OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SYSTEM DESCRIPTION DOCUMENT COVER SHEET

2. *SDD Title*
Site Generated Radiological Waste Handling System Description Document

3. Document Identifier (Including Rev. No. and Change No., if applicable)
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OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SYSTEM DESCRIPTION DOCUMENT REVISION HISTORY

1. SDD Title

Site Generated Radiological Waste Handling System Description Document

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SDD-SRW-SE-000001 REV 01 ICN 01

3. Revision	4. Description of Revision
00	This document was previously issued using document identifier BCB000000-01717-1705-00013.
01	This document supersedes the previous issuance. This document is a complete rewrite of the superseded document, driven largely by the use of an alternate source of regulatory requirements, the implementation of the License Application Design Selection effort, and the use of a new document development procedure.
01 ICN 01	Made minor changes to Sections 1.2 and 1.2.1.4, and App A Section 1.2.1.4. Deleted Section 1.4 text and table. Added Section 2. Changed reference in App A Sections 1.2.3.1 and 1.2.3.2. Changed Table number in App B and deleted TBV column. Added acronyms in Appendix C. In Appendix E added: 1) "Readily Available" to references that did not have TIC or ACC numbers: 2) added one new reference 3) changed revision numbers as required. 4) Replaced MGR RD, Rev 3 DCN 1 with MGR RD Rev 3 DCN 2

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SUMMARY

The Site Generated Radiological Waste Handling System handles radioactive waste products that are generated at the geologic repository operations area. The waste is collected, treated if required, packaged for shipment, and shipped to a disposal site. Waste streams include low-level waste (LLW) in solid and liquid forms, as-well-as mixed waste that contains hazardous and radioactive constituents. Liquid LLW is segregated into two streams, non-recyclable and recyclable. The non-recyclable stream may contain detergents or other non-hazardous cleaning agents and is packaged for shipment. The recyclable stream is treated to recycle a large portion of the water while the remaining concentrated waste is packaged for shipment; this greatly reduces the volume of waste requiring disposal. There will be no liquid LLW discharge. Solid LLW consists of wet solids such as ion exchange resins and filter cartridges, as-well-as dry active waste such as tools, protective clothing, and poly bags. Solids will be sorted, volume reduced, and packaged for shipment. The generation of mixed waste at the Monitored Geologic Repository (MGR) is not planned; however, if it does come into existence, it will be collected and packaged for disposal at its point of occurrence, temporarily staged, then shipped to government-approved off-site facilities for disposal.

The Site Generated Radiological Waste Handling System has equipment located in both the Waste Treatment Building (WTB) and in the Waste Handling Building (WHB). All types of liquid and solid LLW are processed in the WTB, while wet solid waste from the Pool Water Treatment and Cooling System is packaged where received in the WHB. There is no installed hardware for mixed waste.

The Site Generated Radiological Waste Handling System receives waste from locations where water is used for decontamination functions. In most cases the water is piped back to the WTB for processing. The WTB and WHB provide staging areas for storing and shipping LLW packages as well as any mixed waste packages. The buildings house the system and provide shielding and support for the components. The system is ventilated by and connects to the ventilation systems in the buildings to prevent buildup and confine airborne radioactivity via the high efficiency particulate air filters. The Monitored Geologic Repository Operations Monitoring and Control System will provide monitoring and supervisory control facilities for the system.

QUALITY ASSURANCE

The quality assurance (QA) program applies to the development of this document. The "SDD Development/Maintenance (Q SDDs) (WP# 16012126M5)" activity evaluation has determined the development of this document to be subject to "Quality Assurance Requirements and Description" requirements. This document was developed in accordance with AP-3.11Q, "Technical Reports."

1. SYSTEM FUNCTIONS AND DESIGN CRITERIA

The functions and design criteria for the Site Generated Radiological Waste Handling System are identified in the following sections. Throughout this document the term "low-level waste" or LLW is used to indicate MGR site-generated solid and liquid radiological waste products. The term "mixed waste" is used to indicate radiological waste mixed with wastes regulated by the 40 CFR 261, "Identification and Listing of Hazardous Waste." Throughout this document the term "system" shall be used to indicate the Site Generated Radiological Waste Handling System. The system architecture is provided in Appendix B.

1.1 SYSTEM FUNCTIONS

1.1.1 The system collects, processes, and packages solid and liquid LLW for off-site shipment.

1.1.2 The system stores liquid LLW for processing.

1.1.3 The system stores solid LLW for processing.

1.1.4 The system processes liquid LLW to facilitate water recycling and volume reduction.

1.1.5 The system controls solid and liquid LLW migration.

1.1.6 The system reduces the volume of LLW requiring disposal.

1.1.7 The system stages LLW packages prior to off-site shipment.

1.1.8 The system collects, packages, and stages mixed waste for off-site shipment.

1.1.9 The system provides samples associated with the generation, processing, storage, and off-site transport of LLW or mixed waste.

1.2 SYSTEM DESIGN CRITERIA

This section presents the design criteria for the system. Each criterion in this section has a corresponding Criterion Basis Statement in Appendix A that describes the need for the criterion as well as a basis for the performance parameters imposed by the criterion. Each criterion in this section also contains bracketed traces indicating traceability, as applicable, to the functions (F) in Section 1.1, the "Monitored Geologic Repository Requirements Document" (MGR RD) and "Revised Interim Guidance Pending Issuance of New U.S. Nuclear Regulatory Commission (NRC) Regulations (Revision 01, July 22, 1999), for Yucca Mountain, Nevada." In anticipation of the interim guidance being promulgated as a Code of Federal Regulations, it will be referred to as "10 CFR 63" in this system description document. For the applicable version of the codes, standards, and regulatory documents, refer to Appendix E.

1.2.1 System Performance Criteria

1.2.1.1 The system shall have an operational life of 40 years.

[MGR RD 3.2.C]

1.2.1.2 The system shall collect and process the site-generated solid LLW, and liquid streams of non-recyclable LLW, and recyclable LLW. Design throughput shall be based on the anticipated maximum annual waste generation rate for each.

[F 1.1.1, 1.1.4, 1.1.5][MGR RD 3.1.C, 3.3.E, 3.3.G][10 CFR 63.112(e)(10)]

1.2.1.3 The system shall be designed to facilitate the collection and preparation for disposal of solid and liquid mixed waste streams. The design throughput shall be based on the annual anticipated maximum waste generation rate.

[F 1.1.8][MGR RD 3.1.C, 3.3.G][10 CFR 63.112(e)(10)]

1.2.1.4 The system shall be designed with the capability to collect and prepare for shipment the annual maximum quantity of 260 spent Dual-Purpose Canisters per year.

[F 1.1.1, 1.1.3][MGR RD 3.1.C, 3.3.E, 3.3.G][10 CFR 63.112(e)(10)]

1.2.1.5 The system shall process and recycle recyclable waste for the purposes of water conservation, volume reduction, and waste minimization.

[F 1.1.4, 1.1.5, 1.1.6][MGR RD 3.3.G]

1.2.1.6 The system shall provide volume reduction of solid LLW.

[F 1.1.1, 1.1.6][MGR RD 3.3.G]

1.2.1.7 The system shall provide for retrieval of liquid, slurry, and solid samples of LLW source streams to support analysis for process monitoring, shipping, and disposal.

[F 1.1.9][MGR RD 3.3.G]

1.2.1.8 The system shall maintain the separation of site-generated hazardous waste, non-hazardous waste, and LLW to preclude generation of mixed waste and/or more LLW.

[F 1.1.2, 1.1.3, 1.1.5][MGR RD 3.3.F]

1.2.1.9 The system shall provide space requirements, layout, and equipment for the receipt, segregation, and storage of materials and chemicals that support waste processing operations.

[F 1.1.2, 1.1.3, 1.1.5][MGR RD 3.3.G]

1.2.1.10 The system shall provide space requirements, layout, and equipment for the receipt and storage of liquid LLW to support batch processing.

