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U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

MINED GEOLOGIC DISPOSAL SYSTEM LICENSE APPLICATION ANNOTATED OUTLINE

Volume 2 of 3

UNITED STATES DEPARTMENT OF ENERGY

MGDS License Application Annotated Outline

Chapter 4.0 Geologic Repository Operations Area: Physical Facilities

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LIST OF INFORMATION NEEDS

4.0-1 Update the introduction to Chapter 4 to include a general compliance statement, which affirms that the GROA SSCs comply with all applicable regulatory requirements.

4.0 GEOLOGIC REPOSITORY OPERATIONS AREA: PHYSICAL FACILITIES

[This chapter presents information describing the physical facilities and the compliance assessment for the geologic repository operations area (GROA). Included are the design description; the compliance methods for surface facilities, shafts, ramps, and the underground facility; and the interfaces among all structures, systems, and components (SSCs) (Figure 4.0-1). The SSCs important to safety, retrievability, or isolation are identified and discussed. Physical measures to provide radiation protection are also described.

The design and analysis results for the GROA indicate that the SSCs are designed to prevent or mitigate the consequences of design basis accidents, ensure waste isolation, and facilitate waste retrievability. Analyses provided in this chapter demonstrate the GROA SSCs comply with all applicable regulatory requirements. Therefore, it is unlikely that circumstances by which GROA operations threaten the health and safety of the operating personnel or the public could develop. These conclusions are supported in the following Sections (INN-4.0-1):]

The description of the GROA is presented in Section 4.1, which is organized as Surface Facilities (Subsection 4.1.1), Shafts and Ramps (Subsection 4.1.2); Underground Facility (Subsection 4.1.3); Radiation Protection (Subsection 4.1.4); and Interface of SSCs (Subsection 4.1.5). An assessment of compliance with Part 60 regulations for the surface facilities is provided in Section 4.2; an assessment of compliance for shafts and ramps is in Section 4.3; and a compliance assessment for the underground facility is in Section 4.4. Section 4.5 discusses the integrated GROA compliance with performance objectives of 10 CFR 60, *Disposal of High-Level Radioactive Wastes in Geologic Repositories.*

REFERENCES

10 CFR 60, Disposal of High-Level Radioactive Wastes in Geologic Repositories

ACRONYMS AND ABBREVIATIONS

ACD	Advanced Conceptual Design
ALARA	As Low as Reasonably Achievable
DOE	U.S. Department of Energy
EPA	Environmental Protection Agency
FCRG	Format and Content Reg Guide
GROA	Geologic Repository Operations Area
HEPA	High-Efficiency Particulate Air
HLW	High-Level Waste
LA	License Application
LAD	License Application Design
MGDS	Mined Geologic Disposal System
NRC	Nuclear Regulatory Commission
R&D	Research and Development
RCA	Radiation Control Area
RIB	Reference Information Base
SNF	Spent Nuclear Fuel
SSCs	Structures, Systems, and Components
TBD	To Be Determined
TBM	Tunnel Boring Machine

FIGURE CAPTIONS

Figure 4.0-1 Repository Layout

General arrangement drawing of the entire repository with major features identified. Surface facilities, shafts and ramps, and underground facility. Shows the site boundary.

[This drawing can be found in Section 4.1.]

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.0-1
Section Number and Title:	4.0 GEOLOGIC REPOSITORY OPERATIONS AREA: PHYSICAL FACILITIES
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Update the introduction to Chapter 4 to include a general compliance statement, which affirms that the GROA SSCs comply with all applicable regulatory requirements.
Information will be used to support:	
The Information is needed by/for (date or event):	For final revision of AO (2000)
Most likely source of the Information:	Regulatory and Licensing
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS License Application Annotated Outline

Section 4.1 Description of the Geologic Repository Operations Area Systems, Structures, and Components

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LIST OF INFORMATION NEEDS

4.1.0.1-1	Describe the mission of the GROA.
4.1.0.2-1	Provide a general description of the GROA.
4.1.0.2-2	Identify the major operations performed at the facility.
4.1.0.2-3	Provide an overview of the GROA operations phases.
4.1.0.2-4	Provide an overview of the materials to be placed in the repository.
4.1.0.2-5	Describe the relationship and interface with the other portions of the MGDS.
4.1.0.2-6	Identify the major sub-areas within the GROA.
4.1.0.2-7	Provide the location of the GROA relative to the accessible environment.
4.1.0.2-8	Describe where a complete description of the GROA facilities and systems can be found.
4.1.0.2-9	Provide key parameters that give a physical feel to the facilities provided.
4.1.0.2-10	Describe the major design features important to waste isolation.
4.1.0.3-1	Briefly describe the major construction and operating phases of the GROA.
4.1.0.3-2	Provide a Gantt type schedule showing the major construction and operations phases.
4.1.0.4-1	Describe the purpose of the section.
4.1.0.4-2	Describe the section organization and indicate where references are listed.
4.1.0.4.1-1	Describe the regulatory requirements and design criteria from 10 CFR 60.
4.1.0.4.1-2	Describe the design requirements form other federal, state and local agencies.
4.1.0.4.1-3	Indicate where in section 5.1 the characteristics and history of the waste can be found.
4.1.0.4.2-1	Describe the design requirements contained in DOE documents and system and subsystem requirements documents.

LIST OF INFORMATION NEEDS (continued)

4.1.0.4.2-2	Indicate where in section 5.1 the detailed waste package design information can be found.
4.1.0.4.3-1	Describe the major site features that affect GROA design and performance.
4.1.0.4.3-2	Discuss site design basis, including compilation and interpretation of all physical data relevant to GROA design.
4.1.0.4.3-3	Describe the interpretation of site geology such as stratigraphy, structural features, major and minor faults, etc...
4.1.0.4.3-4	Describe the interpretation of surface and groundwater hydrologic data including surface drainage characteristics, drainage through strata penetrated by ramps and shafts, above and below ground.
4.1.0.4.3-5	Provide soil properties and other relevant data for the design of foundations.
4.1.0.4.3-6	Provide relevant meteorological data.
4.1.0.4.3-7	Provide rock data and properties that are relevant to the design of surface facilities, shafts and ramps, and the underground facility.
4.1.0.4.3-8	Describe site-specific human induced phenomena.
4.1.0.5-1	Describe and discuss the framework for SSC identification.
4.1.0.5-2	Identify where the SSCs are described in detail.
4.1.0.5-3	Provide a discussion on how sections 4.2 through 4.4 discusses the analysis that identifies the SSCs important to safety.
4.1.0.5-4	Discuss the activities and events, either planned or unplanned, that could interfere with SSC performance.
4.1.0.6-1	Identify SSCs that require R&D to confirm the adequacy of design.
4.1.0.6-2	Identify the development programs needed for SSC requiring R&D.
4.1.0.6-3	Describe the justification for licensing for construction before the results of the R&D programs are available.
4.1.0.7-1	Describe how and where alternative design features are described.
4.1.1-1	Provide the location and layout of the surface facilities.

LIST OF INFORMATION NEEDS (continued)

4.1.1-2	Identify the GROA surface areas.
4.1.1-3	Identify each surface facility included in the GROA (listed by GROA area).
4.1.1-4	Describe the purposed, function, operations, design basis, etc (see section 4.1.1 for additional details).
4.1.1-5	Identify the major SSCs that are important to safety. Identify the SSCs that are important to retrievability.
4.1.1.1-1	Describe the purpose of each system within the SYSTEM.
4.1.1.1-2	List the individual systems included in this group of systems.
4.1.1.1-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.1-4	Provide preliminary design information for each system included in the text of section 4.1.1.1.
4.1.1.1-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.1-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.2-1	Describe the purpose of each system within the SYSTEM.
4.1.1.2-2	List the individual systems included in this group of systems
4.1.1.2-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.2-4	Provide preliminary design information for each system included in the text of section 4.1.1.2.
4.1.1.2-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.2-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.3-1	Describe the purpose of each system within the SYSTEM.

LIST OF INFORMATION NEEDS (continued)

4.1.1.3-2	List the individual systems included in this group of systems.
4.1.1.3-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.3-4	Provide preliminary design information for each system included in the text of section 4.1.1.3.
4.1.1.3-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.3-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.4-1	Describe the purpose of each system within the SYSTEM.
4.1.1.4-2	List the individual systems included in this group of systems.
4.1.1.4-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.4-4	Provide preliminary design information for each system included in the text of section 4.1.1.4.
4.1.1.4-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.4-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.5-1	Describe the purpose of each system within the SYSTEM.
4.1.1.5-2	List the individual systems included in this group of systems.
4.1.1.5-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.5-4	Provide preliminary design information for each system included in the text of section 4.1.1.5.
4.1.1.5-5	Describe any design alternatives that were considered and the rational for selecting the current design.

LIST OF INFORMATION NEEDS (continued)

4.1.1.5-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.5-7	Provide a description of how the communications systems linking the surface and subsurface is addressed.
4.1.1.6-1	Describe the purpose of each system within the SYSTEM.
4.1.1.6-2	List the individual systems included in this group of systems.
4.1.1.6-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.6-4	Provide preliminary design information for each system included in the text of section 4.1.1.6.
4.1.1.6-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.6-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.6-7	Provide a discussion of the operating features, including redundant design features that are essential to safety under normal and accident conditions.
4.1.1.7-1	Describe the purpose of each system within the SYSTEM.
4.1.1.7-2	List the individual systems included in this group of systems.
4.1.1.7-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.7-4	Provide preliminary design information for each system included in the text of section 4.1.1.7.
4.1.1.7-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.7-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.7-7	Provide a discussion of the operating features, including redundant design features that are essential to safety under normal and accident conditions. Indicating how the control logic will be described.

LIST OF INFORMATION NEEDS (continued)

4.1.1.7-8	Provide a description of the data management systems.
4.1.1.7-9	Provide a description of the GROA computer systems.
4.1.1.7-10	Provide a description of the monitoring instruments and control systems that monitor and control safety related systems and equipment.
4.1.1.7-11	A drawing of the architecture of computers and associated controls.
4.1.1.7-12	Provide a drawing of the control room for the instrumentation and control system.
4.1.1.8-1	Describe the purpose of each system within the SYSTEM.
4.1.1.8-2	List the individual systems included in this group of systems.
4.1.1.8-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.8-4	Provide preliminary design information for each system included in the text of section 4.1.1.8
4.1.1.8-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.8-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.8-7	Provide drawings showing the location of onsite railroads and paved roads.
4.1.1.8-8	Provide drawings of hoist buildings and ramp buildings.
4.1.1.9-1	Describe the purpose of each system within the SYSTEM.
4.1.1.9-2	List the individual systems included in this group of systems.
4.1.1.9-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.9-4	Provide preliminary design information for each system included in the text of section 4.1.1.9.
4.1.1.9-5	Describe any design alternatives that were considered and the rational for selecting the current design.

LIST OF INFORMATION NEEDS (continued)

4.1.1.9-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.9-7	Provide a discussion of the operating features, including redundant design features that are essential to safety under normal and accident conditions.
4.1.1.10-1	Describe the purpose of each system within the SYSTEM.
4.1.1.10-2	List the individual systems included in this group of systems.
4.1.1.10-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.10-4	Provide preliminary design information for each system included in the text of section 4.1.1.10.
4.1.1.10-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.10-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.10.2.1-1	Provide a table identifying the support facility summaries (focus on the development side).
4.1.1.10.2.1-2	Provide a site layout drawing(s) that show the development side facility plans.
4.1.1.10.2.2-1	Provide general arrangement(s) of the maintenance shop.
4.1.1.10.2.3-1	Provide general arrangement(s) of the supply warehouse(s).
4.1.1.10.2.4-1	Provide a general arrangement drawing of the change house.
4.1.1.10.2.6-1	Provide general arrangement drawing(s) of the Office buildings.
4.1.1.10.2.7-1	Provide general arrangement drawing(s) for the support facilities of the development side of the GROA.
4.1.1.11-1	Describe the purpose of each system within the SYSTEM.
4.1.1.11-2	List the individual systems included in this group of systems.

LIST OF INFORMATION NEEDS (continued)

4.1.1.11-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.11-4	Provide preliminary design information for each system included in the text of section 4.1.1.11.
4.1.1.11-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.11-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.1.11-7	Provide a discussion on decommissioning operations that may affect long term isolation of waste and a discussion on decommissioning methods and procedures.
4.1.1.12-1	Describe the purpose of each system within the SYSTEM.
4.1.1.12-2	List the individual systems included in this group of systems.
4.1.1.12-3	Provide a general design description, referring to the site map, to show how the various systems work together.
4.1.1.12-4	Provide preliminary design information for each system included in the text of section 4.1.1.12.
4.1.1.12-5	Describe any design alternatives that were considered and the rational for selecting the current design.
4.1.1.12-6	Provide the detailed design information as applicable for systems that affect safety.
4.1.2.1-1	Provide a detailed description of the waste ramp.
4.1.2.1.1.1-1	Provide a table showing the general characteristics of the waste ramp.
4.1.2.1.1.1-2	Provide a table that shows the design basis summaries.
4.1.2.1.1.2-1	Provide figure showing the stratigraphic section at the waste ramp centerline.
4.1.2.1.1.3-1	Provide a site plan of the waste ramp portal.
4.1.2.1.1.3-2	Provide a general arrangement/layout drawing of the waste ramp porta..

LIST OF INFORMATION NEEDS (continued)

4.1.2.1.1.4-1	Provide a cross section view of the waste ramp portal lining and support.
4.1.2.1.1.5-1	Provide a plan and general arrangement drawing of the waste ramp layout.
4.1.2.1.1.6-1	Provide a summary table of the key waste ramp lining and support characteristics.
4.1.2.1.1.7-1	Provide a series of typical cross section drawing that show the stratigraphic units throughout the waste ramp.
4.1.2.1.1.8-1	Provide a general arrangement drawing that shows the site drainage for the waste ramp portal.
4.1.2.1.1.9-1	Provide a general arrangement drawing showing the waste ramp drainage.
4.1.2.1.2.2-1	Provide the general specifications of the waste transport cask and the prime mover.
4.1.2.1.2.2-2	Provide a figure showing the waste transport cask and prime mover on the waste ramp.
4.1.2.1.2.2-3	Provide the general arrangement drawings for the waste transport cask.
4.1.2.1.2.3-1	Provide a table of the representative airflow(s) during repository operations.
4.1.2.1.2.4-1	Provide a summary of the waste ramp safety features and measures.
4.1.2.1.2.4-2	Provide the credible accident scenarios versus the waste ramp safety features and measures to mitigate accident severity.
4.1.2.1.2.5-1	Provide a summary schedule for waste ramp operations.
4.1.2.1.2.6-1	Provide a summary maintenance schedule and description for the waste ramp.
4.1.2.1.2.7-1	Provide the design validation and performance monitoring plan summary and instrument schedule for the waste ramp.
4.1.2.1.3.1-1	Provide a layout drawing showing the operational seal locations.
4.1.2.1.3.2-1	Provide the post-closure seal locations.
4.1.2.1.3.2-2	Provide a series of general arrangement drawings that show the post closure seals.

LIST OF INFORMATION NEEDS (continued)

4.1.2.2-1	Provide a detailed description of the muck shaft or ramp.
4.1.2.2.1.1-1	Provide a table showing the general characteristics of the muck shaft or ramp.
4.1.2.2.1.1-2	Provide a table that shows the design basis summaries of the muck shaft or ramp.
4.1.2.2.1.2-1	Provide a figure showing the stratigraphic section at the muck shaft or ramp centerline.
4.1.2.2.1.3-1	Provide a site plan of the muck shaft or ramp portal.
4.1.2.2.1.3-2	Provide a general arrangement/layout drawing of the muck shaft or ramp portal.
4.1.2.2.1.4-1	Provide a cross section view of the muck shaft or ramp portal lining and support.
4.1.2.2.1.5-1	Provide plan and general arrangement drawings of the muck shaft or ramp layout.
4.1.2.2.1.6-1	Provide a summary table of the key muck shaft or ramp lining and support characteristics.
4.1.2.2.1.7-1	Provide a series of typical cross section drawings that show the stratigraphic units throughout the muck shaft or ramp.
4.1.2.2.1.8-1	Provide general arrangement drawing that shows the site drainage for the muck shaft or ramp portal.
4.1.2.2.1.9-1	Provide a general arrangement drawing showing the muck shaft or ramp drainage.
4.1.2.2.2.2-1	Provide a figure showing the typical personnel hauling equipment arrangement.
4.1.2.2.2.2-2	Provide the general arrangement drawings for the typical materials and supplies hauling equipment.
4.1.2.2.2.3-1	Provide the representative airflow(s) during repository operations.
4.1.2.2.2.4-1	Provide a summary of the muck shaft or ramp safety features and measures.

LIST OF INFORMATION NEEDS (continued)

4.1.2.2.2.4-2 Provide the credible accident scenarios versus the muck shaft or ramp safety features and measures to mitigate accident severity.

4.1.2.2.2.5-1 Provide a summary operating schedule for the muck shaft or ramp operations.

4.1.2.2.2.6-1 Provide a summary maintenance schedule and description for the muck shaft or ramp.

4.1.2.2.2.7-1 Provide the design validation and performance monitoring plan summary and instrument schedule for the muck shaft or ramp.

4.1.2.2.3.1-1 Provide a layout drawing showing the operational seal locations.

4.1.2.2.3.2-1 Provide the post-closure seal locations.

4.1.2.2.3.2-2 Provide a series of general arrangement drawings that show the post closure seals.

4.1.2.3-1 Provide a detailed description of the ventilation intake shaft.

4.1.2.3.1.1-1 Provide a table showing the general characteristics of the ventilation intake shaft.

4.1.2.3.1.1-2 Provide a table that shows the design basis summaries.

4.1.2.3.1.2-1 Provide figure showing the stratigraphic section at the ventilation intake shaft centerline.

4.1.2.3.1.3-1 Provide a site plan for the ventilation intake shaft collar.

4.1.2.3.1.3-2 Provide a general arrangement/layout drawing of the ventilation intake shaft collar.

4.1.2.3.1.4-1 Provide a cross section view of the ventilation intake shaft collar lining and support.

4.1.2.3.1.5-1 Provide a long section and general arrangement drawing of the ventilation intake shaft layout.

4.1.2.3.1.6-1 Provide a summary table of the key ventilation intake shaft lining and support characteristics.

4.1.2.3.1.7-1 Provide a series of typical cross section crawing that show the stratigraphic units throughout the ventilation intake shaft.

LIST OF INFORMATION NEEDS (continued)

4.1.2.3.1.8-1 Provide a general arrangement drawing that shows the site drainage for the ventilation intake shaft collar.

4.1.2.3.1.9-1 Provide a general arrangement drawing showing the ventilation intake shaft drainage.

4.1.2.3.2.1-1 Provide a table of representative airflow(s) during repository operations.

4.1.2.3.2.2-1 Provide a summary maintenance schedule and description for the ventilation intake shaft.

4.1.2.3.2.3-1 Provide the design validation and performance monitoring plan summary and instrument schedule for the ventilation intake shaft.

4.1.2.3.3.1-1 Provide the operational seal locations.

4.1.2.3.3.2-1 Provide the post closure seal locations.

4.1.2.3.3.2-2 Provide a series of general arrangement drawings that show the post closure seals.

4.1.2.4-1 Provide a detailed description of the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.1.1-1 Provide a table showing the general characteristics of the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.1.1-2 Provide a table that shows the design basis summaries of the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.1.2-1 Provide a figure showing the stratigraphic section at the ventilation exhaust shaft - emplacement side centerline.

4.1.2.4.1.1.3-1 Provide a site plan for the ventilation exhaust shaft - emplacement side collar.

4.1.2.4.1.1.3-2 Provide general arrangement/layout drawings of the ventilation exhaust shaft - emplacement side collar.

4.1.2.4.1.1.4-1 Provide a cross section view of the ventilation exhaust shaft - emplacement side collar lining and support.

4.1.2.4.1.1.5-1 Provide a long section and general arrangement drawing of the ventilation exhaust shaft - emplacement side layout.

LIST OF INFORMATION NEEDS (continued)

4.1.2.4.1.1.6-1 Provide a summary table of the key ventilation exhaust shaft - emplacement side lining and support characteristics.

4.1.2.4.1.1.7-1 Provide a series of typical cross section drawings that show the stratigraphic units throughout the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.1.8-1 Provide general arrangement drawings that show the site drainage for the ventilation exhaust shaft - emplacement side collar.

