conventional decontamination techniques.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

TDS 014, Rev. 00 was a Design Concept Assumption.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDS 015(W)

Subject: Rod Consolidation

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: (☐)Surface, (☐)Subsurface, (☐)Waste Package Development,
or Other (specify: _____)

Rev. 00

Rod consolidation will not be performed at the MGDS.

Need for assumption (statement of intended use):

Rod consolidation has been considered as a way to reduce the size and weight of waste containers and thus reduce the cost of shielding and handling. Many studies have indicated that rod consolidation does not, in fact, accomplish these objectives and does have opposite impacts.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Assumption already appears as Key 008 in this document.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization Surface

(☐) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 013(W)

Subject: Deformation Modulus

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: ()Surface, (☒)Subsurface, ()Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Following review, the deformation of rock modulus data were rejected for inclusion in the RIB.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

() Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 014(W)

Subject: Rock Compressive Strength

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: (☐) Surface, (☒) Subsurface, (☐) Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Following review, the compressive strength of rock mass data were rejected for inclusion in the RIB.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

(☐) Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 015(W)

Subject: Rock Tensile Strength

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: ()Surface, (☒)Subsurface, ()Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Following review, the tensile strength of rock mass data were rejected for inclusion in the RIB.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

() Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 018(W)

Subject: TSw2 Rock Joint Strength

I. STATEMENT OF ASSUMPTION

WITHDRAWN --For same reasons as for TDSS 019 and TDSS 020.

II. BACKGROUND

Rev: 00

Rock Joint Strength - TSw2.

Rock Mass Quality Category

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Cohesion (MPa)	0.01	0.04	0.08	0.14	0.18
Friction Angle (°)	12.6	16.8	22.3	30.5	36.0

Requesting M&O organization: () Surface, (X) Subsurface, () Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

Needed for rock mass stability and deformation calculations.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

From SAND89-0837, Table 12-11.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization SPI

() No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 019(W)

Subject: Rock Joint Stiffness

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: () Surface, (☒) Subsurface, () Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Following review, the rock joint stiffness parameters were rejected for inclusion in the RIB.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

() Substantiation Date _____

(☒) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 020(W)

Subject: Rock Mass Quality Indices

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization:- (☐)Surface, (☒)Subsurface, (☐)Waste Package Development, or Other (specify: _____)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Following review, the rock mass quality indices for thermal/mechanical rock units were rejected for inclusion in the RIB.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(☒) No Substantiation Required

(☐) Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 023(W)

Subject: Unsaturated Zone Groundwater Flux

I. STATEMENT OF ASSUMPTION

Groundwater annual flux estimates at the proposed repository horizon are:

Matrix: 0.1 - 1 mm

Fractures: 1 - 5 mm

- Fast Paths: 0.1 - 50m

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, (X) Waste Package Development, or (X) Other (specify): Scientific Program Operations

Need for assumption (statement of intended use):

Needed for waste package design and repository design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Values based on

Development and Calibration of the Three-Dimensional Site-Scale Unsaturated Zone Model of Yucca Mountain, Nevada, August 1996, by G. S. Bodvarsson and T. M. Bandurraga;

Summary Report of Chlorine-36 Studies: Sampling, Analysis, and Simulation of Chlorine-36 in the Exploratory Studies Facility (Draft), August 29, 1996, by J. Fabryka-Martin, et al. (LA-CST-TIP-96-002);

Site Scale Unsaturated Zone Flow and Transport Model (Draft), 8/29/96, by Bruce A. Robinson, et al.;

Summary Report of Chlorine-36 Studies (Draft), August 30, 1996, by J. Fabryka-Martin, et al. (LA-CST-TIP-96-003).

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 023(W) (continued)

Subject: Unsaturated Zone
Groundwater Flux

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Scientific Program Operations

Document(s) Supporting Withdrawal of Assumption: The old flux assumption is being deleted and a new flux assumption is being added (See TDSS 026). The previous flux specification and references will be preserved in the withdrawn section.

Withdrawal Date: REV 4 ICN 1

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: TDSS 024(W)

Subject: Unsaturated Zone Groundwater pH

I. STATEMENT OF ASSUMPTION

Groundwater pH values at the proposed repository horizon are:

Typical: 7.4

Extreme: 2 to 12

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, (X) Waste Package Development, or (X) Other (specify): Scientific Program Operations

Need for assumption (statement of intended use):

Needed for waste package design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Values are based on

Volume II: Near Field and Altered-Zone Environment Report (UCRL-LR-124998), August 23, 1996, by Dale G. Wilder.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Scientific Program Operations

Document(s) Supporting Withdrawal of Assumption: The old unsaturated zone ground water pH assumption is now covered by the revised TDSS 025 assumption.

Withdrawal Date: REV 4 ICN 1

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: REQSE 001(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN

II. BACKGROUND

Requesting M&O organization: () Surface, () Subsurface, () Waste Package Development, or Other (specify: Systems Analysis and Modeling)

Need for assumption (statement of intended use):

To limit the predicted thermal and thermomechanical response of the host rock and surrounding strata, and groundwater system, the Engineered Barrier Segment configuration and loading shall:

Limit temperatures in the Calico Hills nonwelded (CHn) unit to less than 115°C.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Assumption covered by DCSS 025, Rev. 02A.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: REQSE 002(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCSS 030, Rev. 00.

II. BACKGROUND

Requesting M&O organization: ()Surface, ()Subsurface, ()Waste Package Development, or Other (specify: System Analysis and Modeling)

Rev. 00

Limit surface uplift to less than 0.5 cm/yr and relative motion of the top of TSw1 to less than 1 m with no intact rock failure and no continuous slip.

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base):

Items such as this that may become requirements are provided as design goals in the CDA, hence the reclassification of this item to a design concept.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

☒ **No Substantiation Required**

☐ **Substantiation Date** _____

☒ **Withdrawal Date** 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: REOSE 003(W)

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Reclassified as DCSS 031, Rev. 00.

II. BACKGROUND

Rev. 00

Limit temperatures PTn in (Upper Paint Brush non-welded) to less than 115°C.

Requesting M&O organization: (☒) Surface, (☐) Subsurface, (☐) Waste Package Development,
or Other (specify System Analysis and Modeling)

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment (*e.g., midpoint of ranges given in the YMSCP Technical Data Base or Reference Information Base*):

Items such as this that may become requirements are provided as design goals in the CDA, hence the reclassification of this item to a design concept.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible M&O Organization _____

(X) No Substantiation Required

() Substantiation Date _____

(X) Withdrawal Date 4/28/95 (Rev. 01)

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: ALT 022(W)

Subject: Chemically Treated Invert

I. STATEMENT OF ASSUMPTION

WITHDRAWN - This alternate assumption was associated with an earlier alternate concept for VA design issue #2 that would have considered the chemically-treated invert for possible EBS performance enhancement. This has been eliminated from the alternate concepts. This alternate assumption never became a controlled design assumption applicable to the reference design, and it is no longer even an alternate assumption.

Sedimentary apatite ore, or a material with similar ability to sorb ^{237}Np and/or other radionuclides, shall be placed in and/or around the emplacement drift invert segments below each waste package, and the amount of this material needed to sorb a significant amount of the ^{237}Np in a large SNF WP is sufficiently small that it can be reasonably placed under a WP. It is further assumed that the infiltration rate at the repository horizon will not cause the chemicals in the emplacement drift inverts to be washed away prior to the time of their usefulness when the waste packages breach.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Establishes a scenario that constrains aspects of the waste package, surface facilities, and subsurface facilities designs.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is applicable to VA issue #2 alternate concepts 3, 4, and 5.

The use of material to sorb ^{237}Np would be adopted to enhance the capability of the EBS to severely retard the transport of ^{237}Np for 10,000 years after closure of the repository. The function of the material would not be required until waste packages have breached.

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: ALT 022(W) (continued)

Subject: Chemically Treated Invert

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption: Issue Resolution Report for VA Design Issue #2

Withdrawal Date: Rev. 05

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: ALT 025(W)

Subject: Waste Package Materials

I. STATEMENT OF ASSUMPTION

WITHDRAWN - Alternate assumption ALT 025 represented a modification of assumption DCWP 004 for a previously defined alternate concept for VA design issue #17 to change the material for corrosion resistant barriers in waste packages. That concept was subsequently adopted as the reference concept (as indicated in Table C-1), and ALT 025 would have been incorporated in a change to assumption DCWP-004. However, the waste package materials information was baselined by the Level 3 Configuration Control Board in *Waste Package Material Selection Analysis*, BBA000000-01717-0200-00020 REV 01 (CRWMS M&O 1998b), and DCWP 004 was withdrawn since an assumption was no longer needed.

The following materials will be used in future waste package (WP) design work:

Component	Material
Corrosion allowance barrier for SNF waste forms	ASTM A 516 Grade 55 or 70
Corrosion resistant barrier for SNF waste forms	C-22, ASTM B 575 N06022 (Alloy 622)
Fuel basket tubes for SNF waste forms	ASTM A 516 Grade 55 or 70
Fuel basket plates for SNF waste forms	Neutronit A 978 or equivalent
Waste container fill gas for SNF waste forms	Helium
Basket guides for SNF waste forms	ASTM A 516 Grade 55 or 70
Corrosion allowance barrier for HLW glass	ASTM A 516 Grade 55 or 70
Corrosion resistant barrier for HLW glass	C-22, ASTM B 575 N06022 (Alloy 622)
Canister guide for HLW glass	ASTM A 516 Grade 55 or 70

HLW - High-Level Waste, SNF - Spent Nuclear Fuel

Where a choice is indicated (ASTM A 516 Grade 55 or 70), either of these materials could be used; a choice between them will require additional engineering analysis.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, (X) Waste Package Development, or () Other (specify):

Need for assumption (statement of intended use):

**Controlled Design Assumption
Assumption Rationale Sheet**

Assumption Identifier: ALT 025(W) (continued)

Subject: Waste Package Materials

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This alternate assumption is a modification of assumption DCWP 004 that is applicable to the alternate concept for VA issue #17.