[F 1.1.2, 1.1.5][MGR RD 3.3.G]

1.2.1.11 The system shall provide space requirements, layout, and equipment for the receipt and storage of solid LLW to support batch processing.

[F 1.1.3, 1.1.5][MGR RD 3.3.G]

1.2.1.12 The system shall provide space requirements, layout, and equipment for the staging of LLW packages awaiting shipment.

[F 1.1.7][MGR RD 3.3.G]

1.2.1.13 The system shall be designed such that all operations can be shut down promptly or left as is, enabling the evacuation of system operators during an emergency.

[MGR RD 3.1.C][10 CFR 63.112(e)(10)]

1.2.2 Safety Criteria

1.2.2.1 Nuclear Safety Criteria

1.2.2.1.1 The system design shall include no interconnection with the potable water distribution system.

[F 1.1.5][MGR RD 3.1.G]

1.2.2.1.2 The system shall be designed to ensure that occupational doses are as low as reasonably achievable (ALARA) in accordance with the project ALARA program goals (TBD-406) and the applicable guidelines in "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable " (Regulatory Guide 8.8).

[F 1.1.5][MGR RD 3.1.B, 3.1.C, 3.1.G][10 CFR 63.111(a)(1), 63.112(e)(2)]

1.2.2.1.3 The system design shall include provisions for decommissioning and decontamination, including the removal of potentially contaminated structures, systems, and components (SSCs).

[MGR RD 3.1.C][10 CFR 63.21(c)(17)]

1.2.2.1.4 The system shall control radioactive material releases to unrestricted areas.

[F 1.1.5][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1), 63.111(b)(1), 63.112(e)(10)]

1.2.2.2 Non-nuclear Safety Criteria

Non-nuclear safety criteria specific for this system will be provided in a later revision.

1.2.3 System Environment Criteria

1.2.3.1 The system components shall be designed to withstand and operate in the temperature environment defined in Table 1 for the areas of the WTB in which the system components are located.

Table 1. Temperature Environment

Location of System Component	Normal Environment	Off-Normal Environment
Normally Occupied Areas (e.g., Offices, Maintenance Areas, Access Control)	78 - 70°F	(TBD-395) °F for (TBD-395) Hours
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Waste Treatment Areas)	92 - 63°F	(TBD-395) °F for (TBD-395) Hours
Unoccupied Areas (e.g., Waste Evaporator Room)	106 - 63°F	(TBD-395) °F for (TBD-395) Hours
Electronics Equipment Areas	74 - 70°F Note 1	74 - 70°F Note 1

Note 1: It is intended to maintain these areas at the specified temperature under all anticipated conditions. However, due to economic or design impracticability, areas that house less sensitive electronic components may not be maintained at this temperature. In these cases, cooling will be provided for the electronic components, but not necessarily the entire area.

[MGR RD 3.3.A]

1.2.3.2 The system components shall be designed to withstand and operate in the humidity environment defined in Table 2 for the areas of the WTB in which the components are located.

Table 2. Humidity Environment

Location of System Component	Normal Environment
Normally Occupied Areas (e.g., Offices, Maintenance Areas, Access Control)	30% - 60%
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Waste Treatment Areas)	Humidity Not Controlled (TBD-409) Note 1
Unoccupied Areas (e.g., Waste Evaporator Room)	Humidity Not Controlled (TBD-409) Note 1
Electronics Equipment Areas	40% - 50%

Note 1: Humidity control is not provided in most of these areas. Therefore, components susceptible to extreme humidity conditions must be evaluated for low and/or high humidity environments since special provisions (e.g., heater strips, humidifier) may be necessary.

[MGR RD 3.3.A]

1.2.3.3 The system shall be designed such that components susceptible to radiation can withstand and operate in the radiation environment (TBD-405) in which the component is located.

[MGR RD 3.3.A]

1.2.4 System Interfacing Criteria

1.2.4.1 The system shall receive shielding, physical support, ventilation boundaries, and environmental boundaries from the Waste Treatment Building System.

[F 1.1.5][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1), 63.111(b)(1), 63.112(e)(10)]

1.2.4.2 The system shall receive shielding, physical support, ventilation boundaries, and environmental boundaries from the Waste Handling Building System.

[F 1.1.5][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1), 63.111(b)(1), 63.112(e)(10)]

1.2.4.3 The system areas and selected components shall be vented to the Waste Treatment Building Ventilation System or Waste Handling Building Ventilation System, as applicable.

[F 1.1.5][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1), 63.111(b)(1), 63.112(e)(10)]

1.2.4.4 The system shall receive electrical power from the Waste Treatment Building System support facilities and the Waste Handling Building Electrical System.

[F 1.1.1]

1.2.4.5 The system shall receive water from the Site Water System.

[F 1.1.1]

1.2.4.6 The system shall provide system and component status and variables input to, and, receive control output signals from the Monitored Geologic Repository Operations Monitoring and Control System.

[MGR RD 3.3.K]

1.2.4.7 The system shall receive radioactive waste from the leaks and decontamination operations in the Waste Handling Building System and Waste Treatment Building System.

[F 1.1.1][MGR RD 3.1.C, 3.3.G, 3.4.2.D, 3.4.2.H][10 CFR 63.112(e)(10)]

1.2.4.8 The system shall receive leak-off, filters, and resin from the Pool Water Treatment and Cooling System.

[F 1.1.1][MGR RD 3.1.C, 3.3.G][10 CFR 63.112(e)(10)]

1.2.4.9 The system shall interface with the Site Generated Hazardous, Nonhazardous, and Sanitary Waste Disposal System when mixed waste is identified.

[F 1.1.8][MGR RD 3.1.C, 3.3.G][10 CFR 63.112(e)(10)]

1.2.4.10 The system shall treat and package LLW for shipment to the U.S. Department of Energy (DOE) Nevada Test Site LLW disposal facilities in accordance with the applicable disposal requirements in the "Nevada Test Site Waste Acceptance Criteria."

[F 1.1.1, 1.1.7][MGR RD 3.3.G]

1.2.5 Operational Criteria

1.2.5.1 The system shall include provisions for the maintenance, periodic inspection, testing, and decontamination of system equipment.

[MGR RD 3.1.C][10 CFR 63.112(e)(13)]

1.2.6 Codes and Standards Criteria

1.2.6.1 The system shall comply with the applicable provisions of "Occupational Safety and Health Standards" (29 CFR 1910).

[MGR RD 3.1.E]

1.2.6.2 The system shall be designed to ensure compliance with container storage requirements of "Interim Status Standards For Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (40 CFR 265, Subpart I)

[MGR RD 3.1.G]

1.2.6.3 The system shall comply with the applicable provisions of "Volume Reduction of Low-Level Radioactive Waste or Mixed Waste" (ANSI/ANS-40.35-1991).

[MGR RD 3.1.G, 3.3.A, 3.3.G]

1.2.6.4 The system shall comply with the applicable provisions of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988).

[MGR RD 3.3.A, 3.3.G]

1.2.6.5 The system shall comply with the applicable provisions of "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type) (ANSI/ANS-57.9-1992).

[MGR RD 3.3.A, 3.3.G]

1.2.6.6 The system shall comply with the applicable provisions of "Design Guidance For Radioactive Waste Management Systems, Structures, And Components Installed In Light-Water-Cooled Nuclear Power Plants" (Regulatory Guide 1.143).

[MGR RD 3.1.G, 3.3.G]

1.2.6.7 The system shall comply with the applicable provisions of "Standards for Protection Against Radiation" (10 CFR 20).

[MGR RD 3.1.B]

1.2.6.8 The system shall comply with the applicable provisions of "Packaging and Transport of Radioactive Material" (10 CFR 71).

[MGR RD 3.1.G, 3.3.G]

1.2.6.9 The system shall comply with the applicable provisions of "Shippers. General Requirements for Shipping and Packaging" (49 CFR 173).

[MGR RD 3.1.G, 3.3.G]

1.2.6.10 The system shall comply with the applicable provisions of "Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants" (ANSI/ANS-55.1-1992).