4.1.2.4.1.1.9-1 Provide a general arrangement drawing showing the ventilation exhaust shaft - emplacement side drainage.

4.1.2.4.1.2.1-1 Provide a table of representative airflow(s) during repository operations.

4.1.2.4.1.2.2-1 Provide the general specifications of the High Efficiency Particular Air Filters.

4.1.2.4.1.2.2-2 Provide the general arrangement drawings of the emplacement exhaust shaft-emplacement side ventilation system.

4.1.2.4.1.2.2-3 Provide the general arrangement drawings of the exhaust air bypass the High-Efficiency Particular Air filter system.

4.1.2.4.1.2.3-1 Provide a summary of the safety features and measures of the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.2.3-2 Identify the credible accident scenarios versus shaft - emplacement side safety features and measures to mitigate accident severity.

4.1.2.4.1.2.4-1 Provide a summary maintenance schedule and description for the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.2.5-1 Provide the design validation and performance monitoring plan summary and instrument schedule for the ventilation exhaust shaft - emplacement side.

4.1.2.4.1.3.1-1 Provide a layout drawing showing the operational seal locations.

4.1.2.4.1.3.2-1 Provide the post-closure seal locations.

4.1.2.4.1.3.2-2 Provide a series of general arrangement drawings that show the post closure seals.

4.1.2.4.2.1.1-1 Provide a table showing the general characteristics of the ventilation exhaust shaft - development side.

LIST OF INFORMATION NEEDS (continued)

4.1.2.4.2.1.1-2 Provide a table that shows the design basis summaries of the ventilation exhaust shaft - emplacement side.

4.1.2.4.2.1.2-1 Provide a figure showing the stratigraphic section at the ventilation exhaust shaft - development side centerline.

4.1.2.4.2.1.3-1 Provide a site plan of the ventilation exhaust shaft - development side collar.

4.1.2.4.2.1.3-2 Provide general arrangement/layout drawings of the ventilation exhaust shaft - development side collar.

4.1.2.4.2.1.4-1 Provide a cross section view of the ventilation exhaust shaft - development side collar lining and support.

4.1.2.4.2.1.5-1 Provide a long section and general arrangement drawing of the ventilation exhaust shaft - development side layout.

4.1.2.4.2.1.6-1 Provide a summary table of the key ventilation exhaust shaft - development side lining and support characteristics.

4.1.2.4.2.1.7-1 Provide a series of typical cross section drawing that show the stratigraphic units throughout the ventilation exhaust shaft - development side

4.1.2.4.2.1.8-1 Provide a general arrangement drawing that shows the site drainage for the ventilation exhaust shaft - development side collar.

4.1.2.4.2.1.9-1 Provide a general arrangement drawing showing the ventilation exhaust shaft - development side drainage.

4.1.2.4.2.2.1-1 Provide representative airflows during repository operations.

4.1.2.4.2.2.3-1 Provide a summary of the safety features and measures of the emplacement side exhaust shaft - development side.

4.1.2.4.2.2.3-2 Identify the credible accident scenarios versus shaft - development side safety features and measures to mitigate accident severity.

4.1.2.4.2.2.4-1 Provide a summary maintenance schedule and description for the ventilation exhaust shaft - development side.

4.1.2.4.2.2.5-1 Provide the design validation and performance monitoring plan summary and instrument schedule for the ventilation exhaust shaft - development side.

4.1.2.4.2.3.1-1 Provide a layout drawing showing the operational seal locations.

LIST OF INFORMATION NEEDS (continued)

4.1.2.4.2.3.2-1 Provide the post-closure seal locations.

4.1.2.4.2.3.2-2 Provide a series of general arrangement drawings that show the post closure seals.

4.1.2.5-1 Provide a detailed description of the personnel and material shafts.

4.1.2.5.1.1-1 Provide a table showing the general characteristics of the personnel and material shafts.

4.1.2.5.1.1-2 Provide a table that shows the design basis summaries.

4.1.2.5.1.2-1 Provide figure showing the stratigraphic section at the personnel and material shafts centerline.

4.1.2.5.1.3-1 Provide a site plan of the personnel and material shafts portal.

4.1.2.5.1.3-2 Provide a general arrangement/layout drawing of the personnel and material shafts portal.

4.1.2.5.1.4-1 Provide a cross section view of the personnel and material shafts portal lining and support.

4.1.2.5.1.5-1 Provide a plan and general arrangement drawing of the personnel and material shafts layout.

4.1.2.5.1.6-1 Provide a summary table of the key personnel and material shafts lining and support characteristics.

4.1.2.5.1.7-1 Provide a series of typical cross section drawing that show the stratigraphic units throughout the personnel and material shafts.

4.1.2.5.1.8-1 Provide a general arrangement drawing that shows the site drainage for the personnel and material shafts portal.

4.1.2.5.1.9-1 Provide a general arrangement drawing showing the personnel and material shafts drainage.

4.1.2.5.2.1-1 Provide the general specifications of the hoisting equipment.

4.1.2.5.2.1-2 Provide the general arrangement drawings for the hoisting equipment.

4.1.2.5.2.2-1 Provide the representative airflow(s) during repository operations.

LIST OF INFORMATION NEEDS (continued)

4.1.2.5.2.3-1	Provide a summary of the personnel and material shafts safety features and measures.
4.1.2.5.2.3-2	Provide the credible accident scenarios versus the personnel and material shafts safety features and measures to mitigate accident severity.
4.1.2.5.2.4-1	Provide a summary operating schedule for the personnel and material shafts operations.
4.1.2.5.2.5-1	Provide a summary maintenance schedule and description for the personnel and material shafts.
4.1.2.5.2.6-1	Provide the design validation and performance monitoring plan summary and instrument schedule for the personnel and material shafts.
4.1.2.5.3.1-1	Provide a layout drawing showing the operational seal locations. In addition, provide a general description of the operational seals.
4.1.2.5.3.2-1	Provide the post-closure seal locations.
4.1.2.5.3.2-2	Provide a series of general arrangement drawings that show the post closure seals.
4.1.2.6-1	Provide a description of the GROA decommissioning system.
4.1.2.6.1-1	Provide a summary of the operational seal locations and types.
4.1.2.6.2-1	Table of post-closure seal locations and type summaries.
4.1.2.6.2.5-1	Prove the general arrangement drawings of other plugs or bulkheads.
4.1.2.6.3.1-1	Provide the properties of the backfill materials located in shafts.
4.1.2.6.3.1-2	Provide the properties of the backfill materials located in the ramps.
4.1.2.6.3.2-1	Provide the properties of the seal materials used in the shafts.
4.1.2.6.3.2-2	Provide the properties of the ramp seal materials.
4.1.2.6.3.3-1	Provide the properties of other plug or bulkhead materials.
4.1.2.6.4.1-1	Provide the general specifications for the shaft backfilling equipment.
4.1.2.6.4.1-2	Provide a sequence diagram showing the shaft backfill operations.

LIST OF INFORMATION NEEDS (continued)

4.1.2.6.4.1-3	Prove a set of general arrangement drawings showing the shaft backfilling equipment.
4.1.2.6.4.2-1	Provide the general specifications of the ramp backfilling equipment.
4.1.2.6.4.2-2	Provide a sequence diagram showing the ramp backfill operations.
4.1.2.6.4.2-3	Provide a set of general arrangement drawings showing the ramp backfilling equipment.
4.1.2.6.4.3-1	Provide the general specifications of the shaft sealing equipment.
4.1.2.6.4.3-2	Provide a sequence diagram showing the shaft sealing operations.
4.1.2.6.4.3-3	Provide a set of general arrangement drawings showing the shaft sealing equipment.
4.1.2.6.4.4-1	Provide the general specifications of the ramp sealing equipment.
4.1.2.6.4.4-2	Provide a sequence diagram showing the ramp sealing operations.
4.1.2.6.4.4-3	Provide a set of general arrangement drawings showing the ramp sealing equipment.
4.1.2.6.4.5-1	Provide the general specifications of any other plug or bulkhead equipment.
4.1.2.6.4.5-2	Provide a sequence diagram showing any other plug or bulkhead operations.
4.1.2.6.4.5-3	Provide a set of general arrangement drawings showing any other plug or bulkhead equipment.
4.1.3-1	Table containing the identification and (important to safety, retrievability, or isolation) classification of SSCs for the underground facility.
4.1.3-2	Table of inspection schedules for SSCs for the underground facility.
4.1.3-3	Table containing testing schedule for SSCs for the underground facility.
4.1.3-4	Table containing the maintenance schedule for the SSCs for the underground facility.
4.1.3.1.1.1-1	These tables summarize the bases for excavation system design.

LIST OF INFORMATION NEEDS (continued)

4.1.3.1.1.2-1	These figures show various TBM designs that are considered as the primary means of drift excavation.
4.1.3.1.1.3-1	These figures show various mechanical excavator designs (roadheaders, mini-disc cutters, and others) that are considered as a secondary means of excavation. Designs are included for excavation of drifts, alcoves, and shafts.
4.1.3.1.2.1-1	These data include (1) loading conditions (excavation, seismic, and thermal), (2) design data (thermal and mechanical properties of tuff and engineered materials, and waste characteristics), and (3) repository layout.
4.1.3.1.2.2-1	Rock mass classification parameters (Q, RMR, and RQD) for application of empirical support selection methods.
4.1.3.2-1	Provide the performance requirements, design descriptions, and operating descriptions for each of the muck handling systems. Provide the performance requirements for the muck handling equipment.
4.1.3.2-2	Provide a layout drawing of the muck handling equipment and include units or systems such as load-haul-dump and belt conveyors.
4.1.3.3.1.2-1	Figure(s) showing the absolute pressure gradients throughout the intake, subsurface, and exhaust for each of the two systems.
4.1.3.3.1.3-1	Approximately tree figures, each with multiple sketches, may be used to depict the various ventilation control devices required to direct and control the flow of air in the subsurface.
4.1.3.3.1.4-1	This table will contain data on the capacities of the fans and filtering systems required for the ventilation systems.
4.1.3.3.1.6-1	The maintenance intervals of the major ventilation system components will be described in this table.
4.1.3.3.1.8-1	The emplacement mode and average package spacing would be needed to prepare this figure.
4.1.3.3.1.8-2	These curves will show cooling effects of ventilation air in a heated drift for a range of drift lengths, airflow quantities, and areal heat loads.
4.1.3.3.1.9-1	Figures that show the evolution of the ventilation systems as the repository if constructed, operated, maintained, and decommissioned.

LIST OF INFORMATION NEEDS (continued)

4.1.3.3.2.1-1 The layout of the underground shop area in the development system will be needed to start this activity.

4.1.3.3.2.2-1 Unit airflow quantities will be assigned to each activity to be carried out in the subsurface.

4.1.3.3.2.3-1 The information contained in these tables will include the airflow quantity required for each of the time periods and the associated pressure and power requirements to supply that air quantity.

4.1.3.3.3.1-1 The layout of the underground shop area in the emplacement system will be needed to start this activity.

4.1.3.3.3.2-1 Unit airflow quantities will be assigned to each activity to be carried out in the subsurface.

4.1.3.3.3.3-1 The information contained in these tables will include the airflow quantity required for each of the time periods and the associated pressure and power requirements to supply that air quantity.

4.1.3.4-1 Provide the results of a systems study, which includes a thermal management study, that identifies the key parameters affecting waste emplacement and provides a flexible design that allows for emplacement in accordance with the emplacement licensing strategy.

4.1.3.4.1.1-1 These tables summarize design basis information for the waste emplacement system.

4.1.3.4.1.2-1 These figures show the layout of emplacement drifts and the mode of emplacement.

4.1.3.4.1.2-2 Provide a discussion on the use of backfill.

4.1.3.4.1.3-1 These figures and tables give designs and design parameters for waste handling equipment for emplacement and for transport of waste packages from surface facilities to subsurface emplacement locations.

4.1.3.4.2.1-1 These data include (1) loading conditions (excavation, seismic, and thermal), (2) design data (thermal and mechanical properties of tuff and engineered materials, and waste characteristics), and (3) repository layout.

4.1.3.4.2.2-1 Rock mass classification parameters (Q, RMR, and RQD) for application of empirical support selection methods.

LIST OF INFORMATION NEEDS (continued)

4.1.3.6-1	Descriptions of all subsurface emergency systems.
4.1.3.7-1	This section will contain a description of the communication system(s) envisioned for use in the repository subsurface, and between the surface and subsurface areas.
4.1.3.9-1	Provide a discussion of all aspects of the preparation of the subsurface facility for permanent closure.
4.1.4-1	Provide a description of the layouts of the facilities for radiation protection in the GROA and the radiological design features for each system described in section 4.1 of the LA.
4.1.4-2	Provide radiation exposures to workers and the general public from handling, storage, retrieval, emplacement and isolation operations.
4.1.4-3	Provide a design ALARA Manual.
4.1.4-4	Provide an Operations ALARA Manual.
4.1.4.1-1	Within the emplacement side of the subsurface repository operations area, certain areas will be controlled to prevent access by personnel.
4.1.4.1-2	Provide a description of the facilities and equipment used for radiation protection. Provide Table 4.1.4.1-1 that lists SSCs intended for radiation protection.
4.1.4.2-1	Provide the figure(s) necessary to adequately represent the radiation zones within the GROA.
4.1.4.2-2	Those design features which contribute to the attainment of ALARA will be described.
4.1.4.2-3	Identify the measures used to maintain radiological safety and minimize contamination.
4.1.4.2.4-1	Provide the ventilation system component parameters important to effluent analyses.
4.1.4.3.1.1-1	Provide the typical fission and activation products and subsequent decay daughters in typical PWR and BWR fuel assemblies.
4.1.4.3.1.1-2	Provide the photon, neutron, and heat source terms for typical spent nuclear fuel types.

LIST OF INFORMATION NEEDS (continued)

4.1.4.3.1.1-3	Identify the types of radioactive effluents expected to be discharged into the underground facility as a result of operational occurrences.
4.1.4.3.1.2-1	Identify the ventilation system(s) that will handle airborne radioactive sources.
4.1.4.3.2-1	Provide the name and a description of the computer codes used in the shielding analyses.
4.1.4.3.2-2	Provide the minimum shielding requirements for GROA facilities.
4.1.4.4-1	This section will address the use of radiation monitors in the GROA.
4.1.4.4-2	Provide a discussion about the use of portal monitors to monitor personnel leaving the facility. Identify the locations at which the portal monitors will be used.
4.1.4.4-3	Describe and provide the location of the fixed-area monitors and continuous airborne monitoring instrumentation.
4.1.4.4-4	Provide an illustration of the fixed-area radiation monitoring system. Include sample pumps and collectors.
4.1.4.4-5	Provide a tabulation of the monitoring instrumentation design parameters.
4.1.5-1	Provide a discussion on the interfaces between the GROA and waste management systems such as transportation.
4.1.5-2	Provide a description of the SSCs that interface between surface facilities, shafts and ramps, and the underground facility.
4.1.5-3	Provide a discussion on the interface between safety related and non-safety related systems.

4.1 DESCRIPTION OF THE GROA SSCs

Note: skeleton text has not been developed for this section. Each subsection includes a description of the information that is expected to be developed.

4.1.0 Introduction

- Describe the purpose, scope and organization of Section 4.1.
- Describe where in this License Application (LA) Annotated Outline other GROA descriptive materials are located (e.g., Section 4.2 - Assessment of Compliance of Surface Facilities and Section 7.0 - Conduct of Repository Operations).
- Describe the organization of 4.1.0.

4.1.0.1 GROA Mission

- Describe the mission of the GROA. [INN 4.1.0.1-1]

4.1.0.2 GROA Description

- Provide a general description of GROA (including the quote of 10 CFR 60, *Disposal of High-Level Radioactive Wastes in Geologic Repositories*, Section 2, Description. [INN 4.1.0.2-1]
- Identify the major operations performed (e.g., receive and emplace High-Level Waste (HLW), cask maintenance, support development operations, performance conformation, interim storage, waste management, and balance of plant functions). [INN 4.1.0.2-2]
- Provide an overview of the GROA operations phases (i.e., startup, emplacement/development, caretaker, closure, decommissioning). [INN 4.1.0.2-3]
- Provide an overview of the materials to be placed in the repository (e.g., material types, forms for transportation and storage, storage quantities and receipt rates). [INN 4.1.0.2-4]
- Describe the relationship and interface with the other portions of the MGDS (i.e., waste isolation system). [INN 4.1.0.2-5]
- Identify the major subareas within the GROA (e.g., Radiological Control Area, Emplacement Area, Development Area, Balance of Plant Area and

Development Support Camp) and note which are Surface Facilities, Shafts and Ramps, and Underground. [INN 4.1.0.2-6]

- Provide the location of the GROA relative to the accessible environment (i.e., site boundary). Utilize plot plans, Figures 4.1.0.2-1, and an underground sections, Figure 4.1.0.2-2. These figures will identify facilities and GROA subareas. [INN 4.1.0.2-7]

- Describe where the complete descriptions of the GROA facilities and systems are provided (i.e., facility lists and descriptions, and SSC lists and descriptions). Provide the necessary references. [INN 4.1.0.2-8]

- Provide key parameters that give a physical feel to the facilities provided (e.g., number of facilities, construction type, number of employees, site area, overall floor space, and site location and terrain). [INN 4.1.0.2-9]

- Describe major design features important to safety, retrievability and waste isolation. [INN 4.1.0.2-10]

4.1.0.3 Schedule for Construction and Operation

- Briefly describe the major construction and operating phases (i.e., design, construction, startup, emplacement/development, caretaker, closure and decommissioning). [INN 4.1.0.3-1]

- Provide a Gantt type schedule showing the major construction and operations phases in Figure 4.1.0.3-1. [INN 4.1.0.3-2]

4.1.0.4 Design Criteria

- Describe the purpose of this section (i.e., summarize key design criteria and provide references to the appropriate criteria document). [INN 4.1.0.4-1]

- Describe the section organization and indicate where references are listed. [INN 4.1.0.4-2]

4.1.0.4.1 Regulatory Requirements

- Describe the regulatory requirements and design criteria from 10 CFR 60 [INN 4.1.0.4.1-1]

- Describe the design requirements from other federal, state, and local agencies, such as Occupational Safety and Health, mine safety,

Environmental Protection Agency (EPA) [INN 4.1.0.4.1-2]. [Format and Content Reg Guide (FCRG) DG-3003 comment]

- Indicate that the characteristics and history of the waste are described in detail in Section 5.1. [INN 4.1.0.4.1-3]

4.1.0.4.2 Derivative Design Criteria

- Describe the design requirements contained in U.S. Department of Energy (DOE) documents and system and subsystem design requirements documents. [INN 4.1.0.4.2-1]

- Describe the key design criteria that were derived from the higher regulatory requirements based on studies and agreements. Provide references to other criteria documents. [INN 4.1.0.4.2-1]

- Indicate that the detailed waste package design information is provided in Section 5.1. [INN 4.1.0.4.2-2]

4.1.0.4.3 Site Characteristics

[Site characteristics for the GROA will be summarized in this subsection. Detailed descriptions of site conditions expected to be encountered in constructing the surface facilities, shafts, ramps, and the underground facilities, are provided in Subsections 4.1.1, 4.1.2, and 4.1.3, respectively.]

- Describe the major site features that affect GROA design and performance. (Refer to other documents or sections for details.) [INN 4.1.0.4.3-1]

- Discuss site design basis, including compilation and interpretation of all physical data relevant to GROA design. [INN 4.1.0.4.3-2]

- Describe the interpretation of site geology such as stratigraphy, structural features, major and minor faults, old volcanos, and history of seismic activity. The physical geologic data is provided in Subsection 3.1.1. [INN 4.1.0.4.3-3]

- Describe the interpretation of surface and groundwater hydrologic data including surface drainage characteristics, drainage through strata penetrated by ramps and shafts, above and below ground. The data are provided in Subsection 3.1.2. [INN 4.1.0.4.3-4]

- Provide the soil properties and other relevant data for the design of foundations. [INN 4.1.0.4.3-5]

- Provide the relevant meteorological data. [INN 4.1.0.4.3-6]

- Provide the rock data and properties that are relevant to the design of surface facilities, shafts and ramps, and the underground facility. [INN 4.1.0.4.3-7]

- Describe the site-specific human-induced phenomena such as nuclear detonations and aircraft travel. The detailed data are provided in Subsection 3.1.4. [INN 4.1.0.4.3-8]

4.1.0.5 Identification and Classification of SSCs

- Describe the need for breaking the plant into SSCs and discuss the framework for SSC identification. [INN 4.1.0.5-1]

- Indicate where in the report the SSCs are described in detail and indicate that the SSCs are listed in those sections. [INN 4.1.0.5-2]

- Refer to Subsections 4.1.1, 4.1.2, and 4.1.3 for identification of items important to safety and items important to retrievability.