Materials for the reference concept were selected in *Waste Package Material Selection Analysis* (BBA000000-01717-0200-00020 REV 00). The concept includes an outer barrier of corrosion allowance material that corrodes at a slow, predictable rate, and an inner barrier of a corrosion resistant material. To provide extra corrosion resistance, the inner barrier for the alternate concept is changed to Alloy 622 (a.k.a. C-22, ASTM B 575 N06022). Under the assumption that the percolation flux is large, the waste packages will be exposed to humid or wet environments earlier than would otherwise be expected. Early exposure of the corrosion allowance barrier to corrosive conditions may lead to early breaching of this outer barrier and exposure of the corrosion resistant barrier to high-temperature corrodents.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package

Document(s) Supporting Withdrawal of Assumption: BBA000000-01717-0200-00020 REV 01

Withdrawal Date: Rev. 05

C-1. Reference and Alternate Concepts for VA Design Issues	C-2
C-2. CDA Assumptions Related to Reference Concepts for VA Design Issues	C-11
C-3. CDA Assumptions Related to Alternate Concepts for VA Design Issues	C-15

APPENDIX C

CONTROLLED DESIGN ASSUMPTIONS FOR VIABILITY ASSESSMENT DESIGN ISSUES

Appendix C. Controlled Design Assumptions for Viability Assessment Design Issues

Design and systems engineering related issues important to the Viability Assessment (VA) milestone were briefed to the DOE in May 1997 (CRWMS M&O 1997g). These issues are related to tradeoffs or decisions with significant, potential impacts for the OCRWM Program.

A reference concept for each of the VA design issues has been defined as presented in the middle column of Table C-1. The controlled design assumptions in the body of this CDA Document have been updated to reflect those reference concepts. Table C-2 identifies the assumptions with the primary relationships to the reference concepts for the VA design issues. The applicability of a particular assumption to the reference concept for a specific VA design issue is indicated by an X in the respective column.

One or more alternate concepts have been defined for most of the VA design issues. These are also described in Table C-1. Table C-3 identifies the assumptions that would be modified, added, or withdrawn for each of the alternate concepts. Table C-3 uses the following legend, and each entry is preceded by a number to identify the alternate concept to which it is applicable.

X - Assumption is applicable to the respective alternate concept for the specific VA design issue and requires no modification.

M - Assumption would be modified for applicability to the respective alternate concept for the specific VA design issue.

A - Assumption would be added for applicability to the respective alternate concept for the specific VA design issue.

W - Assumption would be withdrawn for the respective alternate concept and would be replaced by a modified or added assumption.

Appendix D presents the new and modified assumptions that are contingent on the alternate assumptions. See the note on the cover page for Appendix D that the alternate assumptions in Appendix D are not part of the controlled design assumptions applicable to the reference design. Also, see the discussion of alternate concepts and assumptions in Section 1.3 and the caution that the assumptions in Appendix D should not be used other than to help understand the alternate concepts and the potential impacts that they would have on the reference system design assumptions.

Table C-1. Reference and Alternate Concepts for VA Design Issues

VA Design Issue	Reference Concept	Alternate Concepts
1. Thermal Loading Range	<p>High thermal load concept with Areal Mass Loading (AML) at a specific value within the 19.8-24.7 kgU/m² (80-100 MTU/acre) range. Layout geometry will be similar to that in the ACO Report, commonly termed "point load." Commercial SNF WPs will be assigned area according to their individual mass content, while HLW and other low or no-heat WPs are placed between commercial SNF WPs without accounting for their mass content. Drift spacing will be maximized within the constraints of providing WP spacing for specified mass per area and maintaining the ability to emplace the other WPs between the large commercial SNF WPs. The overall thermal management concepts for the reference case include loading waste into WPs in approximately the order in which received (within the limit specified elsewhere on initial heat output and criticality), emplacing the WPs in drifts in the order received from the surface facility (which is the order in which they are loaded), and only minimal ventilation in each emplacement drift after emplacement is completed for the drift.</p>	<p>A lower mass loading alternative will be considered, as will other thermal management techniques that can be used independently or in combination.</p> <p>1) A lower AML at a specific value within the range of 6.2-8.9 kgU/m² (25-35 MTU/acre) will be considered as an alternative for LA with the potential for improvement in total system performance.</p> <p>2) A layout, commonly termed "line load," with wider drift spacing and WP spacing determined by package length (within handling constraints) and not adjusted for individual mass content will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design. The AML value for the line load would be defined on the basis of the mass content of an entire drift, since WP spacing would not be adjusted to measure mass per area for individual WPs.</p> <p>3) Emplacing waste in order different from that in which received by sequencing of CSNF assemblies into WPs (using either waste handling building storage or other surface lag storage capabilities) and/or sequencing of WPs into the emplacement drifts (using surface or subsurface lag storage capabilities) will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design.</p> <p>4) Forced ventilation of emplacement drifts for several decades will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design.</p>

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
2. EBS Performance Enhancements	No backfill is required but would not be precluded from being stowed in the emplacement drifts.	<p>Three EBS performance enhancing measures are considered either individually or in appropriate combinations.</p> <p>1) Emplacement drift backfill is emplaced as part of the repository closure process at the end of the preclosure period. Backfill material with favorable thermohydrologic properties would cover the WPs.</p> <p>2) Drip shields are put above the WPs, and followed by emplacement of backfill in the drift to a level above the drip shield. Part of the backfill may be emplaced over the WP before the drip shield.</p> <p>3) Ceramic coating of waste packages has been defined as an additional alternate concept to be further evaluated in subsequent design phases.</p>

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
3. Criticality Control	<p>Criticality Control Methodology - The disposal criticality analysis methodology will use probabilistic risk analysis and disposal burnup credit for evaluating disposal criticality control.</p> <p>Criticality Control Design - CSNF WP design will use principle isotope burnup credit and take credit for neutron absorber material in control panels in the following WPs:</p> <ul style="list-style-type: none"> a) Main PWR WP design (21 PWR uncanistered fuel assemblies) b) Main BWR WP design (44 BWR uncanistered fuel assemblies) c) South Texas Fuel WP design (12 PWR S.Tx uncanistered fuel assemblies) <p>Will also use and take credit for neutron absorber material in control rods in PWR WP design.</p> <p>DHLW WP design allows limited fissile loading of canisters.</p>	<p>Criticality Control Methodology - No alternates to be considered.</p> <p>Criticality Control Design - If needed, the CSNF WP designs for PWR and BWR WPs will use and receive credit for additional concepts as follows:</p> <ul style="list-style-type: none"> 1) Iron Shot Filler Material For PWR WPs (Main & South Texas) and BWR WPs 2) Depleted Uranium Filler Material For PWR WPs (Main & South Texas) and BWR WPs

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
4. Emplacement Drift Ground Support Concept	<p>Install precast concrete segmental lining in emplacement drifts that are not to be mapped, and install steel sets in emplacement drifts that are to be mapped in accordance with the reference mapping strategy defined in the reference concept for Issue #9.</p> <p>The precast concrete segmental lining will be installed as the initial and only ground support in emplacement drifts that do not require mapping. This is the preferred ground support method from an engineering perspective because it can be rapidly installed and can be fabricated under controlled conditions to enhance quality. However, mapping is not safely performed before installation nor adequately performed after installation. Thus, in emplacement drifts that require mapping, steel sets will be installed after the initial installation of support such as rockbolts and the subsequent mapping.</p>	<p>1) Install steel sets with steel lagging. This method is the second preference from an engineering perspective and allows steel lagging to be installed in stages at different times. It allows mapping, if necessary. It could be used if mapping of all emplacement drifts were required and concrete were found to be unacceptable.</p> <p>2) Install cast-in-place concrete lining after initial installation of support such as rockbolts. This method is the third preference from an engineering perspective and would allow mapping, if necessary, after the initial installation of rockbolts and before the installation of the concrete lining. If the alternate mapping strategy for Issue #9 is imposed to require mapping of all emplacement drifts, this would become the preferred ground support concept.</p>
5. Performance Confirmation Concept	Performance Confirmation requirements in accordance with controlled design assumptions Key 061, 063, and 067.	None defined. An enhanced case for Performance Confirmation requirements, as defined in Performance Confirmation Concepts Study Report (CRWMS M&O, 1996e), might be considered in a future COA update.
6. Retrieval Concept	WP retrieval equipment concepts are equivalent to those for WP emplacement (see related Issue #11). Emplacement & retrieval of WPs will utilize Gantries without carry-over capability.	Emplacement & retrieval of WPs will utilize a carry-over Gantry that will facilitate selective retrieval of WPs.

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
7. Confirmation of Waste Handling Capability	<p>A combination of wet and dry operations will be used in the Waste Handling Building (WHB). It will include three identical lines to transfer SNF assemblies from a shipping cask or dual-purpose canister (DPC) to a disposal container (DC) and two lines to transfer disposable canisters of HLW or SNF from a shipping cask to a DC. Each SNF assembly transfer line will use a fuel pool to open the casks and DPCs, remove the assemblies, and place them in baskets for transfer to a hot cell where the assemblies will be loaded into a DC. All operations other than SNF assembly unloading will be conducted dry. (See "wet handling concept" in <i>Waste Handling Systems Configuration Analysis</i>, CRWMS M&O 1997b, for additional description).</p> <p>Lag storage within the WHB will include an additional storage pool to stage CSNF assemblies that would accumulate as a result of surges in shipments. An external parking area will be designed to stage shipping casks, but an external lag storage facility for interim storage is not required with waste receipt to begin concurrent with emplacement.</p> <p>Waste will be loaded for emplacement in approximately the order in which it is received.</p>	<p>The reference concept of combining wet and dry operations is the selected design concept applicable to all of the following alternatives:</p> <ol style="list-style-type: none"> 1) Receive waste (starting in 2007) before emplacement begins (in 2010) and include an external lag storage facility to accommodate the amount of waste received prior to start of emplacement. Waste handling facilities would be phased. First phase would provide an ISF style storage facility with storage area and storage modules designed to house large welded canisters and a structure for transferring DPCs from shipping casks to storage modules. Second phase would include front end of the WHB to provide facility to transfer CSNF assemblies from a shipping cask to a welded canister and transport it to an outside storage module. Third phase would complete the WHB similar to that in the reference design. 2) Sequence waste into DCs for emplacement in an order different from that in which received for purposes of thermal management. Additional capacity for staging pool for CSNF assemblies is anticipated.
8. Disposal of Site-Generated Waste	<p>Treat and package radioactive low level waste (LLW) at the repository and ship for disposal at the Nevada Test Site (NTS). Package and ship hazardous and mixed wastes to approved, off-site facilities for treatment and disposal after less than 90 days storage at the repository.</p>	<p>Alternatives to the reference concept for disposal of LLW follow:</p> <ol style="list-style-type: none"> 1) Dispose of LLW at an off-site DOE or commercial facility. 2) Dispose of LLW at the repository at a surface location to be identified.