[MGR RD 3.3.A, 3.3.G]

1.2.6.11 The system shall comply with the applicable provisions of "Liquid Radioactive Waste Processing System for Light Water Reactor Plants" (ANSI/ANS-55.6-1993).

[MGR RD 3.3.A, 3.3.G]

1.2.6.12 The system shall comply with the applicable provisions of "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants" (Regulatory Guide 1.21).

[MGR RD 3.1.G, 3.3.G]

1.2.6.13 The system shall be designed in accordance with applicable sections of the Department of Defense Design Criteria Standard "Department of Defense Design Criteria Standard, Human Engineering" (MIL-STD-1472E).

[MGR RD 3.3.A]

1.2.6.14 The system shall be designed in accordance with applicable sections of "Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities" (UCRL-15673).

[MGR RD 3.3.A]

1.2.6.15 The system shall be designed in accordance with applicable sections of "Human-System Interface Design Review Guideline" (NUREG-0700).

[MGR RD 3.1.G]

1.2.6.16 The system shall be designed in accordance with applicable sections of "Safety Color Code" (ANSI Z535.1-1998), "Environmental and Facility Safety Signs" (ANSI Z535.2-1998), "Criteria for Safety Symbols" (ANSI Z535.3-1998), "Product Safety Signs and Labels" (ANSI Z535.4-1998), and "Accident Prevention Tags (for Temporary Hazards)" (ANSI Z535.5-1998).

[MGR RD 3.3.A]

1.2.6.17 The system shall be designed in accordance with applicable sections of "American National Standard For Human Factors Engineering of Visual Display Terminal Workstations" (ANSI/HFS 100-1988), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 3: Visual Display Requirements" (ISO 9241-3), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 8: Requirements for Displayed Colours" (ISO 9241-8).

[MGR RD 3.3.A]

1.2.6.18 The system shall be designed in accordance with applicable sections of "Guidelines for Designing User Interface Software" (ESD-TR-86-278), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 10: Dialogue Principles" (ISO 9241-10), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 14: Menu Dialogues" (ISO 9241-14), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 15: Command Dialogues" (ISO 9241-15).

[MGR RD 3.3.A]

1.2.6.19 The system shall be designed in accordance with the applicable sections of the "National Electrical Code" (NFPA 70).

[MGR RD 3.3.A]

1.2.6.20 The system shall be designed in accordance with the applicable sections of "Standard for the Protection of Electronic Computer/Data Processing Equipment" (NFPA 75).

[MGR RD 3.3.A]

1.2.6.21 The system shall be designed in accordance with the applicable sections of "IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment" (IEEE Std 1100-1992).

[MGR RD 3.3.A]

1.2.6.22 The system shall be designed in accordance with the applicable sections of "IEEE Standard for Information Technology - Open Systems Interconnection (OSI) Abstract Data Manipulation - Application Program Interface (API) [Language Independent]" (IEEE Std 1224-1993).

[MGR RD 3.3.A]

1.2.6.23 The system shall be designed in accordance with the applicable sections of "Application of Safety Instrumented Systems for the Process Industries" (ANSI/ISA-S84.01-1996).

[MGR RD 3.3.A]

1.2.6.24 The system shall comply with the applicable assumptions contained in the "Monitored Geologic Repository Project Description Document."

1.2.6.25 The system shall be constructed in accordance with the applicable sections of "Safety and Health Regulations for Construction" (29 CFR 1926).

[MGR RD 3.1.F]

1.3 SUBSYSTEM DESIGN CRITERIA

There are no subsystem design criteria for this system.

1.4 CONFORMANCE VERIFICATION

This section will be completed in a later revision.

2. DESIGN DESCRIPTION

Section 2 of this SDD summarizes information which is contained in other references. By assembling system specific information contained elsewhere (i.e., analyses, technical reports, etc.), Section 2 provides insight into current state of the design of this system. However, due to the nature of the design development, the information contained in this section will continue to change as the design matures.

The design of the SRW System is based on Attachment II Section 1.5 of the "Engineering Files for Site Recommendation".

2.1 SYSTEM DESIGN SUMMARY

Secondary LLW is generated at the MGR as a result of receiving, handling, and repackaging of commercial spent nuclear fuel and DOE high-level waste materials for disposal at the repository. The major portion of secondary LLW is generated in the WHB, with lesser quantities of LLW generated in the WTB. The Carrier Preparation Building (CPB) is not anticipated to be a significant generator of secondary LLW. All secondary waste generated is monitored at the source of generation and the disposition of the waste is subject to administrative controls. All secondary LLW generated as a result of operation of the MGR is properly treated and packaged for disposal at the Nevada Test Site (NTS) LLW disposal complex under the requirements of the "Nevada Test Site Waste Acceptance Criteria".

Operations at the MGR primarily preclude the use of hazardous materials, and therefore, it is not anticipated that any significant quantity of mixed waste will be generated by MGR operations. In the event of generation of mixed waste, that waste is collected and repackaged for disposal at its point of occurrence. Properly packaged mixed waste is then transferred to the WTB for interim storage until being transported to an appropriately approved disposal facility.

Secondary LLW is either liquid wastes or solid wastes. Subject to administrative controls, all secondary liquid LLW is transferred to the WTB for treatment, potential recycle, and solidification prior to shipment to the NTS for disposal. Liquid LLW is collected, segregated into a recyclable liquid LLW fraction or a nonrecyclable liquid fraction, and transferred to the recyclable liquid LLW process in the WTB or to the nonrecyclable liquid LLW process in the WTB, respectively. Recyclable liquid LLW is treated (using filtration, evaporation, and ion exchange) and then recycled back for reuses within the WHB or WTB. The residual liquid from this recycling is solidified for disposal at the NTS. Nonrecyclable liquid LLW is solidified and shipped to the NTS for disposal. There are no liquid effluents from this processing.

Wet-solid LLW (e.g., ion exchange resins and filtration materials) generated in the WHB is packaged for disposal at the source of generation, and then transferred to the WTB in containers to await transfer to the NTS for disposal. Subject to administrative controls, all remaining solid LLW is collected at its

point of origin, and then transferred to the WTB for processing and packaging for disposal.

Dry solid LLW transported to the solid LLW processing system in the WTB undergoes sorting, sizing, shredding, compacting, and packaging before this material is shipped to the NTS for disposal.

The majority of the site generated radiological waste handling and processing equipment is located within the WTB. Provisions are included within the WHB for the packaging of wet-solid LLW prior to this waste being sent to the WTB. This system interfaces with the systems identified in Section 1.2.4.

2.2 DESIGN ASSUMPTIONS

Design assumptions will be completed in a later revision.

2.3 DETAILED DESIGN DESCRIPTION

2.3.1 Liquid Low-Level Waste Radioactive Waste Management System

Liquid LLW is classified as recyclable liquid or nonrecyclable liquid LLW. These two waste forms are collected and treated in separate systems within the WTB.

2.3.1.1 Recyclable Liquid LLW Management System

The functions of the recyclable liquid LLW management system is to collect recyclable liquid LLW from MGR operations, to treat this liquid waste sufficient that the product is acceptable for recycle purposes, to provide a source for recycle water, and to transfer the residual liquid from the recycling treatment to the nonrecyclable liquid LLW management system for solidification. There are no liquid effluents from this processing. Residual waste materials from the recycle process are solidified and shipped to the NTS for disposal.

For both water conservation and waste minimization reasons recyclable liquid LLW is treated sufficient to allow the product recycled water to be used for decontamination activities within the WTB and WHB. Recyclable liquid LLW is collected and segregated from nonrecyclable liquid LLW in both the WHB and the WTB. The recyclable liquid LLW is transferred to the recyclable liquid LLW processing system in the WTB. Liquid to be processed is initially filtered to remove particulate materials. After filtration the liquid is transferred to a batch evaporator for evaporation. The vapor off the top of the evaporator is condensed and then passed through a mixed-bed (cation and anion) ion exchange unit to remove any entrained radiologically active ionic species. The de-ionized water is then passed through an organic material-capturing filter to remove trace organic materials and any ion exchange resin carried out of the ion exchange bed. The final recycled water is transferred to a recycle water storage tank, and then

pumped to users in the WHB and WTB. Figure 1 presents a simplified process flow diagram for the recyclable liquid LLW processing system.