- Refer to Sections 4.2 through 4.4 for the analysis that identifies the SSCs important to safety (i.e., Q list). [INN 4.1.0.5-3]

- Discuss activities and events, either planned or unplanned, that could interfere with SSC performance. [INN 4.1.0.5-4]

4.1.0.6 SSCs Requiring Research and Development (R&D)

- Identify SSCs that require R&D to confirm the adequacy of design. Describe where these SSCs are identified and the development needs discussed. [INN 4.1.0.6-1]

- List the development programs in Table 4.1.0.6-1. [INN 4.1.0.6-2]

- Describe each development program [INN 4.1.0.6-2] including:

  - Purpose for the program (i.e., key issue to be resolved).

  - List the SSCs that will depend on the program for validation.

- Development schedule required to meet the repository licensing, design, construction and startup objectives.

- Contingency plans should the program results not validate the current design concepts.

- Describe why it is justifiable to license construction before the results of the R&D programs are available. [INN 4.1.0.6-3]

4.1.0.7 Alternative Design Features

- Describe how and where alternative design features are described. Comparative evaluations of the selected design features will be addressed and alternatives that could provide for longer waste isolation will be emphasized. [INN 4.1.0.7-1]

4.1.1 Surface Facilities

- Show location and layout of surface facilities in Figure 4.1.1-1 [INN 4.1.1-1]

- Identify the GROA surface areas (i.e., Radiological Control Area, Balance of Plant Area and Development Support Camp) and describe how the site surface facilities works as a whole (i.e. relationship between surface and subsurface areas; relationship between GROA and ESF surface facilities; and general site material and personnel movement). [INN 4.1.1-2]

- Provide the site conditions expected to be encountered in constructing the surface facilities.

- Identify each surface facility included in the GROA in Table 4.1.1-1. The facilities will be listed by GROA area and will include the following data for each facility: facility name, construction type, number of floors, gross area and number of operating personnel. [INN 4.1.1-3]

- Provide the information listed below for each facility. [INN 4.1.1-4]

  - Describe the purpose for the facility.

  - List the functions/operations performed.

  - Describe the design criteria, design basis, performance requirements, and codes and standards applied.

- Provide a general design description referring to site map, building floor plans, building sections and space requirements table. Cover general arrangement, number of floors, size, materials of construction, and construction type.

- Describe the basic operation of the building (i.e. material and personnel movement).

- Describe the number of operating personnel and features provided to support these workers.

- Describe the structural/architectural safety features.

  Identify the major SSCs in each facility

- Note that schedules for inspections, testing, and maintenance are presented in Section 7.1 of the LA.

• Identify the major SSCs that are important to safety in Table 4.1.1-2. [INN 4.1.1-5]

• Identify the SSCs important to retrievability in Table 4.1.1-3. [INN 4.1.1-5]

• Refer to Section 1.4 "Certification of Safeguards" and Section 1.5 "Physical Security Plan".

• Provide variables, conditions, or items of the surface facilities that are probable subjects of license specifications. Refer to Sections 2.6 and 7.8 of the LA.

• Provide a discussion of any unresolved safety issues that require R&D to resolve, and a schedule that shows when these issues will be resolved. Refer to Subsection 4.1.0.6 where issues are summarized for the GROA.

  [Note: The systems are described in the subsections that follow. Currently, the systems are grouped as identified in the FCRG. After the SSCs are identified, the subsection titles will be revised to best match the SSC hierarchy.]

4.1.1.1 Hot Cell Waste-Handling System, Buildings, and Equipment

• Describe the purpose of the system (i.e., receive HLW in transfer casks, load waste packages, transport to emplacement; maintain/decontaminate

the transfer casks and conduct performance confirmation operations). [INN 4.1.1.1-1]

- List the individual systems included in this group of systems, and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.1-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.1-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.1-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Describe the system flow referring to appropriate diagram (e.g., Process Flow Diagrams, Material Flow Diagrams, Piping and Instrumentation Diagrams, Fire Protection Diagrams, and Electrical One-line Diagrams).

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

  - Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; As Low As Reasonably Achievable (ALARA) plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.1-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.1-6]

  - Describe the control logic referring to Logic Diagrams
  - Advanced Process Flow Diagrams
  - Advanced Material Flow Diagrams
  - Advanced Piping and Instrumentation Diagrams
  - Advanced Fire Protection Diagrams
  - Advanced Electrical One-line Diagrams
  - TBD
  - TBD.

• Describe any temporary storage facilities. Figure 4.1.0.1-1 shows their location.

• Describe waste retrievability operations. [INN 4.1.1.1-7]

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.2 On-Site Radioactive Waste Management System

- Describe the purpose for the systems (i.e., collect, treat, package, dispose and/or ship low level radioactive and mixed solid and liquid wastes generated at the repository, and control and monitor effluents to the atmosphere). Describe the waste management philosophy. [INN 4.1.1.2-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.2-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.2-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.2-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Describe the system flow referring to appropriate diagram (e.g., Process Flow Diagrams, Material Flow Diagrams, Piping and Instrumentation Diagrams, Fire Protection Diagrams, and Electrical One-line Diagrams).

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.2-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.2-6]

  - Describe the control logic referring to Logic Diagrams
  - Advanced Process Flow Diagrams
  - Advanced Material Flow Diagrams
  - Advanced Piping and Instrumentation Diagrams
  - Advanced Fire Protection Diagrams
  - Advanced Electrical One-line Diagrams
  - TBD
  - TBD.

• Describe each waste source. [INN 4.1.1.1-7]

• For each waste source, describe collection, treatment, packaging, and disposal system and subsystem designs. [INN 4.1.1.-8]

- Describe effluent control and monitoring systems during normal operations. [INN 4.1.1.1-9]

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.3 Fire and Explosion Protection System

- Describe the purpose for the systems (i.e., prevent fires and explosions and protect facilities and personnel should a fire or explosion occur). Describe the protection philosophy. Identify the facilities that require protection. [INN 4.1.1.3-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.3-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.3-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.3-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Describe the system flow referring to appropriate diagram (e.g., Process Flow Diagrams, Material Flow Diagrams, Piping and Instrumentation Diagrams, Fire Protection Diagrams, and Electrical One-line Diagrams).

- Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts. Include a discussion on sprinkler coverage. Provide the locations of fire extinguishers, alarms, standpipes and fire walls. Provide a listing of the quantity, location and key physical properties of hazardous and combustible materials.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.3-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.3-6]

- Describe the control logic referring to Logic Diagrams
- Advanced Process Flow Diagrams
- Advanced Material Flow Diagrams
- Advanced Piping and Instrumentation Diagrams
- Advanced Fire Protection Diagrams
- Advanced Electrical One-line Diagrams

- TBD
- TBD.

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.4 Emergency Systems

- Describe the purpose for the systems (i.e., to protect facilities and personnel from natural and human induced emergencies, such as offsite power failures, floods, seismic events, military action, sabotage, and other emergencies). Describe the protection philosophy. Emphasize protection from radioactive waste and effluents. Note that the physical security is described in Section 1.5 and the fire and explosion protection systems are described in Section 4.1.1.3. [INN 4.1.1.4-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.4-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.4-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.4-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

- Describe the system flow referring to appropriate diagram (e.g., Process Flow Diagrams, Material Flow Diagrams, Piping and Instrumentation Diagrams, Fire Protection Diagrams, and Electrical One-line Diagrams).

- Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.4-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.4-6]

- Describe the control logic referring to Logic Diagrams
- Advanced Process Flow Diagrams
- Advanced Material Flow Diagrams
- Advanced Piping and Instrumentation Diagrams
- Advanced Fire Protection Diagrams
- Advanced Electrical One-line Diagrams

- TBD
- TBD.

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.5 Communications Systems

- Describe the purpose for the systems (i.e., on-site telephone service, closed circuit televisions and communication links with off-site agencies). Describe the communication system philosophy. [INN 4.1.1.5-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.5-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.5-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.5-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.5-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.5-6]

  - Describe the control logic referring to Logic Diagrams
  - TBD
  - TBD.

• Ensure that the communication systems linking the surface and subsurface are addressed. [INN 4.1.1.5-7]

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.6 Utility Systems

• Describe the purpose for the systems (i.e., supply bulk commodities to and collect piped non-radioactive wastes from locations throughout the

repository). Systems such as electrical power, standby/emergency power, auxiliary or back-up systems, compressed air, cooling water, raw water, steam, sanitary water, diesel fuel, sanitary sewage, chemical drains, and bulk chemical storage will be included. [INN 4.1.1.6-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.6-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.6-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.6-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Describe the system flow referring to appropriate diagram (e.g., Process Flow Diagrams, Material Flow Diagrams, Piping and Instrumentation Diagrams, Fire Protection Diagrams, and Electrical One-line Diagrams).

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

  - Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment

arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.6-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.6-6]

  - Describe the control logic referring to Logic Diagrams
  - Advanced Process Flow Diagrams
  - Advanced Material Flow Diagrams
  - Advanced Piping and Instrumentation Diagrams
  - Advanced Fire Protection Diagrams
  - Advanced Electrical One-line Diagrams
  - TBD
  - TBD.

• Discuss operating features, including redundant design features that are essential to safety under normal and accident conditions. [INN 4.1.1.6-7]

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.7 Instrumentation and Control Systems

- Describe the purpose for the systems (i.e., collect, record and display data from monitors throughout the repository and provide control signals to local equipment and instrument controllers). Describe the control philosophy. [INN 4.1.1.7-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.7-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.7-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.7-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

  - Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.7-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.7-6]

- Describe the control logic referring to Logic Diagrams
- TBD
- TBD.

• Ensure that the redundant design features that are essential to safety under normal and accident conditions are addressed. Indicate that the control logic will be described with the systems supported by the I&C system. [INN 4.1.1.7-7]

• Add data management (including support to waste management and tracking) to the listing of computer systems. Also add data management systems that track personnel. [INN 4.1.1.7-8]

• Describe design of GROA computer systems [INN 4.1.1.7-9], including:

- Data acquisition
- Meteorological monitoring
- Hydrological monitoring
- Geophysical monitoring
- Seismic monitoring
- Surface-based testing

- In site testing
- Performance conformation.

- Describe monitoring instruments and control systems that monitor and control safety related systems and equipment. [INN 4.1.1.7-10] The architecture of computers and controls is provided in Figure 4.1.1.7-1. [INN 4.1.1.7-11] The control room is illustrated in Figure 4.1.1.7-2. [INN 4.1.1.7-12]

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.8 On-site Transportation Systems

- Describe the purpose for the systems (i.e., provide facilities and equipment to move personnel and materials between buildings within the site boundary). Systems such as railroads, paved roads, ramp buildings, vehicle staging areas, bus loading areas and parking lots are included. Describe the onsite transportation philosophy. [INN 4.1.1.8-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.8-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.8-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.8-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and

ventilation systems, and any other systems). Quantify interfaces with other systems.

- Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.8-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.8-6]

  - Describe the control logic referring to Logic Diagrams
  - TBD
  - TBD.

• Figure 4.1.1.8-1 [INN 4.1.1.8-7] illustrates location of on-site railroads and paved roads. Detailed engineering of hoist buildings and ramp buildings is provided in Figure 4.1.1.8-2. [INN 4.1.1.8-8]

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.9 Ventilation Systems

- Describe the purpose for the systems (i.e., maintain the temperature and air quality within the surface facilities and within the underground areas, where the ventilation equipment is located at the surface; control releases to the atmosphere through a system of differential pressure zones and exhaust air filtration). Systems such as emplacement vent system, development vent system, High-Efficiency Particulate Air (HEPA) filtration, adsorption system, stack monitoring, and chilled water system will be included. [INN 4.1.1.9-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.9-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.9-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.9-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Describe the system flow referring to appropriate diagram (e.g., Process Flow Diagrams, Material Flow Diagrams, Piping and

Instrumentation Diagrams, Fire Protection Diagrams, and Electrical One-line Diagrams).

- Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.9-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.9-6]

- Describe the control logic referring to Logic Diagrams
- Advanced Process Flow Diagrams
- Advanced Material Flow Diagrams
- Advanced Piping and Instrumentation Diagrams
- Advanced Fire Protection Diagrams
- Advanced Electrical One-line Diagrams
- TBD
- TBD.

- Discuss the features that are essential to safety under normal and accident conditions [INN 4.1.1.9-7].

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.1.10 Operations Support Systems

- Describe the purpose for the systems (i.e., provide facilities outside the radiation control area (RCA) to support plant maintenance, operations and administration). Facilities such as the maintenance shop, supplies warehouse, storage yard, lockers and showers, visitor center and office buildings will be included. [INN 4.1.1.10-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.10-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.10-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.10-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

- Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.10-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.10-6]

  - Describe the control logic referring to Logic Diagrams
  - TBD
  - TBD.

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

[Note: This section can be broken into two major areas, the emplacement side and the development side (see Subsections 4.1.1.10.1 and 4.1.1.10.2).]

4.1.1.10.1 Emplacement Side Operations Support Systems

4.1.1.10.2 Development Side Operations Support Systems

4.1.1.10.2.1 General Development Side Support Facilities Description

Table 4.1.1.10.2.1-1 General Development Side Support Facility Summary [INN 4.1.1.10.2.1-1]

Figure 4.1.1.10.2.1-1 Development Side Site Plan [INN 4.1.1.10.2.1-2]
Figure 4.1.1.10.2.1-2 Development Side Site Plan [INN 4.1.1.10.2.1-2]

4.1.1.10.2.2 Development Side Maintenance Shops

Figure 4.1.1.10.2.2-1 Maintenance Shop General Arrangement [INN 4.1.1.10.2.2-1]

4.1.1.10.2.3 Development Side Supplies Warehouse and Storage Yard

Figure 4.1.1.10.2.3-1 Supplies Warehouse General Arrangement [INN 4.1.1.10.2.3-1]

4.1.1.10.2.4 Development Side Worker's Lockers and Showers

Figure 4.1.1.10.2.4-1 Changehouse General Arrangement [INN 4.1.1.10.2.4-1]

4.1.1.10.2.5 Visitors Center

4.1.1.10.2.6 Development Side Offices

Figure 4.1.1.10.2.6-1 Office Building General Arrangement [INN 4.1.1.1.10.2.6-1]

4.1.1.10.2.7 Other Development Side Support Facilities

Figure 4.1.1.10.2.7-1 Development Side Support Facility General Arrangement
Figure 4.1.1.10.2.7-2 Development Side Support Facility General Arrangement
Figure 4.1.1.10.2.7-3 Development Side Support Facility General Arrangement [INN 4.1.1.10.2.7-1]

4.1.1.11 Decommissioning System

- Describe the purpose for the systems (i.e., provide features to facilitate the removal of the surface facilities, land reclamation and erection of fences and permanent markers after the closure of the subsurface facilities). Describe the decommissioning philosophy (e.g., return to near greenfield condition). [INN 4.1.1.11-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes

and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.11-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.11-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.11-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

  - Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

  - For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

  - Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

  - Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans;

electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

- Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.11-5]

- Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.11-6]

  - Describe the control logic referring to Logic Diagrams
  - TBD
  - TBD.

- The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.

- Ensure that the following topics are addressed [INN 4.1.1.11-7]:

  - Decommissioning operations that may affect long term isolation of waste.

  - Decommissioning methods and procedures.

[Note: One potential section outline follows.]

4.1.1.11.1 Major Facility Decontamination and Decommissioning Description

4.1.1.11.1.1 Waste Handling Building

4.1.1.11.1.2 Waste Treatment Building

4.1.1.11.1.3 Performance Confirmation Building

4.1.1.11.1.4 Emplacement Side Exhaust Ventilation Plant

Refer to Subsection 4.1.2.4.1.2.2 for general facility description.

4.1.1.11.1.5 Decontamination Building

4.1.1.11.2 Other Equipment Decontamination and Decommissioning Description

4.1.1.11.3 Other Systems Decontamination and Decommissioning Description

4.1.1.11.4 Other Facilities Decontamination and Decommissioning Description

4.1.1.11.5 Decommissioning Operations Adversely Impacting Waste Isolation

4.1.1.12 Other Surface Systems

- Describe the purpose for the systems. Systems such as muck piles and surface lagoons will be included. [INN 4.1.1.12-1]

- List the individual systems included in this group of systems and for each system identify: design criteria, design basis, performance requirements, safety class, materials of construction, applicable codes and standards, and R&D programs required to verify design basis assumptions. [INN 4.1.1.12-2]

- Provide a general design description, referring to the site map, to show how the various systems work together. [INN 4.1.1.12-3]

- Provide the following preliminary design information for each system included in this section: [INN 4.1.1.12-4]

  - Describe the purpose of the system.

  - Provide the system design basis and margin of safety.

  - Indicate if the system was selected as a safety system and briefly provide the rationale for the selection. The demonstration of compliance and resulting margin of safety is provided in Section 4.2.

  - Define the system scope including inputs and outputs and interfaces with other systems (e.g., utility and waste treatment, emergency and ventilation systems, and any other systems). Quantify interfaces with other systems.

  - Identify the system operating conditions, capacities and other key design parameters and describe the design uncertainties and their significance.

  - Identify the major components or equipment items in each system. Note which components are safety related. Describe the location of system components referring to drawings such as equipment

arrangement drawings, floor plans, building sections, equipment location diagrams, and one-line diagrams for piping and ducts.

- For components identified as important to safety, describe the key design parameters (e.g., duty, capacity and horsepower), safety features, and utility tie-ins. This data may be provided as an equipment list. Refer to outline specifications.

- Describe the normal, off-normal and transient operation of the system and system response to emergency events. Where appropriate describe the logic for the major controls.

- Summarize and refer to any applicable plans, studies and calculations (e.g., space evaluations; energy conservation plans; electrical, communication and alarm plans; computer modelling studies for stack gas dispersion and material movement; electrical load, transfer and voltage drop calculations; site investigation reports; ALARA plans; confinement zone study; preliminary hazards analysis; and equipment redundancy analysis).

• Describe any design alternatives that were considered and the rationale for selecting the current design. [INN 4.1.1.12-5]

• Provide the following detailed design information, as applicable, for systems that affect safety: [INN 4.1.1.12-6]

  - Describe the control logic referring to Logic Diagrams
  - TBD
  - TBD.

[The balance of the detailed design data will be developed during Final Procurement and Construction Design and will not be provided in the construction LA.]

4.1.2 Shafts and Ramps

[Note: Descriptive material on boreholes is planned to be covered in this section. If described elsewhere, provide cross-reference to appropriate section and to Section 4.3]

4.1.2.1 Waste Ramp

[A Waste Ramp is currently planned.] [INN 4.1.2.1-1]

4.1.2.1.1 Waste Ramp Design Description

4.1.2.1.1.1 Design Bases

Table 4.1.2.1.1.1-1 Ramp General Characteristics [INN 4.1.2.1.1.1-1]
Table 4.1.2.1.1.1-2 Design Basis Summary [INN 4.1.2.1.1.1-2]

4.1.2.1.1.2 Geologic Stratigraphy

Figure 4.1.2.1.1.2-1 Stratigraphic Section at Ramp Centerline [INN 4.1.2.1.1.2-1]

4.1.2.1.1.3 Ramp Portal Layout and Arrangement

Figure 4.1.2.1.1.3-1 Ramp Portal Site Plan [INN 4.1.2.1.1.3-1]
Figure 4.1.2.1.1.3-2 Ramp Portal Arrangement [INN 4.1.2.1.1.3-2]
Figure 4.1.2.1.1.3-3 Ramp Portal Arrangement [INN 4.1.2.1.1.3-2]

4.1.2.1.1.4 Ramp Portal Lining and Support

Figure 4.1.2.1.1.4-1 Ramp Portal General Cross Section [INN 4.1.2.1.1.4-1]

4.1.2.1.1.5 Ramp Layout and Arrangement

Figure 4.1.2.1.1.5-1 Ramp Plan
Figure 4.1.2.1.1.5-2 Ramp General Arrangement [INN 4.1.2.1.1.5-1]

4.1.2.1.1.6 Ramp Lining and Support

Table 4.1.2.1.1.6-1 Ramp Lining and Support Summary [INN 4.1.2.1.1.6-1]

4.1.2.1.1.7 Ramp Cross Sections

Figure 4.1.2.1.1.7-1 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-2 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-3 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-4 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-5 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-6 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-7 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.1.1.7-8 Typical Ramp Cross Section at Stratigraphic Unit [INN 4.1.2.1.1.7-1]

4.1.2.1.1.8 Ramp Portal Drainage

Figure 4.1.2.1.1.8-1 Ramp Portal Site Drainage Arrangement
Figure 4.1.2.1.1.8-2 Ramp Portal Site Drainage Arrangement [INN 4.1.2.1.1.8-1]

4.1.2.1.1.9 Ramp Drainage

Figure 4.1.2.1.1.9-1 Ramp Drainage Arrangement [INN 4.1.2.1.1.9-1]

4.1.2.1.2 Waste Ramp Operating Description

4.1.2.1.2.1 Waste Description

References waste descriptions located in other sections of the LA.