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
9. Strategy for Mapping Repository	Map completely a portion (1 in 10) of the emplacement drifts prior to installing the primary ground support. Essentially all other drifts in the repository horizon also will be mapped completely, including perimeter drifts, PC drifts, ventilation drifts, and possibly selected drifts within the emplacement drift pattern that are excluded from emplacement.	<ol style="list-style-type: none"> 1) Map completely all emplacement drifts. Essentially all other drifts in the repository horizon also will be mapped completely, as in the reference concept. 2) Map none of the emplacement drifts if a grid of about 300 by 600 meters is determined to provide appropriate mapping coverage and this grid can be achieved by fully mapping all other drifts in the repository horizon.
10. Postclosure Performance Standards	Use interim postclosure performance measure and goal provided by DOE (YMP 1997) as a planning basis for VA Design and postclosure performance assessment of the repository.	No alternate concepts are defined in terms of changes to the assumed postclosure standard. Nevertheless, Performance Assessment is planning to conduct modeling that will provide analysis relevant to potential changes to the reference concept. Performance Assessment is planning to analyze the repository long-term performance with sensitivity analyses of the expected annual dose to an average individual in a critical group at different distances from the repository (varying from 5 km to 30 km) and for time periods up to and beyond 10,000 years to support the goal described in Key Assumption 060. Analyses are planned for system designs with alternative EBS performance enhancements identified above for VA Issue #2. The results will allow predicted long term performance to be compared to potential dose limits.

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
11. Viability of Underground Remote Control Concepts	<p>WP emplacement operations are to be accomplished primarily by remote systems, including remotely operated mobile emplacement gantries, gantry carriers, and transporters, remote loading and unloading mechanisms, and locomotives that can be both manually and remotely operated.</p> <p>Normal WP retrieval process, if necessary, will utilize essentially the same equipment used during emplacement. Off-normal retrieval will employ a variety of remotely operated vehicles that can be used to extricate WPs from various off-normal situations. These include remotely operated multi-purpose mini-excavating equipment, load-haul-dump vehicles, inclinable platforms & towing equipment. Shielded manually-operated concepts may be used.</p> <p>Performance Confirmation program will utilize remote sensors and instrumentation to monitor and acquire exhaust air and borehole data. A mobile remotely operated inspection gantry will be used to inspect emplacement drifts and WPs, and to emplace and recover test coupons.</p>	<p>Emplacement/Retrieval - 1) Alternate design concepts considered for routine emplacement/retrieval have included emplacement on rail cars, by non-rail based wheeled or track driven vehicles, using air pallet technology, or using rollers & turn tables. -</p> <p>2) Alternate concepts for off-normal retrieval of WPs include various designs of remote excavation & hauling equipment and also portable shielding and shielded equipment that allows direct manual operation.</p> <p>Performance Confirmation - 3) Alternatives being considered that relate to degree & type of coverage of remote sensors/instrumentation.</p> <p>4) Enhancements to role & functionality of the basic remote inspection gantry, e.g., periodic thermal & radiological mapping of emplacement drifts, air sampling, chemical sensing, drift convergence measurement, and placement/retrieval of temporary in-drift monitoring equipment.</p> <p>5) Reliance on available borehole monitoring coverage with no direct in-drift monitoring.</p> <p>6) Periodic removal of WPs from individual drifts allowing personnel access for non-remote inspection/monitoring.</p> <p>7) Other alternate concepts may be developed, including: remote systems for minor emplacement drift maintenance, emergency response and mitigation, and applications related to regulatory monitoring, site security and safety.</p>
12. Burnup Credit	<p>NOTE: Work on this issue has been suspended pending results of overlapping issue #3, which will consider burnup credit in the resolution of criticality control methodology and concepts. Burnup credit will not be addressed as a separate issue in the update of the Controlled Design Assumptions Document.</p>	

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
13. Repository Seals Requirements & Concepts	Seals will be put in the ramps, shafts, and boreholes from the surface to ensure no preferential pathways exist for water ingress and gaseous flow and which would increase the release of radionuclides to the accessible environment.	None defined; without seals, preferential pathways would exist. Activities underway for this issue involve development of design requirements for components of the sealing system. These are not being treated as alternate concepts.
14. RSC/ISF Interface	Regional Servicing Contractors (RSCs) will be delivering SNF to the repository under a privatization concept in which they will be providing and maintaining the shipping casks. NOTE: Initial interface assumptions will be included in future CDA update after release of the final RFP for RSC.	Repository will be collocated with an ISF-style storage facility. This will include early receipt of SNF at the ISF but will not necessarily be consistent with alternate concept 1 for VA Issue #7. The RSC role in the reference concept would expand to include responsibility for providing the storage modules for use at the facility. Legislation is being monitored and could dictate the manner in which the concept should be defined in the future.
15. Additional Waste Forms	Waste receipts will include a total of 70,000 MTU equivalent comprised of 63,000 for commercial SNF, 4,667 for HLW, and 2,333 for DOE SNF. The receipts are defined by the waste streams documented in Key assumptions 001, 002, 004, 005, as developed in the <i>Waste Quantity, Mix and Throughput Study Report</i> , Rev. 01, (CRWMS M&O 1997c), and modified in Key Assumptions 088 and 092.	Retain the total 70,000 MTU equivalent limit and the 63,000 for commercial SNF, but include all the DOE SNF of about 2,600 MTU by reducing the HLW to equivalent of 4,400 MTU.
16. Waste Package Sizes & Weights	Seventeen different waste packages of varying dimensions are included to accommodate the different waste forms and special cases that are anticipated. For commercial SNF, these include large and small waste packages for both PWR and BWR and a waste package for canistered SNF. Additional waste packages are included for co-disposal of HLW and DOE SNF and for disposal of other special waste forms such as Navy SNF.	None defined. Size and weight could change to reflect alternate concepts that might be considered for waste package materials.

Table C-1. Reference and Alternate Concepts for VA Design Issues (continued)

VA Design Issue	Reference Concept	Alternate Concepts
17. Waste Package Materials	The outer barrier is made of carbon steel (ASTM A 516), a corrosion allowance material. This barrier corrodes at a slow, predictable rate. The inner barrier is made of Alloy 622 (a.k.a. C-22, ASTM B 575 N06022), a corrosion resistant material. The outer barrier corrodes slowly enough that the near-field temperature is low before this barrier is exposed to the environment. Low temperatures contribute to controlling localized corrosion of the Alloy 622. The near-field geochemical environment is not sufficiently aggressive that significant localized corrosion occurs.	Under the assumption that the percolation flux is large, the waste packages will be exposed to humid or wet environments earlier than would otherwise be expected. Early exposure of the corrosion allowance barrier to corrosive conditions may lead to early breaching of this barrier and exposure of the corrosion resistant barrier to high-temperature corrodents. To provide extra corrosion resistance, the inner barrier material was changed to Alloy 622 (a.k.a. C-22, ASTM B 575 N06022), which was previously an alternate concept. Ceramic coating of waste packages has been defined as an alternate concept to be considered further in subsequent design phases.
18. Design Basis Model	NOTE: Reference and alternate concepts are not established because this issue addresses timely product development: Can a design basis model be used to provide timely and effective design guidance in preparation for VA?	
19. Subsurface Design Development	NOTE: Reference and alternate concepts are not established because this issue addresses timely product development: Can design documentation consistent with the resolution of the key design issues be produced in time for the VA submittal?	
20. Surface Design Development	NOTE: Reference and alternate concepts are not established because this issue addresses timely product development: Can design documentation consistent with the resolution of the key design issues be produced in time for the VA submittal?	
21. Site Design Development	NOTE: Reference and alternate concepts are not established because this issue addresses timely product development: Can design documentation consistent with the resolution of the key design issues be produced in time for the VA submittal?	

Table C-2. CDA Assumptions Related to Reference Concepts for VA Design Issues

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Emplacement Drift Ground Support	#5 Performance Confirmation Concept	#6 Retrievalability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Viability	#13 Repository Seals Requirements/Concepts	#14 RSC/ISF Interface	#15 Additional Waste Forms	#16 Waste Package Sizes and Weights	#17 Waste Package Materials	CDA Assumptions
	Key 001						X	X									
	Key 002						X	X									
	Key 003						X	X									
	Key 004	X					X	X									
	Key 005							X						X			
	Key 006			X													
	Key 007											X					
	Key 008																
	Key 009																
	Key 010																
	Key 011										X						
	Key 012																
	Key 013					X											
	Key 014					X											
	Key 015																
	Key 016																
	Key 017																
	Key 018	X															
	Key 019	X															
	Key 020																
	Key 021																
	Key 022																
	Key 023																
	Key 024						X	X									
	Key 025		X														
	Key 026																
	Key 027																
	Key 028																
	Key 029																
	Key 030																
	Key 031																
	Key 032																
	Key 033																
	Key 034																
	Key 035																
	Key 036																
	Key 037																
	Key 038																
	Key 039																
	Key 040																
	Key 041																
	Key 042																
	Key 043																
	Key 044																
	Key 045																
	Key 046																
	Key 047																
	Key 048																
	Key 049																
	Key 050																
	Key 051																

Table C-2. CDA Assumptions Related to Reference Concepts for VA Design Issues (continued)