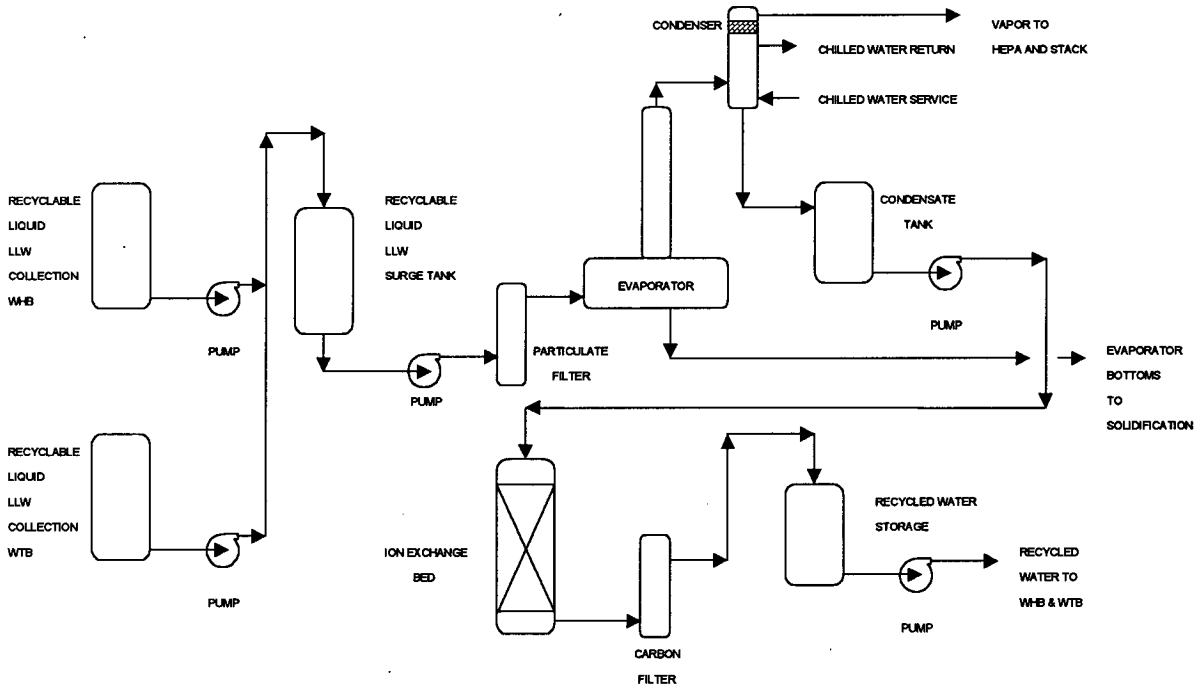

Figure 1. Recyclable Liquid LLW Simplified Process Flow Diagram

2.3.1.2 Nonrecyclable Liquid LLW

The function of the nonrecyclable liquid LLW management system is to collect nonrecyclable liquid from MGR operations, process this liquid sufficient that it is acceptable for solidification purposes, and to solidify this waste for disposal at the NTS. There are no liquid LLW effluents from the MGR operations.

Nonrecyclable liquid LLW is collected and segregated from recyclable liquid LLW in both the WHB and the WTB. The nonrecyclable liquid LLW is transferred to the nonrecyclable liquid LLW processing system in the WTB.

Nonrecyclable liquid LLW is collected in a surge tank. Also collected in this surge tank are the evaporator bottoms from recyclable liquid LLW processing (see discussion above). The contents of this tank are mixed, sampled, and analyzed to determine pH of the liquid. If necessary, acid or caustic solution is added to bring the pH of the contents to near neutral (pH of approximately 7).

The nonrecyclable liquid LLW is then mixed with portland cement, or another appropriate solidification agent, to provide a waste stream free of liquid. The finished drum is then moved to a curing area, followed by shipment to the NTS for disposal. Figure 2 presents a simplified process flow diagram for the nonrecyclable liquid LLW processing system.

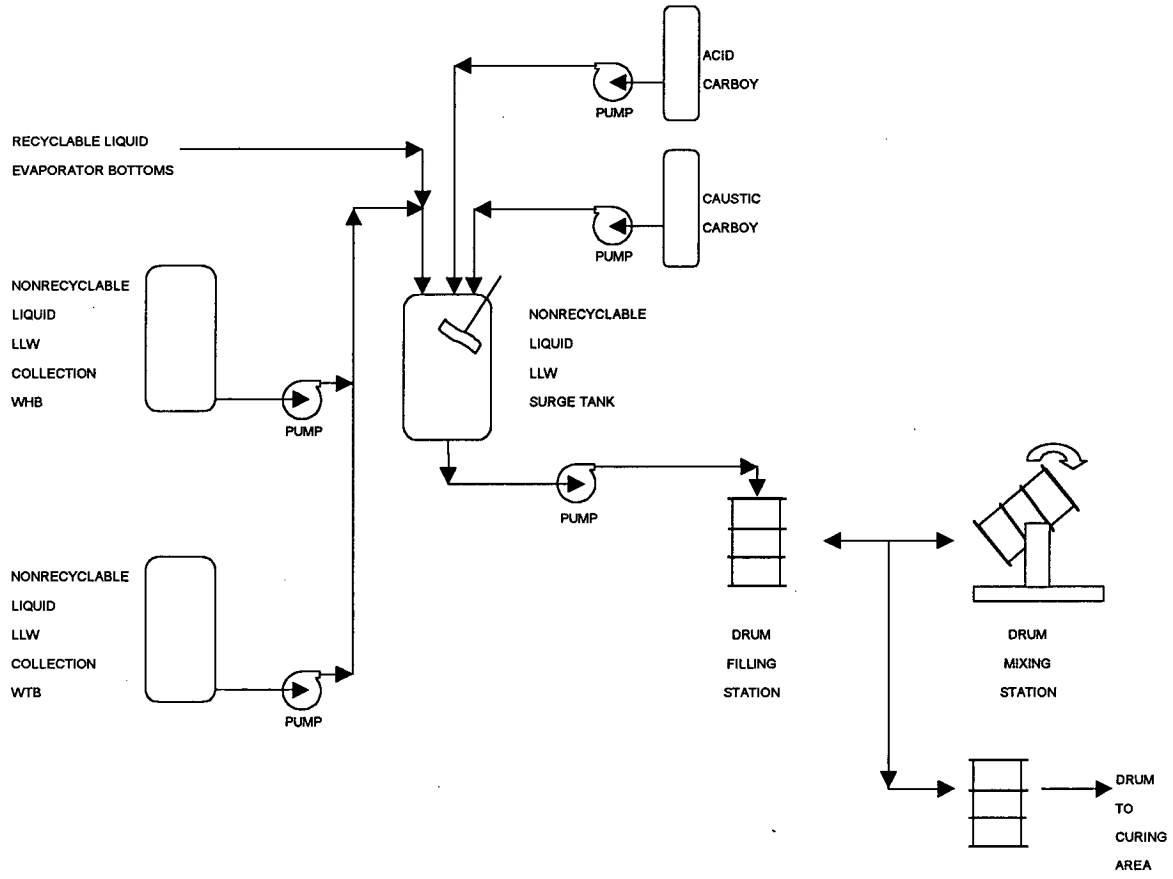

Figure 2. Nonrecyclable Liquid LLW Simplified Process Flow Diagram

2.3.2 Solid Low-Level Waste Management

Solid wastes include two separate categories (i.e., dry solid LLW and wet-solid LLW). These two solid waste forms are discussed separately below.