4.1.2.1.2.2 General Hauling Arrangements

Table 4.1.2.1.2.2-1 Waste Transport Cask and Prime Mover General Specifications [INN 4.1.2.1.2.2-1]

Figure 4.1.2.1.2.2-1 Waste Transport Cask and Prime Mover on Ramp [INN 4.1.2.1.2.2-2]
Figure 4.1.2.1.2.2-2 Waste Transport Cask General Arrangement
Figure 4.1.2.1.2.2-3 Waste Transport Cask General Arrangement
Figure 4.1.2.1.2.2-4 Waste Transport Cask General Arrangement [INN 4.1.2.1.2.2-3]

4.1.2.1.2.3 Ventilation

Table 4.1.2.1.2.3-1 Representative Airflows During Repository Operations [INN 4.1.2.1.2.3-1]

References applicable portions of ventilation Subsection 4.1.3.3 of the LA for additional details.

4.1.2.1.2.4 Safety Measures

Table 4.1.2.1.2.4-1 Summary of Ramp Safety Features and Measures [INN 4.1.2.1.2.4-1]

Table 4.1.2.1.2.4-2 Credible Accident Scenarios Versus Ramp Safety Features and Measures to Mitigate Accident Severity [INN 4.1.2.1.2.4-2]

4.1.2.1.2.5 Operations Schedules

Table 4.1.2.1.2.5-1 Ramp Operating Schedule Summary [INN 4.1.2.1.2.5-1]

4.1.2.1.2.6 Maintenance Schedules

Table 4.1.2.1.2.6-1 Ramp Maintenance Schedule Summary and Description [INN 4.1.2.1.2.6-1]

4.1.2.1.2.7 Instrumentation and Control Systems

Table 4.1.2.1.2.7-1 Ramp Design Validation and Performance Monitoring Plan Summary and Instrumentation Schedule [INN 4.1.2.1.2.7-1]

4.1.2.1.3 Waste Ramp Seals

4.1.2.1.3.1 Operational Seals

Table 4.1.2.1.3.1-1 Operational Seal Locations and General Descriptions [INN 4.1.2.1.3.1-1]

4.1.2.1.3.2 Post-Closure Seals

Table 4.1.2.1.3.2-1 Post-Closure Seal Locations and General Descriptions [INN 4.1.2.1.3.2-1]

Figure 4.1.2.1.3.2-1 Post-Closure Seal General Arrangement
Figure 4.1.2.1.3.2-2 Post-Closure Seal General Arrangement
Figure 4.1.2.1.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.1.3.2-2]

4.1.2.2 Muck Shaft or Ramp

[INN 4.1.2.2-1]

4.1.2.2.1 Muck Ramp Design Description

4.1.2.2.1.1 Design Bases

Table 4.1.2.2.1.1-1 Ramp General Characteristics [INN 4.1.2.2.1.1-1]
Table 4.1.2.2.1.1-2 Design Basis Summary [INN 4.1.2.2.1.1-2]

4.1.2.2.1.2 Geologic Stratigraphy

Figure 4.1.2.2.1.2-1 Stratigraphic Section at Ramp Centerline [INN 4.1.2.2.1.2-1]

4.1.2.2.1.3 Ramp Portal Layout and Arrangement

Figure 4.1.2.2.1.3-1 Ramp Portal Site Plan [INN 4.1.2.2.1.3-1]
Figure 4.1.2.2.1.3-2 Ramp Portal Arrangement [INN 4.1.2.2.1.3-2]
Figure 4.1.2.2.1.3-3 Ramp Portal Arrangement [INN 4.1.2.2.1.3-2]

4.1.2.2.1.4 Ramp Portal Lining and Support

Figure 4.1.2.2.1.4-1 Ramp Portal General Cross Section [INN 4.1.2.2.1.4-1]

4.1.2.2.1.5 Ramp Layout and Arrangement

Figure 4.1.2.2.1.5-1 Ramp Plan [INN 4.1.2.2.1.5-1]
Figure 4.1.2.2.1.5-2 Ramp General Arrangement [INN 4.1.2.2.1.5-1]

4.1.2.2.1.6 Ramp Lining and Support

Table 4.1.2.2.1.6-1 Ramp Lining and Support Summary [INN 4.1.2.2.1.6-1]

4.1.2.2.1.7 Ramp Cross Sections

Figure 4.1.2.2.1.7-1 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-2 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-3 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-4 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-5 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-6 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-7 Typical Ramp Cross Section at Stratigraphic Unit
Figure 4.1.2.2.1.7-8 Typical Ramp Cross Section at Stratigraphic Unit [INN 4.1.2.2.1.7-1]

4.1.2.2.1.8 [Ramp Portal] Drainage

Figure 4.1.2.2.1.8-1 [Ramp Portal] Site Drainage Arrangement
Figure 4.1.2.2.1.8-2 [Ramp Portal] Site Drainage Arrangement

4.1.2.2.1.9 [Ramp] Drainage

Figure 4.1.2.2.1.9-1 [Ramp] Drainage Arrangement

4.1.2.2.2 Muck [Ramp] Operating Description

[Ramp haulage for muck is assumed in current designs]

4.1.2.2.2.1 Waste Description

[Does not appear to be an applicable request for information. Should consider proposing a revision to the FCRG. This was a DOE review comment to the Nuclear Regulatory Commission (NRC)]

4.1.2.2.2.2 General Hauling Arrangements

Refers to Subsection 4.1.3.2 for Additional Muck Hauling Arrangements and Details

Figure 4.1.2.2.2.2-1 Typical Personnel Hauling Equipment Arrangement
Figure 4.1.2.2.2.2-2 Typical Materials and Supplies Hauling Equipment Arrangement
Figure 4.1.2.2.2.2-3 Typical Materials and Supplies Hauling Equipment Arrangement
Figure 4.1.2.2.2.2-4 Typical Materials and Supplies Hauling Equipment Arrangement
Figure 4.1.2.2.2.2-5 Typical Materials and Supplies Hauling Equipment Arrangement
Figure 4.1.2.2.2.2-6 Typical Materials and Supplies Hauling Equipment Arrangement
Figure 4.1.2.2.2.2-7 Typical Materials and Supplies Hauling Equipment Arrangement

4.1.2.2.2.3 Ventilation

Table 4.1.2.2.2.3-1 Representative Airflows During Repository Operations

References applicable portions of ventilation Subsection 4.1.3.3 of the LA for additional details.

4.1.2.2.2.4 Safety Measures

Table 4.1.2.2.2.4-1 Summary of [Ramp] Safety Features and Measures
Table 4.1.2.2.2.4-2 Credible Accident Scenarios Versus [Ramp] Safety Features and Measures to Mitigate Accident Severity

4.1.2.2.2.5 Operations Schedules

Table 4.1.2.2.2.5-1 Ramp Operating Schedule Summary [INN 4.1.2.2.5-1]

4.1.2.2.2.6 Maintenance Schedules

Table 4.1.2.2.2.6-1 Ramp Maintenance Schedule Summary and Description [INN 4.1.2.2.2.6-1]

4.1.2.2.2.7 Instrumentation and Control Systems

Table 4.1.2.2.2.7-1 Ramp Design Validation and Performance Monitoring Plan Summary and Instrumentation Schedule [INN 4.1.2.2.2.7-1]

4.1.2.2.3 Muck Ramp Seals

4.1.2.2.3.1 Operational Seals

Table 4.1.2.2.3.1-1 Operational Seal Locations and General Descriptions [INN 4.1.2.2.3.1-1]

4.1.2.2.3.2 Post-Closure Seals

Table 4.1.2.2.3.2-1 Post-Closure Seal Locations and General Descriptions [INN 4.1.2.2.3.2-1]

Figure 4.1.2.2.3.2-1 Post-Closure Seal General Arrangement
Figure 4.1.2.2.3.2-2 Post-Closure Seal General Arrangement
Figure 4.1.2.2.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.2.3.2-2]

4.1.2.3 Ventilation Intake Shafts

[INN 4.1.2.3-1]

4.1.2.3.1 Ventilation Intake Shaft Design Description

4.1.2.3.1.1 Design Bases

Table 4.1.2.3.1.1-1 Shaft General Characteristics [INN 4.1.2.3.1.1-1]
Table 4.1.2.3.1.1-2 Design Basis Summary [INN 4.1.2.3.1.1-2]

4.1.2.3.1.2 Geologic Stratigraphy

Figure 4.1.2.3.1.2-1 Stratigraphic Section at Shaft Centerline [INN 4.1.2.3.1.2-1]

4.1.2.3.1.3 Shaft Collar Layout and Arrangement

Figure 4.1.2.3.1.3-1 Shaft Collar Site Plan [INN 4.1.2.3.1.3-1]
Figure 4.1.2.3.1.3-2 Shaft Collar Arrangement
Figure 4.1.2.3.1.3-3 Shaft Collar Arrangement [INN 4.1.2.3.1.3-2]

4.1.2.3.1.4 Shaft Collar Lining and Support

Figure 4.1.2.3.1.4-1 Shaft Collar General Cross Section [INN 4.1.2.3.1.4-1]

4.1.2.3.1.5 Shaft Layout and Arrangement

Figure 4.1.2.3.1.5-1 Shaft Long Section
Figure 4.1.2.3.1.5-2 Shaft General Arrangement [INN 4.1.2.3.1.5-1]

4.1.2.3.1.6 Shaft Lining and Support

Table 4.1.2.3.1.6-1 Shaft Lining and Support Summary [INN 4.1.2.3.1.6-1]

4.1.2.3.1.7 Shaft Cross Sections

Figure 4.1.2.3.1.7-1 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-2 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-3 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-4 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-5 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-6 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-7 Typical Shaft Cross Section at Stratigraphic Unit
Figure 4.1.2.3.1.7-8 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.3.1.7-1]

4.1.2.3.1.8 Shaft Collar Drainage

Figure 4.1.2.3.1.8-1 Shaft Collar Site Drainage Arrangement
Figure 4.1.2.3.1.8-2 Shaft Collar Site Drainage Arrangement [INN 4.1.2.3.1.8-1]

4.1.2.3.1.9 Shaft Drainage

Figure 4.1.2.3.1.9-1 Shaft Drainage Arrangement [INN 4.1.2.3.1.9-1]

4.1.2.3.2 Ventilation Intake Shaft Operating Description

4.1.2.3.2.1 Ventilation

Table 4.1.2.3.2.1-1 Representative Airflows During Repository Operations [INN 4.1.2.3.2.1-1]

References applicable portions of ventilation Subsection 4.1.3.3 of the LA for additional details.

4.1.2.3.2.2 Maintenance Schedules

Table 4.1.2.3.2.2-1 Shaft Maintenance Schedule Summary and Description [INN 4.1.2.3.2.2-1]

4.1.2.3.2.3 Instrumentation and Control Systems

Table 4.1.2.3.2.3-1 Shaft Design Validation and Performance Monitoring Plan Summary and Instrumentation Schedule [INN 4.1.2.3.2.3-1]

4.1.2.3.3 Ventilation Intake Shaft Seals

4.1.2.3.3.1 Operational Seals

Table 4.1.2.3.3.1-1 Operational Seal Locations and General Descriptions [INN 4.1.2.3.3.1-1]

4.1.2.3.3.2 Post-Closure Seals

Table 4.1.2.3.3.2-1 Post-Closure Seal Locations and General Descriptions [INN 4.1.2.3.3.2-1]

Figure 4.1.2.3.3.2-1 Post-Closure Seal General Arrangement
Figure 4.1.2.3.3.2-2 Post-Closure Seal General Arrangement
Figure 4.1.2.3.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.3.3.2-2]

4.1.2.4 Ventilation Exhaust Shafts

[INN 4.1.2.4-1]

4.1.2.4.1 Ventilation Exhaust Shafts - Emplacement Side

4.1.2.4.1.1 Emplacement Side Exhaust Shaft Design Description

4.1.2.4.1.1.1 Design Bases

Table 4.1.2.4.1.1.1-1 Shaft General Characteristics [INN 4.1.2.4.1.1.1-1]
Table 4.1.2.4.1.1.1-2 Design Basis Summary [INN 4.1.2.4.1.1.1-2]

4.1.2.4.1.1.2 Geologic Stratigraphy

Figure 4.1.2.4.1.1.2-1 Stratigraphic Section at Shaft Centerline [INN 4.1.2.4.1.1.2-1]

4.1.2.4.1.1.3 Shaft Collar Layout and Arrangement

Figure 4.1.2.4.1.1.3-1 Shaft Collar Site Plan [INN 4.1.2.4.1.1.3-1]
Figure 4.1.2.4.1.1.3-2 Shaft Collar Arrangement [INN 4.1.2.4.1.1.3-2]
Figure 4.1.2.4.1.1.3-3 Shaft Collar Arrangement [INN 4.1.2.4.1.1.3-2]

4.1.2.4.1.1.4 Shaft Collar Lining and Support

Figure 4.1.2.4.1.1.4-1 Shaft Collar General Cross Section [INN 4.1.2.4.1.1.4-1]

4.1.2.4.1.1.5 Shaft Layout and Arrangement

Figure 4.1.2.4.1.1.5-1 Shaft Long Section [INN 4.1.2.4.1.1.5-1]
Figure 4.1.2.4.1.1.5-2 Shaft General Arrangement [INN 4.1.2.4.1.1.5-1]

4.1.2.4.1.1.6 Shaft Lining and Support

Table 4.1.2.4.1.1.6-1 Shaft Lining and Support Summary [INN 4.1.2.4.1.1.6-1]

4.1.2.4.1.1.7 Shaft Cross Sections

Figure 4.1.2.4.1.1.7-1 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-2 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-3 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-4 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-5 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-6 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-7 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-8 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

4.1.2.4.1.1.8 Shaft Collar Drainage

Figure 4.1.2.4.1.1.8-1 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.1.1.8-1]
Figure 4.1.2.4.1.1.8-2 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.1.1.8-1]

4.1.2.4.1.1.9 Shaft Drainage

Figure 4.1.2.4.1.1.9-1 Shaft Drainage Arrangement [INN 4.1.2.4.1.1.9-1]

4.1.2.4.1.2 Emplacement Side Exhaust Shaft Operating Description

4.1.2.4.1.2.1 Ventilation

Table 4.1.2.4.1.2.1-1 Representative Airflows During Repository Operations [INN 4.1.2.4.1.2.1-1]

References applicable portions of ventilation Subsection 4.1.3.3 of the LA for additional details.

4.1.2.4.1.2.2 HEPA and Exhaust Filters

Table 4.1.2.4.1.2.2-1 HEPA Filter General Specifications [INN 4.1.2.4.1.2.2-1]

Figure 4.1.2.4.1.2.2-1 Emplacement Exhaust Shaft Ventilation Plant General Arrangement [INN 4.1.2.4.1.2.2-2]

Figure 4.1.2.4.1.2.2-2 Emplacement Exhaust Shaft Ventilation Plant General Arrangement [INN 4.1.2.4.1.2.2-2]

Figure 4.1.2.4.1.2.2-3 Emplacement Exhaust Shaft Ventilation Plant General Arrangement [INN 4.1.2.4.1.2.2-2]

Figure 4.1.2.4.1.2.2-4 Exhaust Air Bypass & HEPA Filter General Arrangement [INN 4.1.2.4.1.2.2-3]

Figure 4.1.2.4.1.2.2-5 Exhaust Air Bypass & HEPA Filter General Arrangement [INN 4.1.2.4.1.2.2-3]

Figure 4.1.2.4.1.2.2-6 Exhaust Air Bypass & HEPA Filter General Arrangement [INN 4.1.2.4.1.2.2-3]

4.1.2.4.1.2.3 Safety Measures

Table 4.1.2.4.1.2.3-1 Summary of Shaft Safety Features and Measures [INN 4.1.2.4.1.2.3-1]

Table 4.1.2.4.1.2.3-2 Credible Accident Scenarios Versus Shaft Safety Features and Measures to Mitigate Accident Severity [INN 4.1.2.4.1.2.3-2]

4.1.2.4.1.2.4 Maintenance Schedules

Table 4.1.2.4.1.2.4-1 Shaft Maintenance Schedule Summary and Description [INN 4.1.2.4.1.2.4-1]

4.1.2.4.1.2.5 Instrumentation and Control Systems

Table 4.1.2.4.1.2.5-1 Shaft Design Validation and Performance Monitoring Plan Summary and Instrumentation Schedule [INN 4.1.2.4.1.2.5-1]

4.1.2.4.1.3 Emplacement Side Exhaust Shaft Seals

4.1.2.4.1.3.1 Operational Seals

Table 4.1.2.4.1.3.1-1 Operational Seal Locations and General Descriptions [INN 4.1.2.4.1.3.1-1]

4.1.2.4.1.3.2 Post-Closure Seals

Table 4.1.2.4.1.3.2-1 Post-Closure Seal Locations and General Descriptions [INN 4.1.2.4.1.3.2-1]

Figure 4.1.2.4.1.3.2-1 Post-Closure Seal General Arrangement [INN 4.1.2.4.1.3.2-2]
Figure 4.1.2.4.1.3.2-2 Post-Closure Seal General Arrangement [INN 4.1.2.4.1.3.2-2]
Figure 4.1.2.4.1.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.4.1.3.2-2]

4.1.2.4.2 Ventilation Exhaust Shafts - Development Side

4.1.2.4.2.1 Development Side Exhaust Shaft Design Description

4.1.2.4.2.1.1 Design Bases

Table 4.1.2.4.2.1.1-1 Shaft General Characteristics [INN 4.1.2.4.2.1.1-1]
Table 4.1.2.4.2.1.1-2 Design Basis Summary [INN 4.1.2.4.2.1.1-2]

4.1.2.4.2.1.2 Geologic Stratigraphy

Figure 4.1.2.4.2.1.2-1 Stratigraphic Section at Shaft Centerline [INN 4.1.2.4.2.1.2-1]

4.1.2.4.2.1.3 Shaft Collar Layout and Arrangement

Figure 4.1.2.4.2.1.3-1 Shaft Collar Site Plan [INN 4.1.2.4.2.1.3-1]
Figure 4.1.2.4.2.1.3-2 Shaft Collar Arrangement [INN 4.1.2.4.2.1.3-2]
Figure 4.1.2.4.2.1.3-3 Shaft Collar Arrangement [INN 4.1.2.4.2.1.3-2]

4.1.2.4.2.1.4 Shaft Collar Lining and Support

Figure 4.1.2.4.2.1.4-1 Shaft Collar General Cross Section [INN 4.1.2.4.2.1.4-1]

4.1.2.4.2.1.5 Shaft Layout and Arrangement

Figure 4.1.2.4.2.1.5-1 Shaft Long Section [INN 4.1.2.4.2.1.5-1]
Figure 4.1.2.4.2.1.5-2 Shaft General Arrangement [INN 4.1.2.4.2.1.5-1]

4.1.2.4.2.1.6 Shaft Lining and Support

Table 4.1.2.4.2.1.6-1 Shaft Lining and Support Summary [INN 4.1.2.4.2.1.6-1]

4.1.2.4.2.1.7 Shaft Cross Sections

Figure 4.1.2.4.2.1.7-1 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-2 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-3 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-4 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-5 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-6 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-7 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-8 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

4.1.2.4.2.1.8 Shaft Collar Drainage

Figure 4.1.2.4.2.1.8-1 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.2.1.8-1]
Figure 4.1.2.4.2.1.8-2 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.2.1.8-1]

4.1.2.4.2.1.9 Shaft Drainage

Figure 4.1.2.4.2.1.9-1 Shaft Drainage Arrangement [INN 4.1.2.4.2.1.9-1]

4.1.2.4.2.2 Development Side Exhaust Shaft Operating Description

4.1.2.4.2.2.1 Ventilation

Table 4.1.2.4.2.2.1-1 Representative Airflows During Repository Operations [INN 4.1.2.4.2.2.1-1]

References applicable portions of ventilation Subsection 4.1.3.3 of the LA for additional details.