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Emplacement Drift Ground Support	#5 Performance Confirmation Concept	#6 Recoverability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Viability	#13 Repository Needs Requirements/Concepts	#14 RSC/ISF Interface	#15 Additional Waste Forms	#16 Waste Package Sizes and Weights	#17 Waste Package Materials	CDA Assumptions
Key 063					X		X										Key 063
Key 064						X											Key 064
Key 065																	Key 065
Key 066						X											Key 066
Key 067	X				X						X						Key 067
Key 073			X														Key 073
Key 074		X															Key 074
Key 075		X															Key 075
Key 076		X															Key 076
Key 077	X																Key 077
Key 078	X						X										Key 078
Key 079			X														Key 079
Key 080							X						X				Key 080
Key 081			X					X									Key 081
Key 082									X								Key 082
Key 083				X			X										Key 083
Key 084							X										Key 084
Key 085							X										Key 085
Key 086															X		Key 086
Key 087												X					Key 087
Key 088													X				Key 088
EBDRD 3.2.3.3.A.13												X					EBDRD 3.2.3.3.A.13

Table C-2. CDA Assumptions Related to Reference Concepts for VA Design Issues (continued)

[illegible]

Table C-2. CDA Assumptions Related to Reference Concepts for VA Design Issues (continued)

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Encapsulation Drift Ground Support	#5 Performance Confirmation Concept	#6 Retrievability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Viability	#13 Repository Seals Requirements/Concepts	#14 RSC/ISF Interface	#15 Additional Waste Forms	#16 Waste Package Sizes and Weights	#17 Waste Package Materials	CDA Assumptions
DCS 020							X										DCS 020
DCS 021							X										DCS 021
DCSS 009												X					DCSS 009
DCSS 027				X								X					DCSS 027
TDSS 001-012 & 017												X					TDSS 001-012 & 017
TDSS 025																X	TDSS 025
TDSS 026		X										X				X	TDSS 026

Table C-3. CDA Assumptions Related to Alternate Concepts for VA Design Issues

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Emplacement Drift Ground Support	#5 Performance Confirmation Concept	#6 Retrievability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Viability	#13 Repository Seals Requirements/Concepts	#14 RSC/MSF Interface	#15 Additional Waste Forms	#16 Waste Packages Sizes and Weights	#17 Waste Package Materials	
Key 001 (see ALT 014)							1-M, 2-X	1-X, 2-X									Key 001
Key 002 (see ALT 014)							1-M, 2-X	1-X, 2-X									Key 002
Key 003 (see ALT 015)							1-M, 2-M	1-X, 2-X									Key 003
Key 004 (see ALT 015)							1-M, 2-X										Key 004
Key 005 (see ALT 001)								1-X, 2-X						1-M			Key 005
Key 009			All-X														Key 009
Key 011		All-X															Key 011
Key 013																	Key 013
Key 016		All-X				1-X											Key 016
Key 017						1-X											Key 017
Key 019 (see ALT 002)	1-M																Key 019
Key 022 (see ALT 003)	1-M																Key 022
Key 024							1-X, 2-X	2-M									Key 024

Table C-3. CDA Assumptions Related to Alternate Concepts for VA Design Issues (continued)

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Emplacement Drift Ground Support	#5 Performance Confirmation Concept	#6 Recoverability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Feasibility	#13 Repository Beds Requirements/Concepts	#14 RSC/ISF Interface	#15 Additional Waste Forms	#16 Waste Packages Sizes and Weights	#17 Waste Package Materials	
Key 046 (see ALT 020 & ALT 021)		1-W, 2-W											I				Key 046
Key 053						1-X 2-X											Key 053
Key 055						1-X											Key 055
Key 057			Alt-X														Key 057
Key 060		Alt-X															Key 060
Key 061 (see ALT 026, ALT 027, & ALT 028)				1-X 2-X		1-X 2-X			1-X		4-Alt, 5-Alt, 6-Alt						Key 061
Key 064						1-X 2-X											Key 064
Key 065					1-X												Key 065
Key 067 (see ALT 007)	4-Alt																Key 067
Key 073		Alt-X	Alt-X														Key 073
Key 074		Alt-X														1-X	Key 074
Key 076		Alt-X														1-X	Key 076
Key 078		Alt-X														1-X	Key 078
Key 077 (see ALT 004)	2-W																Key 077
Key 078 (see ALT 005, ALT 006, & ALT 016)	3-W					1-W 2-W											Key 078
Key 079			Alt-X														Key 079

[illegible]

Table C-3. CDA Assumptions Related to Alternate Concepts for VA Design Issues (continued)

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Emplacement Drift Ground Support	#5 Performance Confirmation Concept	#6 Retrievability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Viability	#13 Repository Seals Requirements/Concepts	#14 RSC/RSF Interface	#15 Additional Waste Forms	#16 Waste Packages Sizes and Weights	#17 Waste Package Materials	
DCSS 027 (see ALT 011)				1-A, 2-X									1				DCSS 027
DCWP 001		1-X, 2-X, 3-X															DCWP 001
TDSS 025																1-X	TDSS 025
TDSS 026		1-X, 2-X, 3-X														1-X	TDSS 026
ALT 001 (Key 005 mod.)														1-A			ALT 001
ALT 002 (Key 019 mod.)	1-A																ALT 002
ALT 003 (Key 022 mod.)	1-A																ALT 003
ALT 004 (Key 077 mod.)	2-A																ALT 004
ALT 005 (Key 078 mod.)	3-A						2-A										ALT 005
ALT 006 (Key 079 mod.)	3-A						2-A										ALT 006
ALT 007 (Key 067 mod.)	4-A																ALT 007
ALT 008 (Key 082 mod.)							2-A										ALT 008
ALT 009			1-A														ALT 009
ALT 010			2-A														ALT 010
ALT 011 (DCSS 027 mod.)				1-A													ALT 011
ALT 012				1-A													ALT 012

Table C-3. CDA Assumptions Related to Alternate Concepts for VA Design Issues (continued)

CDA Assumptions	#1 Thermal Loading Range	#2 EBS Performance Enhancements	#3 Criticality Control	#4 Emplacement Drift Ground Support	#5 Performance Confirmation Concept	#6 Retrievability Concept	#7 Confirmation of Waste Handling	#8 Disposal of Site-Generated Waste	#9 Strategy for Mapping Repository	#10 Postclosure Performance Standard	#11 Remote Control Concepts Viability	#13 Repository Seals Requirements/Concepts	#14 RSC/ISF Interface	#15 Additional Waste Forms	#16 Waste Packages Sizes and Weights	#17 Waste Package Materials	
ALT 013 (Key 083 mod.)				1-A, 2-A					1-A								ALT 013
ALT 014 (Key 083 mod.)									2-A								ALT 014
ALT 015 (Key 080 mod.)												1-A					ALT 015
ALT 016 (Key 001, 002, & 004 mod.)							1-A										ALT 016
ALT 017							1-A										ALT 017
ALT 018 (Key 078 mod.)							1-A										ALT 018
ALT 019							2-A										ALT 019
ALT 020 (Key 046 mod.)		1-A, 2-A															ALT 020
ALT 021 (Key 046 mod.)		2-A															ALT 021
ALT 023						1-A											ALT 023
ALT 024											6-A						ALT 024
ALT 026 (Key 061 mod.)											4-A						ALT 026
ALT 027 (Key 061 mod.)											5-A						ALT 027
ALT 028 (Key 061 mod.)											6-A						ALT 028

ALT 001	HLW and DOE SNF	D-1
ALT 002	Areal Mass Loading	D-3
ALT 003	Repository Horizon and Location	D-4
ALT 004	Waste Package and Drift Spacing	D-5
ALT 005	Sequencing Waste Package Emplacement	D-7
ALT 006	Sequencing Waste Package Loading	D-8
ALT 007	Emplacement Drift Ventilation	D-9
ALT 008	On-site LLW Disposal	D-10
ALT 009	Iron Shot Filler Material	D-11
ALT 010	DU Filler Material	D-12
ALT 011	Rock Support Material Restrictions	D-13
ALT 012	Emplacement Drift Ground Support	D-14
ALT 013	Map All Emplacement Drifts	D-15
ALT 014	Map No Emplacement Drifts	D-16
ALT 015	RSC Interface with an ISF	D-17
ALT 016	Early Receipt	D-18
ALT 017	Phased WHB	D-19
ALT 018	Adjusted Emplacement Order	D-20
ALT 019	Additional SNF-Assembly Lag Storage	D-21
ALT 020	Backfill in Emplacement Drifts	D-22
ALT 021	Drip Shields and Backfill in Emplacement Drifts	D-23
ALT 023	Selective Retrieval	D-24
ALT 024	Personnel Access to Emplacement Drifts During Performance Confirmation	D-25
ALT 026	Performance Confirmation Requirements (1996)	D-26
ALT 027	Performance Confirmation Requirements (1996)	D-31
ALT 028	Performance Confirmation Requirements (1996)	D-36

APPENDIX D

ALTERNATE ASSUMPTIONS

NOTE: The "ALT" assumptions in Appendix D are not part of the controlled design assumptions applicable to the reference design but only show how new or modified assumptions might look if alternate concepts for VA issues (as identified in the right column of Table C-1) were adopted. Any ALT assumption would have to be converted into one of the assumption categories defined in Attachment II of NLP-3-32 (CRWMS M&O 1997h), with its prefix changed accordingly, before it could be added to the applicable assumptions in the body of the CDA Document.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 001

Subject: HLW and DOE SNF

I. STATEMENT OF ASSUMPTION

The quantities of high-level waste (HLW) and U.S. Department of Energy (DOE) spent nuclear fuel (SNF) within the combined 7000 MTU equivalent to be disposed of in the repository will be modified to take all of the anticipated DOE SNF of approximately 2600 MTU equivalent by reducing the HLW to 4400 MTU equivalent.

All HLW and most DOE SNF will be received in disposable canisters. At the repository, these canisters will be packaged for disposal, and the waste packages emplaced in the subsurface facility. Many of the DOE SNF canisters will be co-disposed in waste packages with the HLW canisters, and the remaining DOE SNF canisters, including the Naval SNF canisters addressed in Key Assumption 086, will be disposed in separate waste packages. A small amount (approximately 50 MT) of DOE SNF may be received uncanistered if it meets the repository waste acceptance criteria and has acceptable characteristics so that it can be handled and processed in the same facilities as the commercial SNF.