2.3.2.1 Dry Solid LLW

The function of the dry solid LLW management system is to collect, segregate, volume reduce, and package dry solid LLW for disposal at the NTS per the requirements of 10 CFR 71 "Packaging and Transportation of Radioactive Materials".

Dry solid waste is collected at its point of generation (i.e., the WHB, the WTB, and potentially the CPB) and transferred to the WTB for processing. Inside the WTB the dry solid LLW is initially sorted to segregate out non-contaminated (radioactive or hazardous) waste (i.e., waste acceptable for landfill) and any hazardous or mixed waste materials. The dry solid LLW is also sorted to separate non-compactible waste from compactible waste. Non-compactible waste may be size reduced prior to packaging for disposal or directly packaged for disposal

depending upon size and material characteristics. Compactible waste is fed into a shredder for size reduction. The shredded dry solid LLW is then compacted into drums for disposal at the NTS. Figure 3 presents a simplified process flow diagram for the dry solid LLW processing system

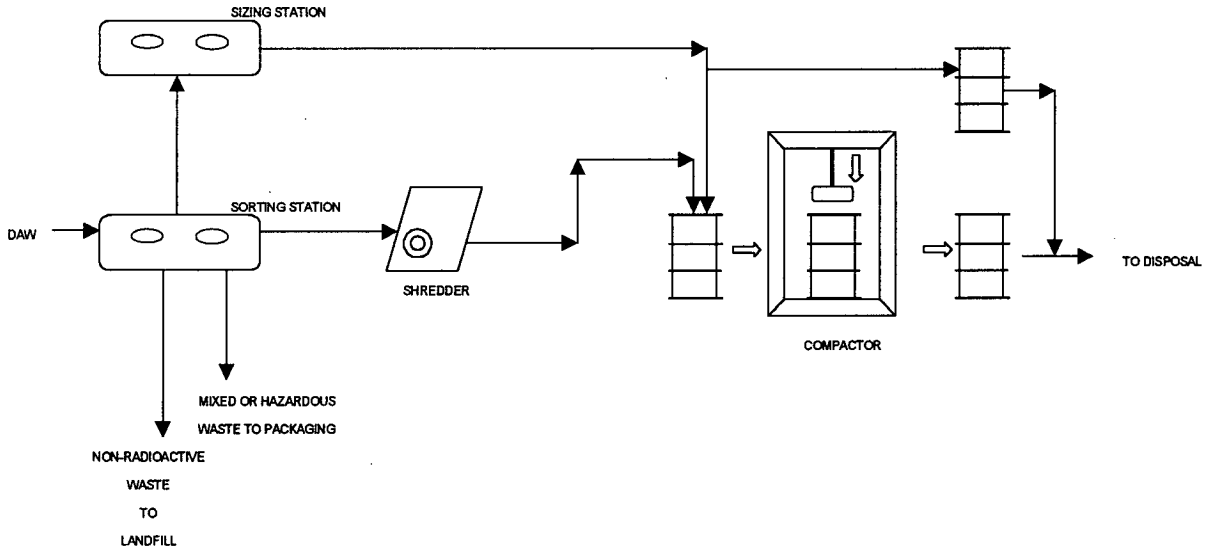

Figure 3. Dry Solid LLW Simplified Process Flow Diagram

2.3.2.2 Wet-Solid Waste

The function of the wet-solid waste management system is to collect, de-water, and package wet-solid waste for disposal at the NTS per the requirements of 10 CFR 71 "Packaging and Transportation of Radioactive Material." These materials are typically sufficiently contaminated to be classified as noncontact handled. For this reason, these wastes will be handled and packaged into shielded containers at their points of origin.

The processing of spent ion exchange resins is performed in both the WHB and the WTB at their points of origin. Spent ion exchange resins become wastes when the ion exchange beds in the pool water treatment areas of the WHB or the recyclable liquid LLW processing area of the WTB require change out. The waste resins are transferred directly to a high-integrity container (HIC), which will later serve as the disposal container. The resin in the HIC is then dried through the passing of dry air through the HIC to ensure the HIC contains no free liquid

Filter cartridges used in the pool water treatment system or in the recyclable liquid LLW processing system are changed out by removing a cartridge unit (multiple filters in certain units) from a system and placing the spent cartridge unit into a 55-gallon drum. The lid to the 55-gallon drum is then placed onto the

drum. The drum is then placed into a shielded transporter (if necessary) before being moved to the filter grouting station in the WTB.

At the grouting station, premixed grout is added to the drum to encapsulate the waste filter cartridges.

2.3.3 Mixed Waste Management System

The function of the mixed waste management system is to collect and package mixed waste sufficient for disposal at the NTS under the requirements identified in the NTS WAC.

If suspect mixed waste is generated, the waste is contained and packaged as mixed waste. During the course of packaging, samples are collected for analytical characterization. After packaging, the waste is transferred to a mixed waste holding area in the WTB.

2.3.4 System Arrangement

The WTB provides space and equipment for the receipt, segregation, and storage for liquid, solid and mixed LLW prior to processing and when awaiting shipment. It also provides space for storing materials and chemicals that support waste processing.

The arrangement and location of equipment has not been accomplished at this point in time. Room areas in the WHB and the WTB have been designated for the handling and processing of site generated LLW.

2.3.5 Other System Features or Characteristics

Design analysis has not been completed sufficient to describe system features to support required maintenance, in-service inspection, surveillance, recovery from anticipated system upsets, recovery from abnormal events, end of life decontamination and decommissioning, etc. System features will be addressed in future revisions of this SDD as the design of the system matures.

2.4 COMPONENT DESCRIPTION

This information will be provided in a future revision.

2.5 CRITERIA COMPLIANCE

The surface facility is developed conceptually at this time without criteria compliance analyses. The criteria compliance for this system will be addressed in future issues of this SDD as the design and analysis of the system matures.

3. SYSTEM OPERATIONS

This section will be completed in a later revision.

4. SYSTEM MAINTENANCE

This section will be completed in a later revision.

APPENDIX A CRITERION BASIS STATEMENTS

This section presents the criterion basis statements for criteria in Section 1.2. Descriptions of the traces to "Monitored Geologic Repository Requirements Document" and "Revised Interim Guidance Pending Issuance of New U.S. Nuclear Regulatory Commission (NRC) Regulations (Revision 01, July 22, 1999), for Yucca Mountain, Nevada" are shown as applicable. In anticipation of the interim guidance being promulgated as a Code of Federal Regulations, it will be referred to as "10 CFR 63" in this system description document.

1.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the operational life of the system. This criterion is required because this system supports the waste handling operations at the repository as required by MGR RD 3.2.C. Additional system operating life that may be needed to support performance confirmation or retrieval operations conducted after cessation of waste emplacement operations, is not covered by this criterion. To meet the operational life requirement, system components may require replacement in addition to any required preventive maintenance program.

II. Criterion Performance Parameter Basis

MGR RD 3.2.C requires the MGR to be capable of receiving, packaging, emplacing, and isolating nuclear waste at the annual rates specified in Table 3-2 of the MGR RD. Table 3-2 indicates that waste receipt will commence in the year 2010 and is expected to be completed by the year 2041, spanning a total of 32 years. To account for future potential schedule fluctuations caused by uncertainties in waste remediation, early receipt, and plant life extensions, a 25 percent margin is added, bringing the required operational life of the system to 40 years.

1.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to establish the types of site generated LLW resulting from normal repository operations and the method of estimating design throughput quantities. This criterion supports compliance with MGR RD 3.3.G, which requires the site generated LLW to be to be sent to an off-site facility. It includes compliance with MGR RD 3.3.E when performing these opening operations. This is also one of the "Means to control radioactive waste..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

N/A

1.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to establish types of site generated mixed wastes resulting from normal repository operations and the method of estimating design throughput quantities. This supports compliance with MGR RD 3.3.G, which requires the site generated mixed waste to be sent to an off-site facility. This is also one of the "Means to control radioactive waste..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

N/A

1.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to establish the quantity of spent dual-purpose containers the system is required to collect and process. The Dual-Purpose Canisters will be contaminated after completing their active life and the residual radioactive waste must be dealt with. This criterion supports compliance with MGR RD 3.3.G which requires the site generated LLW be sent to an off-site facility and 3.3.E which requires managing the LLW generated by opening the dual-purpose canisters. This is also one of the "Means to control radioactive waste..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

The dual-purpose canister value was obtained from Table 5-3 of "Monitored Geologic Repository Project Description Document".