4.1.2.4.2.2.2 HEPA and Exhaust Filters

[HEPA filters do not apply to this shaft]

4.1.2.4.2.2.3 Safety Measures

Table 4.1.2.4.2.2.3-1 Summary of Shaft Safety Features and Measures [INN 4.1.2.4.2.2.3-1]

Table 4.1.2.4.2.2.3-2 Credible Accident Scenarios Versus Shaft Safety Features and Measures to Mitigate Accident Severity [INN 4.1.2.4.2.2.3-2]

4.1.2.4.2.2.4 Maintenance Schedules

Table 4.1.2.4.2.2.4-1 Shaft Maintenance Schedule Summary and Description [INN 4.1.2.4.2.2.4-1]

4.1.2.4.2.2.5 Instrumentation and Control Systems

Table 4.1.2.4.2.2.5-1 Shaft Design Validation and Performance Monitoring Plan Summary and Instrumentation Schedule [INN 4.1.2.4.2.2.5-1]

4.1.2.4.2.3 Development Side Exhaust Shaft Seals

4.1.2.4.2.3.1 Operational Seals

Table 4.1.2.4.2.3.1-1 Operational Seal Locations and General Descriptions [INN 4.1.2.4.2.3.1-1]

4.1.2.4.2.3.2 Post-Closure Seals

Table 4.1.2.4.2.3.2-1 Post-Closure Seal Locations and General Descriptions [INN 4.1.2.4.2.3.2-1]

Figure 4.1.2.4.2.3.2-1 Post-Closure Seal General Arrangement [INN 4.1.2.4.2.3.2-2]
Figure 4.1.2.4.2.3.2-2 Post-Closure Seal General Arrangement [INN 4.1.2.4.2.3.2-2]
Figure 4.1.2.4.2.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.4.2.3.2-2]

4.1.2.5 Personnel and Material Shafts

[INN 4.1.2.5-1]

4.1.2.5.1 Personnel and Materials Shaft Design Description

4.1.2.5.1.1 Design Bases

Table 4.1.2.5.1.1-1 Shaft General Characteristics [INN 4.1.2.5.1.1-1]
Table 4.1.2.5.1.1-2 Design Basis Summary [INN 4.1.2.5.1.1-2]

4.1.2.5.1.2 Geologic Stratigraphy

Figure 4.1.2.5.1.2-1 Stratigraphic Section at Shaft Centerline [INN 4.1.2.5.1.2-1]

4.1.2.5.1.3 Shaft Collar Layout and Arrangement

Figure 4.1.2.5.1.3-1 Shaft Collar Site Plan [INN 4.1.2.5.1.3-1]
Figure 4.1.2.5.1.3-2 Shaft Collar Arrangement [INN 4.1.2.5.1.3-2]
Figure 4.1.2.5.1.3-3 Shaft Collar Arrangement [INN 4.1.2.5.1.3-2]

4.1.2.5.1.4 Shaft Collar Lining and Support

Figure 4.1.2.5.1.4-1 Shaft Collar General Cross Section [INN 4.1.2.5.1.4-1]

4.1.2.5.1.5 Shaft Layout and Arrangement

Figure 4.1.2.5.1.5-1 Shaft Plan [INN 4.1.2.5.1.5-1]
Figure 4.1.2.5.1.5-2 Shaft General Arrangement [INN 4.1.2.5.1.5-1]

4.1.2.5.1.6 Shaft Lining and Support

Table 4.1.2.5.1.6-1 Shaft Lining and Support Summary [INN 4.1.2.5.1.6-1]

4.1.2.5.1.7 Shaft Cross Sections

Figure 4.1.2.5.1.7-1 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

Figure 4.1.2.5.1.7-2 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

Figure 4.1.2.5.1.7-3 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

Figure 4.1.2.5.1.7-4 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

Figure 4.1.2.5.1.7-5 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1

Figure 4.1.2.5.1.7-6 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

Figure 4.1.2.5.1.7-7 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

Figure 4.1.2.5.1.7-8 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.5.1.7-1]

4.1.2.5.1.8 Shaft Collar Drainage

Figure 4.1.2.5.1.8-1 Shaft Collar Site Drainage Arrangement [INN 4.1.2.5.1.8-1]
Figure 4.1.2.5.1.8-2 Shaft Collar Site Drainage Arrangement [INN 4.1.2.5.1.8-1]

4.1.2.5.1.9 Shaft Drainage

Figure 4.1.2.5.1.9-1 Shaft Drainage Arrangement [INN 4.1.2.5.1.9-1]

4.1.2.5.2 Personnel and Materials Shaft Operating Description

4.1.2.5.2.1 Hoisting Equipment

Table 4.1.2.5.2.1-1 Hoisting Equipment General Specifications [INN 4.1.2.5.2.1-1]

Figure 4.1.2.5.2.1-1 Hoisting General Arrangement [INN 4.1.2.5.2.1-2]
Figure 4.1.2.5.2.1-2 Hoisting General Arrangement [INN 4.1.2.5.2.1-2]
Figure 4.1.2.5.2.1-3 Hoisting General Arrangement [INN 4.1.2.5.2.1-2]

4.1.2.5.2.2 Ventilation

Table 4.1.2.5.2.2-1 Representative Airflows During Repository Operations [INN 4.1.2.5.2.2-1]

References applicable portions of ventilation Subsection 4.1.3.3 of the LA for additional details.

4.1.2.5.2.3 Safety Measures

Table 4.1.2.5.2.3-1 Summary of Shaft Safety Features and Measures [INN 4.1.2.5.2.3-1]

Table 4.1.2.5.2.3-2 Credible Accident Scenarios Versus Shaft Safety Features and Measures to Mitigate Accident Severity [INN 4.1.2.5.2.3-2]

4.1.2.5.2.4 Operations Schedules

Table 4.1.2.5.2.4-1 Shaft Operating Schedule Summary [INN 4.1.2.5.2.4-1]

4.1.2.5.2.5 Maintenance Schedules

Table 4.1.2.5.2.5-1 Shaft Maintenance Schedule Summary and Description [INN 4.1.2.5.2.5-1]

4.1.2.5.2.6 Instrumentation and Control Systems

Table 4.1.2.5.2.6-1 Shaft Design Validation and Performance Monitoring Plan Summary and Instrumentation Schedule [INN 4.1.2.5.2.6-1]

4.1.2.5.3 Personnel and Materials Shaft Seals

4.1.2.5.3.1 Operational Seals

Table 4.1.2.5.3.1-1 Operational Seal Locations and General Descriptions [INN 4.1.2.5.3.1-1]

4.1.2.5.3.2 Post-Closure Seals

Table 4.1.2.5.3.2-1 Post-Closure Seal Locations and General Descriptions [INN 4.1.2.5.3.2-1]

Figure 4.1.2.5.3.2-1 Post-Closure Seal General Arrangement

Figure 4.1.2.5.3.2-2 Post-Closure Seal General Arrangement
Figure 4.1.2.5.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.5.3.2-2]

4.1.2.6 Decommissioning System

[INN 4.1.2.6-1]

4.1.2.6.1 Operational Seals

Table 4.1.2.6.1-1 Operational Seal Location and Type Summary [INN 4.1.2.6.1-1]

References descriptions in applicable shaft and ramp sections.

4.1.2.6.2 Post-Closure Seals

Table 4.1.2.6.2-1 Post-Closure Seal Location and Type Summary [INN 4.1.2.6.2-1]

4.1.2.6.2.1 Shaft Backfilling System

References descriptions and figures in applicable shaft and ramp sections.

4.1.2.6.2.2 Ramp Backfilling System

References descriptions and figures in applicable shaft and ramp sections.

4.1.2.6.2.3 Shaft Sealing System

References descriptions and figures in applicable shaft and ramp sections.

4.1.2.6.2.4 Ramp Sealing System

References descriptions and figures in applicable shaft and ramp sections.

4.1.2.6.2.5 Other Plugs and Bulkheads

Figure 4.1.2.6.2.5-1 Other Plug or Bulkhead General Arrangement
Figure 4.1.2.6.2.5-2 Other Plug or Bulkhead General Arrangement
Figure 4.1.2.6.2.5-3 Other Plug or Bulkhead General Arrangement [INN 4.1.2.6.2.5-1]

4.1.2.6.3 Materials Selection Bases

4.1.2.6.3.1 Backfill Materials

Table 4.1.2.6.3.1-1 Shaft Backfill Material Properties [INN 4.1.2.6.3.1-1]
Table 4.1.2.6.3.1-2 Ramp Backfill Material Properties [INN 4.1.2.6.3.1-2]

4.1.2.6.3.2 Seal Materials

Table 4.1.2.6.3.2-1 Shaft Seal Material Properties [INN 4.1.2.6.3.2-1]
Table 4.1.2.6.3.2-2 Ramp Seal Material Properties [INN 4.1.2.6.3.2-2]

4.1.2.6.3.3 Other Plugs and Bulkheads

Table 4.1.2.6.3.3-1 Other Plug or Bulkhead Material Properties [INN 4.1.2.6.3.3-1]

4.1.2.6.4 Installation Methods and Equipment Description

4.1.2.6.4.1 Shaft Backfilling

Table 4.1.2.6.4.1-1 Shaft Backfilling Equipment General Specifications [INN 4.1.2.6.4.1-1]

Figure 4.1.2.6.4.1-1 Shaft Backfill Operations Sequence Diagram [INN 4.1.2.6.4.1-2]

Figure 4.1.2.6.4.1-2 Shaft Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.1-3]

Figure 4.1.2.6.4.1-3 Shaft Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.1-3]

Figure 4.1.2.6.4.1-4 Shaft Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.1-3]

4.1.2.6.4.2 Ramp Backfilling

Table 4.1.2.6.4.2-1 Ramp Backfilling Equipment General Specifications [INN 4.1.2.6.4.2-1]

Figure 4.1.2.6.4.2-1 Ramp Backfill Operations Sequence Diagram [INN 4.1.2.6.4.2-2]

Figure 4.1.2.6.4.2-2 Ramp Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.3-2]

Figure 4.1.2.6.4.2-3 Ramp Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.3-2]

Figure 4.1.2.6.4.2-4 Ramp Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.3-2]

4.1.2.6.4.3 Shaft Sealing

Table 4.1.2.6.4.3-1 Shaft Sealing Equipment General Specifications [INN 4.1.2.6.4.3-1]

Figure 4.1.2.6.4.3-1 Shaft Seal Operations Sequence Diagram [INN 4.1.2.6.4.3-2]

Figure 4.1.2.6.4.3-2 Shaft Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.3-3]

Figure 4.1.2.6.4.3-3 Shaft Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.3-3]

Figure 4.1.2.6.4.3-4 Shaft Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.3-3]

4.1.2.6.4.4 Ramp Sealing

Table 4.1.2.6.4.4-1 Ramp Sealing Equipment General Specifications [INN 4.1.2.6.4.4-1]

Figure 4.1.2.6.4.4-1 Ramp Seal Operations Sequence Diagram [INN 4.1.2.6.4.4-2]

Figure 4.1.2.6.4.4-2 Ramp Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.4-3]

Figure 4.1.2.6.4.4-3 Ramp Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.4-3]

Figure 4.1.2.6.4.4-4 Ramp Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.4-3]

4.1.2.6.4.5 Other Plugs and Bulkheads

Table 4.1.2.6.4.5-1 Other Plug or Bulkhead Equipment General Specifications [INN 4.1.2.6.4.5-1]

Figure 4.1.2.6.4.5-1 Other Plug or Bulkhead Operations Sequence Diagram [INN 4.1.2.6.4.5-2]

Figure 4.1.2.6.4.5-2 Other Plug or Bulkhead Equipment Operating Arrangement [INN 4.1.2.6.4.5-3]

Figure 4.1.2.6.4.5-3 Other Plug or Bulkhead Equipment Operating Arrangement [INN 4.1.2.6.4.5-3]

Figure 4.1.2.6.4.5-4 Other Plug or Bulkhead Equipment Operating Arrangement [INN 4.1.2.6.4.5-3]

4.1.2.7 Other Shaft or Ramp Systems

- Provide the same detailed information for any other shaft or ramp.

4.1.3 Underground Facility

- Provide overall underground facility design criteria, design basis, performance requirements, margins of safety, codes and standards applied, materials of construction, and design descriptions. Include:

  - Development and emplacement areas
  - Accesses
  - Support areas
  - Subsurface-related surface facilities.

- Provide the site conditions expected to be encountered in constructing the underground facility.

- The underground facility is illustrated in Figure 4.1.2.5-3.

- Underground facility SSCs are identified and classified as important to safety, retrievability, or isolation in Table 4.1.3-1. [INN 4.1.3-1]

- Schedules for SCC inspections, testing, and maintenance are provided in Tables 4.1.3-2 [INN 4.1.3-2], 4.1.3-3 [INN 4.1.3-3], and 4.1.3-4 [INN 4.1.3-4] and are discussed in Section 7.1 of the LA.

- Provide variables, conditions, or items of the underground facility that are probable subjects of license specifications. Refer to Sections 2.6 and 7.8 of the LA.

- Provide a discussion of any unresolved safety issues that require R&D to resolve, and a schedule that shows when these issues will be resolved. Refer to Subsection 4.1.0.6 where these issues are summarized for the GROA.

4.1.3.1 Excavation and Ground Support Systems

This subsection provides the following:

- Design bases, design descriptions, and operating descriptions for each of the excavation and support systems. Design parameters for excavation equipment are provided. The types of equipment used for excavation are described. Basic types of ground support equipment are also described.
- The extent of damaged zone including the mechanical, thermomechanical, hydrological, and chemical effects of each excavation method used in the rock mass.
- Ground support systems used to support excavated openings
- Response of support systems under thermal loading and retrieval operations
- Tonnages of excavated rock, and configuration of excavation machinery
- Rates of advance, and configuration of excavation machinery
- The configuration of machinery is shown.

4.1.3.1.1 Excavation Systems

4.1.3.1.1.1 Design Bases

The categories of rock quality for the repository rock mass is shown in Table 4.1.3.1.1.1-1 [INN 4.1.3.1.1.1-1]. The geomechanical data important to mechanical excavation is shown in Table 4.1.3.1.1.1-2 [INN 4.1.3.1.1.1-1]. In addition, the excavated volumes for planned openings are shown in Table 4.1.3.1.1.1-3 [INN 4.1.3.1.1.1-1]. These tables summarize the bases for excavation system design. Rock quality categories are given for the anticipated range of rock conditions. Pertinent geomechanical data include physical and mechanical properties, jointing conditions, quartz content, and comminution parameters. Expected volumes of excavated material are given for the different parts of the advanced conceptual design (ACD) layout, such as accesses, and emplacement drifts. [The *Reference Information Base* (RIB), YMP/93-02 will provide the principal geomechanical data. ACD documents, especially drawings, will include excavation locations, functions, and necessary dimensions.]

4.1.3.1.1.2 Primary Methods - Designs and Operating Features

The Tunnel Boring Machine (TBM) Design Primary method is found in Figure 4.1.3.1.1.2-1, Figure 4.1.3.1.1.2-2, Figure 4.1.3.1.1.2-3, and Figure 4.1.3.1.1.2-4 [INN 4.1.3.1.1.2-1]

These figures show various TBM designs that are considered as the primary means of drift excavation. Designs are included for 7.62 m diameter drifts down to 2 m diameter or less. Performance data includes such data as penetration rate, cutter costs, and recommended machine specifications. Criteria for excavations based on ACD and geomechanical and other site data gathered during ESF form the basis for TBM selection and design. [Performance data will come from ESF excavation monitoring and from manufacturers.]

Performance Data for Mechanical Excavation Methods - Primary Method is shown in Table 4.1.3.1.1.2-1. [INN 4.1.3.1.1.2-1]

4.1.3.1.1.3 Secondary Methods - Designs and Operating Features

Performance Data for Mechanical Excavation Methods - Secondary Method is shown in Table 4.1.3.1.1.3-1 [INN 4.1.3.1.1.3-1].

These figures show various mechanical excavator designs (roadheaders, mini-disc cutters, drill and blasts, and others) that are considered as a secondary means of excavation. Designs are included for excavation of drifts, alcoves, and shafts. Performance data include such data as penetration rate, cutter costs, and recommended machine specifications. Criteria for excavations based on ACD, geomechanical, and other site data obtained during ESF form the basis for mechanical excavator selection and design. [Performance data will come from ESF excavation monitoring, manufacturers, and research contractors.]

4.1.3.1.2 Ground Control

4.1.3.1.2.1 Design Bases

These data include (1) loading conditions (excavation, seismic, and thermal), (2) design data (thermal and mechanical properties of tuff and engineered materials, and waste characteristics), and (3) repository layout. ESF testing and monitoring results and data from the RIB provide the principal geomechanical data. [Information on material performance under thermal conditions is needed.]

The geoengineering data for repository ground control is shown in Table 4.1.3.1.2.1-1 [INN 4.1.3.1.2.1-1]

4.1.3.1.2.2 Ground Support Design

This subsection provides [INN 4.1.3.1.2.2-1]:

- Rock mass classification parameters (Q, RMR, and RQD) for application of empirical support selection methods
- Stress, temperature, and moisture conditions during repository stages, including emplacement and retrieval stages
- Results of numerical analyses, including: ventilation and cooling analysis, short and long-term drift stability analysis
- Empirical and analytical estimates of the geometry and nature of the damaged rock zone
- Case descriptions for:
  - drift sections of differing sizes and applications
  - intersections
  - structural impacts
  - stratigraphic impacts

The characteristics of the damaged rock zone is shown in Table 4.1.3.1.2.2-1 [INN 4.1.3.1.2.2-1]. The ground support for rock mass categories is shown in Table 4.1.3.1.2.2-2 [INN 4.1.3.1.2.2-1]

4.1.3.2 Muck Handling System

- Provide performance requirements, design descriptions, and operating descriptions for each of the muck handling systems. Performance requirements for muck handing equipment are provided in Table 4.1.3.2-1. [INN 4.1.3.2-1] The layout of muck handling equipment is shown in Figure 4.1.3.2-1. [INN 4.1.3.2-2] Include:
  - Units or systems such as load-haul-dump and belt conveyors
  - Disposition of tuff rock removed from development areas.

4.1.3.3 Ventilation System

This subsection provides:

- Construction and emplacement air cooling requirements.
- Design bases for development, emplacement areas, and expansion.

- Design bases for normal and accident conditions.
- Requirements for air cooling for:
  - Test
  - Maintenance
  - Retrieval operations
  - Number of days needed to cool drifts.
- Determination of ability of system to meet requirements.
- Discuss instrumentation for control and maintenance system.
- Any special equipment needed to meet our quality health standards.
- Schedules.

4.1.3.3.1 General Underground Descriptions

4.1.3.3.1.1 Design Bases

4.1.3.3.1.2 Separate Ventilation Systems

Figure(s) 4.1.3.3.1.2-1through 4.1.3.3.1.2-n [INN 4.1.3.3.1.2-1] show the absolute pressure gradients throughout the intake, subsurface, and exhaust for each of the two systems. These figures show that the pressure in the emplacement system will always be lower than in the development system. [This is a requirement to ensure that potential leakage is always from lowerradiation areas toward higher radiation areas. Two figures may be needed: One which shows the worst case development scenario along with the corresponding emplacement system conditions; and one with the worst case emplacement scenario with the corresponding development system conditions. The worst cases of the two systems will occur years apart.]

4.1.3.3.1.3 Ventilation Control Devices

Figures 4.1.3.3.2.3-1, 4.1.3.3.1.3-2, 4.1.3.3.1.3-3 [INN 4.1.3.3.1.3-1], each with multiple sketches, are used to depict the various ventilation control devices required to direct and control the flow of air in the subsurface.

4.1.3.3.1.4 Fan Facilities

Table 4.1.3.3.1.4-1 [INN 4.1.3.3.1.4-1] contains data on the capacities of the fans and filtering systems required for the ventilation systems.

4.1.3.3.1.5 Intake Heating and Cooling Systems

4.1.3.3.1.6 Operations & Maintenance

This subsection describes the operation and maintenance of the underground ventilation systems. A discussion of system operation during normal and off-normal conditions is provided.