The data on HLW and DOE SNF casks, canisters, and waste packages in Tables 3-4, 3-8, and 3-9 of Key Assumptions 001, 002, and 003, respectively, would have to be modified to reflect the change in the relative portions of the 7000 MTU equivalent allocated to HLW and DOE SNF. See Table 3-4 for the yearly streams of transportation cask arrivals. See Table 3-8 for the numbers of canisters of HLW and DOE SNF to be received each year. The DOE SNF canisters to be disposed in separate waste packages are shown separately from those to be co-disposed in HLW waste packages. Table 3-9 shows the number of co-disposal waste packages with five HLW canisters and one DOE SNF canister and the number of separate-disposal waste packages containing varying numbers of DOE SNF canisters.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 005 and is applicable to VA issue #15 alternate concept.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 001 (continued)

Subject: HLW and DOE SNF

The increase in DOE SNF from one-third of the combined 7000 MTU equivalent (2333 MTU equivalent of DOE SNF) to the total amount of DOE SNF of approximately 2600 MTU equivalent is a relatively small increase and only reduces the quantity of HLW to go into the repository by about 6 percent.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 002

Subject: Areal Mass Loading

I. STATEMENT OF ASSUMPTION

A lower mass loading in the range of 6.2 to 8.9 kgU/m² (25 to 36 MTU/acre) will be considered as an alternative for License Application (LA) purposes and will be evaluated with regard to potential improvement in total system performance.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Project Engineering

Need for assumption (statement of intended use):

Establishes a design range permitting Mined Geologic Disposal System (MGDS) and waste package design options to proceed with criteria to achieve these objectives.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 019 and is applicable to VA issue #1 alternate concept 1.

A lower mass loading will be evaluated in the LA process as an appropriate alternative for potential improvement in total system performance. The alternative could be adopted if it provides the appropriate performance enhancement and the reference mass loading in Key Assumption 019 is determined to be unacceptable.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 003

Subject: Repository Horizon and Location

I. STATEMENT OF ASSUMPTION

The repository horizon will be located mainly in the TSw2 geologic unit within the primary area. If additional area is needed due to a lower mass loading than the reference range given in Assumption 019 or due to portions of the primary area being unusable, the initial expansion area will be to the north of the primary area.

If additional expansion areas are found to be suitable, such as in the lower block or across Solitario Canyon, they may be considered as needed after first developing north of the primary area.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Project Engineering

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 022 and is applicable to VA issue #1 alternate concept 1.

Additional area beyond the primary area could be required due to a lower mass loading such as defined in alternate assumption ALT 002 or if portions of the primary area are unusable. Expansion to the north is preferred for subsurface design.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 004

Subject: Waste Package and Drift Spacing

I. STATEMENT OF ASSUMPTION

A layout, commonly termed "line load," with wider drift spacing and the waste package (WP) spacing determined by package length (within handling constraints) instead of mass content will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design. The areal mass loading value would be implemented on the basis of the mass content of an entire drift, as opposed to a unit WP basis.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, or (X) Other (specify): Project Engineering

Need for assumption (statement of intended use):

Establishes a thermal loading layout geometry permitting subsurface design to proceed once the mass loading per acre has been selected.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key assumption 077 and is applicable to VA issue #1 alternate concept 2.

A change from point load to line load will be considered if MGDS performance is predicted to improve without imposing unacceptable operational constraints on the design. The line load concept puts WPs as close as practical to each other within handling constraints, and does not adjust the WP spacing (and thus the area) of an individual WP for its mass content. Hence, the average mass per area is computed over the entire drift. The line load concept is predicted on the basis of an expectation that if WPs are pushed closed enough together, they will radiate well into each other and result in a fall in temperature that would allow the WPs to be closer together for a given AML value.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 004 (continued)

Subject: Waste Package and Drift Spacing

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 005

Subject: Sequencing Waste Package Emplacement

I. STATEMENT OF ASSUMPTION

Sequencing of waste packages into the emplacement drifts (using surface or subsurface lag storage capabilities) will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

☒ Surface, ☐ Subsurface, ☐ Waste Package Development, or ☒ Other (specify): Project Engineering

Need for assumption (statement of intended use):

Affects surface and subsurface design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption would partially replace Key Assumption 078 and is applicable to VA issue #1 alternate concept 3 and VA issue #7 alternate concept 2.

The sequencing of waste package emplacement will be considered as part of the overall thermal management strategy if MGDS performance is predicted to improve without imposing unacceptable operational constraints on the design.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 006

Subject: Sequencing Waste Package Loading

I. STATEMENT OF ASSUMPTION

Sequencing of spent fuel assemblies into waste packages (using either waste handling building storage or surface lag storage capabilities) will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

☒ Surface, ☐ Subsurface, ☐ Waste Package Development, or ☒ Other (specify): Project Engineering

Need for assumption (statement of intended use):

Affects surface and subsurface design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption would partially replace Key Assumption 078 and is applicable to VA issue #1 alternate concept 3 and VA issue #7 alternate concept 2.

The sequencing of spent fuel assemblies in loading waste packages will be considered as part of the overall thermal management strategy if MGDS performance is predicted to improve without imposing unacceptable operational constraints on the design.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 007

Subject: Emplacement Drift Ventilation

I. STATEMENT OF ASSUMPTION

Forced ventilation of emplacement drifts for several decades will be considered if design basis modeling predicts that MGDS performance is improved without imposing unacceptable operational constraints on the design.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, or (X) Other (specify): Project Engineering

Need for assumption (statement of intended use):

Affects design and operation of subsurface ventilation system.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption will replace Key assumption 067 and is applicable to VA issue #1 alternate concept 4.

Forced ventilation will be considered as part of the overall thermal management strategy if MGDS performance is predicted to improve without imposing unacceptable operational constraints on the design.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 008

Subject: On-site LLW Disposal

I. STATEMENT OF ASSUMPTION

If off-site LLW disposal facilities are not available or do not provide a cost-effective means for disposing of site-generated radiological low level waste (LLW) from the repository, the LLW will be disposed at a surface location to be identified at the repository site outside the geologic repository operations area.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 082 and is applicable to VA issue #8 alternate concept 2.

If the NTS and other approved off-site facilities were not available for disposal of site-generated LLW, locations at the repository site could be examined for acceptability for establishment of a LLW disposal facility for this LLW from the repository.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT-009

Subject: Iron Shot Filler Material

I. STATEMENT OF ASSUMPTION

Will be able to take credit for criticality control purposes for moderator displacing iron shot filler material placed inside waste packages.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
(☒) Surface, (☐) Subsurface, (☒) Waste Package Development, (☐) Other (specify):

Need for assumption (statement of intended use):

Would affect waste package design if need to take credit for filler material for criticality control.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- I This assumption is applicable to VA issue #3 alternate concept 1. This assumption would not necessarily impact Key Assumption 073 which indicates that disposable canisters arriving at the repository loaded with SNF would not have to be opened to add filler material.

The results reported in the Advance Conceptual Design Report (CRWMS M&O 1996a) indicate filler material may provide the necessary criticality control.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package Development

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT-010

Subject: DU Filler Material

I. STATEMENT OF ASSUMPTION

Will be able to take credit for criticality control purposes for moderator displacing depleted uranium (DU) filler material placed inside waste packages for criticality control.

II. BACKGROUND check

Requesting Management and Operating Contractor (M&O) organization:
(X) Surface, () Subsurface, (X) Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Would affect waste package design if need to take credit for filler material for criticality control.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

- I This assumption is applicable to VA issue #3 alternate concept 2. This assumption would not necessarily impact Key Assumption 073 which indicates that disposable canisters arriving at the repository loaded with SNF would not have to be opened to add filler material.

The results reported in the Advance Conceptual Design Report (CRWMS M&O 1996a) indicate filler material may provide the necessary criticality control. The dilution provided by DU could provide additional far-field criticality control.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Waste Package Development

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT-011

Subject: Rock Support Material Restrictions

I. STATEMENT OF ASSUMPTION

Concrete materials and organic materials (e.g., epoxy resin, timber) are restricted for use as rock support and other postclosure permanent materials in all openings.

Steel is an allowable preclosure construction material in all openings.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Affects rock support design and possibly other underground work.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

These restrictions are necessary to minimize the impact of subsurface construction on waste isolation. The use of organic and specific cementitious materials should be approved by the Determination of Importance (DI) group. As indicated in Assumption EBDRD 3.2.3.3.A.13, performance evaluations are needed to determine any adverse impacts to waste isolation.

I This is a modified assumption for DCSS 027 if concrete were determined to be unacceptable and is applicable to VA issue #4 alternate concept 1.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 012

Subject: Emplacement Drift Ground Support

I. STATEMENT OF ASSUMPTION

A single ground support type consisting of steel sets with steel lagging will be used in emplacement drifts.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Needed to focus ground support design.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Using a single ground support type greatly simplifies design and construction by eliminating field decisions regarding ground classification and support type to be installed.

A single ground support type allows for efficient application of materials, emphasis on longevity, and minimization of maintenance.

- I This assumption is applicable to VA issue #4 alternate concept 1 and would be used if concrete were determined to be unacceptable.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 013

Subject: Map All Emplacement Drifts

I. STATEMENT OF ASSUMPTION

All emplacement drifts as well as all non-emplacement drifts are to be mapped.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
() Surface, () Subsurface, () Waste Package Development, (X) Other, (specify): Systems
Analysis and Modeling

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 083 that is applicable to the alternate concept for VA issue # 9.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Analysis and Modeling

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 014

Subject: Map No Emplacement Drifts

I. STATEMENT OF ASSUMPTION

All non-emplacement drift repository subsurface facilities are to be mapped. The grid of mapping coverage in the repository horizon will be 300 by 600 meters, and the arrangement of the non-emplacement drifts will accommodate this mapping coverage such that none of the emplacement drifts will have to be mapped.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 083 that is applicable to VA issue #9 alternate concept 2. The importance to postclosure performance of the thermal-hydrological and radionuclide transport properties of faults should be better understood through the investigation of the extent of lateral diversion of flow within hydrogeological units. As this better understanding is obtained, it might be determined that the required grid of mapping coverage in Key Assumption 083 is more conservative than necessary. If assumed grid of mapping coverage in this alternate assumption proves adequate, the non-emplacement drifts may be arranged to provide the necessary coverage by mapping less than 1 in 10, and possibly, no emplacement drifts. Hence, it is being carried as an alternate concept.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Analysis and Modeling

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

I Assumption Identifier: ALT 015

Subject: RSC Interface with an ISF

I. STATEMENT OF ASSUMPTION

- I Regional Servicing Contractors (RSCs), under contract to the DOE, will be responsible for arranging and providing waste acceptance and transportation services to deliver the commercial SNF to a Federal facility which might be the repository or an Interim Storage Facility (ISF). This will include responsibility for providing and maintaining the transportation casks in which the SNF will be received at the Federal facility and the storage modules in which canistered SNF will be stored at the ISF.**

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Interfaces need to be defined to focus MGDS design, particularly in the surface facility waste handling systems.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 080 that is applicable to VA issue #14 alternate concept if it is determined that there should be early receipt of waste beginning in advance of the start of waste emplacement.