1.2.1.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to support MGR RD 3.3.G and ensure meeting acceptance criteria at waste sites such as those from the "Nevada Test Site Waste Acceptance Criteria," paragraph 3.1.6, which requires, if practical, that the waste be treated to reduce volume and provide a more stable waste form.

II. Criterion Performance Parameter Basis

N/A

1.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to support MGR RD 3.3.G and ensure meeting acceptance criteria at waste sites such as those from the "Nevada Test Site Waste Acceptance Criteria," paragraph 3.1.6, which requires, if practical, that the waste be treated to reduce volume.

II. Criterion Performance Parameter Basis

N/A

1.2.1.7 Criterion Basis Statement

I. Criterion Need Basis

Retrieval of samples is required to monitor waste processes as well as support waste packaging and shipping. This supports MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.1.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.3.F to preclude generation of mixed waste and or more LLW and facilitates cost-effective treatment and disposal of such wastes.

II. Criterion Performance Parameter Basis

N/A

1.2.1.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to support the primary functions of handling and processing Radiological Waste for packaging. It supports MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.1.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to allow batch processing of liquid LLW and supports MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.1.11 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to allow batch processing of solid LLW and supports MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.1.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to allow LLW to be stored until it can be shipped to an off-site facility and supports MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.1.13 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports 10 CFR 63.112(e)(10) and MGR RD 3.1.C, which requires permitting "...prompt termination of operations and evacuation of personnel during and emergency."

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is provided to ensure compliance with "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (NUREG 0800, paragraph 9.2.4.II) which requires there to be no interconnections between the potable waters system and any system having the potential for containing radioactive material. As such this supports MGR RD 3.1.G. This criterion is also supported by specific guidance contained in the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Waste Handling System," Guidance Statement 6.6g1.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion implements the requirements from MGR RD 3.1.B for the identification of "Standards for Protection Against Radiation" (10 CFR 20), MGR RD 3.1.C for the identification of 10 CFR 63.111(a)(1) and 10 CFR 63.112(e)(2), and MGR RD 3.1.G for the need to address radiological health and safety. This criterion is also supported by specific guidance contained in the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Handling System," Guidance Statements 6.3g1, 6.4g1, 6.7g1,and 6.8g1.

The primary requirement for ALARA is contained in 10 CFR 20.1101(b), which states: "The licensee shall use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to the members of the public that are as low as is reasonably achievable (ALARA)."

Compliance with "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable" (Regulatory Guide 8.8) is invoked because this regulatory guide is one of the primary regulatory documents that address ALARA and is acceptable to the NRC. This regulatory guide provides guidelines on achieving the occupational ALARA goals during the planning, design, and operations phases of a nuclear facility. According to Section B of this guide: "Effective design of facilities and selection of equipment for systems that contain, collect, store, process, or transport radioactive material in any form will contribute to the effort to maintain radiation doses to station personnel ALARA." Section C.2 addresses facility and equipment design features. The design process of each system must include an evaluation of the applicable requirements in Section C.2 of Regulatory Guide 8.8.

In addition to following the guidelines in Regulatory Guide 8.8, the design of the system must meet the project ALARA program goals. The project ALARA program will include

both qualitative and quantitative goals. Regarding the ALARA program of a licensee, Section C.1.a.(2) of Regulatory Guide 8.8 states: "The policy and commitment should be reflected in written administrative procedures and instructions for operations involving potential exposures of personnel to radiation and should be reflected in station design features. Instructions to designers, constructors, vendors, and station personnel specifying or reviewing station features, systems, or equipment, should reflect the goals and objectives to maintain occupational radiation exposures ALARA."

II. Criterion Performance Parameter Basis

The ALARA program goals are TBD.

1.2.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.C and 10 CFR 63.21(c)(17) for the need to facilitate decommissioning and decontamination at the end of the system life.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is provided to support 10 CFR 63.111(a)(1) and 63.111(b)(1) for protection against radiation exposure and the control of radioactive material releases to unrestricted areas to be maintained within "Standards for Protection against Radiation" (10 CFR 20) limits. This criterion also supports MGR RD 3.1.C and 3.1.B. This is also one of the "Means to control radioactive waste and radioactive effluents..." required by 10 CFR 63.112(e)(10).

II. Criterion Performance Parameter Basis

N/A

1.2.3.1 Criterion Basis Statement

I. Criterion Need Basis

Temperature can directly affect the performance or result in advanced degradation of a component. To ensure proper performance, many equipment manufacturers specify the normal temperature environment in which the component must operate. Manufacturers may also specify the maximum off-normal temperature environment that the components can be exposed to or operate in for a limited time. The off-normal condition may be caused by loss of electric power or failure of the ventilation system.

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

Temperature values are based on "Waste Treatment Building Ventilation System Description Document," (Criteria 1.2.1.1)

Temperature environments during off-normal conditions for all areas (except the electronics equipment areas) are TBD.

1.2.3.2 Criterion Basis Statement

I. Criterion Need Basis

Humidity can affect performance of computers, electronic, electrical, and mechanical components. Low humidity may result in static discharge in electrical and electronic equipment. High humidity can result in advanced corrosion or biological growth within the component. High humidity may also affect the operation of recorders that use paper. High humidity is not expected to be a major concern at the MGR due to the generally dry climate; however, depending on the nature of the operations, some areas may exhibit high humidity conditions. To ensure proper performance, many equipment manufacturers specify the humidity environment in which the component must operate. This criterion establishes the indoor humidity environment in which components are expected to operate based on the intended installation location.

Humidity is not controlled during off-normal conditions because of the generally mild humidity environment at the repository, and the expected short-term duration of off-normal conditions, such as loss of power or ventilation system failure.

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

Humidity values for occupied areas and electronics equipment areas are based on input transmittal "Waste Treatment Building Ventilation System Description Document," (Criteria 1.2.1.2)

Humidity values for other areas are TBD.

1.2.3.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports the waste handling requirements of MGR RD 3.3.A by identifying the radiation environment in which the waste handling equipment will be exposed. Radiation from resin beds, filters, or other radioactive sources can affect electrical and electronic components. Accumulated doses of radiation (also referred to as Total Integrated Dose) can cause eventual degradation of components containing organic

compounds, such as electrical insulation and lubricants. Accumulated doses can also cause damage to components containing polymers.

Shielding, distance, and duration of exposure can significantly reduce the radiation dose and type of radiation that a component receives. Therefore, detailed analyses on a case by case basis will determine the economic feasibility and practicability of providing shielding, distance from the source, minimizing exposure time, frequent replacement of the affected component, or qualification of the component for the radiation environment.

It should be emphasized that this criterion addresses the radiation doses that can affect operability of the components during normal operations, and is not intended to invoke environmental qualification requirements for post-accident operability.

II. Criterion Performance Parameter Basis

The radiation environment is TBD.

1.2.4.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the ventilation area boundaries to limit buildup of airborne particulate activity and ensure it is removed, processed, and monitored. This criterion also provides shielding for components in the system.

This criterion supports MGR RD 3.1.B, 3.1.C, 10 CFR 63.111(a)(1), and 63.111(b)(1) requirements for protection against radiation exposures and the control of radioactive material releases to unrestricted areas to be maintained within "Standards for Protection against Radiation" (10 CFR 20) limits. This is also one of the "Means to control radioactive waste and radioactive effluents..." required by 10 CFR 63.112(e)(10).

II. Criterion Performance Parameter Basis

N/A

1.2.4.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the ventilation area boundaries to limit buildup of airborne particulate activity and ensure it is removed, processed, and monitored. This criterion also provides shielding for components in the system.