Table 4.1.3.3.1.6-1 [INN 4.1.3.3.1.6-1] provides the maintenance intervals of the major ventilation system components.

4.1.3.3.1.7 Monitoring Systems

4.1.3.3.1.8 Ventilation For Retrieval

Figure 4.1.3.3.1.8-1 [INN 4.1.3.3.1.8-1] provides the general layout of the Emplacement Drift Cooling ventilation system [The emplacement mode and average package spacing is needed to prepare this figure]

Figures 4.1.3.3.1.8-2, 4.1.3.3.1.8-3, and 4.1.3.3.1.8-4 [INN 4.1.3.3.1.8-2] show the cooling effects of ventilation air in a heated drift for a range of drift lengths, airflow quantities, and areal heat loads. [The information needed to develop the curves will included thermal information from the waste stream and knowledge of the repository layout, ventilation flowpaths, and thermal management strategy.]

4.1.3.3.1.9 General Flowpaths

Figures 4.1.3.3.1.9-1 through -13 [INN 4.1.3.3.1.9-1] show the evolution of the ventilation systems as the repository is constructed, operated, maintained, and decommissioned. The repository layout and schedule for development and emplacement will be the primary inputs required to begin preparation of these figures.

4.1.3.3.2 Development Ventilation System

4.1.3.3.2.1 Flowpath Description

Figure 4.1.3.3.2.1-1 [INN 4.1.3.3.2.1-1] shows the flowpaths and control devices needed to distribute airflow.

4.1.3.3.2.2 Air Quantity Determination

Table 4.1.3.3.2.2-1 [INN 4.1.3.3.2.2-1] provides the unit airflow quantities assigned to each activity to be carried out in the subsurface. These assignments are based on the requirements for health & safety , regulatory requirements, cooling, etc.

4.1.3.3.2.3 Quantity/Pressure/Power Projection

Tables 4.1.3.3.2.3-1 through 4.1.3.3.2.3-8 [INN 4.1.3.3.2.3-1]contain information that includes the airflow quantity required for each of the time periods and the associated pressure and power requirements to supply that air quantity. [Development of the information will entail assignment of air quantities and computer modeling of the flow network for each time period.]

4.1.3.3.3 Emplacement Ventilation System

4.1.3.3.3.1 Flowpath Description

Figure 4.1.3.3.3.1-1 [INN 4.1.3.3.3.1-1] shows the flowpaths and control devices needed to distribute airflow in the emplacement area.

4.1.3.3.3.2 Air Quantity Determination

Table 4.1.3.3.3.2-1 [INN 4.1.3.3.3.2-1] provides the unit airflow quantities assigned to each activity to be carried out in the subsurface. These assignments are based on the requirements for health & safety , regulatory requirements, cooling, etc.

4.1.3.3.3.3 Quantity/Pressure/Power Projection

Tables 4.1.3.3.3.3-1 through 4.1.3.3.3.3-7 [INN 4.1.3.3.3.3-1]contain information that includes the airflow quantity required for each of the time periods and the associated pressure and power requirements to supply that air quantity. [Development of the information will entail assignment of air quantities and computer modeling of the flow network for each time period.]

4.1.3.4 Waste Emplacement System

This subsection discusses the waste emplacement system, including its design bases, thermal decay characteristics of wastes, physical characteristics of the waste packages, arrangement of the emplacement areas, emplacement configuration, thermal loading, stability of underground openings, and the equipment needed for underground transport and emplacement of the wastes.

- Provide the results of a systems analysis, which includes a thermal management analysis identifying lag storage requirements, emplacement rates, and emplacement locations as a function of waste type (age, waste package loading, etc.), to implement the licensing strategy for waste emplacement.

- Consider means to reduce thermal impact of emplaced waste including waste selection, storage of waste before emplacement, and ventilation of the underground facility for a calculated retrieval period.

- Present an evaluation of alternatives to the major design features that are important to waste isolation.

4.1.3.4.1 Waste Emplacement Concept and Considerations

4.1.3.4.1.1 Waste and Waste Package Characteristics

The following tables summarize design basis information for the waste emplacement system.
Waste Characteristics can be found in Table 4.1.3.4.1.1-1 [INN 4.1.3.4.1.1-1]
Waste Package Characteristics can be found in Table 4.1.3.4.1.1-2 [INN 4.1.3.4.1.1-1]
The characteristics of waste and waste packages are provided in Section 5.1.

4.1.3.4.1.2 General Emplacement Concept

The following figures show the layout of emplacement drifts and the mode of emplacement.

The General Emplacement Configuration is shown in Figure 4.1.3.4.1.2-1,
Figure 4.1.3.4.1.2-2, and Figure 4.1.3.4.1.2-3 [INN 4.1.3.4.1.2-1]

Discuss the use of backfill [INN 4.1.3.4.1-2-2]

4.1.3.4.1.3 Waste Handling Equipment

These figures and tables give designs and design parameters for waste handling equipment for emplacement and for transport of waste packages from surface facilities to subsurface emplacement locations. Equipment design parameters include loads, environmental factors, and radiation shielding considerations.

Emplacement Equipment Design Parameters can be found in Table 4.1.3.4.1.3-1
[INN 4.1.3.4.1.3-1]

Waste Transport Equipment Design Parameters can be found in Table 4.1.3.4.1.3-2
[INN 4.1.3.4.1.3-1]

The Emplacement Equipment is shown in Figure 4.1.3.4.1.3-1 [INN 4.1.3.4.1.3-1]

The Waste Transport Equipment is shown in Figure 4.1.3.4.1.3-2 [INN 4.1.3.4.1.3-1]

4.1.3.4.2 Excavation and Ground Support of Emplacement Area

4.1.3.4.2.1 Design Bases

These data include (1) loading conditions (excavation, seismic, and thermal), (2) design data (thermal and mechanical properties of tuff and engineered materials, and waste characteristics), and (3) repository layout. [INN 4.1.3.4.2.1-1]

[ESF testing and monitoring results and data from the RIB will provide the principal geomechanical data. Information on material performance under thermal conditions is needed.]

4.1.3.4.2.2 Ground Support Design

Rock mass classification parameters (Q, RMR, and RQD) for application of empirical support selection methods. Stress, temperature, and moisture conditions during repository stages, including emplacement and retrieval stages. Results of numerical analyses, including: ventilation and cooling analysis, short and long-term drift stability analysis. Empirical and analytical estimates of the geometry and nature of the damaged rock zone. [INN 4.1.3.4.2.2-1]

4.1.3.5 Waste Retrieval System

- Provide design bases and detailed retrieval plans to locate, access, retrieve, and transport waste packages to surface.
- Discuss drift roof and wall supports. Ventilation system requirements during retrieval are provided in Subsection 4.1.3.3.
- Discuss operations under normal and off-normal conditions.
- Discuss shielding requirements.

4.1.3.6 Emergency Systems

This subsection describes the emergency response equipment, vehicle recovery systems, underground ambulance support, and other emergency systems.

In addition, this subsection describes the evacuation plan, ventilation plan in the event of accident or equipment malfunction, and rescue chambers.

The discussion on the emergency systems include the following:

- Alarm systems
- Emergency power systems
- Systems to prevent the spread of floods and fires
- Differences in emergency systems for development and emplacement areas.

[See INN 4.1.3.6-1]

4.1.3.7 Communication System

This subsection contains a description of the communications system(s) envisioned for use in the repository subsurface, and between the surface and subsurface areas [INN 4.1.3.7-1].

4.1.3.8 Operations Support System

- Describe the designs and operating features of the support systems within the underground facility, including:

  - Mine waste-water drainage
  - Lighting system
  - Power systems
  - Electrical
  - Compressed air
  - Fuels supply
  - Steam supply
  - Water supply
  - Auxiliary systems or back-up systems
  - Maintenance shops
  - Supply rooms
  - Offices.

- Discussions should include design features considered important to safety under normal and accident conditions.

[Much of this material is covered in Subsection 4.1.1 with surface facility systems.]

4.1.3.9 Decommissioning System

This subsection will provide: [INN 4.1.3.9-1]

[Backfilling and sealing systems, materials, and equipment for shafts, ramps, and boreholes are described in Subsection 4.1.2.6]

- Provisions for dealing with sealing fractures, perched water zones, and fault areas are discussed in this section.

- A discussion of detailed sealing waste emplacement areas, including consideration of:

  - Drifts
  - Panels
  - Removal of underground equipment
  - Removal of operational underground systems and structures, including:
    -- Belt conveyors
    -- Ventilation doors
    -- Regulators
  - Bulkheads
  - Ways of dealing with operations seals
  - Injection of grouts.

- Discussion of long term repository drainage.

4.1.3.10 Other Underground Systems

- Provide descriptions of other systems, such as the drainage system, that are part of the underground facility in similar detail.

4.1.4 Radiation Protection

The purpose of this Subsection is to describe the radiation protection systems during the preclosure period for the GROA, that provide the basis for the compliance assessments contained in Sections 4.2, 4.3, 4.4, 4.5, 5.5, 7.2, and 8.4 of the LA.

This subsection describes the general features of the GROA design that permit safe handling of radioactive material during operations and retrieval. The description includes the layouts of the facilities for radiation protection in the GROA and the radiological design features for each system described in Section 4.1 that are employed to meet the standards in 10 CFR 20, *Standards for Protection Against Radiation*, other appropriate NRC guidance, and any applicable standards provided by the EPA. [INN 4.1.4-1]

This section also projects radiation exposures to workers and the general public from handling, storage, retrieval, emplacement, and isolation of waste packages during normal operations, anticipated operational occurrences, and accident conditions that are expected to prevail until permanent facility closure. [INN 4.1.4-2]

The primary goal of Radiation Protection and ALARA programs is to minimize the occupational exposure to radiation during the maintenance, operation, retrieval (if necessary) and decommissioning of the facility. To achieve this, ALARA concepts are integrated into all phases of the project and is particularly important during the design phase. There is also an individual responsibility to minimize personnel exposures. [Individuals are trained in techniques to minimize personnel exposures, and procedures have been written to accomplish work activities while minimizing exposures.]

Two manuals are used to specify design and facility operation ALARA guidelines. The Design ALARA Manual [INN 4.1.4-3] specifies guidelines to be used during the design phase of the facility and modifications to existing design. The Operations ALARA Manual [INN 4.1.4-4] specifies guidelines used during operations to maintain exposures ALARA and is used by the Radiation Protection Staff.

4.1.4.1 Layout Drawings of Radiological Areas and Facilities

Layout drawings of the Radiation Protection Facilities are provided in Figure(s) 4.1.4.1-1(n) [INN 4.1.4.1-1]. These drawings provide the following:

- Location of shield walls
- Thickness of shield walls
- Controlled access areas
- Equipment decontamination areas
- Traffic patterns
- Location of health physics facilities
- Location of laboratories
- Location of counting room.

This Subsection identifies the radiation protection facilities intended for use during emergences.

In addition, this subsection describes facilities and equipment involved in the radiation protection program, including equipment especially designed for radiation protection.

[Provide a cross-reference to the location of SSCs important to safety (in Subsections 4.1.1, 4.1.2, and 4.1.3), and provide a table (Table 4.1.4.1-1) that lists those SSCs intended for radiation protection.] [INN 4.1.4.1-2]

4.1.4.2 ALARA Design Consideration

Layout and arrangement drawings preceding this subsection illustrates the locations of the radiations sources, area radiation monitors, and airborne radioactive material monitors. Radiation shielding and the other design features described in the following subsection ensure that doses to personnel are ALARA.

To aid in layout and shielding design, the facility is divided into radiation zones. These zones indicate dose rates given the maximum radionuclide activity assumed in design. The bases for these zones are listed below.

Zone R-1 - Areas adjacent to the facility to which access is not normally controlled. Dose rates in these areas are limited to 0.025 rem/yr, approximated as 0.0025 mrem/hr.

Zone R-2 - Areas within the facility where personnel are expected to be continuously present. 10 CFR 20.1302 limits dose rates in these areas to 0.5 mrem/hr.

Zone R-3 - Areas within the facility where personnel are expected to be present for extended periods of time. The 1.0 mrem/hr limit is set to ensure personnel exposure will not exceed 40 percent of the annual 10 CFR 20 limit of 5 Rem.

Zone R-4 - Analogous to Zone R-3 except occupancy levels are lower. Dose rates in these areas are limited to 2.5 mrem/hr.

Zone R-5 - Infrequently occupied areas where dose rates exceed continuous occupational levels. 10 CFR 20.1902 posting precautions are applied where warranted. Limit is set at 15 mrem/hr.

Zone R-6 - Access is limited. 10 CFR 20.1601 and 20.1902 precautions are applied where warranted. Limit is set at 100 mrem/hr at 30 centimeters.

Zone R-7 - All areas of the facility where dose rates exceed Zone R-6. Access is physically restricted, and 10 CFR 20.1601, 20.1602 and 20.1902 precautions are applied where warranted.

Radiation zone maps are depicted in Figure 4.1.4.2-1 [INN 4.1.4.2-1]. Gradients are expected in radiation levels within each zone. Although "hot spots" that exceed zone limits may exist, dose levels in most areas are expected to be significantly below these zone limits. Actual zone markings and access control are carried out under the Radiation Protection Program, taking into account applicable regulations and existing radiation levels.

Achieving ALARA exposure levels as a result of design is basically a three step process: 1) prevent the creation or buildup of a radioactive source, 2) if prevention is not successful, isolate the source from personnel, and 3) if complete isolation is not possible, minimize the effect of the source on personnel.

In instances where exposure could occur, steps are taken to minimize exposure. Major components are placed in separate cubicles to reduce exposures of maintenance personnel from other equipment. Special floor coatings are used to aid in clean up operations following any spills or leakage. Ventilation is designed so that air flows from non-contaminated areas

into areas of potential airborne activity. [Additional information on the facility ventilation systems and the off gas treatment system will be provided as ACD allows. Discussion of these systems is also provided in Subsections 4.1.4.2.4.] A radiation monitoring system is provided to alert personnel to any sudden changes in area radiation levels. A description and the location of these monitoring systems are provided in Section 7.2.

[Additional information in specific design features will be provided as ACD allows. INN 4.1.4.2-2]

The identification of measures taken to maintain radiological safety and minimize contamination during handling, storage, retrieval, and emplacement of radioactive waste packages during normal operations, anticipated operational occurrences, and accident conditions are found in this subsection [INN 4.1.4.2-3].

4.1.4.2.1 ALARA Design Principles for GROA Systems

- Describe ALARA design principles for GROA systems. Refer to Figures 4.1.4.1-1(n) [INN 4.1.4.1-1] for layout of equipment.

4.1.4.2.2 ALARA Experience from Past Applications

- [This subsection describes how experience from past applications has been incorporated to minimize contamination incidents.

- This description includes radiological safety features for:

  - Processing radwaste
  - Transporting radwaste
  - Handling radwaste
  - Storage of radwaste
  - Retrieval of radwaste-emplacement of radwaste
  - Isolation of radwaste.]

4.1.4.2.3 ALARA Design Considerations

- [This subsection describes how designs are directed toward:

  - Reducing equipment maintenance
  - Reducing radiation levels and maintenance time
  - Controlling contamination in handling, transfer, and storage of radioactive material.]

4.1.4.2.4 Ventilation and Off-gas Treatment Systems

- Identify ventilation and off-gas treatment systems by reference to Figures 4.1.1.9-2, 4.1.1.9-3 [INN 4.1.1.9-1], and 4.1.3.3.1.2-1 [INN 4.1.3.3.1.2-1]. Describe the following:

  - Releases will be ALARA during normal operation
  - Capacity is sufficient to confine material during projected operating conditions
  - Adequate monitors are incorporated
  - Design features are incorporated to interface with other effluent and vent systems
  - Spread of material will be controlled.

- Discuss program for measuring the efficiency of filters and treatment devices. Discuss how filter changes facilitate ALARA.

Ventilation system component parameters are shown in Table 4.1.4.2.4-1 [INN 4.1.4.2.4-1].

4.1.4.3 Characterization of Shielding

The locations, content, thickness, and projected effectiveness of radiation shielding in the surface and subsurface facilities will be discussed in this section. Permanent shielding, such as emplacement drift doors and waste transporter shielding, as well as temporary shielding which may be required for off-normal work will be described. Characterization of the radiation sources expected in the repository, and the effectiveness of the planned shielding against these sources will be presented. Locations of radiation sources, and their paths of transportation throughout the facility will be provided. [INN 4.1.4.3-1]

4.1.4.3.1 Radiation Sources

The sources of radiation are the bases for radiation protection design. They are also used as input for shielding design calculations and for models to calculate airborne concentrations of radioactive materials. This subsection describes and tabulates the radiation sources by isotopic composition, neutron, X-ray and gamma-ray energy groups, and source geometry. The expected concentrations of airborne radioactive materials by nuclides is also tabulated.

4.1.4.3.1.1 Characterization of Sources

LWR spent nuclear fuel (SNF) assemblies and Defense High-Level Waste received and handled at the MGDS facility are the origin of all anticipated radioactive material. Radiation sources include direct radiation sources such as fuel assemblies, defense waste packages or accumulated contamination, low-level radioactive waste generated on-site, effluent from the facility, and airborne and surface contamination inside certain areas of the facility.

Typical fission and activation products and subsequent decay daughters contained in typical spent PWR and BWR fuel assemblies are listed in Table 4.1.4.3.1.1-1 [INN 4.1.4.3.1.1-1]. This table also includes a correction to account for deposited corrosion products on the fuel assemblies (TBD). Depending upon fuel cladding and assembly hardware manufacturing materials, initial fuel enrichment, and fuel burnup, some variations in fission and activation products will exist between individual fuel assemblies or assembly designs. Photon, neutron, and heat source terms for typical SNF types are presented in Table 4.1.4.3.1.1-2 [INN 4.1.4.3.1.1-2]. This table also includes conservative (i.e., bounding) assumptions for fuel assembly burnup, decay time (since core discharge), and initial enrichment. In general, the highest burnup, lowest allowable decay time, and lowest initial enrichment, for a given fuel type, yields the most conservative source term for shielding and effluents analyses. (Note that these source terms may be different from those used for other analyses, such as criticality analyses as conservative assumptions for one type of analysis may be non-conservative for others.) The source terms include the irradiated fuel, activated portions of the fuel assemblies, and deposited activity from corrosion products. All primary sources originating in the fuel, and secondary gammas generated in shield materials, are considered by the shielding codes used.

The fuel region is modeled as a homogeneous cylinder for shielding calculations, as shown in the model geometry descriptions. The homogeneous source over the active fuel region includes fission product, actinide, corrosion product, and light element activation product sources. The burnup distribution in an assembly is assumed axially and radially flat (i.e., even distribution) for shielding analyses.

A general description of the radioactive materials to be received at the repository is in Section 2.5. Radioactive waste sources are described in Subsection (5.1.2). Effluent sources are described in Section (TBD). Airborne contamination is described in Section (TBD). [INN 4.1.4.3.1.1-3]

4.1.4.3.1.2 Airborne Radioactive Material Sources

The principal design objective of the Offgas Treatment and Ventilation System [INN 4.1.4.3.1.2-1] is to protect plant personnel, the general public, and the environment by ensuring that gaseous releases of potentially radioactive materials both in-plant and to the environment are in accordance with 10 CFR 20, and are ALARA. Ventilation system component parameters are provided in Table 4.1.4.2.4-1. A summary of potential airborne radioactive material by radionuclide is provided in Table 4.1.4.3.1.1-1.

Airborne radioactivity introduced into the transfer facility as a result of cask venting is directed to the HVAC system upstream of filter units. The filtered gas is ultimately released through the unit vent after it is monitored. It is assumed that in areas where there are no potential sources of radioactive leakage, the concentration of radioactivity is equal to the concentration in the air external to the ventilation intakes. This is reasonable since the ventilation system design is such that air flows from areas of low potential airborne

radioactivity to areas of higher airborne radioactivity. For those areas with sources of leakage, the concentration is calculated by

$$C = Co + Q / (2.832 \times 10^4 \ \frac{ml}{ft^3} \times F)$$

C = room concentration (μCi/ml)

Co = outside air concentration for the appropriate ventilation system (μCi/ml)

Q = source term originating in the room (μCi/min)

F = room exhaust flow rate (ft^3/min)

$2.832 \times 10^4 \frac{ml}{ft^3}$ = conversion factor

Decay has conservatively been neglected with the exception of activity during operation, to be consistent with the assumptions inherent in the effluent release calculations.