- I A draft Request for Proposals (RFP) was released by DOE in November 1997 to solicit organizations interested in becoming RSCs. The expressed objective by DOE is to maximize use of private industry and reduce OCRWM involvement in the waste acceptance, storage and transportation of SNF. The final RFP will be used as the basis for developing an initial set of interface assumptions for inclusion in the CDA Document.**

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 016

Subject: Early Receipt

I. STATEMENT OF ASSUMPTION

Receive commercial SNF beginning 2007 without advancing the start of emplacement in 2010.

An external lag storage facility will be collocated near the North Portal with a capacity of about 11,000 MTHM of commercial SNF. This facility will include a storage area with storage modules design to house large welded canisters and a structure for transferring dual purpose canisters from shipping casks to storage modules. This facility is to accommodate the early receipt concept and would be established in conjunction with the phased startup of the waste handling building in assumption ALT 017.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is applicable to VA issue #7 alternate concept 1 and VA issue #14 alternate concept. The assumption would modify the waste streams defined in Key Assumptions 001, 002, and 004. Replacements for the tables in these key assumptions must be provided to implement this assumption.

If the early-receipt concept were adopted, a facility would be required for storage prior to beginning the packaging for disposal and the start of emplacement. Legislation would have to accommodate the collocation of facilities.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 017

Subject: Phased WHB

I. STATEMENT OF ASSUMPTION

Under the early-receipt assumption defined in ALT 016, the waste handling building (WHB) will be similar to the reference design, except the facility would be designed for phased startup. The first phase would be capable of transferring assemblies from a shipping cask to a welded canister, and transporting the canister to an outside storage module. The second phase would add the hot cells for loading, welding and transferring disposal containers for transport to the subsurface emplacement area.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is applicable to VA issue #7 alternate concept 1.

If the early-receipt concept in assumption ALT 016 was adopted and a facility was established for storage prior to the start of emplacement, the waste handling facilities should be phased to initially support the ISF-style facility and subsequently to accomplish the packaging for disposal to facilitate the start of waste emplacement.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 018

Subject: Adjusted Emplacement Order

I. STATEMENT OF ASSUMPTION

Under the early-receipt assumption defined in ALT 018, the SNF temporarily stored in the ISF-style facility can be used to modify to some extent the order in which SNF is loaded into disposal containers and thereby provide some adjustment to the order of waste emplacement for thermal management purposes.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a modification of Key Assumption 078 and is applicable to VA issue #7 alternate concept 1.

The availability of SNF in storage would allow some adjustment in the order of waste emplacement relative to the order of receipt if beneficial for thermal management purposes even if the more extensive sequencing covered in assumptions ALT 005 and 006 is not imposed.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Surface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 019

Subject: Additional SNF-Assembly Lag Storage

I. STATEMENT OF ASSUMPTION

In conjunction with the alternate assumptions ALT 005 and ALT 006 to sequence the loading and emplacement of SNF differently than the approximate order in which received, techniques such as fuel blending or surface cooling would be facilitated by establishing additional lag storage for SNF assemblies, which would likely be achieved with an additional fuel staging pool between planned assembly transfer pools in the WHB.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, () Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is applicable to VA issue # 7 alternate concept 2 and would be used in conjunction with VA issue #1 alternate 3. The assumption is a companion to alternate assumptions ALT 005 and ALT 006.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 020

Subject: Backfill in Emplacement Drifts

I. STATEMENT OF ASSUMPTION

Backfill is required in the emplacement drifts. The specification for the emplacement drift envelope shall accommodate: 1) level single layer backfill material composed of quartz sand or other material of similar favorable thermohydrologic properties and 2) the waste packages should initially be covered with at least 0.6 meters of backfill material. It is further assumed that the material/chemical interactions between the backfill and the waste package do not accelerate degradation of the waste package relative to the no-backfill case.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

☐ Surface, ☐ Subsurface, ☐ Waste Package Development, ☒ Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Establishes a scenario that constrains aspects of the waste package, surface facilities, and subsurface facilities designs.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 046 that is applicable to VA issue #2 alternate concept 1.

It is expected that Total System Performance Assessment calculations conducted employing the higher infiltration fluxes currently thought plausible at the repository horizon could substantially reduce the performance margin relative to the Interim Postclosure Standard. The currently assessed performance margin is documented in the *Engineered Barrier System Performance Requirements Systems Study Report* (CRWMS M&O 1996d). Substantial reduction in the performance margin may sufficiently impact the reasonable assurance argument to necessitate the addition of a barrier (e.g., backfill or other barriers such as dripshields or a ceramic coating that rely on backfill for protection) to enhance EBS performance. Further information regarding the performance benefits can be found in the referenced EBS-Performance Requirements Study.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 021

Subject: Drip Shields and Backfill
in Emplacement Drifts

I. STATEMENT OF ASSUMPTION

Drip shields above the waste packages and under or within the backfill are required in the emplacement drifts. The specification that the emplacement drift envelope shall accommodate is TBD. It is further assumed that the material/chemical interactions between the backfill and the waste package do not accelerate degradation of the waste package relative to the no-backfill case.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
() Surface, () Subsurface, () Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Establishes a scenario that constrains aspects of the waste package, surface facilities, and subsurface facilities designs.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is a replacement for Key Assumption 046 that is applicable to VA issue #2 alternate concept 2.

It is expected that Total System Performance Assessment calculations conducted employing the higher infiltration fluxes currently thought plausible at the repository horizon could substantially reduce the performance margin relative to the Interim Postclosure Standard. The currently assessed performance margin is documented in the *Engineered Barrier System Performance Requirements Systems Study Report* (CRWMS M&O 1996d). Substantial reduction in the performance margin may sufficiently impact the reasonable assurance argument to necessitate the addition of barriers (drip shield and backfill) to enhance EBS performance. Although a drip shield was discounted in the EBS Performance Requirements System Study as a means of improving total systems performance over a million-year time frame, it may be a feasible approach over a 10,000-year time frame for a repository that experiences high flux.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 023

Subject: Selective Retrieval

I. STATEMENT OF ASSUMPTION

To facilitate selective waste package retrieval (or recovery) from an emplacement drift the emplacement gantry shall have the capability to carry waste packages over emplaced packages and to travel the length of the emplacement drift with the waste package in the carryover mode.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Current assumptions and requirements for retrieval do not specify selective retrieval. This assumption applies to an alternate concept only.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This assumption is applicable to the alternate concept for VA issue #6.

If selective retrieval is determined to be necessary, then:

- A gantry with carryover capability would facilitate selective retrieval of waste packages by lifting and carrying the target packages over emplaced packages. Without this capability waste packages between the emplacement drift entrance and the target package(s) would first have to be removed.
- The carryover capability simplifies the task and shortens the time needed for selective retrieval operations and, hence, reduces the cost of this activity.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 024

Subject: Personnel Access to Emplacement Drifts
During Performance Confirmation

I. STATEMENT OF ASSUMPTION

Repository performance confirmation operations will provide for periodic removal and relocation of all waste packages within selected drifts to provide temporary access of personnel for in-drift inspection activities.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

() Surface, (X) Subsurface, () Waste Package Development, () Other (specify):

Need for assumption (statement of intended use):

Current assumptions and requirements preclude personnel entry and depend on remote inspection capabilities.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

This alternate assumption is applicable to the VA issue #11 alternate concept 6. This assumption would be applied in conjunction with assumption ALT 028.

Removing waste packages to allow personnel entry is an alternative to the reference concept that would preclude personnel access and use remotely controlled inspection equipment.

IV. RESPONSIBILITY/SUBSTANTIATION/WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Subsurface

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 026.

Subject: Performance Confirmation
Requirements (1996).

I. STATEMENT OF ASSUMPTION

The following set of requirements is based on the FY 96 *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e) with a modification to reflect enhancements to the role and functionality of the basic remote inspection gantry for use in emplacement drifts. This assumption is a modification of Key Assumption 061 that will be used as a basis for Mined Geologic Disposal System (MGDS) Performance Confirmation planning and design if VA issue #11 alternate concept 4 is adopted.