This criterion supports MGR RD 3.1.B, 3.1.C, 10 CFR 63.111(a)(1), and 63.111(b)(1) requirements for protection against radiation exposures and the control of radioactive material releases to unrestricted areas to be maintained within "Standards for Protection against Radiation" (10 CFR 20) limits. This is also one of the "Means to control radioactive waste and radioactive effluents..." required by 10 CFR 63.112(e)(10).

II. Criterion Performance Parameter Basis

N/A

1.2.4.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the system areas to be ventilated to limit buildup of airborne particulate activity and ensure it is removed, processed, and monitored. Because high-efficiency particulate air filters are provided in the ventilation system, any airborne radioactivity is confined by those filters.

This criterion supports MGR RD 3.1.B, 3.1.C, 10 CFR 63.111(a)(1), and 63.111(b)(1) requirements for protection against radiation exposures and the control of radioactive material releases to unrestricted areas to be maintained within "Standards for Protection against Radiation" (10 CFR 20) limits. This is also one of the "Means to control radioactive waste and radioactive effluents..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

N/A

1.2.4.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the system to obtain electrical power for components.

II. Criterion Performance Parameter Basis

N/A

1.2.4.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the system to obtain make-up and flushing water for operational use.

II. Criterion Performance Parameter Basis

N/A

1.2.4.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with interfacing MGR systems. Specifically, this criterion identifies interfaces with Monitored Geologic Repository Operations Monitoring and Control System for centralized monitoring and control. This criterion also supports the interface ability to provide communications and control of MGR RD 3.3.K with this system.

II. Criterion Performance Parameter Basis

N/A

1.2.4.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the system to receive radioactive waste from system leaks gathered in curbed areas of the buildings or from decontamination functions carried out in the buildings. This supports MGR RD 3.3.G, 3.4.2.D, and 3.4.2.H. This is also one of the "Means to control radioactive waste..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

N/A

1.2.4.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the system to receive radioactive waste, such as leak off, filters, and resin from the Pool Water Treatment and Cooling System. This criterion therefore supports MGR RD 3.3.G. This is also one of the "Means to control radioactive waste..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

N/A

1.2.4.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need for the system to receive mixed waste (i.e. hazardous waste that has become contaminated with radioactivity). This occurrence is expected to be dealt with on a case by case basis. This criterion, therefore, supports MGR RD 3.3.G.

This is also one of the "Means to control radioactive waste..." required by 10 CFR 63.112(e)(10) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

N/A

1.2.4.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports the requirement that from MGR RD 3.3.G that "...low-level radioactive and mixed waste shall be collected and packaged for transport to government-approved off-site facilities for disposal."

The "Nevada Test Site Waste Acceptance Criteria" document establishes the waste acceptance criteria for DOE Nevada Test Site disposal sites. This criterion is provided to ensure the disposal requirements for the DOE Nevada Test Site disposal site are met.

The use of Nevada Test Site is recommended in "Site-Generated Waste Disposal Options (System Study Report)," paragraph 7.2.1, and is further discussed in paragraph 4.3.

II. Criterion Performance Parameter Basis

N/A

1.2.5.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion implements applicable regulatory guidance from MGR RD 3.1.C and 10 CFR 63.112(e)(13) for maintenance, periodic inspection, testing, and decontamination of system equipment. This criterion also addresses the recovery of remotely operated equipment located in radiation environments.

II. Criterion Performance Parameter Basis

N/A

1.2.6.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.E which requires compliance with the applicable provisions of "Occupational Safety and Health Standards" (29 CFR 1910).

II. Criterion Performance Parameter Basis

N/A

1.2.6.2 Criterion Basis Statement

I. Criterion Need Basis

The system must be designed to handle the quantities of mixed waste that may be expected as required by Criterion 1.2.1.3 in this document. "Interim Status Standards For Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (40 CFR 265, Subpart I) supports compliance with MGR RD 3.1.G, which requires compliance with other laws.

II. Criterion Performance Parameter Basis

N/A

1.2.6.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.1.G, 3.3.A, 3.3.G, and "Volume Reduction of Low-Level Radioactive Waste or Mixed Waste" (ANSI/ANS-40.35-1991) which provides general design specifications and performance requirements for the LLW volume reduction equipment. Volume reduction is required to minimize the cost of packaging and disposing of the LLW and mixed waste. This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Waste Handling System," Guidance Statement 7.1g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988) provides general design specifications and performance requirements for the treatment and processing of liquid and dry LLW. Treatment, packaging, and off-site disposal of LLW are required by MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992) provides general design specifications and performance requirements for the treatment and processing of liquid and dry LLW. Treatment, packaging, and off-site disposal of LLW are required by MGR RD 3.3.G. This criterion also supports the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Waste Handling System" Guidance Statement 7.5g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.1.G. "Design Guidance For Radioactive Waste Management Systems, Structures, and Components Installed In Light-Water-Cooled Nuclear Power Plants" (Regulatory Guide 1.143) provides general design guidance acceptable to the NRC staff relating to seismic and quality group classification and quality assurance provisions for radioactive waste management SSCs. Treatment, packaging, and off-site disposal of LLW are required by MGR RD 3.3.G. This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Waste Handling System," Guidance Statement 6.2g2.

II. Criterion Performance Parameter Basis

N/A

1.2.6.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion complies with MGR RD 3.1.B which requires compliance with the applicable provisions of "Standards for Protection Against Radiation" (10 CFR 20).

II. Criterion Performance Parameter Basis

N/A

1.2.6.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion is the law as relates to the shipping of radioactive waste. Compliance with "Packaging and Transport of Radioactive Material" (10 CFR 71) is required to enable shipping of radioactive waste. This supports MGR RD 3.1.G and 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion is the law as relates to the shipping of radioactive waste and supports MGR RD 3.1.G. Compliance with "Shippers. General Requirements for Shipping and Packaging" (49 CFR 173) is required to enable shipping of radioactive waste as required by MGR RD 3.3.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. "Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants" (ANSI/ANS-55.1-1992) provides general design specifications and performance requirements for the Solid Radioactive Waste Processing System. This criterion supports MGR RD 3.3.G, which requires processing of any radiological waste generated at the MGR into a form suitable for disposal at an alternative site. This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Waste Handling System," Guidance Statement 6.2g1 and 7.2g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.11 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. "Liquid Radioactive Waste Processing System for Light Water Reactor Plants" (ANSI/ANS-55.6-1993) provides general design specifications and performance requirements that are applicable to this system. This criterion supports MGR RD 3.3.G, which requires processing of any radiological waste generated at the MGR into a form suitable for disposal at an alternative site. This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Site-Generated Radiological Waste Handling System," Guidance Statement 7.3g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion provides general design guidance acceptable to the NRC staff relating to measuring, evaluating, and reporting radioactivity in solid wastes. "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants" (Regulatory Guide 1.21) supports the processing of radiological waste generated at the MGR into a form suitable for disposal at an alternative site. Treatment, packaging, and off-site disposal of LLW are required by MGR RD 3.3.G. MGR RD 3.1.G requires compliance with regulatory guidance such as this Regulatory Guide.

II. Criterion Performance Parameter Basis

N/A

1.2.6.13 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, arrangement, configuration, and integration of SSCs involve many elements, including monitoring, operating, maintaining, and observing the facilities and systems. To accomplish an effective and safe work environment, the human-system interface must incorporate human factors engineering (HFE) criteria. Use of the "Department of Defense Design Criteria Standard, Human Engineering" (MIL-STD-1472E), in conjunction with the other HFE standards and guidelines cited in this system description document, will provide a human-system interface that maximizes performance and minimizes risk to personnel.

In support of MGR RD 3.3.A, this criterion ensures that the system will be designed to be safely and effectively used by all expected users. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1), endorses the use of MIL-STD-1472E (GPG-FM-027 references an earlier version of MIL-STD-1472).

II. Criterion Performance Parameter Basis

N/A

1.2.6.14 Criterion Basis Statement

I. Criterion Need Basis

Maintainability of system equipment involves many factors, including the human-machine interface. This interface must address the design for maintainability through the incorporation of HFE criteria. In support of MGR RD 3.3.A, this criterion ensures that the system will be designed to be safely and effectively maintained through compliance with applicable industry standards. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1), endorses the use of "Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities" (UCRL-15673) for addressing HFE maintainability design criteria.

II. Criterion Performance Parameter Basis

N/A

1.2.6.15 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, arrangement, configuration, and integration of control rooms, operating galleries, and related SSCs (e.g., controls, displays, labels, workspaces, human-computer interfaces) involve many factors, including the human-machine interface. Through compliance with design, selection, arrangement, configuration, and integration of control rooms, operating galleries, and related SSCs (e.g., controls, displays, labels, workspaces, human-computer interfaces) involve many factors, including the human-machine interface. Through compliance with "Human-System Interface Design Review Guideline" (NUREG-0700), in conjunction with other HFE standards and guidelines, this criterion ensures that control rooms, operating galleries, and related SSCs will be designed in a safe and effective manner.

This criterion supports MGR RD 3.1.G. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1) supports the use of NUREG-0700.

II. Criterion Performance Parameter Basis

N/A

1.2.6.16 Criterion Basis Statement

I. Criterion Need Basis

Information being communicated by safety signs and tags must be capable of being quickly and easily read and uniformly understood. The American National Standards Institute (ANSI) Z535 series (i.e., "Safety Color Code" (ANSI Z535.1-1998), "Environmental and Facility Safety Signs" (ANSI Z535.2-1998), "Criteria for Safety Symbols" (ANSI Z535.3-1998), "Product Safety Signs and Labels" (ANSI Z535.4-1998), and "Accident Prevention Tags (for Temporary Hazards)" (ANSI Z535.5-1998)) are recognized standards in the nuclear industry for the design and use of safety signs and tags. In support of MGR RD 3.3.A, this criterion ensures that, when used in conjunction with other HFE standards and guidelines, the design of safety signs and tags will help provide a safer working environment.

II. Criterion Performance Parameter Basis

N/A

1.2.6.17 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, and integration of computer display terminals and workstations, equipment, and workspaces involve many factors, including the human-computer interface. "American National Standard For Human Factors Engineering of Visual Display Terminal Workstations" (ANSI/HFS 100-1988), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 3: Visual Display Requirements" (ISO 9241-3), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 8: Requirements for Displayed Colours" (ISO 9241-8) support MGR RD 3.3.A by ensuring that HFE criteria will be incorporated into the selection and design of computer equipment and workspaces through compliance with applicable industry standards. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1) endorses use of the International Organization for Standardization (ISO) 9241 standard. When used in conjunction with other HFE standards and guidelines, these codes and standards will ensure a safe and efficient design.

II. Criterion Performance Parameter Basis

N/A

1.2.6.18 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, and integration of software supporting the user interface in computer systems must consider the characteristics of the user population. In support of MGR RD

3.3.A, the application of "Guidelines for Designing User Interface Software" (ESD-TR-86-278), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 10: Dialogue Principles" (ISO 9241-10), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 14: Menu Dialogues" (ISO 9241-14), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 15: Command Dialogues" (ISO 9241-15), ensures that HFE criteria will be incorporated into the selection, design, and integration of user interface software.

The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1) endorses the use of the ISO 9241 standard. When used in conjunction with other HFE standards and guidelines, these codes and standards will ensure a safe and efficient design implementation.

II. Criterion Performance Parameter Basis

N/A

1.2.6.19 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. The "National Electrical Code" (NFPA 70) contains provisions considered necessary for safeguarding of personnel and SSCs from hazards arising from the use of electricity.

II. Criterion Performance Parameter Basis

N/A

1.2.6.20 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. The "Standard for the Protection of Electronic Computer/Data Processing Equipment" (NFPA 75) provides minimum requirements for the protection of electronic computer/data processing equipment from damage by fire or its associated effects (i.e., smoke, corrosion, heat, water).

II. Criterion Performance Parameter Basis

N/A

1.2.6.21 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. "IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment" (IEEE Std 1100-1992) provides a consensus of recommended practices in an area where conflicting information and confusion, stemming primarily from different view points of the same problem, have dominated. IEEE Std 1100-1992 addresses electronic equipment performance issues while maintaining a safe installation.

II. Criterion Performance Parameter Basis

N/A

1.2.6.22 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. The "IEEE Standard for Information Technology - Open Systems Interconnection (OSI) Abstract Data Manipulation - Application Program Interface (API) [Language Independent]" (IEEE Std 1224-1993) provides a language-independent specification of an interface and environment to support application portability at the source code level.

II. Criterion Performance Parameter Basis

N/A

1.2.6.23 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards and supports the requirements of MGR RD 3.3.A. The "Application of Safety Instrumented Systems for the Process Industries" (ANSI/ISA-S84.01-1996) provides design requirements for safety instrumented systems for process industries.

II. Criterion Performance Parameter Basis

N/A

1.2.6.24 Criterion Basis Statement

I. Criterion Need Basis

The "Monitored Geologic Repository Project Description Document" allocates controlled project assumptions to systems. This criterion identifies the need to comply with the applicable assumptions identified in the subject document. The approved assumptions will provide a consistent basis for continuing the system design.

II. Criterion Performance Parameter Basis

N/A

1.2.6.25 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.F for the identification of applicable codes of federal regulations. This criterion requires that system safety criteria be considered in the construction of the repository in accordance with "Safety and Health Regulations for Construction" (29 CFR 1926).

II. Criterion Performance Parameter Basis

N/A

APPENDIX B ARCHITECTURE AND CLASSIFICATION

The system architecture and QA classification are identified in Table 3. The QA classifications are established in Table 1 of "Classification of the MGR Site Generated Radiological Waste Handling System."

Table 3. System Architecture and QA Classification

Site Generated Radiological Waste Handling System	QL-1	QL-2	QL-3	CQ
Liquid LLW System		X		
Mixed LLW System		X		
Solid LLW System		X		

APPENDIX C ACRONYMS, SYMBOLS, AND UNITS

C.1 ACRONYMS

This section provides a listing of acronyms used in this document.

ALARA	as low as is reasonably achievable
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
CPB	Carrier Preparation Building
CQ	conventional quality
DOE	U. S. Department of Energy
F	Function
HFE	human factors engineering
HIC	High–Integrity Container
ISO	International Organization for Standardization
LLW	site-generated low-level liquid and solid radiological waste
MGR	Monitored Geologic Repository
MGR RD	Monitored Geologic Repository Requirements Document
NTS	Nevada Test Site
N/A	not applicable
NRC	U S Nuclear Regulatory Commission
QA	quality assurance
QL	quality level
SDD	System Description Document
SSCs	structures/systems/components
TBD	to be determined
TBV	to be verified
WAC	Waste Acceptance Criteria
WHB	Waste Handling Building
WTB	Waste Treatment Building

C.2 SYMBOLS AND UNITS

This section provides a listing of symbols and units used in this document.

°F	Degrees Fahrenheit
%	Percent
pH	Hydrogen Ion Concentration Potential

APPENDIX D FUTURE REVISION RECOMMENDATIONS AND ISSUES

This appendix identifies issues and actions that require further evaluation. The disposition of these issues and actions could alter the functions and design criteria that are allocated to this system in future revisions to this document. However, the issues and actions identified in this appendix do not require TBDs or TBVs beyond those already identified.

D.1 A verification that we do not need to deal with Noble gases as a radioactive waste form is needed. It must show that we stay within 10 CFR 20 limits with Design Basis Events involving broken fuel and when venting casks as well as in the Site Generated Radiological Waste Handling System.

APPENDIX E REFERENCES

This section provides a listing of references used in this SDD. References list the Accession number or Technical Information Catalog number at the end of the reference, where applicable.

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