[Detailed information on radiation sources will be added as conceptual design progresses.]

The design of the MGDS facility complies with Regulatory Guide 8.8 Position 2 ALARA considerations. Through design features such as access control, shielding and geometry, instrumentation and control types and placement, control of airborne contaminants and radioactive gases, crud control, isolation of radioactive sources, decontamination, airborne contamination monitors, radwaste design, and miscellaneous other considerations, personnel radiation exposure is maintained ALARA. Specific (but not all encompassing) considerations that are directed toward ensuring ALARA are discussed. [More detailed discussion of specific ALARA design considerations for the MGDS facility is to be developed as design allows. This includes access engineering for inspection, testing, repair, and maintenance. Access engineering is the design of systems allowing physical ease of passage and entry to personnel and equipment as an aid to the ALARA principle. Experience from past designs used to develop improved designs will be discussed if applicable.]

a. Biological Shielding is employed in the facility design to reduce the surface dose rates to below an average of (0.5) mr/hr for continuously occupied areas. The (0.5) mr/hr dose rate assures compliance with the 10 CFR 20 radiation area dose limit . The shielding employed in the facility design will assist operations in maintaining exposures to radiation as far below the dose limits in 10 CFR 20 as practical, and this is [deemed to/will] satisfy ALARA criteria based on consideration of costs, other design features, and access requirements.

b. Scatter and streaming of radiation during SNF transfer and storage is maintained ALARA.

c. Passive system designs that require minimum maintenance are employed wherever they are practical.

d. The SNF storage yard and other radiation areas are separated from normally occupied areas within the site (i.e., administrative buildings).

e. Maintenance access areas are provided for timely and efficient repairs.

4.1.4.3.2 Shielding

Calculations to determine the adequacy of facility shielding are based on the source information in Subsection 4.1.4.3.1.1 and the methodology outlined below. Dose points are selected inside and outside cubicles/rooms containing radioactive equipment/sources. Ceilings and floors that separate radiation zone areas are generally the same thickness as walls. Skyshine from the transfer facility is negligible because rooms or cubicles containing radioactive materials are shielded overhead and penetrations are designed off line of sight with high radiation sources. Skyshine from other sources are evaluated as necessary. The major neutron source is from the SNF for which appropriate shielding is provided, commonly concrete. In some cases, where neutron streaming may be a problem, special neutron shielding materials such as borated concrete is used. Sources of gamma radiation, particularly SNF, are distributed throughout the receiving and handling building. The computer codes _____, _____, _____, and [INN 4.1.4.3.2-1] are used to verify gamma (and where applicable neutron) source shielding. The following sequence typifies a gamma/neutron source shielding analysis:

a. Determine the concentration of each principal nuclide in the source medium.

b. Adjust the concentration by accounting for accumulation, dilution, decay, removal, etc.

c. Convert the resulting concentrations to a gamma source strength.

d. Select an idealized model or combination of models to represent the physical shape of the source container and all shields present.

e. Assemble the necessary data on attenuation properties of the source and shield materials.

f. Perform the calculation for the desired detector point and tabulate the results for comparison with design objective dose rates.

g. Document analysis and results.

Shield design is theoretically an iterative process.

All the above identified computer codes are described below.

[INN 4.1.4.3.2-1] employs the point kernel technique to determine dose rates from complex sources whose geometries can be described using combinatorial geometry. Neutron attenuation functions are also available. Detailed descriptions of the code and its geometry routines are found in Reference (TBD).

[INN 4.1.4.3.2-1] is a multipurpose neutron and gamma ray Monte Carlo transport code. Through the use of multigroup cross sections, either forward or adjoin solutions of neutron, gamma ray, or coupled neutron-gamma ray problems may be obtained. Time dependence for both shielding and criticality problems is provided. Three dimensional as well as specialized one dimensional geometry descriptions may be used. An albedo option is available at each material surface. Also available is isotropic or anisotropic scattering up to a P-16 expansion of the angular distribution. A complete description of the code is in Reference (TBD).

Most of the receiving and handling facility shielding is poured ordinary concrete. Some lead, and to a lesser extent steel and specialized shield windows, are used as shielding. For shield design, a typical concrete density of 2.35 g/cm^3 is used. Lead shields are either stacked bricks, laminated slabs, or lead wool. Whenever concrete or lead blocks are used as a shield, care is taken to avoid unshielded paths through joints.

Design features as discussed in Regulatory Guide 8.8 are utilized throughout the facility. Specifically, penetration of shield walls separating Zone IV areas from higher radiation areas is avoided as possible. If such a wall must be penetrated, care is taken to reduce the consequences of the penetration by avoiding paths for direct radiation streaming. Cubicle entrances retain their shielding integrity with labyrinths where possible. Valve galleries are provided to allow remote operation of valves from a shielded area. Minimum shield thicknesses for the facility are given in Table 4.1.4.3.2-1 [INN 4.1.4.3.2-2].

- X-ray, gamma ray, and neutron sources are characterized in Table 4.1.4.3.1.1-2 [INN 4.1.4.3.1.1-2].
- The location of storage containers, tanks, and other equipment expected to require shielding is identified in Figure 4.1.4.1-1.
- Describe the shielding used for each of the sources identified. Design parameters for shielding are provided in Table 4.1.4.3.2-1 [INN 4.1.4.3.2-2].
- Describe geometric arrangement, specialized protection features, or remote handling to ensure dose to workers is ALARA. Refer to Subsection 4.1.4.2.
- Describe use of portable shielding, if applicable.

4.1.4.4 Radiological Monitoring Instrumentation

This subsection will discuss the used radiation monitors in the GROA [INN 4.1.4.4-1]. Fixed monitoring instruments are located at exits from the RCA. Whole body monitors and hand and foot monitors are also utilized at exits from the RCA. These instruments are intended as the primary control to prevent any contamination of personnel, materials, or equipment from being spread into the unrestricted areas of the facility. Appropriate monitoring instruments are also used at various maintenance locations or other work areas within the RCA for contamination control purposes. Portal monitors are utilized as appropriate, to monitor personnel leaving the facility to prevent the spread of contamination. [INN 4.1.4.4-2]

In conformance with applicable regulatory guides all of the aforementioned instruments are subject to initial operational checks and calibration and to a continuing quality control program to assure the accuracy of all measurements of radioactivity and radiation levels.

In addition, routine calibrations are performed after all repairs that could affect instrument calibration.

[Note: This subsection will also address instrument storage, calibration, and maintenance facilities.]

Inplant radiation monitoring systems provide station personnel with the capability to assess the radiological situation in various areas of significance during normal operations as well as during an off-normal or an emergency situation. The monitoring systems include the area radiation monitoring system, airborne radioactivity monitoring system, and portable radiation monitoring equipment as described in this subsection and Section 7.2.

The area radiation monitoring system is provided to monitor radiation levels in various plant locations that are potentially significant personnel exposure areas. Indications and alarms from this system are used as an aid in conjunction with information from process radiation monitors, facility operating procedures, and administrative controls to assure that station personnel exposure remains ALARA within 10 CFR 20 limits.

The process airborne monitoring system is provided in part to monitor ventilated areas that are potential sources of airborne radioactivity. These monitors provide indication of the airborne radioactivity in the areas monitored and provide alarms. Additionally, some of the monitors perform control functions during postulated accident conditions.

In addition, portable or mobile continuous air monitors are utilized during operations that may require high occupancy for special maintenance, and/or where there is a probability that airborne contamination may be a long term problem. These monitors are equipped with a particulate filter and a detector, which collect and measure gross activity concentrations of airborne particulates.

- Describe fixed-area monitors and continuous airborne monitoring instrumentation. The location of monitors is shown in Figure 4.1.4.4-1 [INN 4.1.4.4-3]. The equipment is illustrated in Figure 4.1.4.4-2 [INN 4.1.4.4-4], including sample pumps and collectors.

- Describe criteria for setpoints for alarms.

- Monitoring instrumentation design parameters are tabulated in Table 4.1.4.4-1 [INN 4.1.4.4-5].

- Provide details of represented sample gathering.

4.1.5 Interface of SSCs

The purpose of this section is to demonstrate that, in the event of failure of a non-safety-related system, its interfacing safety-related systems can still perform.

- Discuss interfaces between the GROA and waste management systems such as transportation systems. [INN 4.1.5-1

- Describe SSCs that provide interface between surface facilities, shafts and ramps, and the underground facility. These SSCs are identified in Table 4.1.5-1 [INN 4.1.5-2]. The discussion should include:

  - Ventilation system
  - Hoisting system
  - Communication system
  - Instrumentation and control system
  - Utility system
  - Operation support system
  - Emergency system.

- Discuss interface between safety-related and non-safety-related systems. Reference the above sections where appropriate. [INN 4.1.5-3]

REFERENCES

10 CFR 20, Standards for Protection Against Radiation

10 CFR 60, Disposal of High-Level Radioactive Wastes in Geologic Repositories

Reference Information Base, YMP/93-02

TABLE TITLES

TABLE TITLES (continued)

TABLE TITLES (continued)

TABLE TITLES (continued)

TABLE TITLES (continued)

TABLE TITLES (continued)

TABLE TITLES (continued)

TABLE TITLES (continued)

FIGURE CAPTIONS

Figure 4.1.0.2-1	Location of GROA Relative to Accessible Environment, Surface Facilities [INN 4.1.0.2-4]
Figure 4.1.0.2-2	Location of GROA Underground Facility Relative to Accessible Environment [INN 4.1.0.2-4]
Figure 4.1.0.3-1	Gantt type schedule of the major construction and operation phases. [INN 4.1.0.3-2]
Figure 4.1.1-1	Location and layout of surface facilities [INN 4.1.1-1]
Figure 4.1.1.7-1	Computer and Control System Architecture [INN 4.1.1.7-11]
Figure 4.1.1.7-2	Control Room Layout [INN 4.1.1.7-12]
Figure 4.1.1.8-1	Location of On-Site Transportation Systems [INN 4.1.1.8-7]
Figure 4.1.1.8-2	Detailed Engineering Drawings of Hoist Building and Ramp Buildings [INN 4.1.1.8-8]
Figure 4.1.1.10.2.1-1	Development Side Site Plan [INN 4.1.1.10.2.1-2]
Figure 4.1.1.10.2.1-2	Development Side Site Plan [INN 4.1.1.10.2.1-2]
Figure 4.1.1.10.2.2-1	Maintenance Shop General Arrangement [INN 4.1.1.10.2.2-1]
Figure 4.1.1.10.2.3-1	Supplies Warehouse General Arrangement [INN 4.1.1.10.2.3-1]
Figure 4.1.1.10.2.4-1	Change House General Arrangement [INN 4.1.1.10.2.4-1]
Figure 4.1.1.10.2.6-1	Office Building General Arrangement [INN 4.1.1.10.2.6-1]
Figure 4.1.1.10.2.7-1	Development Side Support Facility General Arrangement [INN 4.1.1.10.2.7-1]
Figure 4.1.1.10.2.7-2	Development Side Support Facility General Arrangement [INN 4.1.1.10.2.7-1]
Figure 4.1.1.10.2.7-3	Development Side Support Facility General Arrangement [INN 4.1.1.10.2.7-1]
Figure 4.1.2.1.1.2-1	Stratigraphic Section at Ramp Centerline [INN 4.1.2.1.1.2-1]

FIGURE CAPTIONS (continued)

FIGURE CAPTIONS (continued)

FIGURE CAPTIONS (continued)

Figure 4.1.2.2.2.2-1 Typical Personnel Hauling Equipment Arrangement [INN 4.1.2.2.2.2-1]

Figure 4.1.2.2.2.2-2 Typical Materials and Supplies Hauling Equipment Arrangement [INN 4.1.2.2.2.2-2]

Figure 4.1.2.2.2.2-3 Typical Materials and Supplies Hauling Equipment Arrangement [INN 4.1.2.2.2.2-2]

Figure 4.1.2.2.2.2-4 Typical Materials and Supplies Hauling Equipment Arrangement [INN 4.1.2.2.2.2-2]

Figure 4.1.2.2.2.2-5 Typical Materials and Supplies Hauling Equipment Arrangement [INN 4.1.2.2.2.2-2]

Figure 4.1.2.2.2.2-6 Typical Materials and Supplies Hauling Equipment Arrangement [INN 4.1.2.2.2.2-2]

Figure 4.1.2.2.2.2-7 Typical Materials and Supplies Hauling Equipment Arrangement [INN 4.1.2.2.2.2-2]

Figure 4.1.2.2.3.2-1 Post-Closure Seal General Arrangement [INN 4.1.2.2.3.2-2]

Figure 4.1.2.2.3.2-2 Post-Closure Seal General Arrangement [INN 4.1.2.2.3.2-2]

Figure 4.1.2.2.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.2.3.2-2]

Figure 4.1.2.3.1.2-1 Stratigraphic Section at Shaft Centerline [INN 4.1.2.3.1.2-1]

Figure 4.1.2.3.1.3-1 Shaft Collar Site Plan [INN 4.1.2.3.1.3-1]

Figure 4.1.2.3.1.3-2 Shaft Collar Arrangement [INN 4.1.2.3.1.3-2]

Figure 4.1.2.3.1.3-3 Shaft Collar Arrangement [INN 4.1.2.3.1.3-2]

Figure 4.1.2.3.1.4-1 Shaft Collar General Cross Section [INN 4.1.2.3.1.4-1]

Figure 4.1.2.3.1.5-1 Shaft Long Section [INN 4.1.2.3.1.5-1]

Figure 4.1.2.3.1.5-2 Shaft General Arrangement [INN 4.1.2.3.1.5-1]

Figure 4.1.2.3.1.7-1 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.3.1.7-1]

FIGURE CAPTIONS (continued)

FIGURE CAPTIONS (continued)

Figure 4.1.2.4.1.1.7-2 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-3 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-4 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-5 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-6 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-7 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.7-8 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.1.1.7-1]

Figure 4.1.2.4.1.1.8-1 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.1.1.8-1]

Figure 4.1.2.4.1.1.8-2 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.1.1.8-1]

Figure 4.1.2.4.1.1.9-1 Shaft Drainage Arrangement [INN 4.1.2.4.1.1.9-1]

Figure 4.1.2.4.1.2.2-1 Emplacement Exhaust Shaft Ventilation Plant General Arrangement [INN 4.1.2.4.1.2.2-2]

Figure 4.1.2.4.1.2.2-2 Emplacement Exhaust Shaft Ventilation Plant General Arrangement [INN 4.1.2.4.1.2.2-2]

Figure 4.1.2.4.1.2.2-3 Emplacement Exhaust Shaft Ventilation Plant General Arrangement [INN 4.1.2.4.1.2.2-2]

Figure 4.1.2.4.1.2.2-4 Exhaust Air Bypass & HEPA Filter General Arrangement [INN 4.1.2.4.1.2.2-3]

Figure 4.1.2.4.1.2.2-5 Exhaust Air Bypass & HEPA Filter General Arrangement [INN 4.1.2.4.1.2.2-3]

Figure 4.1.2.4.1.2.2-6 Exhaust Air Bypass & HEPA Filter General Arrangement [INN 4.1.2.4.1.2.2-3]

Figure 4.1.2.4.1.3.2-1 Post-Closure Seal General Arrangement [INN 4.1.2.4.1.3.2-2]

Figure 4.1.2.4.1.3.2-2 Post-Closure Seal General Arrangement [INN 4.1.2.4.1.3.2-2]

FIGURE CAPTIONS (continued)

Figure 4.1.2.4.1.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.4.1.3.2-2]

Figure 4.1.2.4.2.1.2-1 Stratigraphic Section at Shaft Centerline [INN 4.1.2.4.2.1.2-1]

Figure 4.1.2.4.2.1.3-1 Shaft Collar Site Plan [INN 4.1.2.4.2.1.3-1]

Figure 4.1.2.4.2.1.3-2 Shaft Collar Arrangement [INN 4.1.2.4.2.1.3-2]

Figure 4.1.2.4.2.1.3-3 Shaft Collar Arrangement [INN 4.1.2.4.2.1.3-2]

Figure 4.1.2.4.2.1.4-1 Shaft Collar General Cross Section [INN 4.1.2.4.2.1.4-1]

Figure 4.1.2.4.2.1.5-1 Shaft Long Section [INN 4.1.2.4.2.1.5-1]

Figure 4.1.2.4.2.1.5-2 Shaft General Arrangement [INN 4.1.2.4.2.1.5-1]

Figure 4.1.2.4.2.1.7-1 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-2 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-3 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-4 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-5 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-6 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-7 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.7-8 Typical Shaft Cross Section at Stratigraphic Unit [INN 4.1.2.4.2.1.7-1]

Figure 4.1.2.4.2.1.8-1 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.2.1.8-1]

Figure 4.1.2.4.2.1.8-2 Shaft Collar Site Drainage Arrangement [INN 4.1.2.4.2.1.8-1]

Figure 4.1.2.4.2.1.9-1 Shaft Drainage Arrangement [INN 4.1.2.4.2.1.9-1]

Figure 4.1.2.4.2.3.2-1 Post-Closure Seal General Arrangement [INN 4.1.2.4.2.3.2-2]

Figure 4.1.2.4.2.3.2-2 Post-Closure Seal General Arrangement [INN 4.1.2.4.2.3.2-2]

FIGURE CAPTIONS (continued)

FIGURE CAPTIONS (continued)

Figure 4.1.2.5.2.1-3 Hoisting General Arrangement [INN 4.1.2.5.2.1-2]

Figure 4.1.2.5.3.2-1 Post-Closure Seal General Arrangement [INN 4.1.2.5.3.2-2]

Figure 4.1.2.5.3.2-2 Post-Closure Seal General Arrangement [INN 4.1.2.5.3.2-2]

Figure 4.1.2.5.3.2-3 Post-Closure Seal General Arrangement [INN 4.1.2.5.3.2-2]

Figure 4.1.2.6.2.5-1 Other Plug or Bulkhead General Arrangement [INN 4.1.2.6.2.5-1]

Figure 4.1.2.6.2.5-2 Other Plug or Bulkhead General Arrangement [INN 4.1.2.6.2.5-1]

Figure 4.1.2.6.2.5-3 Other Plug or Bulkhead General Arrangement [INN 4.1.2.6.2.5-1]

Figure 4.1.2.6.4.1-1 Shaft Backfill Operations Sequence Diagram [INN 4.1.2.6.4.1-2]

Figure 4.1.2.6.4.1-2 Shaft Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.1-3]

Figure 4.1.2.6.4.1-3 Shaft Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.1-3]

Figure 4.1.2.6.4.1-4 Shaft Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.1-3]

Figure 4.1.2.6.4.2-1 Ramp Backfill Operations Sequence Diagram [INN 4.1.2.6.4.2-2]

Figure 4.1.2.6.4.2-2 Ramp Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.2-3]

Figure 4.1.2.6.4.2-3 Ramp Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.2-3]

Figure 4.1.2.6.4.2-4 Ramp Backfilling Equipment Operating Arrangement [INN 4.1.2.6.4.2-3]

Figure 4.1.2.6.4.3-1 Shaft Seal Operations Sequence Diagram [INN 4.1.2.6.4.3-2]

Figure 4.1.2.6.4.3-2 Shaft Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.3-3]

Figure 4.1.2.6.4.3-3 Shaft Sealing Equipment Operating Arrangement [INN 4.1.2.6.4.3-3]

FIGURE CAPTIONS (continued)

FIGURE CAPTIONS (continued)

FIGURE CAPTIONS (continued)

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the mission of the GROA.
Information will be used to support:	Input to Subsection 4.1.0.1 of LA, GROA Mission
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general description of GROA (including the quote of 10 CFR 60, *Disposal of High-Level Radioactive Wastes in Geologic Repositories*, Section 2, Description.
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Identify the major operations performed (e.g., receive and emplace HLW, cask maintenance, support development operations, performance conformation, interim storage, waste management, and balance of plant functions).
Information will be used to support:	Input to Subsection 4.1.0.1 of LA, GROA Mission
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide an overview of the GROA operations phases (i.e., startup, emplacement/development, caretaker, closure, decommissioning).
Information will be used to support:	Input to Subsection 4.1.0.1 of LA, GROA Mission
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide an overview of the materials to be placed in the repository (e.g., material types, forms for transportation and storage, storage quantities and receipt rates).
Information will be used to support:	Input to Subsection 4.1.0.1 of LA, GROA Mission
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the relationship and interface with the other portions of the MGDS (i.e., waste isolation system).
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Identify the major subareas within the GROA (e.g., Radiological Control Area, Emplacement Area, Development Area, Balance of Plant Area and Development Support Camp) and note which are Surface Facilities, Shafts and Ramps, and Underground.
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.0.2-1, Figure 4.1.0.2-2
Explicit description of the needed information:	Provide the location of the GROA relative to the accessible environment (i.e., site boundary). Utilize plot plans, Figure 4.1.0.2-1 , and an underground sections, Figure 4.1.0.2-2. These figures will identify facilities and GROA subareas.
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-8
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe where the complete descriptions of the GROA facilities and systems are provided (i.e., facility lists and descriptions, and SSC lists and descriptions). Provide the necessary references.
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-9
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide key parameters that give a physical feel to the facilities provided (e.g., number of facilities, construction type, number of employees, site area, overall floor space, and site location and terrain).
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.2-10
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe major design features important to waste isolation.
Information will be used to support:	General description of the GROA for the LA, Subsection 4.1.0.2.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Briefly describe the major construction and operating phases (i.e., design, construction, startup, emplacement/development, caretaker, closure and decommissioning).
Information will be used to support:	Discussion of the schedule for construction and operation for Subsection 4.1.0.3 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.3-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.0.3-1
Explicit description of the needed information:	Provide a Gantt type schedule showing the major construction and operations phases in Figure 4.1.0.3-1
Information will be used to support:	Discussion of the schedule for construction and operation for Subsection 4.1.0.3 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose of this section (i.e., summarize key design criteria and provide references to the appropriate criteria document).
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the section organization and indicate where references are listed.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the regulatory requirements and design criteria from 10 CFR 60.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the design requirements from other federal, state, and local agencies, such as Occupational Safety and Health, mine safety, EPA. [FCRG comment]
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.1-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Indicate that the characteristics and history of the waste are described in detail in Section 5.1.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the design requirements contained in DOE documents and system and subsystem requirements documents. Describe the key design criteria that were derived from the higher regulatory requirements based on studies and agreements. Provide references to other criteria documents.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Indicate that the detailed waste package design information is provided in Section 5.1.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the major site features that affect GROA design and performance. (Refer to other documents or sections for details.)
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Discuss site design basis, including compilation and interpretation of all physical data relevant to GROA design.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the interpretation of site geology such as stratigraphy, structural features, major and minor faults, old volcanos, and history of seismic activity. The physical geologic data is provided in Subsection 3.1.1.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the interpretation of surface and groundwater hydrologic data including surface drainage characteristics, drainage through strata penetrated by ramps and shafts, above and below ground. The data are provided in Subsection 3.1.2.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide the soil properties and other relevant data for the design of foundations.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide the relevant meteorological data.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide the rock data and properties that are relevant to the design of surface facilities, shafts and ramps, and the underground facility.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.4.3-8
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the site-specific human-induced phenomena such as nuclear detonations and aircraft travel. The detailed data are provided in Subsection 3.1.4.
Information will be used to support:	Discussion of design criteria in Subsection 4.1.0.4 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the need for breaking the plant into SSCs and discuss the framework for SSC identification.
Information will be used to support:	Discussion of the identification and classification of SSCs in Subsection 4.1.0.5 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.5-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Indicate where in the report the SSCs are described in detail and indicate that the SSCs are listed in those sections.
Information will be used to support:	Discussion of the identification and classification of SSCs in Subsection 4.1.0.5 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.5-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Refer to Sections 4.2 through 4.4 for the analysis that identifies the SSCs important to safety (i.e., Q list).
Information will be used to support:	Discussion of the identification and classification of SSCs in Subsection 4.1.0.5 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.5-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Discuss activities and events, either planned or unplanned, that could interfere with SSC performance.
Information will be used to support:	Discussion of the identification and classification of SSCs in Subsection 4.1.0.5 of the LA.
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Identify SSCs that require R&D to confirm the adequacy of design. Describe where these SSCs are identified and the development needs discussed.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.6-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.0.6-1.
Explicit description of the needed information:	List the development programs in Table 4.1.0.6-1, and describe each development program including: a. Purpose of the program (i.e., key issue to be resolved). b. List SSCs that depend on the program for validation. c. Development schedule required to meet the repository licensing, design, construction and startup objectives. d. Contingency plans should the program results not validate the current design concepts.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.6-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe why it is justifiable to license construction before the results of the R&D programs are available.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.0.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe how and where alternative design features are described. Comparative evaluations of the selected design features will be addressed and alternatives that could provide for longer waste isolation will be emphasized.
Information will be used to support:	Subsection 4.1.0.7 of the LA, Alternative Designs
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1-1
Explicit description of the needed information:	Show location and layout of surface facilities in Figure 4.1.1-1
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Identify the GROA surface areas (i.e., Radiological Control Area, Balance of Plant Area and Development Support Camp) and describe how the site surface facilities works as a whole (i.e. relationship between surface and subsurface areas; relationship between GROA and ESF surface facilities; and general site material and personnel movement).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.1-1
Explicit description of the needed information:	Identify each surface facility included in the GROA in Table 4.1.1-1. The facilities will be listed by GROA area and will include the following data for each facility: facility name, construction type, number of floors, gross area and number of operating personnel.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	For each facility: Describe the purpose for the facility and list the functions/operations performed. Describe the facility design basis and provide a general design description referring to site map, building floor plans, building sections and space requirements table. Cover general arrangement, number of floors, size and construction type. Describe the basic operation of the building (i.e. material and personnel movement) and describe the number of operating personnel and features provided to support these workers. Describe the structural/architectural safety features and identify the major SSCs in each facility
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.1-2 Table 4.1.1-3
Explicit description of the needed information:	Identify the major SSCs that are important to safety in Table 4.1.1-2. Identify the SSCs important to retrievability in Table 4.1.1-3.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose of the system (i.e., receive HLW in transfer casks, load waste packages, transport to emplacement; maintain/decontaminate the transfer casks and conduct performance confirmation operations).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.1-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.1-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.1.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.1-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.1-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.1).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., collect, treat, package, dispose and/or ship low level radioactive and mixed solid and liquid wastes generated at the repository, and control and monitor effluents to the atmosphere). Describe the waste management philosophy.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.2-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.2-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.2.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.2-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.2-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.2).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., prevent fires and explosions and protect facilities and personnel should a fire or explosion occur). Describe the protection philosophy. Identify the facilities that require protection.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.3-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.3-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.3-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.3.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.3-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.3-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.3).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., to protect facilities and personnel from natural and human induced emergencies, such as offsite power failures, floods, seismic events, military action, sabotage, and other emergencies). Describe the protection philosophy. Emphasize protection from radioactive waste and effluents. Note that the physical security is described in Section 1.5 and the fire and explosion protection systems are described in Subsection 4.1.1.3.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.4-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.4-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.4-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.4.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.4-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.4-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.4).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., on-site telephone service, closed circuit televisions and communication links with off-site agencies). Describe the communication system philosophy.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.5.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.5).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.5-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a description of how the communication systems linking the surface and subsurface is addressed.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., supply bulk commodities to and collect piped non-radioactive wastes from locations throughout the repository). Systems such as electrical power, standby/emergency power, auxiliary or back-up systems, compressed air, cooling water, raw water, steam, sanitary water, diesel fuel, sanitary sewage, chemical drains, and bulk chemical storage will be included.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.6.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.6).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.6-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a discussion of the operating features, including redundant design features that are essential to safety under normal and accident conditions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., collect, record and display data from monitors throughout the repository and provide control signals to local equipment and instrument controllers). Describe the control philosophy.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.7.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.7).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a discussion of how the redundant design features that are essential to safety under normal and accident conditions are addressed. Indicating how the control logic will be described with the system supported by the Instrumentation and Controls system.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-8
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a description of the data management systems, include: support to waste management and tracking and personnel tracking.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-9
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a description of the GROA computer systems, including: Data Acquisition — Meteorological monitoring Hydrological monitoring — Geophysical monitoring Seismic monitoring — Surface-based testing In-situ testing — Performance confirmation
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-10
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a description of the monitoring instruments and control systems that monitor and control safety related systems and equipment.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-11
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.7-1
Explicit description of the needed information:	A drawing of the architecture of computers and associated controls.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.7-12
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.7-2
Explicit description of the needed information:	Drawing of the control room for the Instrumentation and Control System
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	N/A

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., provide facilities and equipment to move personnel and materials between buildings within the site boundary). Systems such as railroads, paved roads, ramp buildings, vehicle staging areas, bus loading areas and parking lots are included. Describe the onsite transportation philosophy.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.8.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.8).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.8-1
Explicit description of the needed information:	Drawing showing the location of onsite railroads and paved roads.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.8-8
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.8-2
Explicit description of the needed information:	Engineering drawings of hoise buildings and ramp buildings.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., maintain the temperature and air quality within the surface facilities and within the underground areas, where the ventilation equipment is located at the surface; control releases to the atmosphere through a system of differential pressure zones and exhaust air filtration). Systems such as emplacement vent system, development vent system, HEPA filtration, adsorption system, stack monitoring, and chilled water system will be included.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.9.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.9).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.9-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a discussion on the features that are essential to safety under normal and accident conditions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., provide facilities outside the RCA to support plant maintenance, operations and administration). Facilities such as the maintenance shop, supplies warehouse, storage yard, lockers and showers, visitor center and office buildings will be included.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.10.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.10).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.1.10.2.1-1
Explicit description of the needed information:	Provide a table with a support facility summary, and focus on the general development side.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.1.10.2.1-1 and 4.1.1.10.2.1-2
Explicit description of the needed information:	Provide site layout drawings that show the development side facility plans.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.10.2.2-1
Explicit description of the needed information:	Provide a general arrangement drawing of the maintenance shop.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.10.2.3-1
Explicit description of the needed information:	Provide a general arrangement drawing showing the supply warehouse(s).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.10.2.4-1
Explicit description of the needed information:	Provide a general arrangement drawing of the change house.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.1.10.2.6-1
Explicit description of the needed information:	Provide a general arrangement drawing of the Office Building(s).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.10.2.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.1.10.2.7-1, 4.1.1.10.2.7-2, and 4.1.1.10.2.7-3
Explicit description of the needed information:	Provide general arrangement drawings for the support facilities of the development side of the GROA.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems (i.e., provide features to facilitate the removal of the surface facilities, land reclamation and erection of fences and permanent markers after the closure of the subsurface facilities). Describe the decommissioning philosophy (e.g., return to near greenfield condition).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.11.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.11).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.11-7
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a discussion on decommissioning operations that may affect long term isolation of waste and a discussion on decommissioning methods and procedures.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.12-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe the purpose for the systems. Systems such as muck piles and surface lagoons will be included.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.12-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	List the individual systems included in this group of systems and for each system identify: safety class, applicable codes and standards, and R&D programs required to verify design basis assumptions.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.12-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a general design description, referring to the site map, to show how the various systems work together.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.12-4
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide preliminary design information for each system included in this section as identified in the text of Subsection 4.1.1.12.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.12-5
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Describe any design alternatives that were considered and the rational for selecting the current design.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.1.12-6
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide detailed design information as applicable for systems that affect safety (see text in Subsection 4.1.1.12).
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7666
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a detailed description of the waste ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.1.1-1
Explicit description of the needed information:	Provide a table showing the general characteristics of the waste ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.1.1-2
Explicit description of the needed information:	Provide a table that shows the design basis summaries.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.1.1.2-1
Explicit description of the needed information:	Provide figure showing the stratigraphic section at the waste ramp centerline.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.1.1.3-1
Explicit description of the needed information:	Provide a site plan of the waste ramp portal.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.3-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.1.1.3-2 and 4.1.2.1.1.3-3
Explicit description of the needed information:	Provide a general arrangement/layout drawing of the waste ramp portal.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.1.1.4-1
Explicit description of the needed information:	Provide a cross section view of the waste ramp portal lining and support.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.1.1.5-1 and 4.1.2.1.1.5-2
Explicit description of the needed information:	Provide a plan and general arrangement drawing of the waste ramp layout.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.1.6-1
Explicit description of the needed information:	Provide a summary table of the key waste ramp lining and support characteristics.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.1.1.7-1 through 4.1.2.1.1.7-8
Explicit description of the needed information:	Provide a series of typical cross section drawing that show the stratigraphic units throughout the waste ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.8-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.1.1.8-1 and 4.1.2.1.1.8-2
Explicit description of the needed information:	Provide a general arrangement drawing that shows the site drainage for the waste ramp portal.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.1.9-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.1.1.9-1
Explicit description of the needed information:	Provide a general arrangement drawing showing the waste ramp drainage.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.2-1
Explicit description of the needed information:	Provide the general specifications of the waste transport cask and the prime mover.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.1.2.2-1
Explicit description of the needed information:	Provide a figure showing the waste transport cask and prime mover on the waste ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.2-3
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.1.2.2-2, 4.1.2.1.2.2-3, and 4.1.2.1.2.2-4
Explicit description of the needed information:	Provide the general arrangement drawings for the waste transport cask.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.3-1
Explicit description of the needed information:	Provide a table of the representative airflow(s) during repository operations.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.4-1
Explicit description of the needed information:	Provide a summary of the waste ramp safety features and measures.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.4-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.4-2
Explicit description of the needed information:	Provide the credible accident scenarios versus the waste ramp safety features and measures to mitigate accident severity.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.5-1
Explicit description of the needed information:	Provide a summary schedule for waste ramp operations.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.6-1
Explicit description of the needed information:	Provide a summary maintenance schedule and description for the waste ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.2.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.2.7-1
Explicit description of the needed information:	Provide the design validation and performance monitoring plan summary and instrument schedule for the waste ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.3.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.3.1-1
Explicit description of the needed information:	Provide a layout drawing showing the operational seal locations. In addition, provide a general description of the operational seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.3.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.1.3.2-1
Explicit description of the needed information:	Provide the post-closure seal locations. In addition, provide a general description of the post-closure seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.1.3.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.1.3.2-1, 4.1.2.1.3.2-2, and 4.1.2.1.3.2-3
Explicit description of the needed information:	Provide a series of general arrangement drawings that show the post closure seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a detailed description of the muck shaft or ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.1.1-1
Explicit description of the needed information:	Provide a table showing the general characteristics of the muck shaft or ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.1.1-2
Explicit description of the needed information:	Provide a table that shows the design basis summaries of the muck shaft or ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.2.1.2-1
Explicit description of the needed information:	Provide a figure showing the stratigraphic section at the muck shaft or ramp centerline.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.2.1.3-1
Explicit description of the needed information:	Provide a site plan of the muck shaft or ramp portal.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.3-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.2.1.3-2 and 4.1.2.2.1.3-3
Explicit description of the needed information:	Provide a general arrangement/layout drawing of the muck shaft or ramp portal.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.2.1.4-1
Explicit description of the needed information:	Provide a cross section view of the muck shaft or ramp portal lining and support.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.2.1.5-1 and 4.1.2.2.1.5-2
Explicit description of the needed information:	Provide plan and general arrangement drawings of the muck shaft or ramp layout.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.1.6-1
Explicit description of the needed information:	Provide a summary table of the key muck shaft or ramp lining and support characteristics.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.2.1.7-1 through 4.1.2.2.2.17-8
Explicit description of the needed information:	Provide a series of typical cross section drawings that show the stratigraphic units throughout the muck shaft or ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.8-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.2.1.8-1 and 4.1.2.2.1.8-2
Explicit description of the needed information:	Provide general arrangement drawing that shows the site drainage for the muck shaft or ramp portal.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.1.9-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.2.1.9-1
Explicit description of the needed information:	Provide a general arrangement drawing showing the muck shaft or ramp drainage.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.2.2.2-1
Explicit description of the needed information:	Provide a figure showing the typical personnel hauling equipment arrangement.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.2.2.2-2 through 4.1.2.2.2.2-7
Explicit description of the needed information:	Provide the general arrangement drawings for the typical materials and supplies hauling equipment.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.2.3-1
Explicit description of the needed information:	Provide the representative airflow(s) during repository operations.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.2.4-1
Explicit description of the needed information:	Provide a summary of the muck shaft or ramp safety features and measures.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.4-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.2.4-2
Explicit description of the needed information:	Provide the credible accident scenarios versus the muck shaft or ramp safety features and measures to mitigate accident severity.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.2.5-1
Explicit description of the needed information:	Provide a summary operating schedule for the muck shaft or ramp operations.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.2.6-1
Explicit description of the needed information:	Provide a summary maintenance schedule and description for the muck shaft or ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.2.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.2.7-1
Explicit description of the needed information:	Provide the design validation and performance monitoring plan summary and instrument schedule for the muck shaft or ramp.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.3.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.3.1-1
Explicit description of the needed information:	Provide a layout drawing showing the operational seal locations. In addition, provide a general description of the operational seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.3.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.2.3.2-1
Explicit description of the needed information:	Provide the post-closure seal locations. In addition, provide a general description of the post-closure seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.2.3.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.2.3.2-1. 4.1.2.2.3.2-2, and 4.1.2.2.3.2-3
Explicit description of the needed information:	Provide a series of general arrangement drawings that show the post closure seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a detailed description of the ventilation intake shaft.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.1.1-1
Explicit description of the needed information:	Provide a table showing the general characteristics of the ventilation intake shaft.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.1-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.1.1-2
Explicit description of the needed information:	Provide a table that shows the design basis summaries.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.3.1.2-1
Explicit description of the needed information:	Provide figure showing the stratigraphic section at the ventilation intake shaft centerline.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.3.1.3-1
Explicit description of the needed information:	Provide a site plan for the ventilation intake shaft collar.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.3-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.3.1.3-2 and 4.1.2.3.1.3-3
Explicit description of the needed information:	Provide a general arrangement/layout drawing of the ventilation intake shaft collar.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.3.1.4-1
Explicit description of the needed information:	Provide a cross section view of the ventilation intake shaft collar lining and support.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.5-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.3.1.5-1 and 4.1.2.3.1.5-2
Explicit description of the needed information:	Provide a long section and general arrangement drawing of the ventilation intake shaft layout.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.6-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.1.6-1
Explicit description of the needed information:	Provide a summary table of the key ventilation intake shaft lining and support characteristics.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.7-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.3.1.7-1 through 4.1.2.3.1.7-8
Explicit description of the needed information:	Provide a series of typical cross section drawing that show the stratigraphic units throughout the ventilation intake shaft.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.8-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.3.1.8-1 and 4.1.2.3.1.8-2
Explicit description of the needed information:	Provide a general arrangement drawing that shows the site drainage for the ventilation intake shaft collar.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.1.9-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figure 4.1.2.3.1.9-1
Explicit description of the needed information:	Provide a general arrangement drawing showing the ventilation intake shaft drainage.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.2.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.2.1-1
Explicit description of the needed information:	Provide a table of representative airflow(s) during repository operations.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.2.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.2.2-1
Explicit description of the needed information:	Provide a summary maintenance schedule and description for the ventilation intake shaft.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.2.3-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.2.3-1
Explicit description of the needed information:	Provide the design validation and performance monitoring plan summary and instrument schedule for the ventilation intake shaft.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.3.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.3.1-1
Explicit description of the needed information:	Provide the operational seal locations. In addition, provide a general description of the operational seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.3.2-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.3.3.2-1
Explicit description of the needed information:	Provide the post-closure seal locations. In addition, provide a general description of the post-closure seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.3.3.2-2
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Figures 4.1.2.3.3.2-1, 4.1.2.3.3.2-2, and 4.1.2.3.3.2-3
Explicit description of the needed information:	Provide a series of general arrangement drawings that show the post closure seals.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.4-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	
Explicit description of the needed information:	Provide a detailed description of the ventilation exhaust shaft - emplacement side.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	

MGDS LA Annotated Outline Form A: Information Need	
Information Need Number:	INN 4.1.2.4.1.1.1-1
Section Number and Title:	4.1 DESCRIPTION OF THE GROA SSCs
Lead Author/Support Author and Phone:	Ken Ashe (702) 794-7665
Primary LA AO Table or Figure INN supports (if applicable):	Table 4.1.2.4.1.1.1-1
Explicit description of the needed information:	Provide a table showing the general characteristics of the ventilation exhaust shaft - emplacement side.
Information will be used to support:	
The Information is needed by/for (date or event):	
Most likely source of the Information:	
Information Source Description:	
Does the supporting data need to be QA?	

INTEGRATOR (PMO):	
Date information will be available:	
Deliverable providing information:	
If the data needed is QA, then the QA source document number is:	