1. Repository design and operation shall provide facilities, access, instrumentation, recording, maintenance, and support for measuring/monitoring the performance confirmation parameters identified in Appendix D of the FY 96 *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e).
2. The performance confirmation monitoring and measuring system shall have a maintainable service life of 125 years (100 years plus the duration of initial construction plus the duration of final closure plus any time period during site characterization for which the system must be operable). Specific equipment and components shall have maintainable service lives dependent upon their identified function. These service lives are to be determined (TBD).
3. Planning of repository design and operations for performance confirmation test facilities and support shall consider the performance confirmation concepts identified in Section 5 of the *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e) as a point of departure.
4. The performance confirmation system shall be planned to permit availability of TBD percent.
5. Test locations/environments, samples, and specimens, onsite and offsite, shall be representative of the Repository environments and design elements.
6. Performance confirmation staff, measurement and monitoring hardware and software, shall be available to support the variable demand for analysis, assessment, and periodic reporting throughout the Performance Confirmation Program.
7. Surface-based boreholes shall be provided for monitoring unsaturated zone hydrology and shall avoid underground excavations.
8. At least one alcove shall be provided for testing and monitoring a TBD fault zone prior to and following waste emplacement.
9. Monitoring of at least two percent of the thermal rock mass behavior (to be related to the number of emplacement drifts) shall be performed; a portion of the rock mass to be monitored should be near the first emplacement drifts to contain waste.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 026 (continued)

**Subject: Performance Confirmation
Requirements (1996)**

- 10. The performance confirmation monitoring and measuring system should make maximum use of automated equipment to collect, record, and analyze performance data.**
- 11. The Repository Subsurface Facilities shall provide underground openings (drifts, alcoves, boreholes, and ancillary excavations), access, data acquisition, and test support to implement performance confirmation monitoring and test recommendations including interface and coordination with Site Investigation Testing, Repository Testing, Waste Package Testing, and Surface Support. These operations are to include, but are not to be limited to, capabilities for:**
 - a. Any ground support system (i.e., shotcrete or concrete) that covers the repository subsurface opening rock wall surface shall not be installed until after necessary rock mapping is complete.**
 - b. A total of 500 samples of rock core shall be acquired following drift excavation in the emplacement drifts that are mapped as well as the non-emplacement drifts.**
 - c. Placement and recovery of material coupons or specimens in the emplacement drift or other underground locations shall be performed at least once every 10 years.**
 - d. Recovery of selected or malfunctioning waste packages shall be performed on a non-routine basis, as required.**
 - e. The design, excavation, and ground support of emplacement drifts shall permit installation of and access to test/monitoring instrumentation, and observation drift instrumentation, and provide access for remotely operated vehicles or mobile inspection platforms to obtain measurements.**
 - f. Excavation of at least one permanent observation drift above the repository horizon shall be developed in support of thermal monitoring.**
 - g. At least one alcove shall be prepared for underground monitoring of seismic activities.**
 - h. The air temperature, relative humidity, and gaseous radioactive emissions of all emplacement drifts shall be monitored through the drift ventilation.**
 - i. The ventilation monitoring system shall be capable of identifying the specific drifts that are sources of gaseous radioactive emissions, if any, within TBD hours of detection of such emission.**
 - j. The provision and use of remotely operated vehicles or movable inspection platform for monitoring emplacement drift environments and effects shall be considered in support of the following requirements:**

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 026 (continued)

Subject: Performance Confirmation
Requirements (1996)

- Personnel access into emplacement drifts shall not be permitted except for emergencies or if waste packages have been removed from the drift.
- Remote inspections of TBD emplacement drifts shall be performed annually to:
 - Measure and map radiological and thermal emplacement drift conditions
 - Visually monitor for possible rockfalls and inspect for deformation and convergence in excess of TBD mm in drift walls and near-field rock mass
 - Collect samples of water inflow for laboratory analysis
 - Collect wipe samples of dust from surfaces for laboratory analysis
 - Emplace and recover temporary in-drift monitoring instrumentation
 - Obtain small samples of drift liners or near-field geology
 - Inspect waste package integrity using ultrasonic, eddy-current sensors or other implementable technology
 - Monitor waste package corrosion
 - Obtain in-drift air/gas sampling at specific locations.
- Remote inspection equipment may also be used to provide support for in-drift operational, maintenance and regulatory activities not encompassed specifically within PC Program, i.e., response to off-normal events and anomalies, debris removal, and other ad hoc applications.
- k. Subsurface facilities operations shall have a program to inspect for significant water inflow and, if detected, for measuring
 - Groundwater inflow quantities,
 - Temperature, and
 - Chemical composition.

Measurements shall be made by:

- Direct measurement on a recurring basis prior to closure for all underground openings except emplacement drifts,

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 026 (continued)

**Subject: Performance Confirmation
Requirements (1996)**

- Direct measurement during construction and prior to waste emplacement for emplacement drifts, and
- 1. Drift diameter changes shall be monitored periodically to track excavation convergence or instability. These measurements are required:
 - In Permanent Observation Drifts, by measuring rock displacement.
 - In selected drifts, by visual observation of rockfalls.
- m. Alcoves or drifts shall be provided to support backfill performance and constructability experiments and tests.
- n. Alcoves shall be provided to support seal performance and constructability tests.
- o. Subsurface Facilities shall provide facilities and test support as required by Site Investigation Thermal Testing to characterize and monitor thermal interaction effects while heating and while cooling and as required by Waste Package Testing for materials in situ tests.
- 12. The Repository Surface Facilities shall have the capability to support Performance Confirmation surface operations, equipment, and tests including, but not limited to:
 - a. The capability to receive, handle, store, examine, test, and return to the underground waste packages, material coupons, and other specimens recovered from underground emplacement. This capability is to be exercised on a non-routine basis for malfunctioning radioactive waste packages, if any.
 - b. Handling to include transferring and opening the disposal container and canistered and uncanistered waste forms, removing of samples, and repackaging, resealing, and decontaminating the disposal container.
 - c. The capability for routine and non-routine non-destructive testing of sealed or resealed waste packages prior to emplacement or after recovery.
 - d. The capability to receive, decontaminate, manage, temporarily store, and ship material coupons or specimens, retrieved from the emplacement drift, for offsite testing.
 - e. The capability to receive, manage, temporarily store, and ship rock samples for offsite testing.
 - f. The capability to transfer, automatically acquire, record, process, and communicate instrumentation data from surface and subsurface monitoring equipment and tests.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 026 (continued)

Subject: Performance Confirmation
Requirements (1996)

- g. The capability to support and protect continuous and periodic surface monitoring and tests operations.
- h. The facilities and equipment to support performance confirmation operations such as test monitoring and control, data processing, record management and communication, limited laboratory tests, analysis and evaluations.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, (X) Subsurface, (X) Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Performance confirmation requirements are needed for design and planning and do not yet exist in the Mined Geologic Disposal System (MGDS) design requirements documents.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Requirements were recommended in the *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e). The recommended requirements as presented in Key Assumption 061 have been modified in paragraph 11.J of this alternate assumption to identify enhancements to the role and functionality of the basic remote inspection gantry that are applicable to VA issue #11 alternate concept 4.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 027

Subject: Performance Confirmation
Requirements (1996)

I. STATEMENT OF ASSUMPTION

The following set of requirements is based on the FY 96 *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e) with a modification to reflect reliance on available borehole monitoring coverage with no direct in-drift monitoring in emplacement drifts. This assumption is a modification of Key Assumption 061 that will be used as a basis for Mined Geologic Disposal System (MGDS) Performance Confirmation planning and design if VA issue #11 alternate concept 5 is adopted.

1. Repository design and operation shall provide facilities, access, instrumentation, recording, maintenance, and support for measuring/monitoring the performance confirmation parameters identified in Appendix D of the FY 96 *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e).
2. The performance confirmation monitoring and measuring system shall have a maintainable service life of 125 years (100 years plus the duration of initial construction plus the duration of final closure plus any time period during site characterization for which the system must be operable). Specific equipment and components shall have maintainable service lives dependent upon their identified function. These service lives are to be determined (TBD).
3. Planning of repository design and operations for performance confirmation test facilities and support shall consider the performance confirmation concepts identified in Section 5 of the *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e) as a point of departure.
4. The performance confirmation system shall be planned to permit availability of TBD percent.
5. Test locations/environments, samples, and specimens, onsite and offsite, shall be representative of the Repository environments and design elements.
6. Performance confirmation staff, measurement and monitoring hardware and software, shall be available to support the variable demand for analysis, assessment, and periodic reporting throughout the Performance Confirmation Program.
7. Surface-based boreholes shall be provided for monitoring unsaturated zone hydrology and shall avoid underground excavations.
8. At least one alcove shall be provided for testing and monitoring a TBD fault zone prior to and following waste emplacement.
9. Monitoring of at least two percent of the thermal rock mass behavior (to be related to the number of emplacement drifts) shall be performed; a portion of the rock mass to be monitored should be near the first emplacement drifts to contain waste.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 027 (continued)

**Subject: Performance Confirmation
Requirements (1996)**

- 10. The performance confirmation monitoring and measuring system should make maximum use of automated equipment to collect, record, and analyze performance data.**
- 11. The Repository Subsurface Facilities shall provide underground openings (drifts, alcoves, boreholes, and ancillary excavations), access, data acquisition, and test support to implement performance confirmation monitoring and test recommendations including interface and coordination with Site Investigation Testing, Repository Testing, Waste Package Testing, and Surface Support. These operations are to include, but are not to be limited to, capabilities for:**
 - a. Any ground support system (i.e., shotcrete or concrete) that covers the repository subsurface opening rock wall surface shall not be installed until after necessary rock mapping is complete.**
 - b. A total of 500 samples of rock core shall be acquired following drift excavation in the emplacement drifts that are mapped as well as the non-emplacement drifts.**
 - c. Recovery of selected or malfunctioning waste packages shall be performed on a non-routine basis, as required.**
 - d. The design, excavation, and ground support of emplacement drifts shall permit installation of and access to test/monitoring instrumentation, and observation drift instrumentation.**
 - e. Excavation of at least one permanent observation drift above the repository horizon shall be developed in support of thermal monitoring.**
 - f. At least one alcove shall be prepared for underground monitoring of seismic activities.**
 - g. The air temperature, relative humidity, and gaseous radioactive emissions of all emplacement drifts shall be monitored through the drift ventilation.**
 - h. The ventilation monitoring system shall be capable of identifying the specific drifts that are sources of gaseous radioactive emissions, if any, within TBD hours of detection of such emission.**
 - i. Subsurface facilities operations shall have a program to inspect for groundwater inflow and, if detected, for measuring**
 - Groundwater inflow quantities,**
 - Temperature, and**
 - Chemical composition.**

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 027 (continued)

**Subject: Performance Confirmation
Requirements (1996)**

Measurements shall be made by:

- Direct measurement for all underground openings except emplacement drifts,
 - Direct measurement during construction and prior to waste emplacement for emplacement drifts, and
 - j. Drift diameter changes shall be monitored periodically to track excavation convergence or instability. These measurements are required:
 - In Permanent Observation Drifts.
 - In selected drifts, by visual observation of rockfalls.
 - k. Alcoves or drifts shall be provided to support backfill performance and constructability experiments and tests, if backfill in emplacement drifts is required.
 - l. Alcoves shall be provided to support seal performance and constructability tests.
 - m. Subsurface Facilities shall provide facilities and test support as required by Site Investigation Thermal Testing to characterize and monitor thermal interaction effects while heating and while cooling and as required by Waste Package Testing for materials in situ tests.
- 12. The Repository Surface Facilities shall have the capability to support Performance Confirmation surface operations, equipment, and tests including, but not limited to:**
- a. The capability to receive, handle, store, examine, test, and return to the underground waste packages, material coupons, and other specimens recovered from underground emplacement. This capability is to be exercised on a non-routine basis for malfunctioning radioactive waste packages, if any.
 - b. Handling to include transferring and opening the disposal container and canistered and uncanistered waste forms, removing of samples, and repackaging, resealing, and decontaminating the disposal container.
 - c. The capability for routine and non-routine non-destructive testing of sealed or resealed waste packages prior to emplacement or after recovery.
 - d. The capability to receive, decontaminate, manage, temporarily store, and ship material coupons or specimens, retrieved from the emplacement drift, for offsite testing.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 027 (continued)

Subject: Performance Confirmation
Requirements (1996)

- e. The capability to receive, manage, temporarily store, and ship rock samples for offsite testing.
- f. The capability to transfer, automatically acquire, record, process, and communicate instrumentation data from surface and subsurface monitoring equipment and tests.
- g. The capability to support and protect continuous and periodic surface monitoring and tests operations.
- h. The facilities and equipment to support performance confirmation operations such as test monitoring and control, data processing, record management and communication, limited laboratory tests, analysis and evaluations.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:

(X) Surface, (X) Subsurface, (X) Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Performance confirmation requirements are needed for design and planning and do not yet exist in the Mined Geologic Disposal System (MGDS) design requirements documents.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

Requirements were recommended in the *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e). The recommended requirements as presented in Key Assumption 061 have been modified to reflect reliance on available borehole monitoring coverage with no direct in-drift monitoring in emplacement drifts. Changes to Key Assumption 061 include: deletion of paragraph 11.c, modification of paragraph 11.e (new 11.d), deletion of paragraph 11.j, and modification of paragraph 11.l (new paragraph 11.j). These changes are applicable to VA issue #11 alternate concept 5.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT-027 (continued)

Subject: Performance Confirmation
Requirements (1996)

Withdrawal Date:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 028

**Subject: Performance Confirmation
Requirements (1996)**

I. STATEMENT OF ASSUMPTION

The following set of requirements is based on the FY 96 *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e) with a modification to reflect periodic removal of waste packages from individual drifts to allow personnel access for non-remote inspection/monitoring. This assumption is a modification of Key Assumption 061 that will be used as a basis for Mined Geologic Disposal System (MGDS) Performance Confirmation planning and design if VA Issue #11 alternate concept 6 is adopted.

1. Repository design and operation shall provide facilities, access, instrumentation, recording, maintenance, and support for measuring/monitoring the performance confirmation parameters identified in Appendix D of the FY 96 *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e).
2. The performance confirmation monitoring and measuring system shall have a maintainable service life of 125 years (100 years plus the duration of initial construction plus the duration of final closure plus any time period during site characterization for which the system must be operable). Specific equipment and components shall have maintainable service lives dependent upon their identified function. These service lives are to be determined (TBD).
3. Planning of repository design and operations for performance confirmation test facilities and support shall consider the performance confirmation concepts identified in Section 5 of the *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e) as a point of departure.
4. The performance confirmation system shall be planned to permit availability of TBD percent.
5. Test locations/environments, samples, and specimens, onsite and offsite, shall be representative of the Repository environments and design elements.
6. Performance confirmation staff, measurement and monitoring hardware and software, shall be available to support the variable demand for analysis, assessment, and periodic reporting throughout the Performance Confirmation Program.
7. Surface-based boreholes shall be provided for monitoring unsaturated zone hydrology and shall avoid underground excavations.
8. At least one alcove shall be provided for testing and monitoring a TBD fault zone prior to and following waste emplacement.
9. Monitoring of at least two percent of the thermal rock mass behavior (to be related to the number of emplacement drifts) shall be performed; a portion of the rock mass to be monitored should be near the first emplacement drifts to contain waste.

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 028 (continued)

**Subject: Performance Confirmation
Requirements (1996)**

- 10. The performance confirmation monitoring and measuring system should make maximum use of automated equipment to collect, record, and analyze performance data.**
- 11. The Repository Subsurface Facilities shall provide underground openings (drifts, alcoves, boreholes, and ancillary excavations), access, data acquisition, and test support to implement performance confirmation monitoring and test recommendations including interface and coordination with Site Investigation Testing, Repository Testing, Waste Package Testing, and Surface Support. These operations are to include, but are not to be limited to, capabilities for:**
 - a. Any ground support system (i.e., shotcrete or concrete) that covers the repository subsurface opening rock wall surface shall not be installed until after necessary rock mapping is complete.**
 - b. A total of 500 samples of rock core shall be acquired following drift excavation in the emplacement drifts that are mapped as well as the non-emplacement drifts.**
 - c. Placement and recovery of material coupons or specimens in the emplacement drift or other underground locations shall be performed at least once every 10 years.**
 - d. Recovery of selected or malfunctioning waste packages shall be performed on a non-routine basis, as required.**
 - e. The design, excavation, and ground support of emplacement drifts shall permit installation of and access to test/monitoring instrumentation, and observation drift instrumentation, and provide access for remotely operated vehicles or mobile inspection platforms to obtain measurements.**
 - f. Excavation of at least one permanent observation drift above the repository horizon shall be developed in support of thermal monitoring.**
 - g. At least one alcove shall be prepared for underground monitoring of seismic activities.**
 - h. The air temperature, relative humidity, and gaseous radioactive emissions of all emplacement drifts shall be monitored through the drift ventilation.**
 - i. The ventilation monitoring system shall be capable of identifying the specific drifts that are sources of gaseous radioactive emissions, if any, within TBD hours of detection of such emission.**
 - j. The provision and use of remotely operated vehicles or movable inspection platform for monitoring emplacement drift environments and effects shall be considered in support of the following requirements:**

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 028 (continued)

**Subject: Performance Confirmation
Requirements (1996)**

- Personnel access into emplacement drifts shall not be permitted except for emergencies or if waste packages have been removed from the drift.
- Remote inspections of emplacement drifts at least once every ten years shall be performed to monitor rockfall, and visually inspect and thermally image waste packages.
- k. Subsurface facilities operations shall have a program to inspect for groundwater inflow and, if detected, for measuring
 - Groundwater inflow quantities,
 - Temperature, and
 - Chemical composition.

Measurements shall be made by:

- Direct measurement for all underground openings except emplacement drifts,
- Direct measurement during construction and prior to waste emplacement for emplacement drifts, and
- Indirect or remote measurement in emplacement drifts after waste emplacement.
- l. Emplacement drift diameter changes shall be monitored periodically to track excavation convergence or instability. These measurements are required:
 - In Permanent Observation Drifts, by measuring rock displacements.
 - In selected drifts, by visual observation of rockfalls.
- m. Alcoves or drifts shall be provided to support backfill performance and constructability experiments and tests, if backfill in emplacement drifts is required.
- n. Alcoves shall be provided to support seal performance and constructability tests.
- o. Subsurface Facilities shall provide facilities and test support as required by Site Investigation Thermal Testing to characterize and monitor thermal interaction effects while heating and while cooling and as required by Waste Package Testing for materials in situ tests.
- 12. The Repository Surface Facilities shall have the capability to support Performance Confirmation surface operations, equipment, and tests including, but not limited to:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 028 (continued)

Subject: Performance Confirmation
Requirements (1996)

- a. The capability to receive, handle, store, examine, test, and return to the underground waste packages, material coupons, and other specimens recovered from underground emplacement. This capability is to be exercised on a non-routine basis for malfunctioning radioactive waste packages, if any.
- b. Handling to include transferring and opening the disposal container and canistered and uncanistered waste forms, removing of samples, and repackaging, resealing, and decontaminating the disposal container.
- c. The capability for routine and non-routine non-destructive testing of sealed or resealed waste packages prior to emplacement or after recovery.
- d. The capability to receive, decontaminate, manage, temporarily store, and ship material coupons or specimens, retrieved from the emplacement drift, for offsite testing.
- e. The capability to receive, manage, temporarily store, and ship rock samples for offsite testing.
- f. The capability to transfer, automatically acquire, record, process, and communicate instrumentation data from surface and subsurface monitoring equipment and tests.
- g. The capability to support and protect continuous and periodic surface monitoring and tests operations.
- h. The facilities and equipment to support performance confirmation operations such as test monitoring and control, data processing, record management and communication, limited laboratory tests, analysis and evaluations.

II. BACKGROUND

Requesting Management and Operating Contractor (M&O) organization:
(X) Surface, (X) Subsurface, (X) Waste Package Development, (X) Other (specify): Systems Engineering

Need for assumption (statement of intended use):

Performance confirmation requirements are needed for design and planning and do not yet exist in the Mined Geologic Disposal System (MGDS) design requirements documents.

III. RATIONALE

Rationale for assumption (source author, date, and report title) or statement of reasoning behind engineering judgment:

**Controlled Design Assumption
Alternate Assumption Rationale Sheet**

Assumption Identifier: ALT 028 (continued)

Subject: Performance Confirmation
Requirements (1996)

Requirements were recommended in the *Performance Confirmation Concept Study Report* (CRWMS M&O 1996e). The recommended requirements, as presented in Key Assumption 061, have been modified in paragraph 11.J of this alternate assumption to acknowledge that waste packages might be removed from an emplacement drift to allow personnel access. This modification is applicable to VA issue #11 alternate concept 6. This assumption would be applied in conjunction with assumption ALT 024.

IV. RESPONSIBILITY AND WITHDRAWAL

Responsible Management and Operating Contractor (M&O) organization: Systems Engineering

Document(s) Supporting Withdrawal of Assumption:

Withdrawal Date: